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Historical and contemporary perspectives on management of forests and fisheries in island Southeast Asia

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and

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Preface

In June 2002 an international group of historians, anthropologists, and geographers gathered in Leiden to share and compare their knowledge of the human impact on forest and marine ecosystems in insular Southeast Asia – the modern countries of Indonesia, Malaysia, and the Philippines – over approximately the past 150 years. Organized in conjunction with EDEN (Ecology, Demography and Economy in Nusantara), the environmental history research project of the Koninklijk Instituut voor Taal-, Land- en Volkenkunde (KITLV), this workshop was entitled Sustainability and Depletion in Island Southeast Asia; Forests and Fisheries, Past and Present. Its aim was to collate and examine its participants' research with a view to identifying some of the institutional, economic, demographic, and ecological conditions for sustainable use of natural resources. Forests and fisheries were selected as twin empirical themes not only because of their salience as contemporary environmental issues, but also because the issues and problems involved in managing these types of resources sustainably are to some extent similar (although in instructive respects different as well) and it was hoped that each would throw light on the other. To what degree these aspirations were realized must ultimately be judged from the remaining chapters of the present volume, all revised and cross-referenced versions of the papers presented at the Sustainability and Depletion workshop.

This volume is the sequel to *Paper landscapes; Explorations in the environmental history of Indonesia* (Boomgaard et al. 1997), a collection of articles published in 1997 by KITLV Press, which, in turn, was based on the first EDEN workshop held in Leiden in 1996. The essays in *Paper landscapes* emphasize developments in the past that had a bearing on contemporary environmental circumstances, and most of the material presented in the book had been gathered in archives and libraries. Although the present volume also contains historical chapters – some of them going far back in time – the majority of the researchers represented here take their stories up to the present, having based their findings at least partly on fieldwork. Rather than archival researchers, they are muddy-boots environmentalists who have witnessed the muddying of the waters caused by erosion owing to deforestation and by several harm-

ful methods of exploiting the marine environment. Hence the title.

Funding for the workshop and the book was graciously provided by KITLV, the Netherlands Organization for Scientific Research (NWO), and the Royal Netherlands Academy of Arts and Sciences (KNAW). The editing process of the book was greatly facilitated and speeded up by Anne Simpson and Petry Kievit, English-language editors and members of the fellows support group of the Netherlands Institute of Advanced Study (NIAS) in Wassenaar, the Netherlands, where Peter Boomgaard was fellow in residence during the academic year 2003-2004.

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Introduction

Forests and fisheries in island Southeast Asia

Histories of natural resource management and mismanagement

Forests and seas are two domains in contemporary Southeast Asia in which overexploitation and depletion of resources are all too familiar. Snarling chainsaws and falling trees, great rivers jammed with floating logs, and cities cloaked with choking haze from the burning remnants of rainforests have become some of the most recognizable journalistic images of the region. Coral reefs smashed to rubble by dynamite fishing, sea turtles gasping upturned in fishermen's boats, giant factory trawlers emptying the life out of blue tropical seas, and sharks bleeding to death after their fins are casually severed for soup – all have figured in documentary films set among Southeast Asia's islands, and in the publicity campaigns of well-known conservation organizations.

Yet while both deforestation and the exploitation of marine resources (for commercial as well as subsistence purposes) have long histories in the region, the present excessive levels of logging and fishing are rather recent developments. As James J. Fox stresses in the evocative essay which immediately follows this introductory chapter, it is essentially within a single generation – the last generation – that almost all of Indonesia's lowland forests have been felled, and almost all of its coral reefs damaged or destroyed. Although earlier episodes of unsustainable resource extraction did occur at certain times and places, until a few decades ago it was more common for fishing and forest-related economic activities in Southeast Asia to have limited and (at least in the long term) rather stable effects on the environment. Did this stability simply reflect low population densities, weakly developed markets, and inefficient extractive technologies? Or was it (also) the result of successful resource management techniques and institutions? If so, why have these since been abandoned? Perhaps most importantly: what, on past evidence, might usefully be done to relieve the pressure on the region's forests and marine ecosystems?

The ambitious goal of the workshop on which the present book is based was to compare research on the history of relationships between people and environment in island Southeast Asia (Indonesia, Malaysia and the Philippines) with a view to identifying some of the preconditions – whether institutional, economic, demographic, or ecological – for sustainable resource use.

Forests and fisheries were selected as twin empirical foci because of their comparable salience as environmental issues, and also because the problems and issues involved in managing these two types of resource sustainably are to some extent similar. In the present chapter, which attempts to place all contributions to the volume in a comparative and theoretical context, several themes recur in the treatment of both topics. These include the question of how sustainability should be defined; the effect of transitions from subsistence-oriented to commercial resource use; the significance of property rights and social institutions; the role of the state; the prospects for involvement of local communities in resource management; and the relationship between sustainable exploitation and nature conservation. In important ways, nevertheless, the dynamics of forestry and fisheries are different, and like the book as a whole this chapter is divided into two parts. The first, dealing with forests, was written by David Henley. The second, dealing with fisheries, was separately written by Manon Osseweijer.

Forests and forestry

Inconsistencies in the available data make reconstructing the history of deforestation in Southeast Asia a surprisingly contentious business. On the basis of an Indonesian Forest Service vegetation map from 1950, a recent report sponsored by Global Forest Watch (FWI/GFW 2002:8) claims that at that date fully 84% of Indonesia was still under some form of forest (including secondary forest and plantations). In the present volume, by contrast, Peter Boomgaard uses statistical sources from the colonial period to arrive at an alternative estimate for 1950 which is equivalent to 'only' 70% of the land area. In parts of Africa, likewise, errors in historical data and retrospective estimates seem to have been mostly in the direction of exaggerating past forest cover, so that the speed of recent deforestation has been overestimated (Fairhead and Leach 1996, 1998). Nevertheless there is no doubt that in global terms the focus of deforestation has now shifted decisively from the temperate countries, where forest cover has undergone a partial recovery since 1950, to the tropics (Lomborg 2001:113; Repetto 1988:2). Southeast Asia, the most populous and economically dynamic part of the tropical world as well as the closest to the major timber markets of East Asia, has been in the forefront of this development, and will remain so in the foreseeable future. Despite his insistence that the process

of deforestation in Indonesia has been a 'long goodbye' rather than a sudden disaster, Peter Boomgaard (this volume) concedes that if current trends continue the country may be 'entirely without forests' by 2050. In Kalimantan and Sumatra, lowland rainforest – the richest type in terms of timber resources and biodiversity – may disappear as early as 2010 (FWI/GFW 2002:XI). In peninsular Malaysia and in the Philippines north of Mindanao, according to S. Robert Aiken and David Kummer respectively in this volume, it has very nearly disappeared already.

In search of sustainability

The modern retreat of the forest in Southeast Asia, as in other parts of the tropical world (Cleuren 2001), has typically occurred along frontiers which are pioneered by loggers and then consolidated by agricultural colonists (Gerard Persoon and Eric Wakker, this volume). From the air the progress of the frontier is dramatically visible as advancing bands or roadside ribbons of logging, settlement, and land use change in which the forest is first stripped of its most valuable trees, then gradually but permanently converted to an expanse of farmland or plantations. In the intermediate stages of this conversion, what remains of the forest vegetation is intensely vulnerable to (accidental or deliberate) burning. During the drought of 1997 and 1998 almost 100,000 square kilometres of degraded forest in Indonesia was ravaged by fire (Applegate et al. 2002:295), shrouding huge areas of Sumatra, Kalimantan, and even peninsular Malaysia in haze (Glover and Jessup 1999).

In the past, by contrast, the same forests were the home of swidden farmers who felled trees and set fires only locally and temporarily, deliberately making use of forest regrowth to restore the fertility of their fields between successive cycles of cultivation. The resulting landscape was an ever-changing but ultimately enduring patchwork of swidden fields, young woodland, and more mature forest. That this was a highly sustainable way of producing foodcrops on poor rainforest soils has long been appreciated (Conklin 1957; Isikowitz 1951). Toward the end of the twentieth century there was also much interest among scholars and foresters in how shifting cultivators enriched their fallow woodland, and sometimes nearby stands of permanent forest, with useful tree species, leading to a new characterization of swidden farmers as 'managers of the forest' (Colfer and Dudley 1993).

Nor were swidden farming and the associated arboriculture the only ways in which forests now sacrificed for short-term gain once provided long-term economic benefits. In many areas commercial forest products such as rattan, tree resins, beeswax, and certain valuable timber species were collected from them in a sustainable way for decades, even centuries, for export (Knapen 2001:356; Mulder, Heri and Wickham 2000:249-52). In Sumatra, concludes

Freek Colombijn in this volume, this was true of all but three of the commercially significant non-timber forest products over the whole period from 1600 to 1870. In the short term the rate of extraction was not always smooth, and whether or not exploitation could be considered sustainable often depended on the timescale involved. One common practice was what in related literature is referred to as 'pulse harvesting' – the extraction of a resource in short, intensive bursts separated by long rest intervals (Berkes 1998:120). On the Indonesian island of Sumbawa, for example, sappan wood (used to produce dyestuffs) was exploited for centuries in successive waves of intensive cutting separated by interludes during which reserves were able to recover (De Jong Boers 1997:276-7). In seventeenth- and eighteenth-century Java, the Dutch East Indies Company periodically banned the felling of teak in areas where the teak forests were perceived to have been overexploited (Boomgaard, this volume). In such cases it is sometimes unclear whether the system in question reflected an actively planned rotation, or simply an ad hoc reaction to cyclic depletion. Comparable patterns of intermittent overpredation and disequilibrium, as ecologists increasingly recognized in the 1990s, also occur in natural ecosystems (Botkin 1990; Zimmerer and Young 1998). But whatever the degree of intentionality involved, pulse harvesting often made in the long run for sustainable exploitation of forest products.

So far the term 'sustainable' has been used here to refer to systems of resource use which are able to produce, at least on average, a constant level of economic benefits over a long period. This is a narrower definition than those used in much of the recent literature, which take their cue from the ideas on 'sustainable development' formulated by the Brundtland Commision in the 1980s (WCED 1987) and include more abstract criteria such as preserving the 'quality' of the environment and the 'integrity' of ecosystems (Smith and Jalal 2000:16). Since continuity of production depends on the preservation of all aspects of the environment which are necessary to ensure the survival of the species under exploitation, some would say that in the long run economic sustainability is fully compatible with, if not identical to, ecological stability (Pasqual and Souto 2003). The exhaustion of one particular resource, however, need not be an economic problem for its exploiters provided an equally remunerative alternative is available to them after it is gone. Timothy Jessup and Nancy Peluso (1985:506), writing on forest product collectors in Kalimantan, have described a pattern of behaviour which they call 'deplete-and-switch' in which 'a resource is exploited equitably and efficiently until it is exhausted, at which time users can switch to another'. Boom-and-bust exploitation cycles are not exclusive to big business operations, and neither do they always spell disaster for those involved. Following recent calls for a move toward 'resilience' – the ability to absorb and utilize change – as a criterion of excellence in man-made ecosystems (Brookfield 2001:271), it could even be argued that the

ideal situation is one in which 'depleting and switching' can simply continue indefinitely in response to changing market demand and local availability. But ensuring that switching from one resource to another always remains possible means maintaining a high level of biodiversity, at least in the agricultural or forestry domain and preferably also in the wild, as a reservoir of potential economic species and varieties. In this respect economic planning can be said to converge after all with nature conservation, of which more shortly.

Technology, commerce, and demography

The current assault on the Southeast Asian forests reflects a combination of three basic forces: technological innovation, commercial demand for timber and agricultural products, and population growth. In technological terms, to begin with the first of these factors, it has been made possible by chainsaws and heavy motor vehicles – and, in perhaps equal measure, by efficient wood preservatives (Ooi Jin Bee 1993:67). In colonial times, limitations in transport and preservative technology meant that commercial logging in insular Southeast Asia was largely restricted to the exploitation of teak, an exceptionally valuable export timber, from the monsoon forests of Java, where a uniquely well developed road network facilitated its extraction. Elsewhere only even more precious species such as ebony and sandalwood – or, in the vicinity of Singapore and other big cities, high-grade construction timbers like ironwood – could justify the costs involved in felling and transporting wood without modern mechanical aids. The difficulty and expense of extraction not only reduced the pressure on the forests as a whole, but also provided incentives to protect and replant accessible reserves (Boomgaard 1988:72-3). Today, by contrast, rapidly constructed roads enable loggers to venture further and further from the main ports and rivers as the more accessible timber is depleted, and in the past decade much primary rainforest in Indonesia has been felled simply to produce wood pulp and paper (FWI/GFW 2002:32).

If technology has facilitated the linking of supply to demand, it is market forces, and the developed world's 'insatiable appetite' (Tucker 2000) for timber products, which are ultimately responsible for most of the recent forest destruction in island Southeast Asia. In the Philippines, notes Kummer in this volume, deforestation began to accelerate in the 1950s because it was then that rising demand for tropical timber abroad, combined with an increasingly corrupt political system, first made the country's natural forests attractive targets for large-scale logging operations. The logging boom in Indonesia did not begin until the late 1960s, when the incipient decline of timber reserves in the Philippines coincided with the reopening of the Indonesian economy to international trade after a period of protectionism and political instability (Lesley Potter, this volume). The amounts of money involved were huge: by

the mid-1970s forest products accounted for close to 20% of all Indonesian export earnings (Ross 2001:169). In the mid-1990s, despite the country's celebrated success in diversifying its exports under the New Order regime, the figure was still above 10% (Dudley 2002:358). Throughout this period, logging and timber processing were mainly the preserve of large private concerns dominated by politically connected 'timber tycoons' – one of whom, Prajogo Pengestu, came to control more of the world's tropical rainforests than any other individual (Barber, Johnson and Hafild 1994:72). Large-scale private oil palm and pulpwood (acacia) plantations, often owned by the same conglomerates that control the logging concessions, have now emerged as a common use for logged-over land, and provide an additional stimulus for deforestation (FWI/GFW 2002:36-43).

Tree crop plantations, of course, are themselves forests of sorts, and this raises the question – addressed by Kummer in this volume – of where forestry stops and agriculture begins. In the case of the regimented oil palm monocultures which have come to dominate so much of the rural landscape in Indonesia and Malaysia, the contrast with the natural forest they have replaced is in every way dramatic. The question is more complex, however, when it comes to the biodiverse 'agroforestry' systems, based on commercial tree products including copra, rubber, resins, and in some areas also fruits, timber and firewood for local markets, which are now employed by many Southeast Asian smallholders.

> Agro-forests are extremely close to natural forest formations in their dominance, diversity and origin of most of their species. Some of them have the structural as well as functional characteristics of a primary forest ecosystem, with high specific richness, great ecological complexity and closed mineral circulation systems. As with natural forests, agro-forests can be considered sustainable in the long term. (Michon and De Foresta 1995:94.)

Many such agroforests have developed via the commercialization of what used to be subsistence-oriented swidden farming systems (Dove 1993; Salafsky 1995). In ecological terms they may even be superior to these in that by making possible the substitution of imported for locally grown rice, they result in a higher proportion of the landscape remaining under tree cover. Although traditional swidden farmers were often efficient managers of the forest, their greatest attention was focused on food crops which could not be grown under the shadow of a tree canopy (Donner 1987:167).

> Until the introduction of rubber in the 1920s [...] the landscape managed by Salako Dayaks consisted of largely swidden field crops and their multi-aged fallows [...]. Rice self-sufficiency was crucial to local people when markets were few and food supply local; numerous large swiddens provided the family's food and dominated the landscape. In 1991, only a third of the villagers planted any swiddens at all; the

> average size of these was a meager one-third hectare. Economic trees now dominate the landscape. (Peluso 1996:517.)

Despite first impressions, then, the relationship between economic commercialization and deforestation is not always a simple one. It depends partly upon property rights (of which more below) and on whether smallholders are dispossessed by logging and plantation concerns, or allowed to respond to market forces in their own ways. By planting trees to supply local markets with scarce firewood, observed Kummer in his contribution to the workshop on which this book is based, 'Cebuano farmers responding to market incentives have most likely reforested more of Cebu than all of the governmental and private organizations working in the uplands'.

Similar complexities emerge when the relationship between demography and forest depletion, straightforward at first sight, is examined in detail. Population growth, and the associated expansion of the area under (subsistence and semi-subsistence) foodcrop cultivation, was probably the most important single factor behind the retreat of the forests in island Southeast Asia before about 1970, and has continued to play a significant subsidiary role since (Boomgaard, this volume). Because, however, dense populations tend to be more efficient than sparse ones in their use of land for agricultural purposes, the rate of deforestation has seldom been fully proportional to that of population growth. In the past, indeed, some of the largest expanses of grassland and savannah in Southeast Asia were created by very sparse populations of farmers and herders who made more or less indiscriminate use of fire to create pasture for livestock (Henley 2002:188; Terra 1958:171). Where the population was denser, by contrast, the greater scarcity and value of land tended to discourage extensive burning and to encourage investment in 'landesque capital' (Blakie and Brookfield 1987:9), including tree crops as well as tilled fields and irrigation infrastructure (Metzner 1982; Nibbering 1991). Unexpectedly positive relationships between population density and sustainable use of the environment have also been well documented in some African contexts (Leach and Mearns 1996; Tiffen, Mortimore and Gichuki 1994).

In Southeast Asia the link between population growth and deforestation has been further weakened in recent times by an accelerated process of agricultural intensification, based partly on Green Revolution crop varieties and technologies, which has made it possible for unprecedented numbers of people to be fed from limited areas of farmland. As in other parts of the world, moreover, the improvement in yields, for reasons connected with access to markets and credit, has generally been greatest in already populous areas (Platteau 2000:31-67). A related development has been the spectacular growth of non-agricultural employment opportunities, which has greatly reduced the attraction of pioneer farming in remote areas on the forest fringe

by raising the opportunity costs of labour (Angelsen 1995:1718). In the most densely populated parts of Java, ironically, shortages of agricultural labour as a result of competition from off-farm employment were already apparent in the 1980s (Preston 1989). Today they are also widely felt in Malaysia and the Philippines (Rigg 2001:102-21). At the same time an increasing proportion of the population is ceasing to inhabit rural areas at all: by 2010, almost half of all Indonesians and two thirds of Malaysians and Filipinos are likely to live in cities (Jones 1997:238).

Aiken, in this volume, notes that in West Malaysia the pace of new land development began to slow down after 1985 as urbanization and industrialization created more and more jobs which paid better than those available in agriculture. Today, he argues, the agricultural frontier on the peninsula has effectively been closed and the area under forest 'stabilized by economic development', although timber depletion continues beyond the settled area as a result of logging. As a generalization the idea of an 'Environmental Kuznets Curve', in which economic growth leads initially to a deterioration but ultimately to an improvement in environmental quality, has recently attracted a good deal of criticism (Smith and Jalal 2000:29; Pasqual and Souto 2003:47-8). If commercial logging can be curtailed, nevertheless, it is possible that developments like those described by Aiken may ultimately bring Southeast Asia into line with the historical experience of large parts of the developed world, where economic growth, beyond a certain threshold level of prosperity and industrialization, appears to have favoured the protection and sustainable management of forests (Grainger 1993:77-82; Palo 1994:54).

Property rights

Most modern discussions of property rights in resource management ultimately take their cue from Garrett Hardin's famous article on the 'tragedy of the commons' (Hardin 1968). Hardin argued that in the absence of private ownership rights or coercive state control, exhaustible resources would inevitably be exhausted as individual users exploited them unsustainably on the assumption that if they did not do this themselves, others would. As a predictive model this has long been undermined by a great variety of historical and anthropological research showing that in practice access rules, with monitoring and enforcement mechanisms to back them up, have usually been present even when neither private property rights nor government control (at least in the modern sense) were in force. Historically speaking, in other words, the commons is typically a collectively managed rather than an open-access resource. At a seminal conference on common property resource management held 18 years after the publication of Hardin's article, Elinor Ostrom (1985) went so far as to conclude that with the important exception of

ocean fisheries, where the mobile or 'fugitive' character (Oakerson 1992:41) of the resource complicates the problem of apportioning exploitation rights and enforcing exclusion rules, any small group of people which has depended for a long period on a moderately scarce resource can be assumed to have developed the organizational means to manage that resource as its common property.

In a world of change and globalization, on the other hand, small groups of resource users with long histories of dependence on a particular resource are now more the exception than the rule. Later research on the same topic, moreover, has tended to add further exacting preconditions for the emergence of effective collective action in the commons: cultural homogeneity, for instance, or strong economic interdependence among the members of the user group (Agrawal 2001). Because most recent forest exploitation has occurred in frontier environments characterized by migration, conflict, dispossession, and contested ownership and use rights, collective action problems or 'tragedies' very similar to that modelled by Hardin have certainly contributed to the deforestation process in Southeast Asia. In lowland Sumatra and Kalimantan during the 1990s, for example, a destructive yet self-sustaining 'land race' took place in which local people as well as outside interests felt forced to clear as much previously forested land as possible in order to establish control over it before other parties beat them to it (Lynch and Talbott 1995:98; Sellato 2001:126-7).

Privately owned resources, as Hardin predicted, do tend to be conserved more effectively than an unmanaged or mismanaged commons. In Kalimantan during the fires of 1997 and 1998, recalled Potter during the workshop, local people were careful to protect their own holdings but often had no feelings of responsibility toward the forests, which were seen as belonging only to a greedy and irresponsible government. In many places private land ownership has also proven conducive to active reforestation as a means of safeguarding the sustainability of agricultural production: in parts of upland Java, for example, small farmers have successfully halted serious land degradation by planting trees on their holdings (Filius 1997). But even if this were the whole story, it probably would still not be possible to promote environmental protection simply by means of legal intervention to promote private tenure. Land titling and redistribution programmes have a poor record of effectiveness in Southeast Asia (Roth 2003:25, 304), and research suggests that in societies of small farmers individualized land ownership is not primarily an artefact of the state at all, but rather emerges spontaneously in response to local demand for it as population growth and economic development raise the scarcity and value of land (Netting 1993:157-88; Platteau 2000:75-92).

One area in which the state often does play an important role in the allocation of property or access rights is large-scale commercial forestry. Many

writers have commented on the need for the duration of logging leases to be commensurate with the speed of growth of the timber species concerned if concessionaries are to have any financial incentive to manage the resource sustainably (Baland and Platteau 1996:280; Brookfield 1993:28). Potter, in this volume, notes the ironic fact that although in 1972 the Indonesian forestry authorities officially recommended that timber be exploited on the basis of a 35-year rotation, the duration of initial timber leases was only 20 years, creating an obvious reason to 'cut and run' rather than protecting immature trees in anticipation of a subsequent harvest cycle. In 1999 a new forestry law at last provided for the extension of leases up to a maximum of 55 years. But some commentators believe that forestry companies will not adopt sustainable methods of hardwood production regardless of the duration of their leases (Ida Aju Pradnja Resosudarmo 2002:172). One reason for this is that uncertainties regarding the future price of timber products, the continuity of political patronage from within the state apparatus, and even the strength of conservation lobbies, may contribute moreto the outlook of logging concerns than does the formal legal environment (Dauvergne 2001:167-9).

State, community and society in forest management

Regarding the role of government, the environmental literature on Southeast Asia tends to veer between two polar views: that the state is an essential guardian of the commons and counterweight to market forces in promoting sustainable resource management, and that it is a predatory institution conspiring with capital in the unsustainable rape of the commons. In this book Aiken, at one end of the spectrum, acknowledges the partial effectiveness of state forest protection in Malaysia and sees failings in this field mainly as administrative malfunctions or sins of omission. Potter, despite her general scepticism regarding such protection in Indonesia, likewise gives the forestry service some credit for opposing ultimately more powerful political forces favouring forest destruction. Kummer, by contrast, does not hesitate to characterize the whole post-independence Philippine state apparatus as a form of 'institutionalized looting' which is 'best demonstrated in the forestry sector'. Suseno Budidarsono and Paul Burgers echo other reluctant tributes to state teak forest management in Southeast Asia (Bryant 1997:12-3, 221-2; Peluso 1992:76, 243) when they concede that 'iron-handed' enforcement of forestry regulations in the nineteenth and early twentieth centuries, and again under the New Order after 1965, succeeded for long periods in preventing the depletion of Java's teak reserves. But in Timor, notes Fox, attempts to maintain a state sandalwood monopoly have contributed directly to the exhaustion of this resource by encouraging farmers to destroy any sandalwood seedlings

which sprout in their fields rather than preserve them for the benefit of bureaucrats.

That Southeast Asian governments have been deeply implicated in the unsustainable logging of the last generation is clear, although views differ on how the blame for this should be apportioned between capitalists, bureaucrats, and politicians. Whereas some see the problem as one of 'weak state capacity' in the sense of vulnerability to manipulation and corruption by rent-seeking private logging interests (Dauvergne 2001:67, 165; McCarthy 2000:123), others argue that initially strong and efficient government forest management institutions were deliberately appropriated and destroyed by 'rent-seizing' actors within the state apparatus itself in order to finance prestige projects, or for private gain (Ascher 1999:244-5; Ross 2001:1-4, 36-8).

> One would like to think that governments exist to take care of the public good and that ensuring fairness in access to opportunities and resources for all their citizens, present and future, would be their fundamental role. But in so many of the forest-rich countries of the tropics, this has not been the case. Rather than holding forests in trust for the nation, [...] government officials have usurped rights to the forest for their personal enrichment. [...] In many countries, the most visible symptom of bad governance has been abuse of forests. (Sayer 2002:XVII.)

In Indonesia and Malaysia the state has also actively sponsored a great deal of agricultural deforestation by encouraging, and in part also organizing and financing, large-scale migration of farming households to frontier areas (Bahrin and Lee 1988; Levang 1997). Even when state forest management has been effective, moreover, it may have tended to suppress more egalitarian alternatives and erode whatever ability local populations have, or might otherwise have developed, to manage the same resources themselves. In Java, according to Budidarsono and Burgers in this volume, the refusal of the New Order authorities to share any real power over state forest reserves with local people meant that public respect for those reserves never became more than superficial, and evaporated once the regime in question ceased to exist. In Kalimantan, the process of political 'reformation' (*reformasi*) which followed the fall of Soeharto 'was perceived to mean that previous controls no longer applied' (Potter, this volume), so that what followed was an opportunistic free-for-all involving invasions of protected areas and a huge increase in illegal logging.

Few states, of course, are exclusively predatory in nature, and their functions as arbitrators of conflicts and providers of public goods are increasingly recognized in the political economy literature (Barzel 2002; North 1990). Writers on resource management, too, acknowledge the usefulness of what Ronald Oakerson (1992:48) has called 'external arrangements' – that is, government and the law. Ostrom (1990:101-2, 1992:307-8) has observed that

where common property institutions are successful, they are typically nested in hierarchies of larger organizations which include a national legal system. Even on the smallest scale, it should be remembered, traditional resource management systems usually included both coercive regulations (Devung 2003:151) and some form of enforcing authority (Berkes 1998:125). In precolonial Indonesia the authority of indigenous aristocrats, exercised explicitly in the name of the community as a whole, was instrumental in protecting particular commercially valuable resources from untimely depletion (Eghenter 2000:339-40; Jessup and Peluso 1985:519). In Sulawesi, local rulers acted as stewards and protectors of the sago groves which provided emergency food for their subordinates in times of famine (Henley, this volume).

The central obstacle to recreating such arrangements on a larger scale today is ultimately the conundrum identified by Bryant and Parnwell (1996:13) in an earlier discussion of politics and the environment in Southeast Asia: how can states be trusted to implement policies that would resolve environmental problems which they themselves have demonstrably played a major part in generating? The obvious solution would appear to be democracy and devolution of power, but in practice the relationship between decentralization and sustainable resource management is not a strong one. Aiken (this volume) notes that in Malaysia, federal forestry department quotas and regulations have frequently been ignored by state governments because the latter stand to gain more directly from timber fees. Others have pointed to examples of 'irresponsible local government' (Bennett 2002:61-2) and warned that, given the greater opportunities for corruption to which they give rise, 'devolution and decentralization by themselves are no guarantee for reducing the rate of deforestation' (Gautam et al. 2000:XVII). Since the fall of Soeharto, the implementation of democratic reforms, and the beginnings of administrative decentralization, corruption at local level has certainly been on the increase in Indonesia (Athukorala 2002:143). One reason for this is the greater insecurity in office of democratically elected politicians, and their need to generate rapid revenues to fund pork-barrelling election campaigns (Ross 2001:39-41).

In the 1990s many experts, building on the earlier idea of 'community-based natural resource management' (of which more below in the fisheries section of this chapter), came to see the solution to many environmental problems as lying in 'co-management' partnerships between local communities and the state. Communities, it was proposed, would determine their own common property management rules and the state would help to enforce these, in particular by ensuring that outsiders were excluded from access to community resources (Baland and Platteau 1996:348-51; Folke, Berkes and Colding 1998:431-3). Also referred to as joint, collaborative, or adaptive management, co-management has been criticized at a theoretical level – not least by Southeast Asianists (Li 2002; Tsing 1999) – for perpetuating idealized views

of traditional communities as cohesive and egalitarian social units (Scott 1976) existing in harmony with nature (McNeely and Wachtel 1988). Peluso and Vandergeest (2001) have questioned the very existence of traditional 'community forests' in Southeast Asia by arguing that the 'customary rights' of forest-dwellers in the region are in fact the inventions of colonial states. In this volume, Budidarsono and Burgers make the less contentious point that in reality the geographical units identified as communities by the state tend to encompass diverse groups with strongly divergent interests. The chapters by Henley and Colombijn, meanwhile, suggest that although effective co-management systems *avant la lettre* once existed in Indonesia, they long ago disappeared when indigenous states were supplanted by colonialism.

In Southeast Asia numerous plans for community forestry (Colchester 1994; Lynch and Talbot 1995) or 'social forestry' (Dove 1995; Lindayati 2002) under state auspices have been drawn up by international aid organizations. On paper these have had considerable impact on national forest policies, particularly in the Philippines (Braganza 1996:313-19; Van den Top 1998:176-7). But in practice, as the Budidarsono/Burgers and Potter chapters in this volume both illustrate, they have largely remained dead letters. Part of the reason for this, other than the ultimate unwillingness of government agencies to surrender or share authority, is undoubtedly the difficulty of finding communities which are (still) capable, as collectivities, of managing forest resources effectively even with state assistance. Yet as Potter also points out, a more thoroughgoing move toward local participation in forest management may now be inevitable in Indonesia given the magnitude of the deforestation problem and the partial breakdown of central state authority since 1998. If such a move is to be successful, I suspect it will have to be based less on the reinvigorated rights of established 'forest communities' than on newly created institutions of local democracy and on the emergence at the local level of a new 'civil society' (Lee Hock Guan 2004; Leifer 1995). As in the developed world, in other words, effective forest management in Southeast Asia will ultimately depend on civil public behaviour, civilized government, and the involvement of modern non-governmental organizations which are strong enough to counterbalance the power of the state without preventing it from providing public goods or enforcing the law.

Nature conservation

Even if the management of forests for sustained economic yields is consistent with the maintenance of biodiversity and ecosystem resilience, it is still not necessarily compatible with the conservation of wild nature. In the case of rainforest timber, the facts of biology would seem to imply a fundamental incompatibility between nature preservation and commercial exploitation. A

recent revision of the Indonesian forestry law, it was noted above, provides for the extension of logging leases from 20 to 55 years in order to encourage sustainable harvesting. But even after 60 years, according to one report from Sarawak, timber production levels from mixed dipterocarp forest would still be low (Arentz 1996:209). Estimates of the time needed for rainforest timber species to grow from infancy to fully commercial sizes begin at around 70 years, making sustained yield management based on natural regeneration, especially given the difficulty of felling selectively without also destroying much of the forest surrounding the target trees, little more than an abstract ideal. Tropical forests, as one timber company executive frankly told a journalist in 1986, 'just aren't sustainable economically [...] I don't care what anybody says, no one can wait 100 years for trees to grow' (Ooi Jin Bee 1993:139). Even a managed rainforest based on a hypothetical 100-year harvest rotation, moreover, would still differ considerably from its virgin prototype, one plot of which in lowland Borneo has been found to consist of trees ranging from a minimum of 110 to a maximum of more than 700 years old (Dove 1983:126). The prospects for sustainable exploitation of non-timber rainforest products such as rattans are of course better (Van Valkenburg 1997), but it is not clear whether at natural densities these would provide benefits comparable in economic terms with those obtainable from other potential land uses.

If any tropical rainforest is to be preserved in its natural form, then, it will probably have to be protected more or less completely in nature reserves, where economic opportunities for local people may be restricted to employment as park personnel such as the Punan guides employed by the Gunung Mulu National Park in Sarawak (Voeks 1998:321-2). It is of course doubtful whether this kind of protection could ever be a purely local initiative. The almost exclusively colonial origins of nature conservation in Southeast Asia (Aiken 1994; Boomgaard 1999) are acknowledged in several of the contributions to this volume (Boomgaard, Aiken, Persoon and Wakker). According to a well-known argument by Richard Grove (1995, 1997), colonial regimes the world over were in fact excessively committed to nature conservation to the detriment of their indigenous subjects. What is perhaps more surprising is the extent to which the protection of nature in Southeast Asia has remained a foreign concern even in post-colonial times. In West Malaysia (Aiken, this volume) only a handful of new national parks have been established since independence in 1957, and the total effective protected area coverage is still almost the same as it was in 1940. In Sumatra, by contrast, a large number of new protected areas were established during the 1970s and 1980s, but in many cases these were foreign initiatives planned and funded by international organizations. Forest guards, according to Persoon and Wakker (in this volume), 'seem to be fighting an uphill battle for which external support is essential', and conservation projects often threaten to collapse as soon as

foreign 'start-up' aid is withdrawn. This dependence on external support, in turn, renders such projects vulnerable to political accusations that they represent foreign interference in Indonesian affairs.

Lessons from the past?

A glance through the forestry section of this volume will immediately reveal that in accordance with recent trends, most of the contributors have much more to say about the dynamics of forest depletion than they do about the possibilities for sustainable management. Nevertheless, some more positive historical lessons do arguably emerge. One such lesson concerns the ambivalent roles of population growth and economic commercialization in relation to sustainability. On moving resource frontiers and in other situations where time horizons are short and property or access rights insecure, demographic pressure or high levels of commercial demand for particular resources may encourage unsustainable rates and forms of exploitation. Certainly the emergence of superior job and investment opportunities in urban and industrial areas, and the consequent flow of population away from the agricultural and logging frontiers, have been good news for the surviving natural forests in parts of Malaysia. Where the institutional environment is stable and resources are subject to clear rules of access and exclusion, on the other hand, the scarcity and value of those resources under conditions of demographic and commercial pressure may function precisely as incentives to investment in sustainable forms of management. Examples in the forestry sector include smallholder agroforestry, and perhaps also nature reserves designed to attract paying visitors.

The exact form of the institutional arrangements involved here, which may be based on various combinations of private, common or state property, is less important than their robustness and continuity. The role of the state will probably need to be greater in the conservation of remote wild forest reserves than in the management of intensively harvested forests in populous areas, but other than this it is not possible to specify ideal institutional configurations on the basis of the historical evidence. What is clearer is that in the future, governmental and international institutions will have to secure the consent and cooperation of local populations, and of the public in general, if forest management efforts are to succeed. This is so not only because local people inevitably have some ability to disrupt any state management plan, but also because they are often the best designers of resource management rules. Citizens with an interest in forest management, conversely, need the state because even the most benevolent rules sometimes require punitive enforcement by a powerful but legitimate public authority. Ensuring that this authority remains legitimate, and that it does not abuse its power by breaking the rules itself, is of course a very difficult task. The maintenance of a healthy

balance between local organization and initiative on the one hand, and external support and enforcement on the other, presents particular problems in countries like Indonesia and the Philippines where civic traditions are weak and the state tends to alternate between authoritarianism and ineffectiveness. Solving those problems, nevertheless, is the essence of effective resource management, which in this perspective can be seen as one component of the wider challenge of democratization and the creation of a new social contract.

In many developed countries, there has been a significant increase in forest cover over the last few decades. Among the reasons for this reversal of the historical trend have been a contraction of the arable area due to specialization in non-agricultural sectors of the economy, a waning of population growth, an expansion of commercial timber plantations, a growth of public values supporting the protection and regeneration of natural forests, and the emergence of political institutions capable of promoting nature conservation in a legitimate and effective way. Surely it is not too unrealistic to hope that similar conditions will ultimately also prevail in Southeast Asia. A more worrying question is whether, given the current rate of depletion, they will do so before Southeast Asia loses as much of its natural forest as Europe did in the centuries prior to the reversal.

The sustainable management of fisheries, by comparison with that of forests, remains highly problematic today even in the developed world. Although fish reproduce more quickly than trees, they are also far more difficult to locate and confine, and this probably explains in large part why it is so difficult to find even moderate cause for optimism among the litanies of overexploitation which make up the historiography of marine resource exploitation in Southeast Asia. In retrospect, the attempt to draw parallels between fishing and forest exploitation was perhaps far-fetched – the more so since aquaculture, the form of fishery most directly comparable to forestry (particularly smallholder agroforestry) in terms of the feasibility of preventing (illicit) access to it, was not included in the conference purview. The remainder of this chapter, written by Manon Osseweijer, deals with the history and sustainability of island Southeast Asia's capture fisheries.

Capture fisheries

Crisis in the fisheries: to fish or not to fish?

The fishery sector forms the largest extractive use of wildlife in the world and is an important sector for various reasons. Fish is the number one source of animal protein. While the majority of people in developing countries rely on fish as their primary food source, in the developed countries, too, fish

has gained popularity and the demand for fish keeps rising. In addition, the fishery sector provides employment and hence forms a livelihood for an estimated 30 million people who are directly involved in capture fisheries and aquaculture, while another 200 million people are indirectly involved but dependent on the fishery sector. Moreover, fish and other marine resources are biologically necessary for the continuation of healthy coastal and marine habitats. Yet marine resources like fish are perhaps one of the most vulnerable resources as, until recently, they have not been perceived as being a high priority on the political agenda (World Fish Center 2002).

Fisheries in island Southeast Asia, as in other parts of the developing world, have been developed rapidly. Since the early 1980s, approximately half of world fish production was caught in these countries' waters, and five of the world's ten major fish producers were developing countries. Indonesia should also be perceived in this wider context of developing countries that achieved impressive growth rates in their fisheries during the 1960s or 1970s as a result of rising demand for fish (Platteau 1989). This rising demand came from the developing countries themselves, but most of all from rich consumers in developed countries, who demanded luxury species such as shrimp, prawn, lobster, and tuna. The pre-1970s pattern of fishing was characterized by labour-intensive and simple (though developing) techniques for catching, processing, and marketing of fish. The fundamental changes in this pattern can be summarized as: the rise of an ideology of planned development through state planning administrations, the rise of a modernization ideology, the discovery of vast quantities of fish resources in waters off the coast and the availability in the West of efficient technologies to exploit these resources, the rapid emergence of international markets for frozen fish in developed countries, and the pressure of strong balance-of-payment constraints in most developing countries eager to modernize (Platteau 1989:577). One effect of these forces was that ambitious fisheries development programs were embarked upon, aimed at a shift from traditional to modern technologies in the realms of production, processing, distribution, and marketing (Bailey 1988; McGoodwin 1990).

The numerous examples of overfishing as described in the literature on fisheries[1] have spoken of a crisis in the world's fisheries. Increased fishing effort, however, has led to increased catches and stocks that are under severe pressure. Overfishing presents serious problems of quantification since fish stocks, unlike terrestrial natural resources, are mobile and intrinsically difficult to detect. Total catch figures, the usual surrogates for stock statistics, may actually reflect the intensity of fishing activities more closely than they do

[1] See for instance Kurlansky 1999 on cod fishery, Safina 1999 on salmon and tuna fisheries, and publications addressing the more general topic of overfishing, such as McGoodwin 1990 and Iudicello et al. 1999.

the abundance of remaining fish reserves. In fact, since stock depletion tends to lead (at least in the short term) to more vigorous efforts (often sustained partly by rising prices) to catch the remaining fish, it is quite common for the total catch of a particular species to increase even while the stock is declining. However, whereas total production keeps increasing over a long period of time, the catch per unit (per fisherman or per fishing boat) will already be in decline. This is a sign of overfishing, but how much is too much? Although there is as yet no good overview of overexploited stocks, the FAO estimates that 35% of the 200 most important fish species are declining and 60% of them need urgent management action. Therefore there remains little doubt that what Butcher (this volume) calls the 'great fish race' run in Southeast Asian waters since 1960 has had a serious effect on the populations of a great range of marine animals. The problem is even more pronounced where the aggregate catch of a number of species is concerned, and the depletion of one type is compensated by greater concentration on another as described above. Overfishing is not necessarily the only reason for declining catches within a specific fishery; other reasons may include industrial pollution in inshore waters (John Butcher, Manon Osseweijer, this volume) or the diversion of labour and capital out of the fishing sector altogether as more profitable employment and investment opportunities become available in other fields, such as in manufacturing (Peter Reeves and Noelene Reeves, this volume).

Ever since the 1970s marine environmental policy has been emerging, mainly due to pressure exerted by marine conservationists and the extension of national jurisdiction from three nautical miles to 200 nautical miles, defined as the 'exclusive economic zone' (EEZ). This 200-mile limit was a first step in the direction of ending the idea of 'the freedom of the seas'. One might say that with this politico-juridical measure, which has been adopted by most coastal nations, including those of island Southeast Asia, people began to try to 'domesticate the fisheries' (McCay 2000:201-2). This domestication process started with access regulations and quotas and gradually reached 'true' domestication in the form of marine aquaculture or mariculture. However, domestication of coastal and marine fish stocks, in the sense of 'a predictable and mostly linear relationship between fish catches and the abundance of fish populations and hence that controlling catch levels will promote greater abundance', is by no means applicable to reality. Maritime ecological systems are inherently chaotic. Consequently, people involved in capture fisheries, in Southeast Asia and elsewhere in the world, are confronted with difficulty in managing fish stocks and fishing grounds (McCay 2000:211-2). Furthermore, in some cases fishermen have retreated from the sector and found other means to earn a living. But the majority of fishers, in order to provide for their livelihood, have started to use more efficient, but often at the same time more destructive, methods to keep catches up to a high level.

Fishery frontiers

In the course of fisheries history, fishermen all over Southeast Asia have been obliged to open up new horizons by sailing progressively further from their home bases in order to maintain or increase their catches in the face of overfishing (whether by themselves or by outsiders) in more accessible areas. The movement of Chinese-Indonesian fishermen based on Karimun Island (part of the Riau Archipelago, off Sumatra) into the Java and Arafura seas, for example, has been driven by their need to seek out new sources of red snapper, a valuable export species, as the yields from existing snapper fishing grounds have fallen. It would not be far from the mark to conclude that the opening of new fishing frontiers has been facilitated by the parallel advance of technological frontiers in boat design, fishing gear, and the location of fish stocks, which have made the capture as well as preservation methods of the marine resources caught more efficient (Bailey et al. 1987; Kusuma Atmadja 1993).

Because of overfishing in Indonesia's western seas, the 1980 trawl ban (which permitted fish and shrimp trawling activities only east of the 130° E longitude) as well as suggestions by both researchers and Indonesian government officials that the eastern waters were still underfished (referring to pelagic fish production), a shift in fisheries has taken place from western to eastern Indonesia. Many reports of the 1980s bear testimony to this historical shift (see for instance, Comitini and Sutanto Hardjolukito 1983; McElroy 1989).

The opening and pushing back of marine resource frontiers depends on various combinations of three factors: growth in market demand for new products; technological innovation; and exhaustion of existing resources. In capture fisheries (the sector which is central to all contributions on fisheries in the present volume), the 'ecological frontier' takes the form of previously unfished target species, and their development tends to involve a consistent sequence of stages. In the first stage, a potentially profitable fishery is identified but remains in an undeveloped state. Then as basic technology, essential infrastructure, and market demand improve, a rapid take-off follows during which fishing effort and catch increase rapidly. At the end of this phase, the fishery reaches maturity or full development. Stock variability now increases and catches start to exceed the economically optimal level. This is most often followed by a fourth stage, a phase of declining yields as overfishing severely reduces spawning potential. In the most serious cases, stocks fall below economic levels and the fishery collapses (Garcia et al. 1999:370-1).

Boom-and-bust cycles of this type have been evident in the exploitation history of many Southeast Asian marine resources, including seaweed, *trochus* shells, trepang (edible sea cucumber), sharks' fins, and live reef fish (Fox, and

Boomgaard this volume). John Butcher (also in this volume) even speaks of a process of 'fishing down the food web' whereby fishers, having overexploited large predatory fish, switch to smaller species lower down the food chain which have undergone a temporary increase in numbers due to the removal of their predators.

Other consequences of pushing resource frontiers are of a socio-political nature. Small-scale commercial and subsistence fishermen are more and more confronted with outsider fishermen, usually seasonally involved in larger-scale commercial fishing activities who 'follow the fish'. What for the latter is a new frontier to be opened is for local fishing communities the area of home reefs and fishing grounds upon which they depend for their livelihoods. Many examples have been recorded of serious user conflicts over fishing grounds and marine resources.

Fish as common pool resources

When the ownership and utilization of common property resources are considered, both social and natural scientists have used the metaphor of 'tragedy'. The metaphor was used for the first time and introduced to the academic arena by Garett Hardin (1968), inspired by Scott Gordon's publication on fishery resources as common property (Gordon 1954) and has led to a decades-long discourse on common property theory in an interdisciplinary research community. The 'tragedy of the commons' was taken over and used by many scholars, who started to test this theory in well-documented empirical studies, resulting in the formation of a whole body of critique.

One of the basic findings after two decades of research, as formulated by Randy Simmons and Peregrine Schwartz-Shea: 'the commons is not necessarily the problem suggested by theory: people do not always follow the inexorable logic of the tragedy metaphor' (Simmons and Schwartz-Shea 1993:2). As notions of culture and norms were absent in Hardin's argument, all people's decision making was generalized, assuming that humans 'are rational, narrowly self-interested, myopic maximizers' (Simmons and Schwartz-Shea 1993:3). Hence Hardin's search for solutions to this tragedy of the commons in state control and private property arrangements. However, culture and norms of groups in society are critical to understanding people's behaviour in a commons situation, which in this volume is shown by Isabelle Antunès, who describes the common property regulations of *trochus* fisheries in the Kei Islands, in eastern Indonesia. The fact that common property can sometimes be efficient, perhaps more efficient than other forms of ownership and management, though more often in small groups than in large societies, does not alter the fact that managing a commons is often very problematic.

As common property plays such a crucial role in fisheries worldwide,

many of Hardin's critics are scientists specialized in the economics and anthropology of fisheries. Contrary to Hardin, these critics have distinguished between two arrangements: communal or common property, which implies that the resource is controlled by a 'clearly defined community of users'; and open access, which is in fact not a management regime at all; property rights are nonexistent and access is free and open to all (Brox 1990; Berkes 1994; Persoon en Van Est 2003:7). It has been argued that it is this latter form of non-management which Hardin used to construct his theory.

Hence, the interdisciplinary community of anthropologists, economists, political scientists, and lawyers have come up with an alternative perspective for Hardin's tragedy of commons, namely a neo-communitarian perspective about common property resources. This perspective shows that the actual tragedies of over-exploitation and collapsed fish stocks and the related impoverished fishing communities may be cases of 'community failure'. This failure, which is institutional and concerns the control of access to the resource as well as the making and enforcement of internal decisions for collective use, is nourished by factors that include the state and the markets, two frequently mentioned solutions to the tragedy of the commons (Berkes and Folke 1998:7; McCay and Jentoft 1998). In most cases where one could speak of fishery resource tenure, the situation is rather complicated and involves 'bundles of rights' including use rights, rights to exclude others, rights to manage, and rights to sell fishing grounds (Schlager and Ostrom 1993).

In addition, Bonnie McCay also points out the importance of paying attention not only to social and community consequences of limited access to common resources but also to the many settings where 'freedoms to fish have long, complex, and contradictory foundations in social relations and culture'. As many scholars tend to equate fishing communities with community-based management arrangements, it is often forgotten that even in societies with open-access conditions people may use rules of appropriation of marine resources (McCay 2000:205, 209). Generally speaking, fish and other marine resources are not owned by fishers, but managed (or not managed) in the form of access arrangements to fishing grounds. Their mobility and relative uncertain presence makes fish rather difficult to manage. The extent to which fish can be caught and managed in a sustainable way depends heavily on the ecological knowledge base on the specific species, to be found within the world of fishery scientists and within fishing communities.

Sustainable fisheries

Although for a long time it was believed that there were plenty of marine resources for everyone, the idea of sustainability is by no means new to fishery, where the goal of achieving a sustainable yield is well known. A

sustainable yield is often roughly defined as a level of output that can be maintained indefinitely into the future (Charles 2001:1). Since the Brundtland Commission's influential 1987 report on *Our common future*, sustainability has been linked to development, ambitiously defined in that report as 'a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations' (WCED 1987:46). The sustainable development approach requires a more integrated view in which sustainability is multifaceted and the process is as important as the output. This notion attempts to integrate economic and social development into environmental protection by focusing on what will have to be changed so that commodity production and trading systems will reward both the efficient, sustainable use of natural resources and the workers and communities who maintain and extract those resources.

Applied to fisheries, sustainability involves the following issues. Ecological or environmental sustainability incorporates three areas, namely, ensuring that harvests are sustainable, maintaining the resource base (fish stocks), and 'the fundamental task of maintaining or enhancing the resilience and overall health of the ecosystem'. Socioeconomic sustainability refers to 'maintaining or enhancing overall long-term socioeconomic welfare', which implies sustainable net benefits from fisheries and reasonable distribution of these benefits among all fishers (Charles 2001:188-9). To distinguish these varieties of sustainability in a theoretical sense is one thing; taking these varieties into account in the real-life situation of the fishery sector is something else.

As to the socioeconomic circumstances of people involved in fisheries, it has long been believed that fishery rhymes with poverty. With a traditional perception of poverty, scientists, government officials, and NGOs alike explained that either fishermen were poor because of the open-access nature of fisheries (a growing number of fishermen is involved in the exploitation of a certain stock) or people were already poor and regarded fisheries as a last resort (due to a lack of alternative employment outside fishery, people are forced to make a living in this sector) (Béné 2003:951-5). However, more recent insights have pointed toward a more multidimensional nature of poverty, which distinguishes between various factors leading to poverty, such as economic exclusion (leaving individuals out of a fishing activity because of their economic/financial inability to access the necessary capital), social marginalization (the denial of access to a fishing resource faced by certain individuals or groups based on social criteria), and political disempowerment (poor people's lack of a clear political agenda and voice) (Béné 2003:960, 962, 964-5). Consequently, social science research has paid more attention to the range of livelihood strategies of fishermen to cope with the uncertainties inherent in

the fishery sector as well as unexpected crises of both natural and economic cause (Allison and Ellis 2001).

In addition, community sustainability emphasizes the micro level or 'the desirability of sustaining communities as valuable human systems in their own right, and more than simple collections of individuals'. Here the welfare of the community of fishing families is regarded as important because sustainable fishing communities are by definition self-supporting, which is, according to many social scientists, in the public interest as well. Institutional sustainability in the fisheries, finally, refers to the maintaining of suitable financial, administrative and organizational capability. This also includes the bodies or agencies that implement management rules (Charles 2001:189).

As to sustainability in fisheries, many people tend to believe that in the past fishing communities or groups of fishers were always exploiting marine resources in a sustainable manner. A very logical argument usually given is low population pressure on the fisheries sector. However, when investigating the fisheries situation of Indonesia in the colonial and early post-independence past, one encounters a number of examples of unsustainable fishing, such as overfishing of the sea cucumber and pearl oyster grounds in the Aru Archipelago, in eastern Indonesia (Spyer 2000; Osseweijer 2001) and excess fishing of *terubuk* (shads) in the waters of Bengkalis (Riau) in western Indonesia. Boomgaard as well as Pujo Semedi in this volume present quite a few similar examples which demonstrate that greed is of all times and can be pretty devastating.

The role of the state

Scholars and management planners alike have criticized the role in the fisheries of the state and the various governmental levels. Criticisms are: a lack of acknowledgement of property rights and community-based management arrangements, a top-down approach to fisheries policy and management, which is beholden to economic incentives, and a habit of ignoring scientific advice. This negative perspective of the role of the state elicits the question: is the government part of the fishery problem or will it provide solutions? Those who believe that the state is part of the fishery problem tend to overromanticize the capability of fishing communities to manage their fisheries or to overestimate the role that could be played by the private sector, in the case of fisheries in the seafood industry, with little or no involvement by the state. A good example of the seafood industry is the initiative taken by the Marine Stewardship Council, a market-based incentive to improve management of fisheries worldwide. This council, which was founded in 1997, labels fish that is caught in a sustainable way; this can be seen as the counterpart of the eco-labelling of products made of sustainably grown and logged wood.

By labelling seafood products for the Northern (US, EU, Japan) market, the council supports the ecological continuity of fisheries, the integrity of ocean systems, and responsible and effective management. As to community-based management, there are examples of successes, which in turn are used by certain proponents as proof that the state is not needed at all. However, as discussed below, these successes are dependent on very specific circumstances. In general, most people engaged in fisheries management would agree that the state has a role to play in fisheries: at the level of international cooperation as well as the level of nations and regions.

Since the 1960s, Southeast Asian states have been playing a prominent role in opening up new fishery frontiers at a faster rate by adopting policies designed to improve fish marketing and stimulate investment in more efficient boats and equipment (Comitini and Sutanto Hardjolukito 1973; compare Platteau 1989:579-85). This was intensified after the UN Convention on the Law of the Sea (UNCLOS) in 1982, which has enlarged the territorial waters of most of Southeast Asian countries from 12 to 200 miles. The driving force behind establishing Exclusive Economic Zones (EEZ) throughout the world was the desire to control fisheries in coastal and adjacent waters. Now that all waters have been divided among the coastal states, the challenge, of course, is how to use these waters and their resources in a sustainable manner, by 'meeting the targets of human needs satisfaction without violating long-term natural resource capacities and standards of environmental quality and social equity' (Bartelmus in Kullenberg 1999). Since 1967 the Southeast Asian countries, including Malaysia, Indonesia and the Philippines, have joined in the Southeast Asian Fisheries Development Center (SEAFDEC), which is an autonomous intergovernmental body established as a regional treaty organization to promote fisheries development in Southeast Asia. The centre aims specifically to develop fishery potentials in the region through training, research, and information services, thereby improving the food supply by rational utilization and development of fishery resources. In reaction to the overexploitation of fishery resources in many places in the world, since the early 1990s global fisheries have received lots of attention from environmental and environment-related organizations, such as the FAO, the IUCN, the World Bank, the WWF, and Greenpeace, which provide governments with new regulations, perspectives, and development strategies. Where international agreements are concerned, the governments of insular Southeast Asia are involved as well. The participation in the UN Convention on the Law of the Sea (1982) and the Convention on Biological Diversity (2000), which pursues the conservation of biological diversity (including marine and ocean biodiversity), the sustainable use of its components, and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, are good examples of this international cooperation. Another positive sign is

participation in the UN Fish Stocks Agreement, which emphasizes the conservation and management of straddling fish stocks and highly migratory fish stocks, and the support of these countries for FAO's Code of Conduct for Responsible Fisheries (1995) and the related Compliance Agreement to promote international conservation and management measures by fishing vessels on the high seas (1995).

At the national level, the state has also been involved in fishery policy and management. For a long time, in Southeast Asia, as in many other countries in the world, the state had a very optimistic view of fisheries. The seas were believed to be underexploited; the calculated Maximum Sustainable Yields (MSYs) were believed to be nowhere near reached by fishers, for which the low level of gear and technology development was identified as the main limiting factor. Consequently, the governments of these countries all focused on the motorization of fisheries: small-scale fishermen needed motorized boats, better and more modern equipment, and those who still concentrated on inshore waters or the coastal zone should be motivated to take longer fishing trips to more distant fishing grounds.

In Southeast Asia, the majority of fish landings are provided by the inshore and coastal fisheries sub-sector, and as fisheries are placed under mounting pressure it is not surprising that the achievement of sustainable coastal fisheries has become one of the goals of fisheries management. However, whereas Indonesia's overall strategy still emphasizes the maximization of economic benefits (higher production), Malaysia seems to be more focused on the implementation of management measures through the deployment of the legal and institutional framework to control fishing activities, such as direct limitation of fishing (moratoriums), controls on the size and power of fishing vessels, registration of fishermen, resettlement of excess fishermen into other sectors, closed fishing areas, prohibition of certain types of fishing gear, a monitoring, control and surveillance (MCS) programme, and a public water restocking programme (FAO Fishery Country Profile Indonesia 2000; FAO Fishery Country Profile Malaysia 2001). The Philippine strategy, like the other cases, has set sustainable fisheries, including food security, as one of its main goals, and emphasizes the empowerment of people involved in fisheries (FAO Fishery Country Profile The Philippines 2000). Both Malaysia and Indonesia have shown the importance they attach to fisheries by establishing a separate department of fisheries. Fisheries management in Indonesia, however, still leaves much to be desired, especially in the control and sanctioning of fishing of protected species, and the practices of large-scale commercial fishing fleets. Licensing of joint-venture vessels and administration of catches form two weak areas that are prone to corruptive practices by government officials.

The role of the state in fisheries issues is complicated and multifaceted, especially at the provincial and district levels. On the one hand, it is impos-

sible to overlook fishery production, licences, post-harvesting processes, resource conservation, and monitoring, control and surveillance. The development of fisheries, including small-scale commercial ones, and poverty alleviation or alternative livelihood projects, on the other hand, must be borne in mind. Most of the time, these wide-ranging tasks have to be carried out by a too small a number of staff, who usually have a very basic fishery science background but are not trained to design and engage in development programmes for fishing communities. Both Julia Arnscheidt and Osseweijer (this volume) address the problematic role of the state in Indonesian fisheries. Arnscheidt describes the difficulties in the management of marine protected areas (MPAs). Similarly, Osseweijer shows that fishery development projects, designed and implemented by both district fishery offices and government agencies involved in natural resource management, often fail because of different visions and objectives for development held by government officials of various offices, fishery researchers, and local fishing communities.

Community-based natural resource management and co-management

In the 1980s and 1990s, in discussions about the failure of state-controlled management of fishery resources, community-based management was regarded as a more viable solution. After these academic discussions, NGOs and, in more recent years, international donor organizations have also taken up this stance of promoting local resource management. But more sceptical social scientists have contended that even where long-standing resource access regulations can be shown to exist, these may have had less to do with sustainable fisheries management than with the protection of (often inequitable) property rights (Von Benda-Beckmann et al. 1995; Zerner 1994). Customary tenure systems, as J. Cordell (1993:68) has stressed, 'cannot be regarded as panaceas for halting environmental degradation' (see also Polunin 1984). Besides lacking internal homogeneity and harmony, finally, most local communities are also embedded, for better or for worse, in a network of relationships with external stakeholders including state agencies, commercial businesses, national and international non-government organizations, and multilateral aid agencies, all with different viewpoints and interests with respect to resource management and conservation. Thus, with the definition of management (activities undertaken to protect, conserve, and rehabilitate a resource, including policy measures such as regulations) in mind, many examples of community-based fisheries management turn out to be less successful than first believed.

In search of better management approaches in this age of crisis, fisheries scientists have designed systems of collaboration or co-management. In the case of this new management style, sometimes referred to as adaptive man-

agement, both traditional, community-based management and complete government management are dispensed with. Co-management is an approach that requires a shift away from a centralized, top-down form of management to a new strategy in which fisheries managers and fishers jointly manage fisheries (Pinkerton 1989; Sen and Raakjaer Nielsen 1996; Wilson et al. 2003). Gerard Persoon and Diny van Est list some of the most significant factors that played a role in the establishment of the co-management idea: failure or limited success of centralized natural resource management by the state; processes of democratization and greater prominence of local interests; advocacy by environmental NGOs; international attention paid to participation of local populations; the rediscovery of traditional management structures; increased attention paid to distributive justice, poverty alleviation and food security (Persoon and Van Est 2003:4-5).

As it is now believed that fisheries management is only effective if pursued on a small ecological scale, fisheries co-management is designed to focus on the biological and human part of the ecosystem and the decentralization of management authority and responsibility, and use of fishers' knowledge. On the other hand, fishers are no longer expected to depend on the government to solve their problems (Berkes et al. 2001:200). Co-management was perceived as a management style ranging from instructive management, in which the government has the biggest share, to cooperative management implying shared responsibilities between government and fishers, to informative management in which fishers have the biggest share. The form co-management takes, then, depends on the structure of government, the willingness of the state to hand over authority, and the nature of the fishing community involved (Pomeroy 1996; Sen and Raakjaer Nielsen 1996; Persoon and Van Est 2003:6).

However, whereas in the early days of the co-management discourse this new management arrangement was rather narrowly defined, paying attention to only one interest group besides the government, namely the group of fishers in a certain region, since the late 1990s the accent has shifted from user-groups to so-called stakeholders. As a result of continuing 'problems of overfishing and resource depletion, the privileged position of users [has been] challenged and there have been calls for more inclusive and democratic institutions. Fish, it is argued, is a public resource and should be managed through institutional arrangements that take the public interest into account.' (Mikalsen and Jentoft 2001:281.) Consequently, stakeholders are all other parties interested, such as NGOs, the seafood industry, creditors and investors, and non-fishing but fish-consuming inhabitants of the coastal zone (Wilson et al. 2003). Whereas cynics might question the feasibility of many more stakeholders than the government and the fishermen, it is believed by most fishery researchers (social and natural scientists alike) that ignoring certain important

interest groups will jeopardize the chances of finding a solution for unsustainable fishing practices.

With this new approach to fisheries management practices, which links both natural and social systems, ideally the focus is no longer geared to 'the efficient utilization of resources as if they were limitless' (Berkes and Folke 1998:1). For adaptive management, the barrier between research and management is eliminated and both scientific and local or practitioner knowledge of fish, the coastal environment, and fisheries form the basis for management (Berkes and Folke 1998:11). Despite the new insights and perspectives on marine capture fisheries and possible ways to manage these fishing activities, there always is the current that runs counter to the positive changes: the commoditization of the rights to fish that enables open-market forces to operate for improved efficiency. While, on the one hand, there is a preference for a management regime based on the ecosystem in which there is room for societal interests in conservation and biodiversity, economists and other interested parties often still favour efficiency goals and market-based incentives for fishery behaviour using tools such as limited access to fishing grounds and individual target quotas (McCay 2000:213).

In the case of insular Southeast Asia, co-management of fishery resources often takes place in the form of the above-mentioned instructive management: 'there is only minimal exchange of information between government and users [fishers]' (Sen and Raakjaer Nielsen 1996:406). The mechanisms to communicate exist in most cases, but are only used by the government to inform fishers about new regulations and development projects to promote new fishing gear or to establish simple forms of marine aquaculture (Osseweijer, this volume). The management style at the other end of the spectrum, informative management, is a form of management in which certain user-groups are responsible for informing the government of management decisions. This style includes the many cases of traditional or community-based fisheries management like *sasi* in the Moluccas (Antunès, this volume).

Marine environmental conservation

Co-management is sometimes seen not only as a way of regulating the exploitation of natural resources, but also as a potential way to improve the management of nature reserves, or in our case marine protected areas (MPAs), by creating 'a situation in which some or all of the relevant stakeholders in a protected area are involved in a substantial way in management activities' (Borrini-Feyerabend 1996:12). But sustained economic yields, even if these can be achieved, are not necessarily compatible with the conservation of nature, and if the aim is to preserve ecosystems from, rather than for, human use (Ghimire and Pimbert 1997:2), then the problem of finding

local stakeholders to act as co-managers becomes a much more difficult one. About half of all existing protected areas, include the marine protected areas (MPAs), have people living within their boundaries (Borrini-Feyerabend 1996:4). Local communities have gradually become a prime focus of conservationist thinking, and much money as well as effort has recently been directed to community-based conservation projects (Agrawal and Gibson 1999:631). A common problem, however, is that even the most apparently community-friendly environmental and conservation organizations tend to view local people in an instrumental way, asking 'what they might mean for the environment' (Benda-Beckmann 1997:309), rather than what the environment might mean for them in terms of what concrete benefits, if any, are contingent on its protection. Possibilities here include income derived from ecotourism, or salaried employment as park guards, as well as whatever types of continued resource extraction are deemed compatible with the aims of the protected area in question.

In contrast to land-based protected areas, the ecological basis of marine protected areas makes the actual monitoring and control of the marine species targeted for protection entirely different. As stated earlier, most marine resources are migratory and may not be living in the particular region under protection during the whole year. Arnscheidt (in this volume) details the problems of a marine protected area – Pulau Seribu, an archipelago to the north of Jakarta – where the interests of islanders who depend on local marine resources for their living are in radical tension with the conservation objectives of the reserve, and where even park wardens lack adequate incentives to enforce the existing regulations. Although it has pleased conservationists (and sometimes anthropologists) to claim otherwise, the fact that local communities often live in close relations to their natural environment does not necessarily mean that their members have a less utilitarian attitude toward nature than do people of industrialized societies (Polunin 1984; Osseweijer 2001:28). Like sustainable exploitation, nature conservation is further complicated in the case of marine species by their mobility, which enables them to move freely in and out of protected areas. The difficulty of obtaining accurate information regarding the size and location of endangered populations makes it correspondingly difficult to formulate appropriate conservation rules and monitor infringements of these.

Contributions to this volume

The contributions to the fisheries section of this edited volume show a great interest in the ways people try to manage the access to and utilization of the marine commons, to conceptualize their coastal and marine environments, as well as to respond to environmental variability and resource decline, of which

the latter is so characteristic in today's small-scale capture fisheries. All contributions address the question of sustainability and have taken a historical perspective in order to understand the current situation. Many of the contributions are based on situated ethnographic research. Others are more deeply rooted in solid investigation of archives and secondary literature sources.

The regional focus of the fisheries section is Indonesia, although occasional mention is made of the other insular Southeast Asian countries Malaysia, Singapore, and the Philippines: Butcher and Boomgaard provide historical overviews of marine resources and the development of fishery resource exploitation from before the colonization of Southeast Asia into the twentieth century. Pujo Semedi provides a case study on the historical development of North Java's fisheries. In contrast to that development, Reeves and Reeves present the decline of the fishery sector of Singapore. After these examples of intensive fishing and possible overfishing in both western and eastern Indonesia, theoretical issues related to fisheries management are illustrated by case studies. Antunès describes cases from the Kei Islands in eastern Indonesia, where community-based management regimes are still practised but are being challenged by outsiders and new developments. Finally, the chapters by Osseweijer and Arnscheidt take a more distant view of fisheries management. The former describes the Indonesian government's attempts to develop small-scale fisheries in the Riau Islands; the latter pays attention to the management of marine protected areas and the various perceptions and communication problems involved.

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JAMES J. FOX

In a single generation
A lament for the forests and seas of Indonesia

In a single generation, the vast, majestic dipterocarp forests of lowland Sumatra and Borneo have been cleared. The regionally synchronized mass-flowering of these gigantic trees was an extraordinary feature of the lowland tropical rainforests of Indonesia. The rate of loss of these dipterocarps has been staggering. Land has been cleared for pulp and paper production, for oil palm plantations, for log export and sawn timber, for supposed timber forest plantations, and, most incredibly, to establish a million hectares of irrigated rice in central Kalimantan. On present evidence, forest clearing that was proceeding at a rate of over 1.6 million hectares per year has now risen to nearly 2.4 million hectares per year. At this rate, most of the lowland forests of Sumatra will have disappeared by 2005 and those of Kalimantan by 2010.[1]

In a single generation, the depletion of marine resources has followed a similar trajectory, although the evidence for this depletion and for deep-sea damage to seabed habitats is less immediately discernible. Large-scale BLL (bottom long line) fishing vessels have heavily fished Indonesia's seas in a relentless progression from the Strait of Malaka to the ends of the Arafura Sea. Since 1980, large numbers of sophisticated industrial trawling vessels, many of them foreign ships from Taiwan, Korea, and Thailand, have operated virtually without regulatory supervision in the seas of eastern Indonesia. Included in this trawling industry are special prawn trawlers that fish nearer to the shoreline and significantly affect local inshore fisheries. In addition, a substantial live-fish export industry has developed that depends on local reef

[1] According to official figures, since 1967 Indonesia's forest concession system has resulted in the loss of 100 million hectares of forest. A variety of sources give estimates of forest loss in Indonesia. One source is a report for the World Bank prepared by myself, Grahame Applegate and Merrilyn Wasson (2000); another is a paper by the late Derek Holmes produced for the World Bank (2000); and a third source is the excellent, recent publication edited by Carol J. Pierce Colfer and Ida Aju Pradnja Resosudarmo (2001). The single best book of its kind on the forests of Borneo is Harold Brookfield, Lesley Potter and Yvonne Byron (1995).

fishing with potassium cyanide. Indonesia's coral reefs, which are the largest and most extensive in the world, are not only subjected to this destructive overfishing, but to bombing, mining, dredging, and substantial waste discharge. Almost 94% of all coral reefs have suffered damage. Logging, steep-slope farming with subsequent erosion, agricultural run-off, and other widespread pollution have degraded many coastal habitats and with them, the once extensive meadows of sheltering seagrass.

In a single generation, the rich, remarkable species diversity of Indonesia has also come under severe threat. The larger mammals – Sumatran tiger, Javan rhinoceros, and Asian elephant – that once symbolized the exotic dimension of this diversity have been reduced to numbers that are now more easily enumerated than estimated. The numbers of orang-utan and the dugong are still estimated but these estimates are in the thousands.[2] On a larger scale, Indonesia has the highest number of threatened forest bird species in Asia. Some 101 species are threatened with extinction throughout the country, with the largest number in Sumatra, where 17 forest bird species are globally threatened and another 73 are considered in the 'near threatened' category.[3] Indonesia's most commonly targeted fish – snappers and groupers – are all slow-breeding, long-lived species that appear to be heading rapidly toward population collapse.

A single generation has seen the establishment of a national array of marine and forest reserves and parks – but within this same generation, many of these sanctuaries have been significantly threatened, or destroyed outright. Thus two-thirds – some 60,000 out of 90,000 hectares – of Gunung Palung National Park in West Kalimantan has been destroyed over the past ten years. Gunung Leuser National Park in northern Sumatra, Kutai National Park in East Kalimantan (originally designated for preservation on a larger scale by the Sultan of Kutai in a previous generation), and Tanjung Puting National Park in Central Kalimantan – to name just three among many reserves – have all suffered serious degradation and continue to be open to extensive illegal logging.[4] The wondrous coral reefs of the marine protected area of Take Bone Rate – potentially Indonesia's greatest marine treasury – are under continuing threat and have already borne the brunt of heavy human spoilage.[5]

2 Just as existence of orang-utan can be seen as a prime indicator of the quality of a forest, so too with the dugong, whose presence is dependent on the quality of coastal waters and their seagrasses (Marsh 2002).

3 Press Release, Birdlife International, Den Haag, 15 April 2002.

4 *The final cut* [2000], prepared by the Environmental Investigation Agency and Telapak Indonesia, provides a graphic report on illegal logging with particular attention to Tanjung Putih National Park and Gunung Leuser National Park.

5 Taka Bone Rate is the site of a major effort under Coremap to diminish coral reef damage. A recent newspaper article (Hasanuddin Hamid 2002), however, provides an indication of the extent of continuing, ongoing damage to these reefs.

A single generation has also seen an assault on particular ecological niches supporting a panoply of targeted products. This has been especially true of the peat soils that form an essential component of Indonesia's tropical rainforest mosaic. A decade ago Sumatra and Kalimantan had an estimated 15 million hectares of these soils. In some areas, as in the interior of Kalimantan, the accumulated matrix of amorphous organic material that forms these high-dome peats began to form over 13,000 years ago; whereas the peat soils of the freshwater swamps of the coastal lowlands are of more recent, shallower accumulation and thus more vulnerable. It is these peat soils that have been the main target for clearing and burning for local agriculture and the establishment of plantations.[6]

The Grand-Gambut Project (Satu Juta Hectare Proyek Lahan Gambut, PLG) that set about to clear one million hectares of deep-peat forest in Central Kalimantan to establish a transmigration scheme for intensive rice cultivation was doubtlessly the single most ill-conceived development project of the Soeharto era. The scheme has now ended in dismal failure; the construction that occurred during the project has left a large network of primary and secondary irrigation channels, built largely on fibric peat domes, that have exposed an extensive area of peat to desiccation and future fire. It has also opened large tracts of land with rich *ramin* and *meranti* forest to unchecked illegal logging. Even the Forest Laboratory for the Study of Tropical Peat Swamps is being systematically robbed of its timber. The decision to end this scheme but extend the development of the Kapuas, Kahayan, and Barito catchment and to allow the clearing of peat soils less than three metres deep has only increased the assault on this vulnerable niche. Transforming this niche could well alter the hydrology of Kalimantan.[7]

This generation has also seen a recurrence of floods and drought in an oscillating ENSO cycle. The El Niño droughts of 1982-1983 and 1997-1998 with their accompanying fires were particularly sharp punctuation points in this period. The fires of 1997-1998 are estimated to have damaged 9,745,000 hectares of land throughout Indonesia. 85% of this damage occurred in Sumatra and Kalimantan. During the period of these fires, Indonesia produced more than 750 million metric tons of carbon dioxide – 22% of the world's carbon dioxide production. Indonesia suddenly became one of the world's largest polluters of carbon dioxide, only slightly trailing the United States. An estimated 75% of the 750 million metric tons of carbon dioxide produced in these fires came from the combustion of peat.[8]

6 Rieley and Page 1997, and in particular Rieley, Page, Limin and Winarti 1997.

7 Rieley 1999; for more recent research: Chokkalingam, Tacconi and Ruchiyat 2001.

8 Applegate et al. 2002 summarizes a final report for the ADB of the Planning for Fire Prevention and Drought Management Project, 1999.

This generation has also seen the introduction of new timber replacement species on a level unprecedented in the natural history of the region. Dipterocarps are slow-growing trees and their processes of regeneration are sensitive to a variety of climatic and other factors. Other 'exotic' species have therefore been introduced as rapid-growing replacements. One species of tree in particular, *Acacia mangium*, has become the primary plantation tree of choice, but other Acacia and Eucalypts (*Acacia auriculiformis*; *Eucalyptus deglupta* and *Eucalyptus urophylla*) have also been promoted. Out of nearly 6 million hectares allocated for timber plantations, approximately 2.4 million hectares have supposedly been planted with new harvestable timber species, such as *Acacia mangium*.

When Soeharto's New Order was being established in the mid-1960s, Indonesia had a population of just over 100 million. Sumatra had over 16 million inhabitants and Kalimantan over 4 million (Nugroho 1967; *Almanak* 1968). By 2000, Indonesia's population had doubled to over 200 million, but the populations of Sumatra and Kalimantan had more than doubled. Sumatra's population was over 42.5 million and Kalimantan's almost 11 million. This population growth was not just the result of natural increase. It was also the result of a sustained effort to shift people from the densely populated islands of Java and Bali to the outer islands, particularly Sumatra and Kalimantan.

The effects of this policy on the environment are almost incalculable. Official transmigration targeted young rural families who, after they had moved to their new destinations, had larger families than they would have had if they had remained on Java or Bali. To settle these migrants, a large number of forested areas were targeted for wholesale clearing. Once this land was denuded of its valuable timber, soils often proved unsuitable for the agricultural schemes proposed to support the new migrants, or flooding posed insurmountable problems for normal farming. This frequently led to a further displacement and a search for other forms of employment. Unemployed men could be diverted to logging on timber concessions (HPH) and families could follow logging trails into the interior to engage in short-term opportunistic cultivation in the wake of forest clearance. In places, this contributed to conflicts between local inhabitants and new migrants. Instead of population growth, a range of demographic factors associated with population instabilities fuelled rapid ecological transformation.

A single generation is not a long time in historical terms. Virtually all of the changes in Indonesia's environment that occurred during the lifetime of this generation have had a critical human component. It is appropriate therefore to set the transformation effected by a single generation in relation to the time-scale needed to comprehend the magnitude of these changes.

Two observations are pertinent. The first of these relates to peat soils of

Indonesia and the second to dipterocarps as a particular family of trees.

In the case of Indonesia's peat soils, it is possible to calculate the rate of accrual of these resources at different periods over 10,000 years. Thus high peat accumulated at an average rate of 50 cm per 100 years between 9,600 and 8,440 BP. This rate then slowed from 24 cm to 14 cm per 100 years from 8,000 to 5,000 BP. Similarly, the accrual of coastal and basin peats occurred at a rate of 20 cm per 100 years between 4,500 and 3,500 BP, and thereafter slowed to 17 cm per 100 years. In the estimation of present researchers,

> subsequent rates of accumulation have been much slower in all peat types and there may be little, if any, peat accumulation in Indonesia at the present day. The reasons for this may be that rainfall intensity and periodicity have changed considerably in the region over recent millennia. This is especially marked in Kalimantan where the annual dry season is now 3-5 months duration, leading to a net water deficit during this period and loss of peat through oxidation and degradation, the rate of which has been estimated to be 10 cm per 100 years. (Rieley et al. 1997:39.)

If the accumulation of peat has ceased and indeed gone into reverse, then the massive destruction of these soils through a combination of clearing and burning represents the loss of an irreplaceable and certainly non-renewable resource. The transformation of these specific peatland niches in a single generation represents an irreversible environmental change.

A somewhat similar observation can be made in relation to the great variety of dipterocarp species in Indonesia. A remarkable feature of most of these species is the irregular, yet synchronized, regional timing of their flowering. An individual tree may produce four million flowers, from which 120,000 fruits may set. The fact that this mass-flowering and mast-fruiting can occur, with unexplained suddenness over a wide area, appears to be caused by a drop in minimum night temperature of two degrees centigrade or more for a succession of three or more nights. Conditions of this kind appear to be associated with the onset of El Niño-induced droughts (Ashton et al. 1988; Curran et al. 1999).

The existence of a specific seasonal floral trigger among a tree species now widely distributed throughout an aseasonal tropical zone suggests that these dipterocarps may have originated in a region (or at a time) with more notable seasonal variations and by slow penetration in step with the rhythms of the ENSO cycle, gradually established their dominance in the Indonesian region. The time scale for such an establishment process is a matter of millennia. Paleoclimatic studies suggest that temperature conditions for forest growth were most favourable from 17,000 to 9,000 BP and that seasonality declined from 9,000 BP to 6,000 BP; with greater climate variability associated with the ENSO phenomenon developing during the last five millennia. By contrast,

the human plantings of *Acacia mangium* to replace dipterocarp species over hundreds of thousands of hectares have been carried out over less than two decades and have introduced an entirely different growth-rhythm to the forested environment of Indonesia. These new species will radically alter the fire regimes of Indonesia's forests.

Focus on two historical cases

In a single generation, the impact on human communities dependent on marine and forest resources has been equally profound. These communities, however, have proven to be remarkably adaptive and it is therefore pointless simply to describe what once was and will never be again. Instead, I would like to examine the historical development of specific communities whose livelihood has been closely associated with particular resources. A historical perspective provides a better understanding of the quickening pace of recent developments, the intersection of national and international policies that have shaped the local use of resources, the adaptability of local populations and, despite this adaptability, the resulting dilemma that this poses for such marginalized populations.

The Bajau quest for trepang, turtle, and shark in the Timor and Arafura seas

No other single marine product has contributed more to shaping maritime relations in the Timor and Arafura seas than trepang.[9] Trepang, a variety of edible holothurians that have the appearance of a fleshy cucumber, has long been regarded among the Chinese as a kind of 'sea ginseng'. This invertebrate sea slug has been in great demand as a potent delicacy and, as sources along the south China coast became depleted, the search for new sources shifted to what the Chinese called Nan-hai, the 'Southern Seas'. In the late seventeenth century, the fishing and sailing populations of Sulawesi became actively involved in trepang gathering, and this prompted the search for high-quality trepang throughout eastern Indonesia and beyond. Most of the trade in trepang was centred on Macassar in South Sulawesi and, as a result, the trepang industry has been given a 'Macassan' label. The fact is, however, that various different Sulawesi populations participated in trepang gathering. Besides the Macassar populations, the most prominent populations involved in trepang gathering were the Sama Bajau.

[9] See Fox 2000a for a longer discussion of this quest for trepang and the historical and regional context within which it has occurred.

The southward movement of the Bajau was closely associated with the search for marine products. On the basis of comparative linguistic evidence, Alfred Pallesen argues that in the eleventh century, a sea-oriented group of Samal speakers began to work its way down the Sulu Archipelago. This group became the Indonesian Bajau: 'The forward wave of this IB [Indonesian Bajau] movement was to reach the coastlines of the Macassar Strait sometime before the European era, probably by way of the east coast of Borneo via Tawau and Tarakan' (Pallesen 1985:121). This account locates the Bajau in southern Sulawesi toward the end of the fifteenth or the beginning of the sixteenth century. Generally these populations lived in dependent relations with the more powerful sailing peoples such as the Macassarese, Bugis, or Butonese, supplying them with produce from the sea.[10]

As a highly mobile sea population, the Bajau were involved in the search for new sources of trepang. By the eighteenth century, they had begun to explore the coastal waters of the Timor Sea. Dutch records from the early eighteenth century document the initial movement of the Bajau into the area. In a letter of 9 May 1725 from the chief Dutch Company officer in Kupang to the Governor-General in Batavia, there is a report of the apprehension of 'seven Bajau or Macassarese fishing vessels with 91 of their people' at Bernusa near the island of Alor. These boats were said to have come from 'Papuk' in the Gulf of Bone.[11] A few years later, in another letter to the Governor-General of 14 May 1728, the chief officer in Kupang reported:

> Forty small Bajau Laut boats which appeared here mostly in the domain of Thie [on the southwestern coast of Roti] some of whose people came ashore under the pretext that they had come to look for trepang; since the Rotinese rulers did not, however, trust the people, they refused them their shores and made them depart from there, whereupon the boats also appeared on the 8th of March in the open sea outside of this fortress (Fox 1977a:460).

By the 1750s, the gathering of trepang in the outer arc of the Lesser Sundas became regularized. 'Macassan' vessels began to arrive in the Timor area with formal letters of permission from the Company allowing them to gather trepang without hindrance. The search for trepang, however, extended

[10] In addition to Pallesen's 1985 linguistic study of the Sama-Bajau, a useful, broadly based study of these remarkable people is Sather 1997.

[11] Already at this period, the Bajau were identified as 'Macassarese'. This is a form of identification that continued to be used for them well into the nineteenth century, especially because of their close involvement in the Macassan trepang trade. 'Papuk' provides a further identification that is consistent with an origin of these Bajau from Sulawesi. According to Christian Pelras, 'Papu' was the hereditary title of the '"sovereign of the Sama" whose seat, if one can employ that expression in speaking of someone who dwells at sea, was at the base of the Gulf of Bone, in the Luwu region' (Pelras 1972:164-5).

beyond the Indonesian Archipelago to the shores of northern Australia.

Writing about his experiences in northern Australia at the beginning of the nineteenth century, Matthew Flinders points to the link between the gathering of trepang on the Ashmore Reef – directly to the south of the island of Roti – and the discovery of much larger sources of trepang on the Australian coast:

> The natives of Macassar have been long accustomed to fish for trepang [...] upon a dry shoal lying to the south of Rottee; but about twenty years ago, one of their prows was driven by the northwest monsoon to the coast of New Holland, and finding the trepang to be abundant, they afterwards returned; and have continued to fish there since that time (Flinders 1814, II:257).

Throughout much of the nineteenth century, Bajau regularly visited Australia on their own and in Bugis vessels to gather trepang.[12] This 'Macassan' trepang gathering has been well documented by Campbell Macknight in his excellent study *The voyage to Marege'; Macassan trepangers in northern Australia* (Macknight 1976). George Winsor Earl, in his *Sailing directions*, made an extraordinary estimate of this trepang industry:

> The trade in trepang, or sea-slug, which gives employment to 80-100 of the Bughi prahus, on the north coast of Australia alone, and the entire produce of which is taken to China, far exceeds in value the fur-trade, carried on between the N.W. coast of America and China (Earl 1839:14).

In the nineteenth century, the Bajau were also crucial in the gathering of trepang in the Aru region of the Arafura Sea. Trade in this commodity was centred on Makassar. Alfred Russel Wallace has vividly described this nineteenth-century trade in *The Malay Archipelago*. In his description of Makassar as 'one of the great emporiums of the native trade of the Archipelago', Wallace remarks on the great variety of natural products, including trepang from the Gulf of Carpentaria, available in local Bugis and Chinese stalls. He then goes on to note the even greater abundance of marine products from the Aru Islands:

> More important than all of these however is the trade to Aru, a group of islands situated on the south-west coast of New Guinea, and of which almost the whole produce comes to Makassar in native vessels. These islands are out of the track of all European trade [...]. Pearls, mother-of-pearl, and tortoiseshell, find their way

[12] Earl, who had a great admiration for the Bajau, reports a Bajau vessel at Port Essington in 1840 and describes this boat as 'belonging to that singular people the Badju, a tribe without fixed home, living constantly on board their prahus, numbers of which congregate among the small islands near the southern coast of Celebes' (Earl 1846:65). Five years earlier, in 1835, Earl had planned to go on a trepang-gathering expedition with Bajau, setting out from Macassar and going, via the Aru Islands, to the north coast of Australia.

> to Europe, while edible birds' nests and 'tripang' or sea-slug are obtained by shiploads for the gastronomic enjoyment of the Chinese. (Wallace 1869, II:158.)

By the end of the nineteenth century, this abundant trade had begun to diminish and continued to do so through the twentieth century. More significant than this diminishment in marine resources in the Arafura Sea, the establishment in 1891 of the KPM (Koninklijke Paketvaart Maatschappij, Royal Packet Navigation Company) gradually achieved its stated aim of reducing 'the profitability of prahu shipping to the point where new prahus would no longer be built, and the fleet would gradually diminish by attrition' (Dick 1987:107; see Fox 2000a). In 1893, Australian authorities began imposing licensing fees and duties on Macassan vessels of all sizes. The last official voyages to northern Australia came to an end in 1906-1907 (MacKnight 1976:110-4).

Trepang can reproduce asexually under certain tidal conditions but they normally reproduce sexually. Because they are relatively sedentary, proximity to a reasonably sized breeding community is critical to local replenishment. The repeated harvesting of specific stocks limits the cycle of replenishment and can endanger local survival of stocks.

Trepang come in a great variety and their culinary qualities have decidedly different market value. High-quality trepang have commonplace English names that give no idea of their taste attractions. Black Teatfish (*Holothuria nobilis*), White Teatfish (*Holothuria fuscogilva*), or even Prickly Redfish (*Thelenota ananas*) are far more sought after than medium-value Lollyfish (*Holothuria atra*) or low-value Elephant Trunkfish (*Holothuria fuscopunctata*). It is these high-market-value trepang that have been harvested at an unsustainable level. And as a consequence, the quest for trepang throughout most of the Timor and Arafura seas has become ever more problematic.

The Arafura Sea is the only region of Indonesia where trawling vessels are still licensed and thus able to carry out continuing damage to near shore reefs and seabeds with impunity. The whole of the region is clouded in a fog of illegal, unlicensed, unregulated, and unreported fishing that jeopardizes not just the livelihood of the mobile Bajau fishers but that of virtually all the local coastal fishing communities.[13] And the Bajau themselves face competition from other mobile fishing groups such as the Sinjae Bugis, who have invested in diving equipment to gather trepang at greater depths, and Butonese, many of whom come from the Tukang Besi Islands.

The response among some Bajau communities has been a shift to shark

[13] Brian Fegan has written a number of invaluable reports (1999, 2000a, 2000b, 2001) on fishing in the region which provide the clearest information on the extraordinary overfishing in the Timor and Arafura seas.

fishing or more specifically sharkfin fishing, to provide another high-value culinary delicacy for the Chinese market. One such community that made this shift was the Bajau settlement of Mola on the island of Wanci in the Tukang Besi Islands. In the 1980s, this village was still reported to be engaged in trepang gathering but by the late 1980s and early 1990s, in response to the diminishing supply of trepang and the increasing price of sharkfin, fishers from this village (and other nearby Bajau villages) began to concentrate on shark fishing.

Ashmore Reef and the Australian memorandum of understanding

In 1974, the Australian government concluded a memorandum of understanding with Indonesia that identified five small points on the northwest Australian continental shelf to which traditional Indonesian fishers were given access. These areas are 1. Ashmore Reef; 2. Cartier Islet; 3. Scott Reef; 4. Seringapatam Reef; and 5. Browse Islet. The memorandum allowed fishing around these areas to include the taking of trepang, trochus, abalone, green snail, sponges, and all molluscs on the seabed adjacent to these areas, but not turtles of any species.[14]

Although the definition of 'traditional' fishers was ambiguous and resulted in a further advisory clarification in 1988, the memorandum has been taken to include fishers from the island of Rote as well as Bajau whose regular fishing voyages to the Ashmore Reef area in the twentieth century can be documented.[15]

Ashmore Reef is the largest and most important of the five tiny areas designated in the memorandum. It is a raised platform reef near the edge of the Sahul Shelf approximately 120 kilometres directly south of the island of Rote. In 1983, the Australian government declared Ashmore Reef a national nature reserve because it is a staging point for migratory birds, a breeding ground for dugong and several varieties of turtles, and because of its unusual biodiversity. The government website on Ashmore reports that it 'has the highest known diversity and density of sea snakes in the world'. This declaration banned the removal of all fauna and flora to a depth of 50 m.

By the time of this ban, trepang stocks were already depleted near all

[14] It permitted landings to obtain fresh water at two points on Ashmore Reef and allowed boats to shelter within the group without landing except at Ashmore. This memorandum, which is a simple document of three pages plus a map, provided a basis for traditional Indonesian fishing in Australian waters. It came into effect on 1 February 1975. See Fox 1998 for an extended discussion of this memorandum of understanding, its modification, and the consequences of Australian policy.

[15] A major study of these Bajau is Stacey 1999.

the reefs and islets identified by the memorandum of understanding. A stock assessment undertaken by CSIRO Marine Research in 1998 reported that high value species were either absent or at low abundances on all reefs covered under the memorandum. Local gathering efforts had switched to medium- and low-value species, but even these were at low densities on most reefs. The ban of almost 15 years on gathering trepang at Ashmore had resulted in a partial recovery of trepang species, but even this reef showed some evidence of depletion (Ashmore Reef National Nature Reserve and Cartier Island Marine Reserve Management Plans: http//www.deh.gov.au/wasts/mpa/cartier/plan/index.html).

Already by the mid-1990s, most voyages to Ashmore and other reefs in the Australian Fishing Zone to gather trepang had come to an end. Earlier, at the beginning of the 1990s, substantial numbers of Bajau from Mola on Wanci Island had begun to move to Papela, the largest of the fishing villages on Rote, which they used as their base for shark fishing further to the south. In turn, all of the fishers in Papela, who had previously been trepang and trochus gatherers, learned shark fishing from the migrant Bajau and, as had the Bajau some years earlier, they quickly shifted from trepang and trochus gathering to intensive shark fishing.

Just as there are a great variety of trepang, so too there are a great variety of shark species, and the market value for fin from different species varies significantly. A number of species are particularly targeted. Moreover, sharks are long-lived, slow-breeding species so that high-valued, intensively targeted types can rapidly become depleted within defined areas. When fishing shifted to shark and more vessels entered Australian waters in search of these marine targets as the price of fin rose, fishers – the Bajau and their 'pupils' from Pepela and Oelaba – began, almost inevitably, to venture beyond the permitted sea boundaries into the richer waters closely patrolled by the Australian Fishing Service. This, in the Australian Fishing Zone, has resulted in a massive apprehension of vessels for illegal fishing.

The dilemma is palpable. Throughout eastern Indonesia, local fisheries are under severe pressures exerted by larger commercial and industrial ventures. The more mobile fishing populations survive by a style of fishing that often resembles 'raiding' – the intrusion (and, in some cases, negotiated access) into the scattered local fisheries of more sedentary populations. The Ashmore Reef area is a microcosm of this dilemma. Despite official access provided by the Australian government, the resources of the area cannot support the pressure of use exerted by an increasing number of fishers. As alternative possible livelihoods have diminished in their own seas and as prices have risen for scarce commodities, more fishers have been forced into taking greater risks by fishing beyond the boundaries allowed them within the Australian Fishing Zone in order to make an ever more precarious living.

The Atoni Pah Meto and the trade in sandalwood

No natural resource has been more significant than sandalwood (*Santalum album*) in the historical development of Timor.[16] This is the commodity that first attracted the attention of Chinese traders, possibly as early as the eighth century and certainly by the fourteenth century. It enticed scores of traders from Java, Malacca, Luzon and, at a later date, from Makassar. It also drew the Portuguese to Timor and after them the Dutch East Indies Company, if not so much to trade in this commodity as to prevent its trade by others. The trade in sandalwood gave rise to the authority of traditional Timorese polities, networks of ritual exchange that facilitated the passage of goods from the mountains to the coast, and the remarkable rise of native polities led by the Topasses or Black Portuguese, who rejected alignment with both Portuguese from Goa and Dutch from Batavia. By the nineteenth century, with the rise of other more powerful Timorese polities, the Topasses lost control over much of this sandalwood trade, but the trade in this aromatic timber was maintained, in diminished quantities, by Chinese merchants, who brought it to the coast in horse caravans. As the Dutch colonial government began progressively to exert its authority in the interior, it felt it necessary to intervene to conserve stocks of this precious timber – but with limited success. To most students of Timorese history, sandalwood has been seen as a poignant symbol of the depletion of a valuable resource. As I wrote in *Harvest of the palm; Ecological change in eastern Indonesia*, 'sandalwood now stands as a symbol of [Timor's] past not its future' (Fox 1977b:73).

In a recent paper, Andrew McWilliam (2004) has analysed the continuing plunder of Timor's sandalwood in the twentieth century and developed a number of critical insights on the possibilities of sandalwood in Timor's future. It is particularly interesting to compare the policies of the Portuguese and the Dutch toward sandalwood. Both colonial powers operated to restrain what was perceived as the 'rape of sandalwood' (Ormeling 1956:175). The effects of these policies, however, had the same unintended deleterious consequences.

Concerted Dutch pacification of West Timor began in 1906 and continued for the better part of the next decade. Portuguese pacification efforts in East Timor had begun earlier and culminated in final military subjugation after a major uprising in 1914. The Dutch Forestry Service began prohibiting free cutting and sale of sandalwood in some areas in 1916, and issued a Sandalwood Ordinance with further regulatory restrictions in 1925. The Forestry Service even attempted to develop a *cultuur contract* ('cultivation

[16] For discussion of sandalwood in the context of Timor's historical development, see Fox 1977:61-79, 1988, 2000b.

contract') with local Timorese, granting them access to arable land in return for tending sandalwood plantings.

The Portuguese attempted to limit cutting earlier in the twentieth century than the Dutch; they followed with a complete ban in 1925, when the Portuguese Forestry Service assumed control of all reserves. The Indonesians, when they succeeded the Dutch in West Timor in 1950 and occupied East Timor in 1975, maintained more or less intact the existing colonial regulatory frameworks.

These regulations severely restricted timber cutting by smallholders on whose land the sandalwood grew. In West Timor, harvesting was – and continues to be – determined by government decisions based on stock-inventory surveys. Local farmers were allocated payments for cutting and gathering. These payments, based on the amount of gathered sandalwood, are supposed to be a percentage of the value of this timber. However, the government sets nominal prices for the sandalwood well below market prices. Farmers thus gain a mere pittance for the labour of harvesting their own timber. Farmers are expected to protect all sandalwood seedlings that sprout in their fields and conserve the trees to maturity for government harvest. For ordinary cultivators, the appearance of sandalwood in a cultivated field is a cause of threatening imposition. I once happened to be with a farmer in Amarasi who discovered a shoot of sandalwood growing in his dry field. Imploring me not to tell the 'government', he immediately uprooted the stalk and systematically traced its roots through his garden, pulling them up as he went.

The Atoni Pah Meto of West Timor refer to sandalwood as *hau meni*: 'fragrant wood'. As a mature plant, it is a grey-trunked, straggly branched ten-metre tree with ovate grey-green leaves. The small-leafed variety (*noh mnutu*) is favoured by Timorese because it matures more quickly. Trees can take up to 50 years to mature and can produce up to 110 kg of dry heartwood. Most of the tree's oil is produced in its roots.

Sandal is a semi-root parasite, which requires a range of suitable host plants. Although it can grow from seed, in Timor it mainly propagates itself by vegetative regrowth along the lateral roots of maturing trees. A 'mother' tree can give rise to dozens of new saplings. Forty regrowth saplings were recorded within 8 metres of one 37-year-old 'mother' tree in south-central Timor – the traditional heartland of Timorese sandalwood cultivation.[17] Significantly, vegetative regrowth appears to be enhanced by fire, which induces scorching and fissuring in lateral roots, thus promoting further shoot regrowth. Thus local swidden cultivation techniques encourage the rapid growth of sandalwood, whereas supposedly well-intended local government

[17] See McWilliam, 'Haumeni, not many' (2004) for information on the agroforestry of sandalwood in Timor and local government policies for its cultivation.

policies of the past century have disenfranchised local swidden cultivators from the products of their fields and prompted a continuing decline in the number of trees on Timor.

In 1996, the provincial government of West Timor passed a decree granting individuals ownership of sandalwood trees on their land, but the government still insists on maintaining control over the sale of sandalwood, allowing farmers only about 7.5% of the market price of the commodity. This in turn has encouraged continuing illegal logging and surreptitious export by government officials, the military, and the police.

The case of sandalwood on Timor can be taken as indicative of a tendency that began in the colonial period and has been greatly augmented since independence. The state has intervened to control and regulate a resource without fully understanding the social ecology of the resource it is trying to manage or the implications for smallholders of the policies that it is applying.

Conclusions

This article could well be called a 'lament' with two case studies, neither of which is optimistic or encouraging. In terms of the lament, the question to ask is this: if in a single generation so much destruction, degradation, and outright pillage of Indonesia's natural resources have occurred, what will happen in the next generation? At the moment, the outlook is bleak. On current evidence, the rate of ongoing destruction has not decreased and may perhaps be escalating.

Each of the case studies I have presented exemplifies this destruction at a micro-level, but each case also offers possible lessons for the future. The first of these lessons is probably the most fundamental. Until one understands a resource, it is difficult to begin to formulate policies to manage it properly. Certainly over the past generation, we have gained a greater (but by no means adequate) understanding of the resource ecology of Indonesia. What is still needed is a greater understanding of the social ecology of resource use in Indonesia.

We have all come to realize that various optimistic and possibly well-intentioned policies have not achieved their end, but instead have contributed to a growing problem. Top-down regulation by the state is a flawed procedure, but a lack of regulation – or the regulation of resources by market forces (which has never occurred) – provides no solution either. Internal as well as external demand for resources continues to increase. Who has rights to these resources and who may thereby allocate them to meet these demands remains an unanswered question, and whether those who have the right to resources will allocate them responsibly is not clear. The present hope

– and it is only a hope – is that by redistributing rights more equitably to the communities directly linked to these resources, we will restructure a balance that has been sadly disrupted and rekindle a commitment in local communities to the welfare of future generations. We can only hope and continue to strive for something that we call 'sustainability' – even when we ourselves do not understand its full meaning.

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FISHERIES

JOHN G. BUTCHER

The marine animals of Southeast Asia
Towards a demographic history, 1850-2000

Environmental historians trying to trace changes in the populations of marine animals in the seas of Southeast Asia face many challenges. In the past few years trophic modelling has enabled scientists to estimate changes in the biomass of commercial fish in the North Atlantic between 1900 and 1999 (Pauly and Maclean 2003; Malakoff 2002:461). Until such work is done for Southeast Asia, however, we must rely heavily on anecdotal observations, data for the trade in fish products and fish landings, and the results of trawl surveys to gauge changes in populations. Deficient though they are, such sources at least allow us to trace the truly dramatic changes that have taken place in many populations. Far more difficult is the challenge of explaining these changes. Here we must note that the seas of Southeast Asia contain tens of thousands of species of worms, corals, crustaceans, mollusks, echinoderms, fish, reptiles, birds, and mammals. Along with phytoplankton, algae, seagrasses, and detritus these animals form complex food webs. Even without the activities of humans these food webs are never entirely stable. Changes in turbidity, salinity, and nutrient levels from one season to the next and at different stages of the El Niño cycle all affect the different components of the food webs and the hence their interactions with one another. In some cases populations can change wildly from one year to the next or even from one season to the next. Nevertheless, it is clear that fishing and environmental changes caused by humans – sometimes interacting with 'natural' cycles – have had an enormous impact on the populations of many species.

Different species, it needs to be emphasized, vary greatly in the vulnerability to fishing, pollution, and habitat destruction. Most vulnerable to fishing pressure are animals that:

- are commercially valuable
- have small populations
- are easily caught because of their size, their habit of spawning or lay-

ing eggs in particular spots, or their regular movement through an area where they can be easily captured
- reach sexual maturity at a relatively late age
- have relatively few offspring
- are confined to a narrow ecological niche
- are not highly mobile.

As a general rule, the more of these characteristics a particular population of an animal – meaning all the members of a particular 'stock' – has, the more vulnerable that population is to fishing pressure. A particular population does not need to be specifically targeted by fishers in order to be vulnerable to this pressure. This is because different fishing methods vary greatly in how selective they are. Among conventional fishing gears the least selective is the trawl net, which, depending on the size of the mesh, sweeps up nearly everything in its path, often including much that the fishers do not want. Gill nets, entangling as they do fish of a certain size according to the size of the mesh, are much more selective. Even more selective are the hand collection of sedentary creatures such as sea cucumbers and oysters and the harpooning of large animals such as whales. As far as pollution and habitat destruction are concerned, the most vulnerable species are those that are unable to adjust to changes in light and temperature and increases in toxin levels in the water or to move on to new habitats. Since species vary so much in their vulnerability, fishing, pollution, and habitat destruction often transform trophic structures by removing certain animals and so allowing others that had been the prey of those animals or had competed with them for food to thrive. It is in this respect, as we shall see, that human activities have had some of their most profound effects on marine animal populations.

Ideally, a demographic history of the marine animals of Southeast Asia would trace changes for certain categories used by ecosystem modellers such as grouper/snappers, large piscivores, and small demersal benthivores. As a historian still learning the rudiments of fisheries science, I will instead simply give an impression of marine animal populations in the mid-1800s and then highlight some of the major changes that took place first between 1850 and 1940 and then between 1940 and 2000.[1]

[1] Portions of this article have been taken from Butcher 2004:28-31, 53, 57-8, 79, 121, 131, 142, 147-8, 150, 267-8, 273-6, 288. Reproduced here with the kind permission of the publisher, Institute of Southeast Asian Studies, Singapore. The book is part of the Economic History of Southeast Asia Project.

Marine animal populations around 1850

We have no way of estimating the abundance of marine animals in the middle of the nineteenth century, as the first systematic surveys did not take place until after World War II. We therefore have to rely entirely on anecdotal evidence to gain an impression of the abundance of marine life at this time, but this at least gives us a base from which to judge the great changes that started in the middle of the twentieth century.[2]

'No part of the world abounds in more fine fish', declared John Crawfurd (1820, III:439). 'The seas of the western parts of the Archipelago, particularly the Straits of Malacca, and the shores of the Gulf of Siam, are the most remarkable for their abundance of edible fish'. Along the west coast of the Malay Peninsula, wrote John Anderson (1824:158), 'fish of the choicest and most delicate description is extremely abundant', while along the east coast, according to Hugh Clifford (1927:139), 'the fish crowd the shallow shoal waters, and move up and down the coast, during the whole of the open season, in great schools acres in extent'. An Englishman who sailed along the west coast of Borneo in the 1820s commented that 'the coasts and rivers abound with excellent and wholesome fish in the greatest variety, and of the most delicious flavours' (Moor 1837: Appendix 18). Hugh Low (1848:88-9) observed that the waters along the coast of Sarawak abounded in 'fine' fish and that a species of small shrimp was 'found in enormous numbers on the borders of the sea' during 'the fine season'. And the chief commissioner of British Burma described the sea in the Mergui Archipelago as 'literally alive with fish' (Day 1873:cxxvii).

We must treat these descriptions with caution. European observers may have exaggerated the abundance of the marine life of Southeast Asia just as they did the fertility of the soils. Nevertheless, reports about the abundance of fish in very specific locations certainly confirm the impression given by these accounts. According to a survey of the fisheries of the Netherlands Indies published in 1882, *tenggiri* (the term used for Spanish mackerel, *Scomberomorus* spp) and two other fish I am unable to identify were 'very abundant' in the waters near Priaman on the west coast of Sumatra and could be seen from the shore 'in great schools' between October and December (*Zeevisscherijen* 1882:158). At certain times in the Selat Panjang (the strait known to the Dutch as the Brouwerstraat between the east coast of Sumatra on one side and Bengkalis, Pandang and Rantau islands on the other), according to an account of the shad (*terubuk*, *Tenualosa macrura* and *Tenualosa toli*) fishery there, 'the movement near the surface of a solid mass of fish, consisting almost entirely of spawners, produces a choppy rippling

2 On the value of anecdotal evidence see Pauly 1995.

of the water' (*Zeevisscherij* 1882:163; Gramberg 1880:333). Munshi Abdullah (Abdullah bin Abdul Kadir 1970:144-5) recalled that when the British arrived at Singapore in 1819 'fish were very plentiful and large ones were found close to shore'. When the naturalist Julian Tenison-Woods (1888:613) travelled along the west coast of the Malay Peninsula in the 1880s he found that at the mouth of one river 'the mud is almost alive' with crocodiles and added that 'I have never seen such numbers, or such large crocodiles in any other place in the whole course of my travels'. And it was Alfred Russel Wallace's judgement that 'there is perhaps no spot in the world richer in marine productions, corals, shells and fishes' than Ambon harbour:

> The bottom was absolutely hidden by a continuous series of corals, sponges, actiniae, and other marine productions, of magnificent dimensions, varied forms, and brilliant colours. The depth varied from about twenty to fifty feet, and the bottom was very uneven, rocks and chasms, and little hills and valleys, offering a variety of stations for the growth of these animal forests. In and out among them moved numbers of blue and red and yellow fishes, spotted and banded and striped in the most striking manner, while great orange or rosy transparent medusae floated along near the surface. (Wallace 1890:226.)

Of special value in judging the abundance of marine animals at this time are the observations of some of the earliest fisheries scientists. 'The shore is very low, the waters very muddy, and abound in animal life', wrote Francis Day (1873:cxxvi) in his report on the fisheries of Burma. 'Crustacea are in myriads, and marine fish which prey upon them, are in abundance'. On a visit to the fabled fishing grounds near Sitangkai in the Sulu Archipelago Alvin Seale (1908:518) witnessed 'a most astonishing movement of mullet':

> A noise like a great waterfall was heard. Hastening to the beach I saw a vast shoal of fish coming from the north, keeping quite near the shore; they were leaping along the water in great flashing waves. The shoal was fully 100 yards wide and 500 yards long; there must have been over a million individuals in it.

And Hugh M. Smith (1925:9) concluded with respect to the waters of Siam that 'it seems altogether probable that in no other country do shrimps exist in greater profusion'.

We have very few sources that allow us to judge the abundance of large pelagic fish such as tuna belonging to the genus *Thunnus*, mainly because they inhabited very deep water and were beyond the reach of most fishers, but a passage in an account of an English whaler's journey around the world in the 1830s gives us a glimpse into the deep sea. While becalmed about 150 kilometres off the north coast of New Guinea, the crew of the *Tuscan* observed several logs floating near the ship and went in a boat to see the largest, which turned out to be 'an entire tree, more than sixty feet in length', covered with

barnacles, crabs, and other animals and perforated by ship borers:

> In the water around was assembled a vast number of fish, chiefly yellow-tails [*Elagatis*], rudder-fish [*Caranx hippos*], filefish [probably *Abalistes stellaris*], some albacore [*Thunnus alalunga* or possibly yellowfin tuna, *Thunnus albacares*], brown sharks, and many other kinds, of grotesque forms and gaudy hues [...]; the whole presenting a marine spectacle of a highly novel and animated character. The timber was towed to the ship, and part of it taken on board as fire-wood, and upon making sail, a large proportion of the fish accompanied the ship, and continued to do so for several weeks [as the ship sailed first west and then south towards Timor]. (Bennett 1840, II:65-6.)

While tuna and other large pelagic fish were hardly touched or even seen by human beings at this time, the largest marine mammal, the sperm whale, had been the object of hunting by English and American (and some Australian) whalers for several decades. All we can say is that sperm whales were sufficiently abundant to continue to attract whalers to their waters in the 1840s and into the 1850s. In 1852 one traveller came across two large sperm whales in the southwestern part of the Java Sea (Munger 1967:75), but the whalers mainly hunted them in the Indian Ocean south of the string of islands from Java to Timor, the Savu Sea, the Ombai (Timor) Strait, the seas between Timor and the Philippines, and in the Pacific Ocean east of the Philippines as well as further north off the coast of Japan and in the South Pacific.[3] The presence of sperm whales in Southeast Asian waters, it is worth adding, gives us indirect evidence of the abundance of other species. The 1882 survey describes the annual migration of sperm whales from the Indian Ocean through the passages in the Lesser Sunda Islands northward to the Pacific Ocean and back, stopping in straits and bays along the way to feed on the *inktvisschen* (squid or cuttlefish) and small fish found in 'astonishing profusion' in these waters (*Zeevisscherij* 1882:300).

Here I need to make two important points. First, the research of scientists and historians studying changes in marine animal populations in the North Atlantic and nearby seas warns us against assuming that marine animal populations existed in a pristine state in the middle of the nineteenth century. Among other things, we now know that people living in the Caribbean had hunted turtles nearly to the point of extinction before the arrival of Columbus (Jackson et al. 2001). As far as Southeast Asia is concerned, it is striking that some nineteenth-century observers were worried about the human impact on marine animal populations. A British officer stationed at Akyab on the coast of Burma, for example, believed that the fisheries had become 'impoverished' during the thirteen years he had lived there due to

3 Beale 1839:190-1; West and Barnes 1990:136, 137; Bennett 1840, II:98.

'the small mesh of the nets and the minuteness of the distance between the split bamboos forming the fixed fishing screens which were placed across every small creek, opening, or available spot. The smallest fly could not escape' (Day 1873:cxxxvi). The author of a study of shellfish in the vicinity of Singapore commented that 'the poorer Malays and Chinese use most kinds of shell fish as food, and search the shores for them with such diligence, that they have caused a dearth of such as are common in less frequented parts of the coast' (Trail 1847:228). In 1857 the Dutch Resident at Kupang wrote that 'whales are rarely encountered here, as a result of the hunting of them for years by English, American and French whalers' (Barnes 1996:334). And during his stay in Singapore on his way to Japan in 1853, Commodore Perry was told that dugong 'had become very scarce, if not extinct' (Tomes 1857:65). I have no information with which to evaluate the first two reports, but the other two deserve some comment. The fact that British and American whalers, who 'twice in the nineteenth century [...] told Kupang authorities that the whales had been overhunted and had moved on', had practically ceased whaling around Timor by 1857 lends some support to the Resident's judgement, but R.H. Barnes (1996:311, 333) suggests that because 'we have no idea what the normal fluctuations are over a period of years' it is virtually impossible to assess the impact of English and American whaling on the population and notes other possible reasons for the rapid decline in British and American whaling in this area. Even though Perry found it hard to believe (Pineau 1968:49), the report that dugongs were on the verge of extinction near Singapore perhaps has the most support, for they were already 'not unfrequently caught' in the 1820s (Crawfurd 1828:531). Dugongs are particularly vulnerable to human predation, as they are long-lived animals and are easily tracked down in the shallow water they inhabit.

In general, however, there is good reason to believe that, with some possible exceptions, human predation had little impact on marine animal populations at this time. The capture of marine animals was focused both ecologically and geographically on but a small proportion of the sea. It was most intense in the inshore waters near heavily populated areas and in areas where there were animals of exceptional commercial value. Fish and other animals consumed as ordinary food were sufficiently abundant near populated areas so that there was little need to try to transport them over great distances. Moreover, these animals appear to have been sufficiently abundant for the needs of the time that it was possible in many areas to rely heavily on the use of 'passive' fishing devices such as fishing stakes to capture what was needed. Even the most densely populated areas were not so heavily populated that there was any danger of overfishing, and it is quite possible that in the case of Java the high cost of salt for preserving fish further weakened this danger. Moreover, technological limitations greatly reduced the possibil-

ity of overfishing except in waters very close to shore. Fishers could only go where the wind or their own muscles allowed them to go. They had to rely entirely on their own strength to set and haul in nets, which, made as they were of natural fibres, became very heavy as they absorbed water. Nets also had to be regularly dried, repaired, and soaked in preservatives. A net used in Sumatra, for example, could be set three times a day at the most, since it had to be dried out every time it was used (*Zeevisscherijen* 1882:180).

The animal (actually several different species) that we might most expect to have undergone a severe decline in population is trepang, which had been widely collected for sale in China for many decades, but I am aware of no evidence of this. The movement of the Makassarese collectors to the north coast of Australia lends some support to this possibility, but it could well be that the species found in this area fetched the highest prices in China. In any case, Campbell Macknight (1976:57) notes how extraordinarily abundant trepang were:

> No doubt some effect was noticeable in a small, heavily worked area, such as Bowen Strait, but as an example of the quantities available from one limited situation, Bill Harney, a trepanger from the 1930s, says that he has seen 25 tons of dried trepang come off one bank in Port Bradshaw. In fact the very continuation of the industry at a more or less consistent level for such a long period confirms that over-fishing cannot have been a serious problem.

The second important point is that we must be aware that marine animal populations underwent changes for reasons that had little or nothing to do with human activity. Sardinella, for example, could be spectacularly abundant in the Bali Strait one year but then be scarce 'for years' (Van Kampen 1922:8). The shad fishery in the Selat Panjang 'sometimes experiences very unfavourable years' (Gramberg 1880:338). And H. Warington Smyth (1898:470) observed that the Indian mackerel (*pla thu*, *Rastrelliger* spp) fishery was virtually at a standstill when he visited Langsuan Bay in 1896. In the case of sardinella in the Bali Strait, recent research suggests that stock sizes vary according to phases of the ENSO cycle (Ghofar and Mathews 1996:146).

From all this we can at least conclude that, allowing for natural fluctuations and the possibility of some human impact on a tiny number of populations, the seas of Southeast Asia were blessed with a great abundance of animal life. We can also be certain of the dazzling variety of animal life, which a handful of European taxonomists, most notably M.P. Bleeker, were busy naming and cataloguing.

1850 to 1940

During this period virtually all of Southeast Asia came under colonial rule or the rule of the centralizing monarchy based at Bangkok, mining and plantation agriculture expanded rapidly, steamships and railways came to carry a large proportion of the growing flow of goods and people, cities grew quickly, and the human population increased from about 40 to 150 million. As the human population of Southeast Asia grew, consumption of marine fish products appears to have grown at a slightly faster rate. This suggests that up to four times as much fish and other animals intended for everyday consumption were extracted from the seas each year by the end of the period than at the beginning. In addition, great quantities of pearl oysters were being collected for sale in Europe by the 1890s. And, especially from the 1910s onward, Japan became an important consumer of fish caught in Southeast Asia by Japanese fishers, who supplied local markets as well. Thus some marine animal populations came under much greater pressure. The question is whether any of them experienced significant declines.

During the first few decades of this period catches increased mainly by the application of existing fishing methods to old fishing grounds or to new fishing grounds that were ecologically similar to the old ones. In particular, there was a proliferation in the number of fishing stakes set in estuaries and other shallow waters near the coast. This happened in the Philippines, the Gulf of Thailand, and the Straits of Malacca, most famously in the Rokan estuary, which appears to have been barely fished in the 1870s but which the fishing stakes operated by the Chinese of Bagan Si Api Api soon made one of the most productive fisheries in the world. Officials in the Netherlands Indies, Malaya, and somewhat later in Siam and the Philippines began to warn that fishing stakes, especially those with fine mesh designed to capture shrimps for human consumption and tiny fish to be fed to ducks and pigs or used as fertilizer, were destroying inshore fish stocks. According to P.N. van Kampen (1909:12), the *jermal* that he observed in the Rokan estuary 'caught everything swept into it by the current'. 'Perhaps', he added, 'the decline in fish catches in recent years is related to this murderous way of fishing'. On the other side of the straits H.C. Robinson concluded, after examining the fish caught by a *jermal* in the estuary of the Selangor River, that 'the fish caught consisted to a very large extent of quite immature specimens of estuarine and surface-feeding varieties, and, as a rough estimate, individuals of marketable weight formed not more than a third of the total weight'. According to Robinson, *jermal* located in estuarine waters captured 'not only the young fry, but also the breeding stock of those fish that deposit their spawn in brackish and muddy waters which in Malayan seas form a considerable proportion of the fauna' (Wilkinson, Berkeley and Robinson 1904:33-4). In Siam, Hugh

Smith (1925:23) argued that:

> Fishing almost ceases to be a legitimate industry when, as in Chumporn Bay, for example, the entire water, inshore and offshore, is filled with overlapping leaders and wings of traps forming a maze which makes the escape of fish practically impossible and of necessity renders the less favorably located traps unproductive.

And in his report on San Miguel Bay, where fishing stakes were the most important fishing gear, Agustin Umali (1937:255) claimed that 'indiscriminate catching of the different species' regardless of size or maturity 'has resulted in a decrease of the supply that is now beginning to be felt more acutely by the individual fishermen'. Unfortunately, it is very difficult to form firm conclusions about what was happening to fish populations in these areas. In the case of the Rokan estuary, for example, fish catches clearly fell for a number of years beginning in 1905, but siltation, shifts in currents, and greater targeting of shrimps may have been the reason for this. It is, however, worth mentioning the possibility that the upsurge in the shrimp fishery may have been related not only to the greater profitability of *terasi* but also to the removal of fish that had preyed on shrimp or competed with them for food (Butcher 1996:105-12). As for the case of Siam, it appears that the fishing stakes were basically just nibbling at the edges of the Indian mackerel population that was their main target. All over Southeast Asia there was a tendency to construct fishing stakes in deeper water further and further from shore, but whether this indicates that fish populations had declined markedly or simply that fishers were competing for space and the most advantageous positions is far from clear.

Even more unclear, I believe, is what to make of the big drop in fish landings along the north coast of Java in the late 1800s, a phenomenon addressed by both Masyhuri and Pujo Semedi. Masyhuri (1995) focuses on the abolition in 1864 of the farms to collect certain taxes on the fishing industry. The holders of these farms, he argues, had had an incentive to promote the fishing industry, since they could keep whatever money they collected over and above what they had agreed to give the government. He also points out that the government sold salt to the farmers at a lower price than that at which the government's salt monopoly sold it and that this too helped to promote the industry. The abolition of the farm, he concludes, brought about a collapse of the offshore *mayang* fishery – mainly targeted at scads (*layang*, *Decapterus* spp) –, since this required the greatest investment, and an intensification of fishing effort in inshore waters, leading to overfishing in these waters. In contrast, Pujo Semedi (2001) argues that the rapid growth in the fishing industry that had taken place in the mid-1800s 'was not sustained [because,] from 1870 onwards, catches declined as a result of overfishing'. After 1900 the government began to assist Javanese fishers in a number of ways, but 'nothing was done [...] to limit the pressure on fish stocks, and indeed the basic problem of

poor catches was only exacerbated by the success of these organisations [to help fishers] in facilitating the purchase and operation of more fishing boats'. My own view, based on a tiny fraction of the material Masyhuri and Pujo Semedi worked with, is that the abolition of the fisheries tax farms was very important if only because it forced fishers to pay the full cost of salt if they wanted to preserve their catches properly. Even when the government established salting sheds where fishers could buy salt more cheaply the industry was severely constrained, as the salt had to be used in the sheds and the price was still much higher than in Siam, the source of large quantities of imports. I also wonder whether fishing was conducted on such a scale in the mid-1800s that it would have had a significant impact on populations, but this is one of the aspects of the issue that would be worth exploring.[4]

There are, however, a few marine animals about which there can be little doubt that they experienced marked declines in population at this time. I will focus on three of these: pearl oysters in the Aru Islands, fusiliers along the slopes of coral reefs in many parts of Southeast Asia, and demersal fish in certain bays in the Philippines.

In the late 1800s the demand in Europe for pearl shell increased dramatically. By the 1870s dress diving made it possible for divers to stay under water much longer than 'naked' divers had, to collect shells from somewhat greater depths, and to work more of the year. Several individuals and companies employed dress diving to tap the riches of the Aru oyster beds starting in the 1880s, but it was only when the Netherlands Indies government granted the Celebes Trading Company, headed by James Clark, who had already severely depleted oyster beds in the Torres Strait, a concession to collect shells that dress diving clearly began to reduce stocks of pearl oysters. Two years after the company began operations Van Kampen wrote that there appeared to be evidence of a decline in stocks in the inshore waters worked by indigenous divers, who collected everything and did not put back small oysters, but he was less sure about the impact of the Celebes Trading Company. According to Van Kampen, it was 'in the interests of the Europeans to leave the young shells alone', but we should note that the initial concession was for only three years and the members of the consortium 'did not think it would be renewed'.[5] The owners therefore had no reason not to exploit the beds as heavily as they possibly could. Perhaps more importantly, the divers, who

4 The movement of scads in and out of the Java Sea is associated with the monsoons. In particular, one large polpulation moves in from the Flores Sea as the salinity increases during the east monsoon. Thus, if it could be established that there was a long series of weak east monsoons during the period when catches fell, it might be possible to argue that this rather than overfishing may have been at least partly responsible for declining catches. The attention Lesley Potter and other forestry historians have paid to the climate might shed some light on this issue.

5 *Parliament of the Commonwealth of Australia* 1913: testimony by Clark, question 4440.

were paid according to how much they collected, had no incentive to leave shells that other divers might collect. According to Van Kampen's calculations, each lugger collected about seven tons of shell each year, which he noted was roughly the amount collected by each lugger in the Torres Strait pearl fishery when the industry was at its peak in the early 1890s, but catches soon began to drop. As Clark himself noted in testimony before a royal commission in 1913, pearl shell 'was more plentiful when we went there, but, of course, we have worked it out to some extent, and we get about the same quantity per boat as we got in Australia'.[6] In fact, Clark discovered soon after the fleets arrived in the Aru Islands that the consortium had more boats than it could profitably employ there.

Up until the 1910s the fishers of Southeast Asia appear to have made little effort to capture the fusiliers that lived in extraordinary profusion just off the slopes of coral reefs. Okinawan fishers, setting nets known as *muro ami* along a slope and then herding the fish into the net with the use of scare lines, therefore found a fishery resource that was virtually untapped. *Muro ami* fishing quickly proved to be an extraordinarily effective means of capturing fish. According to one source, a *muro ami* team working out of Iloilo once caught '4,400 pounds [2 tons] of fish from a single haul' (Montalban and Martin 1930:470). Another source states that 'each team landed 70 to 80 tons of fish per month' (*Japanese fishing* 1946:1). The effectiveness of this method of fishing explains not only how the *muro ami* fishers grabbed such a large share of the fish market in Batavia, Singapore, and Manila but also why during the 1920s and 1930s teams of *muro ami* fishers went further and further afield in their search for rich fishing grounds. Those based at Singapore fished in the Riau-Lingga Archipelago, near the Anambas Islands, up the east coast of the Malay Peninsula as far as the Gulf of Siam, and along the west coast from Langkawi to the Mergui Archipelago, while those based at Batavia scoured the reefs near Bawean and elsewhere in the eastern part of the Java Sea, near Bangka and Belitung, and along the west coast of Sumatra. So effective was *muro ami* that even in the mid-1920s some fishery officers were wondering whether it might threaten stocks, but none appear to have been particularly alarmed. In 1926 the director of the fisheries department in Malaya pointed out the 'obvious danger' of overfishing but, while calling for scientific study of fusiliers, seemed to accept the statements of the *muro ami* fishers that they did not reach the depths where most fusiliers lived and that therefore the areas they fished were constantly being replenished (*Annual report* 1925:402). In 1932 a fisheries officer observed that the *muro ami* teams had found it necessary to go further and further from Singapore 'because the nearby grounds yielded comparatively only small catches' but argued that this was because

6 *Parliament of the Commonwealth of Australia* 1913: testimony by Clark, question 4398.

the fish had learned how to avoid the fishers rather than because stocks had been depleted (*Annual report* 1932:436). H. van Pel (1938:222) reported that few fish were left after the *muro ami* team he accompanied had fished all the reefs on the eastern sides of the Thousand Islands, adding matter of factly that reefs were not fished again for two years after a team had been through. Perhaps the best evidence of the impact of *muro ami* fishing on fish stocks is a statement in the report of the Institute for Sea Fisheries in Batavia in 1937 that 'in recent years these species [*ekor kuning* (*Caesio erythorgaster*) and *pisang-pisang* (other *Caesio* spp)] make up a smaller percentage of the total catch of reef fish and the length of the fish appears to have become significantly smaller'.[7] None of my sources mention the possible effects of the weights used by the *muro ami* fishers, but we know from more recent accounts that the weights at the end of scare lines shatter corals and so destroy the habitat of fusiliers and other reef fish (Carpenter and Alcala 1977). Since one *muro ami* team consisted of forty or so men who swam along with scare lines and each team set its net several times each day, the *muro ami* fishers must have damaged vast areas of coral reefs in pursuit of fusiliers. Up until the late 1930s, it must be added, coral mining destroyed many reefs in the Thousand Islands – so much so that J. Reuter (1940:214) described what was happening to the fish habitat as the equivalent of deforestation – but I am not aware of this occurring on such a great scale in other parts of the island world.

The Dutch, British, Americans, and French all experimented with trawling in the hope of opening up a new fishery resource. Their surveys give us the first picture of the benthic communities of Southeast Asian seas. We can note, for example, that the *Gier* hauled up large quantities of metre-high cup sponges in the Java Sea in its pursuit of fish. But for a variety of reasons these experiments did not lead to the commercial exploitation of demersal fish. The pioneers of trawling in Southeast Asia were in fact the Japanese. As well as employing large trawlers in the South China Sea they exploited the shallow waters of the Philippines using a beam trawl, which they operated first from sailing craft and then, by the 1930s, from motorized vessels. By the late 1930s these trawlers operated not only in Manila Bay but also in Lingayen Gulf, Ragay Gulf, and San Miguel Bay. Filipino fishers in many of these fishing grounds were bitterly critical of the beam trawlers and insisted that they had depleted stocks. After investigating complaints made by Filipino fishers and local authorities in San Miguel Bay in petitions to the president of the Philippines, Umali concluded that the owners of fish corrals, the most important Filipino fishing gear, were simply jealous of the success achieved by the Japanese and he urged Filipinos to adopt the beam trawl. He did, however, suggest legislation regulating the size of the mesh of the

7 *Instituut voor de Zeevisscherij* 1939:12, mededeling no. 3.

cod end of the net to allow as many immature fish as possible to escape, and in another report he warned that 'the continuous and unregulated activity of beam trawlers' would eventually deplete fish stocks (Umali 1937:236, 253-5, 1932:407-8). There is in fact powerful evidence that this was already happening in Manila Bay. Porfirio Manacop (1955:173) concluded that 'the ground fishery of Manila Bay [...] was already badly depleted at the outbreak of the war in 1941'. As evidence of this depletion, he pointed to the fourfold increase in the catch per vessel per day that took place when beam trawling resumed in 1945 after three years during which there was very little trawling in the bay.

In addition to the three cases I have cited, it is quite likely that human predation was having an impact on some other populations. What becomes clear from Hugh Smith's report on the fisheries of Siam is that those marine animals that both fetched high prices in the market and spent part of their life cycle at or passing through spots where they were easily captured were under the greatest threat. Smith (1925:8-9) feared for the future of green turtles because there was no control on the collection of their eggs by concessionaires. He observed that barramundi were 'much less [abundant] than formerly' and noted that shad, caught by gill nets as they ascended the Chaophraya River, 'is not now abundant in any Siamese rivers' (Smith 1925:12-3). C.N. Maxwell (1921:186-7) expressed similar concerns for shad (*terubuk*) along the west coast of the Malay Peninsula, but he attributed a marked decline in these fish not to fishing but to the pollution of the rivers where they spawned by the tailings of tin mines. On several occasions, he wrote, he had 'picked up these fish by hand in a dying condition apparently choked by silt in their attempt to ascend the rivers'. It is notable that 'exceptionally large shoals' of shad appeared off the coast of Perak in 1938 (*Annual report* 1938:1), but it is possible that by this time the transition to dredging as the main mining method had greatly reduced tailings.

Though I have focused on those animals that appear to have suffered population declines, it is important to note that the populations of most marine animals experienced little or no change as a result of human activity. By 1940 virtually the full range of marine animals was being exploited, the only major exception being mesopelagic fish in the depths of the deep basins. In addition to those fish already mentioned, yellowfin tuna were now being captured by Japanese longliners, while the exploitation of skipjack tuna (*Katsuwonus pelamis*), long captured by people in the Moluccas in particular, was stepped up by Japanese pole and line vessels. But most of these new fisheries probably had no impact on the populations they targeted, which in the case of yellowfin and skipjack tuna extended over vast areas. Just how abundant these fish were is apparent in Albert Herre's observation that 'part of a school [of yellowfin tuna] that entered a fish corral at Cabadbaran,

Agusan Province, Mindinao, would have given 250,000 people over a pound apiece of clear meat' (Herre 1945:160).

In 1939 H.C. Delsman (1939a:104), in a tropical echo of Thomas Huxley's famous statement regarding the inexhaustibility of the world's fish stocks, claimed that:

> In Europe the starting point and object of the international fishery researches is mainly the protection of fish against overfishing; in the Indies there is no need for such precautions. There is no question of exhausting the supply anywhere in the Archipelago – except perhaps at some river mouths – nor is any such exhaustion likely to occur as soon in the tropics as it might in Europe, since the high temperature in the tropical seas causes the growth and renewal of the fish supply to take place more rapidly than in colder climates.

From the standpoint of our current understanding of tropical seas this statement ignores some important differences between tropical seas and those of higher latitudes. As H. Delsman (1939b) himself pointed out in another article, vertical mixing – the process which brings nitrates and phosphates to the surface water where photosynthesis occurs – does not take place in Southeast Asian waters on the same scale as it does in the seas of higher latitudes. Moreover, Delsman appears to have ignored those cases where the evidence of overfishing is very strong. Nevertheless, his statement makes sense in the context of his time. By the outbreak of the Pacific War most fishing was still carried out without the assistance of motors, large sections of the sea had barely been fished by any means, and, to make a very rough estimate, total fish landings were a tenth of what they were fifty years later.

1940 to 2000

With very few exceptions marine animal populations experienced much less human predation during the Pacific War. As soon as the war was over, however, the exploitation of marine animals escalated. The great fish race began immediately after the war in the Philippines, where explosives and surplus vessels and engines were plentiful, accelerated in the Gulf of Thailand in the early 1960s, and then spread to Malaysia and Indonesia. As a general rule, the introduction of the otter trawl followed by a rapid increase in the number of vessels operating this gear – from fewer than a hundred to over two thousand in just six years in the case of Thailand – brought about the initial surge in catches, and then purse seines and other gears targeting pelagic fish sustained or increased total catches. Nominal landings of marine fish in Southeast Asia jumped from 1.6 million tons in 1956 to 5.9 million tons in 1977 (a growth rate of 6.4 percent a year) and then continued to climb, though at

a slower rate (3.1 percent a year), to 11.5 million tons in 1999. Between 1977 and 1999 it was mainly the big increase in landings in Indonesia – from 1.2 to 3.9 million tons (5.6 percent a year) – that pushed up the total for Southeast Asia.[8] Rapid adoption of motors and new fishing gears, the construction of nets from synthetic fibres, the widespread use of more effective fish aggregating devices, invention of new ways of locating fish, a more than tripling of the human population, rising standards of living, improved transport and storage facilities, growing demand for shrimp and tuna in Japan, Europe, and North America, government subsidies, international aid, and the assumption that exploitation of fish stocks could be expanded indefinitely all combined to bring about the spectacular increase in catches. At the same time, increasing pollution, sedimentation, and habitat destruction reduced the biological productivity of many fisheries. Again, the question is what effect these assaults on marine animals had on populations. Fortunately, an abundance of sources allows us to make some general observations.

Trawl surveys provide a very detailed picture of the impact of trawling on demersal populations. By measuring the quantity of fish, shrimps, squids, and other creatures caught in an hour of trawling, these surveys measure the density and composition of bottom assemblages. We can see the stunning effect of trawling most clearly in the case of the Gulf of Thailand, where the most detailed research has been done. Between 1963 and 1971, as Table 1 shows, the overall catch rate fell by 74 percent. Catch rates for virtually all groups declined, but some declined much more sharply than others. The biggest declines were for rays, which are large and relatively long-lived, and slipmouths (*Leiognathidae*), which though much smaller inhabit the same shallow inshore waters most heavily targeted by trawlers searching for shrimp. The one group for which the catch rate actually increased was *Loligo* (squid) species, most likely because of the removal of animals that had preyed on their larvae. It is notable that although the catch rate for shrimp, which was the most valuable component of a trawl catch, fell it did not fall as sharply as that for other groups. The relative abundance of shrimps and the ready market for squids helped to sustain trawling, as did the fact that 'scrap fish' were sold to fishmeal plants. This explains why catch rates continued to fall, with the result that by the mid-1990s the fish biomass in the Gulf of Thailand was estimated to be about 10 percent of what it had been when trawling began (*Project final report* 2001:11). Similar changes took place in other parts of Southeast Asia. In the waters around Penang catch rates fell from 140 kilograms per hour in 1970 (after several years of trawling in this area) to 25 in 1990, while on the east coast of the Malay Peninsula, where trawling

[8] These figures and those for landings of skipjacks and yellowfin tuna cited below come from various volumes of the *FAO yearbook of fishery statistics*, Rome: FAO.

began later, the catch rate fell from 450 to 55 kilograms per hour during the same period (Abu Talib and Alias 1997:58). The two beam trawlers operating in Manila Bay in 1945 caught 800 to 1,200 kilograms of fish a day, but by 1952, when 64 otter trawlers as well as 35 beam trawlers operated in the bay, the catch had fallen to 120 to 200 kilograms a day (Manacop 1955:173). In the Samar Sea trawling greatly reduced fish stocks until it was banned in this area in 1976. Stocks then quickly recovered – doubling between surveys done in 1979 and 1980 – but then collapsed because of illegal trawling, a tremendous increase in the number of small-scale fishers, a big increase in the number of fish corrals, and sedimentation caused by logging. The only marine animal to thrive in this new environment was jellyfish, which on the one hand now had far fewer predators and on the other preyed on the larvae and juveniles of those fish remaining in the sea. The generally tiny fish caught in the corrals were fed to groupers grown in the large fish pens constructed in these waters (Saeger 1981, 1993). By the early 1990s, it would appear, fish could reach large sizes in the Samar Sea only by being cultivated within the confines of bamboo fences.

Table 1. Catch composition by year in kilograms per hour of trawling by R/V *Pamong II* throughout the Gulf of Thailand

Group of fish	1963	1971	1971 as % of 1963
Sharks	2.1	0.60	29
Rays	15	1.4	9
Leiognathidae	72	3.0	4
Carangidae	20	3.9	20
Loligo spp	6.1	11	180
Shrimps	0.6	0.26	43
Good fish	220	54	25
Scrap fish	29	12	41
Total	250	66	26

Source: Tiews 1973:277, Table 3.

It appears that trawling did not have quite as devastating an impact in Indonesian waters. On the Indonesian side of the Straits of Malacca the density of demersal fish stocks dropped from 3.8 to 1.4 tons per square kilometre between 1973 and 1975. As in the Gulf of Thailand slipmouths underwent a very sharp decline, dropping from 0.94 to 0.11 tons per square kilometre during that period. But the imposition of a ban on trawling in most of Indonesia in the early 1980s allowed populations in this area to recover very rapidly. By 1985 the density of demersal fish stocks in the Straits of Malacca had reached 3.0 tons per square kilometre, while that for slipmouths had bounced back to 1.0 tons per square kilometre (Purwito Martosubroto 1989:12). In the Java

Sea trawling certainly depleted demersal fish populations, but by the time the ban was imposed it had not altered the trophic structure as it had in the Gulf of Thailand (Purwito Martosubroto 1996:72). As for the narrow shelf off the northwest coast of Sumatra, a trawl survey in 1980 found an abundance of slipmouths in the shallow waters and many high-priced fish in the snapper-lizardfish group in deeper waters, indicating that trawling had been much less intense there than it had been in other areas (Bianchi 1996:128-30). It seems very likely that demersal fish stocks declined in all of these areas starting in the late 1980s. The number of fishers using bottom gill nets and other fishing gears to catch demersal fish steadily increased. More importantly, the trawl ban was increasingly circumvented in various ways both by Indonesians and by Thais desperate to find new fishing grounds. Though I am aware of no surveys of demersal fish stocks in the 1990s, the fact that Thai trawlers continued to venture into Indonesian waters at least indicates that stocks were still very much bigger there than they were in Thai waters. One more important fishing area in Indonesia that must be mentioned is the Arafura Sea, where the ban did not apply to the large double-rigged trawlers targeting shrimp or to Indonesian and Thai vessels operating trawls in the guise of 'fish nets'. The catch rate – for shrimp and fish combined – was approximately halved during the 1970s. It then appears to have remained steady at least until the early 1990s, but it seems very likely that the composition of species during this period underwent a major change. From an ecological point of view the most striking feature of the Arafura shrimp fisheries was that the crews threw nearly all the fish they caught back into the water. These fish, most of which were already dead, were then eaten by seabirds and dolphins following the trawlers. In effect, S. Evans and R. Wahju (1996:370) explained, 'the fishery is continuously removing organic production from the benthic system without replacing it. Although this is an undoubted benefit to the seabirds which scavenge on it, it must be to the long-term cost of the benthic ecosystem and therefore fish stocks which use it as a source of food.' I am aware of no research that has explored this hypothesis.[9]

As demersal catches declined, there was a great upsurge in the capture of small pelagic fish such as scads, Indian mackerel, sardines, and anchovies. There was great room for expansion. These species had been lightly fished or,

[9] Their hypothesis raises the more general question of how trawling altered the composition of species not only by capturing fish varying greatly in size and longevity but also by radically changing the structure of the benthos. Research conducted on the northwest shelf of Australia showed that as trawling converted areas dense with sponges, soft corals, and other benthic animals to areas nearly devoid of them, those fish associated with a dense epibenthos became relatively less abundant while those associated with an open sandy bottom became relatively more abundant (Young and Sainsbury 1985). The intensity of trawling in the Gulf of Thailand and the Arafura Sea would have been far greater than it ever was on the Northwest Shelf.

in some areas, not fished at all. Moreover, as J. Gulland (1974:266) explained, 'because many of the species [...] eat phytoplankton or small zooplankton, and lie early in the food chain, their total potential [catch] is large'. Writing in 1974, about the time when the boom in small pelagic fisheries began, Gulland therefore concluded 'few, if any, stocks are heavily exploited', the only exception being the Indian mackerel in the Gulf of Thailand. As an example of just how big populations (and potential catches) of small pelagic were we might note that an FAO survey of the waters off the southeast coast of Vietnam found 'one school of mackerel [that] extended over an area of 45 by 30 miles' (Loftas 1970:282).

Between the 1970s and the early 1990s increasingly powerful methods were developed to capture small pelagic fish. Purse seines were used in conjunction not only with traditional floating fish lures such as the *rumpon* and *payao* but also with increasingly powerful lights. At the same time the purse seiners pursued new fishing strategies. Up until the late 1980s, for example, the purse seiners based at ports along the north coast of Java had worked on their own, but now several boats belonging to one company fished in a pack, coordinating their movements by radio. As soon as one boat had found a promising fishing ground, 'it calls the others which then concentrate on this area. When the catch decreases they spread again on several fishing grounds in order to find the fish. With this expansion-contraction strategy they can survey two or three fishing grounds during the trip.' (Potier and Petit 1995:178.) The research vessel *Bawal Putih I* observed a cluster of 107 fishing boats south of Matasiri Island in October 1992 and a cluster of 96 south of Midai Island in the South China Sea in April 1993; in such clusters the distance between the purse seiners varied from less than half a nautical mile to a maximum of 4 nautical miles, while the average distance from one boat to the next was 1.4 nautical miles. By working in packs, M. Potier and D. Petit (1995:182) explained, the purse seiners 'can exploit a fishing ground to its maximum level [...] even if their fishing zone is not located over areas where the fish abundance is the highest'. As a result of developments such as these, landings of small pelagic fish skyrocketed. Very roughly, total landings of these fish in Thailand, Malaysia, Indonesia, and the Philippines increased from 0.17 to 3.4 million tons between 1950 and 1995 (Devaraj and Vivekanandan 1997:52). The sharpest increases took place in the 1970s and 1980s.

All this still leaves the question of whether populations of small pelagic fish underwent major changes. Here the challenge is even greater than it is in the case of demersal communities. Small pelagic fish tend to be very mobile, and populations can fluctuate wildly according to salinity, the availability of nutrients, and other variables. In any case, there is no survey technique to gauge the abundance of small pelagic fish that is as effective as the trawl net is for demersal communities. As far as the impact fishing was having on pop-

ulations is concerned, changes in the catch per unit of effort provide a poor indication of what is happening to the population. In the case of the Java Sea purse seine fishery, it is striking that catches per purse seiner per year generally increased between 1983 and 1992, but this probably reflected the rapid increase in the fishing power of these vessels. In particular, we must note that purse seine operators developed more and more effective means of attracting fish. Thus the catch could rise even if the population from which it was being extracted was becoming smaller and smaller. In view of this it is possible that the rise in the catch per purse seiner up to 1992 masked a decline in fish populations (Widodo 1997:209-11) and that a fall in the catch rate between 1992 and 1994 (Roch et al. 1998:379) indicates an even greater decline. It is worth noting that in the case of anchovies it appears that during the 1980s and into the 1990s their numbers actually increased along the western side of the Gulf of Thailand because of the nutrients discharged by shrimp farms along this coast. The strong market for anchovies set off a conflict-ridden race to capture them that may well have brought the population down again.

One small pelagic fishery for which changes in population have been estimated is that for flying fish off the southwest coast of Sulawesi. During the 1950s and 1960s Mandarese and other fishing communities continued to capture flying fish during the east monsoon as they long had by enticing them to deposit and fertilize their eggs in floating traps. The object of the fishery was the fish themselves, which were salted and dried and then sold locally, in other parts of Sulawesi, and in Kalimantan, while the eggs 'were merely a savory byproduct' (Zerner 1987:20). Beginning in 1971, however, rising demand for flying fish roe in Japan prompted fishers to target the fish for their roe and to step up their efforts to capture them. They designed larger and more effective traps and began catching the fish with gill nets as well. Catches reached a peak in 1976 but fell to half that level by 1983. Budy Resosudarmo (1995:361) estimated that between 1970 and 1990 the flying fish population off the southwest coast of Sulawesi fell from about 32,000 to 12,000 tons.

As noted earlier, skipjack tuna and especially large tuna in the genus *Thunnus* had barely been fished in the prewar period. But this changed quickly soon after the war. Japanese longliners began targeting yellowfin tuna in and near the Banda Sea as soon as the MacArthur line was lifted in 1952 and soon spread out into the Indian Ocean. In the late 1960s these vessels began using deep longlines to capture bigeye tuna, which tend to swim about in the thermocline. In the 1970s longline and pole and line vessels of Indonesian state-run companies began to capture yellowfin tuna and skipjack tuna respectively. Fishers in the Philippines developed a powerful means of capturing skipjack and juvenile yellowfin by using purse seines in conjunction with *payao*. The Japanese began catching these fish when they gathered

under logs floating in the Pacific Ocean north of New Guinea. Taiwanese and Korean longliners joined the Japanese in capturing large tunas, sometimes under arrangements with Southeast Asian countries but often not. In the 1990s Filipino purse seiners heavily exploited skipjacks around Sulawesi, often followed by handliners in pursuit of the large tunas that also gather under *payao* but further down the water column out of reach of purse seines. In the meantime, Indonesians tried to capture the same fish. Between 1973 and 1999, according to FAO data, landings of skipjack tuna in Indonesia and the Philippines jumped from 53,000 to 350,000 tons, while landings of yellowfin tuna increased from 56,000 to 270,000 tons. For many reasons these figures provide a poor indication of actual catches in Indonesian and Philippine waters, but they show how dramatically this fishery expanded.

It is difficult to assess what impact this upsurge in tuna fishing had had on populations by the late 1990s. On the one hand there was some reason to believe that there was room for further exploitation. As an FAO report explained, 'the principal market tuna species are highly resistant to exploitation' (FAO 1997: Section C1). They are extremely fecund, are distributed over immense expanses of the ocean, and spend at least some time out of the reach of existing fishing gears. In the case of most tuna populations, fishing could severely reduce the number of fish in a particular area. This certainly happened in many Southeast Asian tuna fishing grounds, most notably in the southern Philippines, the source of many of the vessels that surged into Indonesian waters in the early 1990s. But it probably had a less profound impact on the total biomass of the population, distributed as it was over a vast area (Fonteneau 1997:45). On the other hand, however, fishers were rapidly developing the capacity to track down and capture tuna over more and more of their range. Information from satellites began to guide purse seiners to the most promising fishing grounds. During the El Niño of 1997-1998 the powerful European Union purse seine fleet that normally operated in the western Indian Ocean shifted as far east as 100° E. They undertook this long journey because satellite readings showing a cooling of the surface water in the eastern Indian Ocean indicated that the thermocline was nearer the surface than usual and that tuna were therefore likely to be higher in the water column and easier to catch (IOTC 1999:5-6). In the late 1990s Philippine purse seiners operating in the western Pacific began to use satellite sensing of phytoplankton pigment concentrations – an indicator of primary production – to indicate where tuna were likely to be feeding (*Satellite maps* 1998). Some operators began using radar sensitive enough to pick up flocks of birds, whose presence indicated that tuna were likely to be feeding on small fish near the surface of the water just as the birds were. The power of sonar and echosounding devices to detect fish was rapidly improving. At the same time purse seine operators began to deploy free-floating fish aggregating devices

(FADs) to cut down on the time spent chasing after tuna. By making their nets deeper they captured fish further down the water column, and by devising ways to let these nets fall through the water more quickly they made it harder for fish to escape. Up to the early 1990s bigeye tuna made up a very small proportion of purse seine catches in the Indian Ocean, but the combination of FADs, deep nets, and sonar brought about a 'spectacular' growth in catches of bigeye tuna in purse seines. At the same time catches of bigeye tuna by Taiwanese and other longliners grew rapidly during the 1990s. In order to gauge the impact that this intensification of fishing had had on populations of the larger species of tuna, a working party set up by the Indian Ocean Tuna Commission made use of records kept by Japanese longliners since the 1950s. Analysis of these records showed that the hook rate (expressed as the number of fish caught per 100 hooks) fell at least 64 percent between 1954 and 1998, suggesting a marked decline in numbers. So great was the working party's concern in the case of bigeye tuna that it recommended that 'the increase in catches [...] from all gears should be halted immediately'. The shorter-lived skipjack, the principal target of the purse seiners, gave the working party much less concern. It noted that the quantity of skipjack caught per successful set on FADs declined by 'nearly 50%' between 1992 and 1997, but this may have been simply because so many FADs were being used that the effectiveness of each one was reduced (IOTC 1999:13-4, 16, 18, 23).

We can now turn our attention to the animals making up and living in close association with coral reefs. First to be targeted on a large scale were the fusiliers. In the post-war years these fish were caught in ever greater numbers using drive-in nets (*muro ami*) and explosives. In the Philippines the Abines family conducted *muro ami* fishing on a far greater scale than the Japanese had before the war, employing three or four hundred boys and young men in a single team and scouring reefs not only around the Philippines but also far out in the South China Sea. By the early 1990s the Abines family and its competitors had adopted a variation on the *muro ami* known as *pa-aling*. This new method did less damage to the corals because, instead of weighted scare lines, the swimmers used hoses to create a screen of bubbles to drive the fish into the net, but it proved to be an even more powerful means of capturing fish. According to one estimate, one setting of the net could capture about 20 percent of the total fish biomass of a reef. In 2001 three scientists who had studied *pa-aling* called on the Philippines government to ban it (Abesamis, Aliño and Jocson forthcoming). The record on the application of drive-in nets to fusiliers is less clear in Indonesia. In 1974 Unar noted that because fusiliers 'are very closely dependent on their environment [...] they are relatively sensitive to intensive exploitation', but in his judgement overfishing had not yet taken place, since the fishers only operated during the transition between the monsoons when the currents were suitable. He was much more concerned

about the impact of explosives, observing that 'evidence suggests that certain coral reef fisheries in the Moluccas have been completely destroyed by explosives' (Unar 1974:285).

The next animals associated with coral reefs to be targeted on a large scale were the groupers, wrasse, and other fish that, as adults, swim in and out of the myriad of holes and crevices making up a reef. These fish were mainly captured for sale live in Hong Kong and some other markets in Greater China. The main way of catching them alive was to stun them with cyanide, which was often injected into the crevices. As is well documented, this form of fishing brought about collapses in the population of these fish, first on reefs in the South China Sea, then in the Philippines, and then in Indonesia. Several aspects of the behaviour and life cycle of coral reef fish heighten their vulnerability whether they are targeted with cyanide, hook and line, or some other fishing gear. As the fishers soon learned, the most valuable reef fish gather together to spawn in a few locations at particular times. By the 1990s some operators were using global positioning systems to record spawning locations so that they could return to these spots to capture more fish. Moreover, because these fish are also extremely long lived – a humphead wrasse weighing 180 kilograms may be as much as a hundred years old (Johannes and Riepen 1995:33) – even light fishing pressure soon takes its toll. The removal of a few old females can be particularly destructive, since they produce vastly more eggs than an equivalent weight of younger ones (Pauly 1997:125). For these reasons, populations of coral reef fish were quickly depleted regardless of what method was used.

Explosives, drive-in nets, and cyanide took a great toll on the corals themselves. Explosives were widely used in the Philippines to capture reef fish, and, as Unar noted, explosives apparently had already destroyed many coral reefs in the Moluccas by the 1970s. The scare lines used in large-scale drive-in net fishing presumably destroyed vast areas of branching corals. Cyanide then killed vast areas of corals in the 1980s and 1990s. But by the 1980s forces unrelated to fishing compounded the assault on corals, which thrive in clear, nutrient-poor water that is neither too cold nor too warm. Increased sedimentation from logging and other activities on land increased turbidity in the waters around many reefs, discharges of sewage increased the level of nutrients, and various forms of pollution including sewage, industrial waste, and oil spills killed corals. Finally, rising seawater temperatures have caused episodes of coral bleaching, most notably in 1998, when most of the reefs of Southeast Asia were badly affected. The result of all these assaults on corals was that by the mid-1990s just 29 percent of the reefs in Indonesia were in 'good' condition (Cesar et al. 1997:345), and according to an estimate made in 2001 blast fishing and siltation had 'severely damaged' 70 percent of the reefs in the Philippines (ASEAN-SEAFDEC 2001:34). By the 1980s the underwater world of corals,

sponges, and other animals in Ambon harbour which had bedazzled Wallace in the 1850s was almost devoid of life. Many coral reefs became covered in algae, which flourished because of the extra nutrients and, even more importantly, the removal of herbivorous fish (McManus et al. 2000).

One of the most striking features of the fisheries of the island world during the late 1900s was the renewed demand in Greater China for trepang and various shellfish. For various reasons it was mainly relatively poor island communities who seized the opportunity provided by this renewed demand. Some groups, notably the Bajau Laut, had engaged in collecting for centuries, but the number of collectors increased greatly as prices rose and populations grew rapidly on some islands such as those near Buton. Although those engaged in collecting needed little capital, they did need boats and, as time went by, many of them adopted the hookah so that they could dive deeper and stay under water longer.

Southeast Asians had collected shellfish and trepang for the long-distance trade for many centuries, but during the late 1900s populations of these animals collapsed in many places both because so many people took part in collecting and because new technology enabled them to harvest far more efficiently. A report on the trade in seashells in the Philippines describes what happened in two places:

> Compressor divers from Bantayan Island now must descend to depths of 18 m to 23 m to gather specimens – averaging one kilogram of assorted shells – where 10 years ago they could expect to catch 25 kg a day each, at depths of only 1.5 m. A fisher from Katakian Island in Quezon province, who once harvested clams measuring 60 cm in length, stated that most specimens now average 15 cm in length. (Salamanca and Pajaro 1996:70.)

In the Moluccas a village that had harvested trochus shells once every three years began collecting the shells every year in 1987; soon afterwards, the average amount of trochus collected per year fell from 1,100 to 400 kilograms (Cesar et al. 1997:348). In general, it appears that trepang stocks withstood the increased pressure better than shellfish did, but Mark Erdmann (1995:6) reported in 1995 that 'the most valuable species [of trepang] are now virtually extinct' in the Spermonde Islands. The age-old movement of certain groups of collectors from reef to reef accelerated as prices rose and stocks of certain species were quickly depleted in one area after another. Anthony Reid (1992:6) describes the movement of a group of Butonese whom he interviewed in 1991:

> With the increase in price [of trochus shell] in recent years, and the progressive exhaustion of trepang and giant clams, trochus have become the most important item in the economy of the fishermen of all three islands [the tiny islands near Buton Island that they came from]. The first major target of these outside south-

> east Sulawesi waters was the north coast of Flores, which was fished extensively for trochus in the 1970s and '80s. As these stocks became exhausted, they moved further east in the 1980s, to the reefs of Maluku (notably Tanimbar) and Irian, and also to northern and central Sulawesi. The high prices of trochus have led to its being gathered to the point where it is scarce everywhere.

At the time Reid conducted his interviews, only New Guinea and the north coast of Australia were believed to have abundant supplies of trochus and other valuable sedentary species. Widespread degradation of the coral reefs inhabited by many of these animals accelerated their decline within the island world.

As noted earlier, sharks were often caught in trawl nets, but it seems unlikely that the total population of sharks underwent any significant change until the 1980s. It was then that the renewed demand in Greater China for marine exotica brought about a massive fishery for sharks, mainly for their precious fins. One of the main shark fishing grounds was the Arafura Sea, which was inhabited by many species of sharks including the one with the highest priced fins in the world, the whitespotted wedgefish (Rose 1996:16, 50, 65). Taiwanese vessels began operating here in the early 1970s at the latest, fishing off the coasts of Indonesian islands and all along the coast of Australia from the Northwest Shelf to Cape York (Bentley 1996:29). When, in 1979, the Australian government proclaimed a 200-nautical-mile Australian Fisheries Zone, it granted licences to Taiwanese vessels allowing them to fish in most parts of this zone, but it restricted the number of vessels to a maximum of thirty and limited catches to 10,000 tons. The main fishing gear used by the Taiwanese was the gill net, which they made larger and larger in order to increase the catching power of each vessel. In 1979 their gill nets were, on average, 7.5 kilometres long and 15 metres deep, but by 1986 they were 15.8 kilometres long and 20 metres deep. Concerned both that sharks were being overexploited and that many dolphins were being caught in the nets, the government limited the length of the nets to 2.5 kilometres in 1986. At this point, the gill netters shifted northward into Indonesian waters. In 1994 fifty-five Taiwanese vessels were licensed to fish in the Indonesian section of the Arafura Sea; it is likely that others fished in this area without licences. At the same time an unknown number of Indonesian vessels targeted sharks in the Arafura Sea. There is probably no way of knowing the quantity of sharks captured in this area or anywhere else in Indonesian waters. FAO data show that landings of sharks and rays for all of Indonesia increased from 31,000 tons in 1979 to 90,000 tons in 1993 (FAO 1994). Even if these figures accurately reflect landings, however, they greatly underestimate catches in Indonesian waters, since the Taiwanese did not land their catches in Indonesia and, even more importantly, both the Taiwanese and the larger Indonesian operators usually cut off the fins before throwing the sharks dead or alive back into the sea.

Although I am aware of no studies of the population of sharks and rays in the Arafura Sea, it seems very likely that the combined pressure of Taiwanese and Indonesian fishers quickly depleted shark stocks there. As Debra Rose (1996:1) explains, 'long life cycles, delayed sexual maturation, and low fecundity rates severely limit the rate of sustainable harvest' for many species of sharks and rays. Therefore, it is puzzling, as Ramón Bonfil (1994:58-9) suggests, that reported landings kept on increasing year after year.

The list of animals undergoing population declines between 1940 and 2000 might be greatly extended. By the late 1980s shad were 'very rarely found' along the Malay Peninsula (Gambang 1988:1). In the Selat Panjang, where, as mentioned earlier in this article, the water had once rippled with fish, one species (*Tenualosa toli*) that had once been common had virtually disappeared, while the population of the other (*Tenualosa macrura*) had fallen dramatically since about 1970 (Blaber et al. 1999:689). Crocodiles, which had prompted Tenison-Woods to comment that 'the mud is almost alive' with them, had 'now seriously declined in numbers and distribution' (Polunin 1983:473). Populations of sea turtles, often caught as by-catch by trawlers as well as targeted for their shells and meat, had fallen markedly. And dugongs, perhaps already under threat near Singapore as early as the 1850s, had become very rare, often the victims of trawlers operating close to shore. All of these animals were extremely vulnerable to population declines because they spent all or part of their lives in very specific habitats. This made them not only easy to kill but also highly susceptible to degradation or removal of those habitats. *Terubuk* ingested sawdust dumped into the rivers of east Sumatra, crocodiles suffered from the removal of mangroves, sea turtles had fewer beaches where they could lay their eggs undisturbed, and dugongs lost many of the seagrass beds on which they grazed.

Conclusion

This sketch of a demographic history of the marine animals of Southeast Asia allows us to draw a few preliminary conclusions. Most obviously, the populations of a great range of marine animals declined between 1850 and 2000. Though the oysters of the Aru Islands, the demersal fish of Manila Bay, and the fusiliers inhabiting many reefs all experienced declines before 1940, the sharpest reductions in populations took place after about 1960. Demersal fish, fusiliers, groupers and other fish closely associated with coral reefs, and corals underwent the most dramatic declines, though demersal fish won a temporary reprieve in much of Indonesia and there may be some demersal fish stocks inhabiting very deep shelf areas that are out of reach of trawlers. The populations of most pelagic fish probably declined much less. Sharks

(not neatly classified as demersal or pelagic) certainly declined sharply in intensively trawled areas, and it seems likely that they did in other areas such as the Arafura Sea where they were targeted by other fishing methods. And turtles, crocodiles, and dugongs declined sharply.[10] But not all animals experienced declines. Mesopelagic fish in the seas of Southeast Asia, which in 1980 were estimated to have a biomass of about 14 million tons (Gjøsaeter and Kawaguchi 1980:127), remained untouched, as they were both hard to catch and, in most cases, not suitable for human consumption. And some species – generally ones that are short-lived and low in the food web – actually underwent population increases, most notably squids and (at least temporarily) anchovies in the Gulf of Thailand and jellyfish in the Samar Sea and some other intensively fished areas. Recent studies have shown that because of the removal of top predators the mean trophic level of catches has declined in fisheries in many parts of the world including the demersal fishery of the Gulf of Thailand (Pauly et al. 1998; Pauly and Chuenpagdee forthcoming). Further research may show that such 'fishing down the food web' partly explains why total nominal fish landings in Southeast Asia continued to rise in the 1990s. Less discarding of by-catch, the landing of a steadily smaller proportion of the catch outside the region, and of course 'mining' of fish stocks provide other possible explanations, though the first challenge may simply be to judge the reliability of the data.

The task of explaining population declines is a complex one. Human predation of marine animals, alteration of their habitats, and 'normal' cycles all must form part of the explanation. But scientists are now giving us many new insights into the interaction between these different forces. Looking at long-term changes in many coastal ecosystems around the world, Jeremy Jackson and his colleagues argue that overfishing not only comes first in the sequence of human disturbance but also 'may often be a necessary precondition for eutrophication, outbreaks of disease, or species introductions to occur' (Jackson et al. 2001:635). As mentioned, this seems to explain why algae have taken over the remnants of many coral reefs in Southeast Asia. Daniel Pauly and Ratana Chuenpagdee (forthcoming) suggest that the removal of high-trophic-level fish from the Gulf of Thailand accounts for much of the impact usually attributed to pollution. In particular, they argue that the removal of these fish brought about a great increase in the number of jellyfish and other animals that eat herbivorous zooplankton, thereby creating the conditions for phytoplankton blooms and, in turn, oxygen depletion. And A. Ghofar and C. Mathews (1996:146) suggest that intensive exploitation of sardinella in the Bali Strait may make it difficult for stocks to rebound

10 I am far from clear about whales, which, though still hunted by 'traditional' methods at Lamalera and a few other places, have been free of industrial exploitation for many years.

from natural downturns in primary productivity related to the ENSO cycle. In short, any explanation of population collapses must consider 'synergistic effects' (Jackson et al. 2001).

Clearly, we have only begun to study the historical demography of the marine animals of Southeast Asia. Fortunately, there is a wealth of sources that we might use for this purpose. Among these sources is the multitude of articles in fisheries journals, which are historical in the sense that they usually describe particular fish populations at particular times. The greatest challenge, as I see it, is conceptual in nature. It is only by understanding population dynamics and trophic interactions that we will make progress. Put differently, it will only be through collaboration between historians and fisheries scientists that we will, eventually, have something like a demography of the marine animals of Southeast Asia over the past century and a half.

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PETER BOOMGAARD

Resources and people of the sea in and around the Indonesian Archipelago, 900-1900

This article is an exercise in making do with a meagre data set.[1] Its main purpose is to take stock of the available data on resources from the sea in the proto- or even pre-statistical period of the history of the Indonesian Archipelago. However, even scraping the archival barrel until it has yielded the last bit of information on this topic does not allow the type of analysis that would be possible when using twentieth-century data. Therefore, a historian who would like to find out whether experience from the remote past can be brought to bear on the problems of the present can expect only modest results. Nevertheless, in keeping with the theme of this book, I examine the data with a view to depletion and sustainability of resources.

In purely quantitative terms, fisheries cannot be said to have been a very important branch of the Indonesian economy over the last two centuries, as witness Table 1.

Table 1. Share of fisheries in Gross Domestic Product (GDP) and the labour force in Java and Indonesia, 1820-2000.[2]

Year	Java		Indonesia	
	% GDP	% labour	% GDP	% labour
1820	3	3		
1880	2	2		
1930	1	1		
2000			2	4.5

1 I wish to thank Manon Osseweijer and Rosemary Robson for contributions to this article.

2 Data from Boomgaard 1989:117; Van Zanden 2002:22; www.fao.org/fi/fcp/en/IDN/profile.htm; www.odci.gov/cia/publications/factbook/geos/id.html. Accessed September 2003.

All the figures in Table 1 are rough estimates, and it is far from certain that they measure the same phenomena from one year to another, or even within one year. Keeping this in mind, we should be cautious in interpreting the trends suggested by these figures. The first trend is the one visible in the figures on Java, which appear to suggest a continuous drop in the relative importance of fisheries between 1820 and 1930. This might point in the direction of overfishing, or the increasing availability of alternative, better paid (or less onerous) occupations, or both. Java's economy around 1930 was more complex than it had been a century earlier, which is in keeping with a growing choice of alternative jobs.

Comparing the data for the whole of Indonesia around 2000 with those for Java of earlier dates, two features stand out. The figures for Indonesia as a whole are higher than those for Java in 1930, while the proportion of fisheries in the labour force of Indonesia in 2000 is higher than that of Java in any year represented in Table 1. As I have no figures for Indonesia as a whole in 1930 or for Java in 2000, we are left to speculate on the developments that led to these remarkable differences. In view of the alarming reports on the depletion of the Indonesian seas (Osseweijer, this volume), it is unlikely that there has been an increase in the relative importance of fisheries in Indonesia as a whole, in terms of either GDP or labour force. That implies that the figures for Indonesia as a whole in 1930 were either on the same level as in 2000 or even higher. This, in turn, means that the proportion of the labour force engaged in fisheries in the Outer Island regions in 1930 must have been much higher than that to be found in the table for Java (1%), an observation that also applies to the share of fisheries in Outer Islands GDP in comparison to that of Java. As it is generally accepted that Java around 1930 was economically more highly developed than the Outer Islands, this conclusion tallies nicely with the observation made above that higher levels of economic development in Java made for increased availability of alternative jobs over time, which is reflected in the drop in importance of the fisheries sector. As a corollary, therefore, we may speculate that Outer Islands fisheries were probably even more important in quantitative terms in earlier years, which then would also apply to Indonesia as a whole.

Finally, I should point out that, given the data for 2000, labour productivity of fisherfolk in the Outer Islands appears to have been much lower than it was in Java. This would certainly not apply to all areas (such as the fisheries of Sumatra's northeastern coast), but it is in keeping with what we know about the bulk of the other Outer Island regions, where fishing often was (and is) a subsistence activity with a very low capital input.

But surely size is not everything. I can think of at least three factors that suggest that maritime resources played a role that went beyond their share in GDP. The first one is that fish, and other products from the sea, were (and are)

more important than the size of the sector suggests because of the role they played in the diet of the majority of the population.[3] It could even be argued that in some societies the presence of large quantities of fish has shaped the diet, and thus societal structure, to a large extent.

The second factor is that it seems likely that people who made a living from the sea may have formed societies with identities quite distinct from those of other people. Here we can think of the Orang Laut and the Bajau ('sea gypsies'), but also of traditional Javanese fishing regions such as Pekalongan and Madura, and many small islands in eastern Indonesia. In these societies, products of the sea were virtually the only means of exchange for acquiring prestige goods or even basic necessities, while the sea and its cyclical changes, caused by seasonal fluctuations, imposed its rhythm upon them.

Finally, specific maritime resources have generated, for one reason or another, considerable interest among foreign observers. These products were often restricted to certain areas, at least in commercially exploitable quantities, and demand for them was subject to swings in popularity in countries outside the Indonesian Archipelago. I am thinking of products such as pearls, mother-of-pearl, various types of shells (cowries and shanks), trepang, ambergris, and tortoiseshell. Some products, such as pearls, were associated with fabulous riches.

Fish versus non-fish and non-food in the sources

Some time ago Antoinette Barret Jones published a list of terms of natural products to be found in Javanese inscriptions dating from 929 and earlier years. Of this list, 22 items are or can be sea products (some fish and crustaceans could be freshwater products). More than half the items on this list are fish (12), while the remainder are crustaceans (4), molluscs (3), mammals (2), and reptiles (1). There is a strong emphasis on animals that can be eaten (Jones 1984:57-8).

A totally different impression is conveyed by the collection of Chinese sources on the 'Malay world' (now Malaysia, Indonesia, and parts of the Philippines), dating from the period between 500 and 1650 (mainly 950-1650). Of the 30-odd references to sea products, only a small number have to do with fish (4) and other edible items (2). The vast majority refer to more durable commodities, such as tortoiseshell (10), pearls (6), shells (5), coral (3), and ambergris (3) (Groeneveldt 1876).

3 I am well aware that not all fish come from the sea and that fresh-water fish and other creatures from lakes and rivers are not unimportant in the diet. However, I am not in a position to separate them analytically, nor is it necessary to do so.

Something similar can be observed when we look at the (printed) sources for the VOC (Dutch East Indies Company) period (1600-1800), although it depends on the kind of sources. If we look only at the *Generale missiven*, the *Dagh-register*, and De Jonge's *Opkomst*, all of them sources that reflect the activities of the VOC in Asia in general, we find an overwhelming emphasis on commodities for international markets, such as tortoiseshell, pearls, mother-of-pearl, trepang, cowries and shanks (conches). Fish and other kinds of seafood (shrimps, lobsters, mussels, crabs) are hardly ever mentioned. By contrast, the *Plakaatboek*, mainly concerned with regulations for Batavia (present-day Jakarta), has much more to say about fish and fisherfolk. Here, the VOC does not so much act in its capacity of large trading company but in that of municipal government, regulating markets and prices and generating income by taxing fishermen.

Clearly, therefore, fish and other types of seafood are well represented in the sources that reflect daily life to a greater or lesser degree. Within this group of sources fish is much better represented than mussels, crabs, and other kinds of seafood. In the sources reflecting mercantile interests, seafood is almost invisible, and the focus is on non-food commodities produced (or rather gathered) for faraway markets. Researchers who use only the latter sources would get a seriously distorted picture of the Indonesian seas and their products, not to mention their (coastal) people.

As we may assume that seafood in terms of daily experience and the labour force involved, and probably also in terms of its importance for GDP, was always more important than the 'splendid and trifling' commodities for the international markets, the first section of this article is dedicated to edible fish and other seafood.

Seafood

The first point to be made here is that fish was an important item in the diet of many of the peoples of the Indonesian Archipelago. A Dutch source, dating from about 1600, mentions that the Javanese (from Banten) eat mainly rice and fish, although there are plenty of goats, sheep, geese, ducks and chickens, of which they eat very little. An English report on Java, dating from about the same time, states that the Javanese diet consists almost entirely of rice, with some chicken and fish, but not in large quantities. A slightly older Portuguese report mentions that people from Sumatra fed themselves mainly on rice and shad roe (no doubt *telur terubuk*), and that fish was so abundantly available that only the roe was consumed while the fish was thrown out and left to rot on the beach. Perhaps this report is not entirely reliable, although the 'rotting fish' might be an early reference to *terasi* (fermented shrimp).

Finally, three centuries later, the British naturalist Henry Forbes, who spent a lengthy period of time in Java around 1880, stated that (fried) fishes were the 'staple flesh-food of the natives'.[4]

If this was true for Java and Sumatra, it should not surprise us that Eastern Indonesia, consisting almost entirely of small islands, was even more orientated towards seafood. In fact, it is probably fair to say that most of the Moluccas (in the modern sense of the word) lived on a diet of sago, roots and tubers, bananas, and fish plus other seafood. Fish was the main source of animal protein, besides some 'bushmeat' and meat from domesticated animals sacrificed during large feasts of merit. In some areas, there was no cultivation of the soil at all (Valentijn 1724-26, I:20; Wallace 1869:345, 386, 452).

In colonial times, scholars believed that the presence of such trees as sago and breadfruit were conducive to the 'creation' of lazy people. Although nowadays we would no longer phrase it like that, it remains an interesting question what the abundance of certain food sources does to the people who are their guardians. In the case of the Moluccas, how did the presence of sago and fish influence those societies? Scholars (Rumphius, Pieter Bleeker, Alfred Russel Wallace) were always impressed by the enormous quantities of fish, not to mention the remarkable variety of species, to be found in the waters around Ambon. It does seem likely that the combination of unlimited supplies of fish, sago, and bananas was conducive to the creation and continuation of societies without much agriculture or animal husbandry. This combination apparently did not block processes of state formation, as witnessed by the sultanates of Ternate and Tidore. These states were able to develop on the basis of the trade in cloves, an arboricultural product, but products of the sea such as tortoiseshell may have played a minor role as well.

There are hardly any indications that in the two centuries between Rumphius and Wallace the impressive biodiversity to be encountered in the sea had been compromised in any way, or that the quantity of fish to be found in these waters had decreased. The only possible exception I came across dates from 1714, when the governor of Ambon and Dependencies ordered a prohibition on fishing in coastal waters up to a distance one hour's sailing, in order to prevent the fish being chased away from the area. This sounds as if fish – at least temporarily – had become scarce near the coast, but this may have been a one-off event, owing its existence to a weather anomaly (El Niño?). However, it may also be a somewhat distorted rendering of a *sasi* closure. Such a regulation was put in place during the short period that schools of pelagic fish such as tuna and *lomba* returned to the mouth of a certain river. The coastal waters were then declared off-limits to everyone until those fish had arrived in sufficient quantities for exploitation – indeed, in order to

4 Forbes 1885:60; Keuning 1938:89; Foster 1943:169; Teensma 1989:318.

avoid scaring them off (*Generale missiven*, VII:136; Zerner 1998:543-8).

My impression is that many different species of fish and other sea animals were eaten, a topic to which I shall return presently. Given the enormous biodiversity as witnessed by our sources, this was a sustainable option. This state of affairs may have kept people from overexploiting a limited number of species, thereby maintaining the level of biodiversity. This mechanism appears to be a feedback loop that in all probability would only be operational in areas where the population density was not too high.

Returning to Java, it seems that, besides rice, people ate mainly fish (and even then not in large quantities), and not meat. Why? Was it purely a question of poverty? What may have been overlooked in the sources I have quoted is that people ate meat during *selamatan*, that is, festive or ceremonial meals held in connection with life-cycle events and activities related to the agricultural calendar. As such occasions were not infrequent, the consumption of meat may have been somewhat higher than we have been led to believe. Nevertheless, Java was not a typical meat-eating society, and the question remains to be answered whether this had anything to do with an ample supply of seafood, with a lack of income or livestock, or with cultural preferences or taboos.

A lack of livestock in earlier years is certainly a possibility. Between 1820 and the 1850s the number of livestock per capita was increasing in Java (Boomgaard 2004), and conceivably this may have been an older trend. As during the same period the share of fishermen in the labour force was decreasing, and if that was also an older trend, it is plausible to assume that seafood was losing out to meat. After the 1850s the amount of livestock per capita in Java went down, but it is far from certain that this was compensated for by an increasing local yield of fish, although admittedly another possibility is increased imports of seafood (Java was importing salted fish from Siam).

To my knowledge, there is only one area in Java for which we have an impression of the development of fish consumption, albeit a rather indirect one. As the VOC was not only a merchant company but also the territorial lord of the 'kingdom' of Jacatra [Jayakerta] that had been conquered in 1619 and then renamed Batavia, it also exercised a number of sovereign rights. These rights included the collection of dues to be paid by fishermen who wanted to sell their catch at the Batavia fish market. These rights were usually farmed out for a lump sum to the highest bidder, often an ethnic Chinese merchant. For the year 1673, the total value of the tax farm including all its rights (imported rice, shops, fish market) amounted to 8,432 rixdollars (*rijksdaalders*) per month, of which 830 rixdollars were for the fish market. About 55 years later, the value of the fish market was 2,150. This increase in dues received from the fish market was no doubt directly related to the growth of

the population of Batavia and Environs, from around 50,000 to slightly over 100,000.

However, during the 1740s the value of the fish-market tax farm had dropped to between 1,300 and 1,700 rixdollars. As this was shortly after the Chinese massacre in Batavia of 1740, which caused a considerable drop in Batavia's population, the lower amount of the fish-market tax farm probably reflects a lower demand. One could also speculate that the temporary disappearance of ethnic Chinese capital may have created problems for the fisheries sector.[5]

It also seems that local fisheries were remarkably stable over time. The Portuguese traveller Tomé Pires, whose writings reflect the situation around 1515, several times mentions fishing and the production of salted and dried fish in the coastal zone of northeastern Sumatra, nowadays still a fishing region. Another Portuguese report, dating from 1582, mentions (salted) roe of *terubuk*, also called Malay caviar, which is still a speciality of the area, while John Anderson, visiting this region around 1825, also mentions extensive *terubuk* fisheries. Around 1870, the Sultanate of Siak, in the same area, was reported to export (salted) roe.[6]

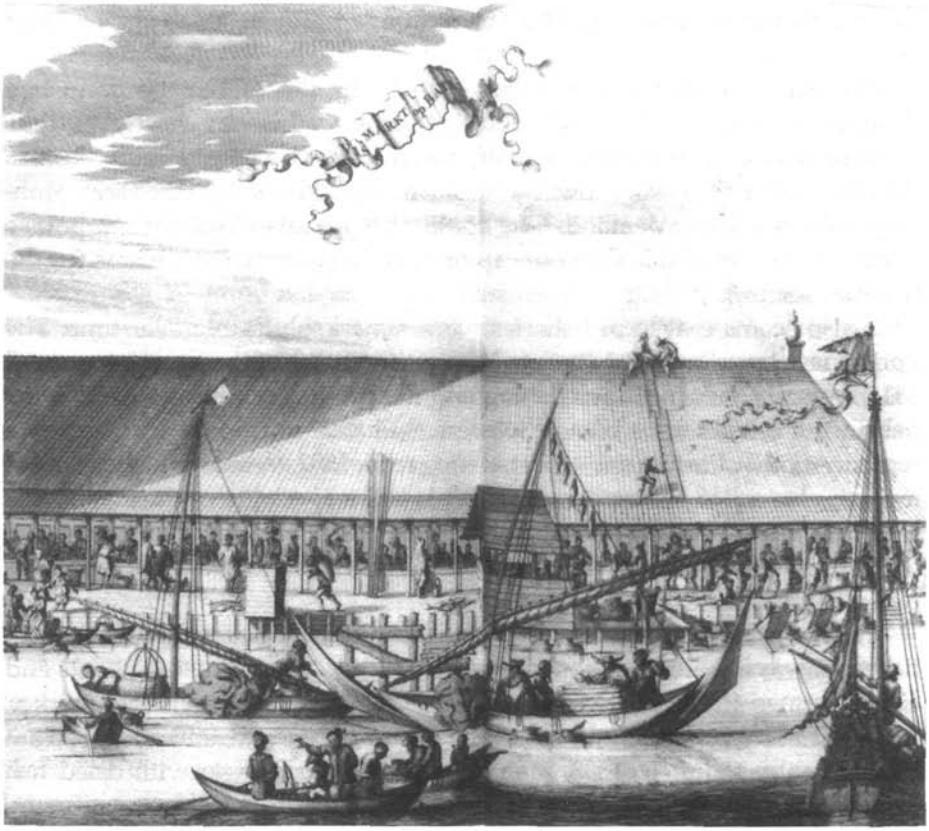
In Java, there are similar examples. Pekalongan, nowadays an area of fisheries, was already mentioned as such in 1664, when 37 fishing boats and 422 fishermen from Pekalongan took their catch to the Batavia fish market. A similar story could be told about the island of Madura, still an important fishing centre today. In 1688, nine vessels came to Batavia with dried fish from Madura, and in 1705 the people of Madura were asked to send as many dried fish to Batavia as they could.[7]

Batavia had trouble acquiring sufficient fish for its expanding population. In the early seventeenth century, fishing in the Bay of Batavia was undertaken by ethnic Chinese inhabitants and by slaves of the European 'freeburghers' of the town, about whom I will say more presently. But without the help of people from adjacent areas, such as Banten, Krawang, and Cirebon, the city of Batavia could not feed itself. Later on, as we have just seen, fishermen came from even further afield (Pekalongan, Madura). Outside help was probably needed for any city over a certain size. Banten, around 1600, prior to the arrival of the VOC one of the most important ports of trade of Java, had to import salted fish from Krawang and even from Banjarmasin (Borneo). One might even suppose that every city had a number of feeder fishing towns or

5 *Generale missiven*, VIII:232, XI:200, 335, 470, 731; De Jonge 1862-95, VI:122. Regulations for the fish market of Batavia date from 1631 (*Plakaatboek*, I:259, Decree 3 September 1631).

6 *Aardrijkskundig woordenboek* 1863-69, III:308-10, under 'Siak'; Cortesão 1944:148-9; Anderson 1971:24; Teensma 1989:318; on *terubuk*, mostly *Clupea macrura*, see Burkill 1935:589-90, under 'Clupea'.

7 *Dagh-register* 1664:246; De Jonge 1862-95, VIII:54, 271.



Batavia fish market, circa 1680. The VOC farmed out the right to collect the dues that were paid by the fishermen who sold their catch at the Batavia fish market. (Engraving, taken from Nieuhof 1682:206-7.)

villages nearby, such as Krawang for Banten, Banten and Krawang later on for Batavia, Kaligawe (mentioned as a fishing village in 1678) for Semarang, and Gresik (1677) and Madura for Surabaya.[8] It is not clear whether the need for outside help was caused by local overfishing or by an insufficient number of local fishermen.

Fish was not the only type of seafood eaten by the people of the Indonesian Archipelago. On Java's famous Borobudur, built around 800, we find reliefs depicting crabs, prawns, and turtles (which could be eaten), in addition to fish, including sharks. On the list, mentioned earlier, of sea creatures found in Javanese inscriptions of 929 and earlier, we encounter sea-crabs, another

8 De Jonge 1862-95, VII:142, 199; Rouffaer and IJzerman 1915:103, 119.

(small) crustacean, squid, prawns, mussels, and various types of fish, again including sharks.

In the seventeenth century, the Dutch envoy Johan Nieuhof published a richly illustrated list of edible sea creatures, in addition to a number of freshwater creatures, to be found around Java and in other areas of the Archipelago. Among the fish he mentions are rays that were so big they could feed 40 people. However, the most impressive publication in this respect is Rumphius's famous book published in 1705 on the marine life to be encountered around Ambon (Moluccas). It is amazing to see how many sea creatures were eaten locally, and from time to time Rumphius could not suppress a shudder when mentioning yet another strange animal (such as trepang) that was eaten by the locals, and certainly not by the Europeans who resided in the area.

Almost exactly two centuries after the appearance of Rumphius's *Rariteitkamer*, the Dutch physician C.L. van der Burg published his comprehensive study of foodstuffs of the Indonesian Archipelago (Van der Burg 1904). In addition to many pages dedicated to various types of fish, the book contains a great many references to other edible animals (and plants) of the sea, such as dried jellyfish.[9]

Finally, it seems that fishing was often undertaken by foreigners, as we saw in the case of Batavia. Here, according to data from 1623, 1632 and 1633, fishing was in the hands of ethnic Chinese fishermen and slaves of freeburghers. In Banten around 1600, it was also slaves who did the fishing. Around Aceh in 1688, the owners of fishing boats were well-to-do local people, but the actual fishing was done by their slaves. In 1721, slaves are also mentioned as fishermen in Malacca, and in 1727 around Ambon.[10]

In the area between Sumatra and the Malay Peninsula the people called Orang Laut were conspicuous in their exploitation of the sea. In the eastern part of the Archipelago a similar role was filled by the Bajau and the Bugis.

It is not clear whether it is significant that many fishermen did not actually come from the region where they were active. This could mean that local people often found the risks of a fisherman's life too high when weighed against the meagre remuneration. The many cases of slavery appear to point in that direction, as slaves are often employed in dangerous and unpleasant sectors of the economy.

One of the possible implications is that overexploitation of resources is not something about which non-local fishermen would be overly concerned.

9 *Plakaatboek*, I:239; Nieuhof 1682:268-81; Rumphius 1705; Van der Burg 1904; Steinmann 1934:102; Jones 1984:57-8.

10 *Generale missiven*, VII:563, VIII:129; De Jonge 1862-95, III:182, IV:280, V:191, 214; Dampier 1931:91.

However, it is far from certain that local people were any more concerned about sustainable exploitation, or even that such concerns were called for prior to, say, 1850.

It is also likely that many fishermen, at least the non-slaves among them, were heavily indebted to a moneylender, often the same person, called *langganan* in Java, who provided them with the tools of their trade (De Haan 1935:282).

Pearls and their mothers

Originally the VOC was only marginally interested in pearls in Indonesian waters, while seventeenth-century reports are full of details about the pearl fisheries between Sri Lanka, particularly the small island of Mannar, and the town of Tuticorin, located on the southern tip of India.[11] Pearls had been 'harvested' in this area since at least the first millennium BC. Both places came into the hands of the VOC just before 1660, having been under Portuguese rule for a long time, and it is to the Portuguese that we owe an early (1518) description of these fisheries:

> Nigh to this Island [Sri Lanka] there is in the sea a shoal covered by a depth of ten or twelve fathoms of water whereon are found pearls both great and small in extreme abundance. Of these some are shaped like a pear. The Moors and Heathens of a city named Cael, pertaining to the King of Coulam, used to come hither twice in every year to fish for them. They find them in oysters smaller and smoother than ours. Men dive and find them at the bottom of the water, where they can stay for many hours. The little pearls belong to the pearl-gatherer and the great ones to the King, who keeps his factor there. They pay him as well certain fees to obtain his permission to fish. (Dames 1918-21, II:116-7.)

Although this quote contains at least one dubious passage – the writer must have meant minutes instead of hours – there are two elements that merit our attention. Fishing takes place twice a year, and the fishers pay dues to a ruler, whose representative oversees the pearl-diving activities. When the Dutch became aware of the commercial possibilities of these pearl fisheries, they worked out a system of exploitation that may have been largely copied from the Portuguese, who, in turn, probably had taken their cue from local rulers. Nevertheless it would appear that the first 30 years under VOC rule was a period beset by natural and man-made problems, and that it was not until 1690 that the system functioned satisfactorily. In a long report, dated 1691, Hendrik Adriaan van Reede tot Drakestein, Lord of Mydreght, the

[11] The pearls are produced by the Ceylon pearl oyster (*Pinctada radiata*).

well-known author of *Hortus Malabaricus*, named three natural factors that had a negative influence on the pearl banks. He mentioned banks being covered with sand owing to shifting water currents, and two sorts of pests, one a plant and the other one a kind of small mussel. In the last two cases it could take eight to nine years before the pearl oysters again settled themselves on the coral reefs that are the basis of a pearl bank. However, Van Reede, who at an early age became the VOC's governor of Malabar, southern India, also surmised that corruption may have played a role in the long period of low yields of these banks.

Be that as it may, the system of exploitation that would remain in place for some 80 years, functioned as follows. The VOC engaged a number of Parruas or Paravas, an ethnic group of people who had migrated to the area more than a century before the Dutch arrived on the scene. They had been converted by the Portuguese, and they were specialists in pearl diving. These people would then, under the watchful eyes of the Dutch, 'visit' the banks, sampling the oysters in various places, in order to determine the quality of the pearls and therefore the average value per 1,000 oysters, as the percentage of oysters containing a pearl was very small. When Van Reede supervised the 'visit' of 1690, the sample consisted of 26,200 oysters. If the average value of pearls per 1,000 oysters was sufficiently high, the Company would announce that a pearl fishery was going to be held from a certain date onward, and would invite all interested parties. Nieuhof says that people from Turkey and Arabia also flocked to the fisheries, but we must assume that they were residing locally. In any case, many participants may have been 'aliens', even if they had been living there for quite some time.

During the sixteenth century there were usually two fisheries per year – the 'great' fishery of April/May and the 'small' fishery of September/October. Diminishing yields after 1580 forced the Portuguese to restrict the fisheries to one period only, during the months of March to May. During the Dutch period, on the appointed first day all vessels flocked to the place where the lord of the land (for the Tuticorin fisheries that was the Nayak of Madurai) and the VOC officials had pitched their tents, visible from afar as they had their flags flying there. While music played, the boats got ready to set sail, waiting for a signal from the canon. The number of participants could be considerable, as witness the 483 vessels that took part in the Tuticorin fishery of 1668, manned by 16,359 people, of whom 4,842 were actually pearl divers. A fishery usually lasted from three to ten weeks, depending on the catch. By that time the divers were so exhausted that they could scarcely carry on, and many seem to have died. Medical notions of the time attributed this to the awful stench emitted by the oysters, which were left to rot in order to facilitate finding the pearls inside them.

The VOC did not monopolize the pearls. It only levied a due from the

fishers, who were the owners of what they had collected. However, the fishermen were usually deeply in debt to the owners of the vessels they had used, and they had to sell their pearls to them with a 20 per cent discount off the price on the open market. The dues collected by the VOC amounted to a not inconsiderable sum of money. For instance, the eight pearl fisheries held near Mannar between 1666 and 1699 netted the VOC on average 65,000 guilders per fishery. Sometimes there were bumper catches, such as the one realized during the 1668 Tuticorin fishery mentioned earlier, when the VOC received 125,000 guilders in dues. However, fisheries were not held every year. They were repeated for a number of years in a row until the banks were apparently depleted, at least temporarily. Then they would be out of bounds for as long as it took the young oysters to mature, usually about three to four years, if nothing untoward happened.

In 1744 the system was changed, because Governor-General Gustaaf Willem Baron van Imhoff thought that the VOC could do much better financially. From then on, the right to collect the dues levied on fishermen was farmed out, in some years bringing in enormous amounts of money (884,100 guilders in 1749), and in other years nothing at all.[12]

Van Imhoff, therefore, appears to have been right. We are left to speculate whether this was because prices had risen, more pearls were being collected, or pearl divers were being squeezed harder. The first option can never explain more than a fraction of the enormous difference between the maximum under the VOC system and records under the new regulations, the new maximum being 7.5 times higher than the older records. Therefore, a combination of the two other possibilities is the most likely explanation.

With the gradual takeover by the British in the 1780s and 1790s the official policy seemed to waver between direct administration and tax farming. After a number of production crises in the 1820s, 1830s and 1840s, possibly due to overfishing, a system of licenses was devised, limiting the number of boats admitted to the fisheries, and pegging the government share at about three quarters of the proceeds, much higher than it used to be. As this proportion drove away too many fishermen, the share was lowered around 1880 to two-thirds, which led to a threefold increase in exploitation, and a production crisis soon after 1900. Although the fisheries survived, their frequency has been much reduced. In fact, the first major fishery after 1907 was that of 1925, followed only in 1958 by another major fishery (Subrahmanyam 1996:154-69).

Information as detailed as the data for Sri Lanka and Tuticorin is, alas, not available for the Indonesian Archipelago in the same period. What information we do have is patchy at best. From the late eleventh to the early four-

12 *Generale missiven*, III:268, XI:177, 278, 425, 434-5; Nieuhof 1682:185-92; Stapel 1927-54, I-2:140-3, II-2:288, 375-84, 413-33, 459; *Selections* 1946:81-2; Donkin 1998:60-1, 157-65; Vink 2002.

teenth century, pearls are mentioned on the east coast of the Malay Peninsula, in eastern Sumatra, Java, and the Philippines (Sulu, Luzon).

In seventeenth-century VOC sources only the islands of Aru, in the southeast Moluccas, are mentioned occasionally as a source of pearls. Here, trade followed the flag, because the first two people in VOC service who were dropped on Aru's shores (a schoolmaster and a visitor of the sick, a kind of second-rate preacher) in 1660 discovered the existence of the pearls. According to them, the local populace were not aware of their value. However, the first explorations were rather disappointing, because the pearls were very small. Nevertheless, it seems that by 1700 the people from Banda frequently came to Aru in order to buy the pearls that had been collected there. The pearls were still small, but even these 'seed pearls' fetched a good price in Europe, as they were used for medicinal purposes. They were pulverized and dissolved in some sort of concoction that was taken by people with weak hearts.

Aru was regularly mentioned in the eighteenth and nineteenth centuries. There is no indication that VOC personnel on Aru, headed in the eighteenth century by a sergeant, were trying to achieve anything comparable to the system of exploitation in Sri Lanka. In 1726, the sergeant was merely instructed to try to acquire as much mother-of-pearl as he could, but he had to report back that the local residents were unwilling to collect more than they already did. In 1743 it was decided to leave the buying of Aru pearls to a licensed consortium of Banda burghers, who would pay the VOC one-tenth of the value of the pearls. In 1851, Aru exported pearls to the tune of 15,000 guilders, as well as 130,000 guilders' worth of mother-of-pearl shells (in other words, the pearl oysters themselves). This indicates that, although not negligible, the Aru pearls were, at least in the nineteenth century, not the most interesting part of the oyster.[13] In 1905 the government farmed out the right to fish for pearls and pearl oysters to the Celebes Trading Company of Australia, while the local population retained the right to collect pearls and shells. It does not seem as if the government was overly concerned about sustainable exploitation of the pearl-oyster banks.[14]

Around 1700 VOC-generated information begins to appear in five other areas. The first is that of the islands near the coast of what is now called Papua, and which were then called the Papuan Islands (Waigeo, Misool, and so on). The second place is Obi Island, in the Moluccas, the third one the bay of Kau, Halmahera, and the fourth one the Sulu Sultanate, nowadays just

13 The pearl oysters here are the silver or golden-lipped pearl oyster (*Pinctada maxima*).

14 *Generale missiven*, III:315-6 and 484, VIII:70, XI:33; Valentijn 1724-26, III-1:42; *Aardrijkskundig woordenboek* 1863-69, I:37-8, under 'Aroe-Eilanden'; Wallace 1869:439, 485; Hirth and Rockhill 1911:61-3, 160, 229-30; Stapel 1927-54, I-2:698; Donkin 1998:28, map; Francis 2002:161-2.

The pearl fisheries of Tuticorin, southern India, circa 1680. In the seventeenth and eighteenth centuries, pearl oysters were to be found in various places in the Indonesian Archipelago (Papua, Aru and other Moluccan islands, Java) and in the Sulu Archipelago (Philippines), but the main pearl fisheries under VOC supervision were located in the area between southern India and Sri Lanka. (Engraving, taken from Nieuhof 1682:190.)

across the Indonesian border in the Philippines. The fifth place is the bay of Segara Anakan, to the south of western Java and entirely out of line with all the other places mentioned here, which are all located in the eastern part of the Archipelago, forming one complex, as it were. Details are not abundant, but information on Sulu suggests that the Sultan monopolized the collection of pearl oysters and the trade, probably of both pearls and mother-of-pearl, the latter product going to China. The area of the pearl banks was strictly guarded. As we have seen, pearls from Sulu were also mentioned in pre-European sources.[15]

15 *Generale missiven*, VI:673, 757, VII:511, 521, VIII:11; Rumphius 1705:157; Leupe 1875:220, 235-6; Warren 1981:8.

An interesting aside is the sudden appearance of mother-of-pearl in sources from 1722 onwards. In that year, the VOC directors, for unclear reasons, ordered 6,000 (Amsterdam) pounds [of 0.495 kg] of mother-of-pearl to be shipped to the Netherlands. From that moment onward, and for a long time to come, all the pearl-oyster areas in eastern Indonesia had to send mother-of-pearl rather than pearls to Batavia. Mother-of-pearl was used in the Netherlands – and elsewhere – for the production of objects of art, which were highly sought after by rich collectors. It is an interesting example of how a single order from the Netherlands could change demand in the Archipelago.[16]

Finally, a few words about Java. The first time Segara Anakan is mentioned in VOC sources, in 1706, the area of which it formed part (Priangan) had just been ceded to the VOC by the ruler of Mataram. So here again trade followed the flag. The VOC attempted to have local powerholders ('regents', as they were called by the Dutch) safeguard the pearl banks against damage caused by fishermen. It would appear that the Dutch were trying to apply the same arrangements they had used in Sri Lankan fisheries to the banks of Segara Anakan. However, they could not be physically present at the scene of the fisheries, as Batavia was too far away, and they had to leave the supervision to three local regents. This seemed to work, and in 1717 they were able to ship the first 30 pounds of seed-pearls to the Netherlands. After a number of bad years in a row, the VOC suspected that it was being cheated, and it sent a sergeant to supervise the pearl fisheries. For a number of years this appeared to help, although there were still problems with local fishermen, apparently specialized in the production of *terasi* (the source calls it *belacan*). In 1746 Van Imhoff's change in policy was also implemented here, and the fisheries were farmed out to an ethnic Chinese merchant who had to pay 1,200 reals-of-eight per year for the privilege. When the local populace proved reluctant to work for the leaseholder, this arrangement failed, and after 1754 the VOC seems to have given up on Segara Anakan pearls as a source of income. It is possible that pirates destroyed the fishing villages and carried off their residents in the 1780s. Be that as it may, the pearls, even though they were still being mentioned around 1850 and 1900, never again became an item of regular government income. However, as late as 1850 the fishermen were still collecting and selling pearls (to ethnic Chinese merchants), and, according to Franz Wilhelm Junghuhn, eating the oysters with a bit of *sayur*.

A second source of pearls in Java was not discovered by the Dutch until 1769, when they conquered Blambangan, a small polity in the easternmost part of the island. The right to tax the collection of these pearls was immediately farmed out to the Captain of the Chinese at Surabaya. It soon (1771)

16 *Generale missiven*, VII:633, 662, 684, 693, 711, 714, VIII:70, 130, 132, 189; De Jonge 1862-95, IX:286; Leupe 1875:271.

transpired that the quality and quantity of the pearls left much to be desired, and in 1783 they were reported to be of no consequence. A source dated around 1810 mentions two pearl reefs in the same area, one of which was ruined because it had been overexploited. The tax farmer had allowed three fisheries per year, which turned out to be too high a frequency.[17]

Summarizing the findings about pearls in Indonesia, it can be said that they had been exploited as a resource at least since around 1200 (and possibly much earlier). After 1600 Sumatra was never mentioned as a source of pearls, and we are left to speculate whether this was the result of overexploitation or of natural disasters. It is even possible that Sumatra itself had never produced pearls, and that early Chinese and other sources only mentioned them because they were traded by Sriwijaya, on Sumatra's eastern coast. Java still had its pearl reefs in the eighteenth century, but exploitation does not appear to have been sufficiently remunerating for the VOC to tax the proceeds, perhaps because the reefs were overexploited, which may have been partly because neither the VOC nor the tax farmers were able to control the collection and sale of the pearls. Turning to eastern Indonesia, it would appear that Sulu, a sultanate with a ruler who made sure his pearl reefs were not pilfered, was exploiting this resource in a sustainable way. The pearls of Aru survived until 1900, perhaps because local residents were not all that interested in collecting as many pearls as they could. This is at least implied by the remark cited above that the people did not want to collect more pearl oysters than they already did. We do not know whether this was a conscious attempt at management of sorts, or the economic behaviour of 'non-profit-maximizing peasants'.

Trepang

I can be brief about trepang, because there is a recent article written by Heather Sutherland (2000) on this topic to which I refer the reader for a more detailed treatment. Trepang or *teripang* is also called *bêche-de-mer*, sea slug, and sea cucumber.[18] It was a Chinese culinary delicacy, which is hard to believe for those who see it for the first time.

It is an interesting product for a number of reasons, one of them being that it is scarcely to be found in VOC sources earlier than 1720. Then it sud-

[17] India Office Library, London, Collection McKenzie, Private, No. 82: Report on Banyuwangi, c. 1810; *Generale missiven*, VI:446, 654, VII:319, VIII:94, 147-8, 175; Junghuhn 1853-54, I:260; De Jonge 1862-95, VIII:137-8, 278, 283, XI:99, 141, 191, XII:56; De Haan 1910-12, IV:42-4.

[18] Nowadays there is no longer a Dutch word for it, but in an eighteenth-century source I came across the word *zeezuyger*, literally 'sea-sucker'. These are benthic invertebrates that are, indeed, bottom feeders or grazers. Systematically they belong to the holothurians, *phylum Echinodermata*.

denly appears out of nowhere, when a VOC report mentions vessels of subjects of the king of Bone and Goa (Sulawesi) from Bonthain (Sulawesi) and Manggarai (Flores) who were looking for trepang in the Southeast Moluccas. The numbers of vessels could be considerable, for instance 60 in 1726 near Luang and 30 near Moa.

Most reports refer to the Southeast Moluccas, including Aru, but we also find references to the coast of Papua, Halmahera, and Sumba, and it is well known that Makassarese fishermen went all the way to Australia in search of trepang at least as early as 1800. Between 1770 and 1850, trepang is also mentioned in Java's waters, particularly in and around the mangroves lining the coast. Around 1770, the right to tax the trepang fishermen of Blambangan, eastern Java, had been farmed out to the Captain of the Chinese in Surabaya, the same person who held the tax farm of the pearl reefs (and the edible bird's nests). For an explanation of this sudden hunt for trepang we need to look at developments in the Chinese markets.

Another point of interest is that the trade in trepang was a specialized business, almost entirely in the hands of Makassarese, Buginese, and Bajau, although the actual catching of it was often a local activity. Focal points of the trade, at different moments in time, were Makassar, Sulu, and Singapore.

It would appear that trepang fishing in Indonesia (and the Philippines, the other top producer) reached a peak in the late 1980s, which suggests that up to that time depletion of the stock did not occur.[19]

Tortoiseshell and turtles

There are also recent detailed studies available about tortoiseshell (Ptak 1991; Sutherland 2002). The word itself is a misnomer as we are really dealing with the shell or carapace of a (maritime) turtle and not a (terrestrial) tortoise. The carapace most favoured in trade is that of the hawksbill turtle (*Eretmochelys imbricata*), and the usable parts of the shell are called *karet* in Indonesian.[20] The material was used 'for inlays in furniture, for household objects, to decorate weapons, to make labels on books, to carve flutes, to produce headdress ornaments, particularly hairpins, for medical substances, etcetera' (Ptak 1991:202). China was an important market for *karet*, but some of it was exported to India and Europe as well.

In contrast to trepang, tortoiseshell had been a trade item for hundreds

19 *Generale missiven*, VII:487, 533, VIII:70, 181; De Jonge 1862-95, XI:99, 141; Rumphius 1705:75; Junghuhn 1853-54, I:258; Wallace 1869:331, 376, 439, 485, 590; Leupe 1875:110; Forbes 1885:299, 315; www.spc.int/coastfish/News/BDM/17/BDM17-02-Akamine.htm. Accessed September 2003.

20 Nowadays *karet* means 'rubber', but before the exploitation of *jelutung* around 1850, and the arrival of *Hevea brasiliensis* around 1900, *karet* referred mainly to tortoiseshell.

of years, and at least since 900 the Chinese had known that they could find tortoiseshell in Java. Although occasionally tortoiseshell from Borneo or Sumatra is mentioned in VOC sources, most of it came from Makassar and other places in the eastern part of the Archipelago, Makassar being the main entrepôt, as it was with trepang. Originally, the VOC was content to have the *karet* it needed, for instance for the Indian markets, shipped to Batavia from Makassar. However, around 1700, the VOC started to explore the Southeast Moluccas and the Papuan Islands, where they discovered the sources of the tortoiseshell. From 1710 onwards, it started to send vessels from Banda in order to collect *karet* at the source, a voyage that was undertaken annually. Here again we encounter the Aru Islands as an important production area, which also, as we have seen, applied to pearls, mother-of-pearl, and trepang.

The population of hawksbill turtles in Indonesia has been decreasing at least since the 1980s, as is the case in most other areas where they are (or were) found. Of all the turtles it is the only one that is classified as 'critically endangered' instead of just 'endangered', according to Appendix I of the CITES list. In Indonesia the animal is protected by law, but products made with hawksbill turtle can still be found in souvenir shops in Jakarta, Yogyakarta, Bali, and Makassar.[21]

Conclusion

I have discussed two types of commodities from the sea. The first is seafood, as a rule consumed within the Indonesian Archipelago. The second, the 'splendid and trifling' products of high value per unit of weight, such as pearls and *karet*, were commodities destined for the international market.

Foreigners played a considerable role in all this. It was foreign demand that created new maritime activities, as is well illustrated in the cases of trepang and mother-of-pearl. It was foreign ships that carried the products from the Archipelago to Europe, India, and China. One assumes that foreign – in this case, often Chinese – capital may have played a role in enticing the local population to exploit certain resources as well. And even in the indigenous fishing sector, fishermen and boat owners were often people who had originally come from other places, although they might have lived in their locality for quite some time. Fishermen were often slaves, which suggests that it was not a well-remunerated, highly sought-after job.

21 *Dagh-register* 1632:116, 1633:140, 1640:62, 1641:377, 432, 1663:82, 231, 1664:200, 275, 386; *Generale missiven*, VI:417, 669, 752, 846, VII:711, VIII:70; Leupe 1875:220; Groeneveldt 1876:13, 16, 48; Rouffaer and IJzerman 1915:124; www.tve.org/earthreport/archive/20Sep2000.html; www.arbec.com.my/seaturtles/art12julysept01.html; www.profauna.or.id/English/hawksbill-trade.html. Accessed September 2003.

One assumes that temporary migrants among the non-local people may not have been overly concerned about depletion of resources. Some societies, such as the Bajau, the Arunese, and the Parruas from southern India, were almost entirely specialized in gathering products of the sea. It is also remarkable how much eastern Indonesia, with its many small islands, is orientated towards seafood and other maritime products. In these cases it may be supposed that products of the sea have shaped the societies concerned to a large extent.

We have also seen that the variety of sea products that could be and was eaten was considerable, as was maritime biodiversity in various areas of the Indonesian Archipelago. It is reasonable to suppose that these resources could be exploited sustainably as long as people continued to have a quite varied diet, something that had been made possible by the high level of biodiversity in the first place. This suggests a positive feedback mechanism.

However, cities often could not produce sufficient fish to feed themselves, which might suggest local depletion of fish stocks as early as 1600. The problem was then 'outsourced' to 'feeder' towns and villages.

Another point is the importance of the state, including state-like organizations such as the VOC. If the state is strong enough and sufficiently interested in the sustainable exploitation of a product, it seems to be able to succeed in achieving this, as the case of pearls suggests. One suspects, however, that at higher population densities even a strong state may not be strong enough. If the state is too greedy, the damage can be serious, and then a strong state may be worse than a weak state.

Finally the evidence on depletion is conflicting. On the one hand there are examples that point in the direction of early overexploitation, as witness the data on pearls from Sumatra and Java. However, if we look at the pearl fisheries of southern India and Sri Lanka, in addition to those of Sulu and Aru, serious depletion does not appear to have set in prior to 1900. As regards trepang and turtles, depletion does not seem to predate the 1980s. Small wonder then that the sea has been regarded by so many as a particularly robust and inexhaustible biotope.

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PETER and NOELENE REEVES

Port-city development and Singapore's inshore and culture fisheries

Singapore is quintessentially a port city. This article looks at the effects of the development of the port city on inshore and culture fisheries in the nineteenth and twentieth centuries. It seeks to show how these fisheries, important to the island as both an occupational and economic sector through the pre-colonial and the colonial periods, were, firstly, displaced in favour of maritime activity with greater potential and, secondly, made untenable by the physical and economic development of the island in support of its modern maritime role.

Sustainability of wild fish stocks to supply the need for food to any given population is of concern to those who see want on destruction of ecosystems for commercial gain devastating the resources of an area unnecessarily. No matter how important fisheries are as occupations or to the economy of a society, unless the environment is managed to allow for replenishment, the future of fisheries is limited. It was only from the mid-twentieth century that fisheries departments and experts in Singapore set out to understand the fish in the sea around the island, their food and habits, movements, and breeding cycles, to assist in managing the local environment, and by then Singapore's destiny (as a port city) had already been chartered.

Port-city development

The basis of our argument here relates to the nature of 'port cities'. Port cities need to be understood not simply as settlements attached to a port or a harbour. They are cities with a milieu in which the whole development of the city is geared to the development of the port and to those economic and industrial functions that reinforce the port's growth. The growth of the port and its related activities, in turn, determines the nature of the city. This argument is posited on the need to understand the port city as evolving, in a dynamic way, those economic aspects which are related to its functioning as a port (Reeves, Broeze and McPherson 1989:42, 44). The maturation of the

port city touches basic aspects of the city's economic functioning and it is this which helps to set up, first, constraints on the operation of fisheries and then counter-attractions which increasingly undermine the viability of fishing as an industry.

Such a process of 'development' has been important for Singapore because of the island-state's dependence on its entrepôt and trading functions through its seaport. This begins from the earliest colonial stages from 1819 onwards with the physical creation of the port, first in the Singapore River and then on the southwestern and northeastern coasts (Singapore Legislative Assembly 1957; M. Teo 1962; Port of Singapore Authority and Maritime Museum 1982; M. Chew 1998). This comprised the building of the quays, docks and other harbour works, and the godowns and other buildings and equipment associated with the loading and unloading of cargo and passengers.

However, the process goes beyond construction of the 'port'. There is the development of infrastructure such as roads, railways and communications, the installation of power, and the servicing of operations in the port. It also extends offshore into the navigational requirements: the actual construction of lights and markers, the dredging of channels, as well as the maintenance of clearways for shipping. There is increasing demand for services required by shipping: food, water, recruitment or changing of crews, accommodation, bunkering and a range of services related to information, insurance, and repairs. These functions are linked to the growth of various industries in the port – in services, processing, manufacturing, shipbuilding and ship repair – which affect the physical growth and condition of the city, the land areas in which development takes place, and the coastal zones that are touched by such 'industrial' expansion.

Moreover, the development of these ever-broadening functions of the servicing, supplying, and handling of cargoes means that maritime functions bring population growth – much of it in Singapore through immigration and the import of labour – which increases demand for residential and recreational land. Such an expansion of the port and 'maritime' activities – and the ways in which those activities fed into the developing character of Singapore – was what gave Singapore its particular character as a port city and the formation of those characteristics then provided the *raison d'être* for the particular forms of construction, reclamation, and other physical changes for the port and for the island as a whole that in turn interact with the sustainability of the inshore fishing industry. (In contemporary times there have also been new pressures associated with the development of the modern equivalent of the shipping harbour or seaport, that is, the airport. In the Singapore case, as we will see, that has also had implications for inshore fishing in terms of the reclamation of land needed for the expansion of Changi airport.)

We will discuss the interaction of fisheries with the development of the

island and its port along with industrial and other facilities in four phases: the first century of colonial rule (1819-1920); the period of limited expansion from the 1920s to the 1940s; the crucial period of change from the 1950s to 1970s; and the period after 1980.

Fisheries and the port, 1819-1920

Subsistence fishing activity was to be found on the island when the British came (Mills 1925:56; Burdon 1957:4; Regnier 1991:18). It is reported that in 1811 there was a fishing 'village' at the mouth of the Singapore River and it seems possible that there were also some fishers on some of the southern islands (Chew Soo Beng 1981:30-1). Although recent excavation and research has shown that Singapore was a thriving, populous fortified port city in the fourteenth century (Miksic 1985, 2000), in 1819 the island appears to have been largely uninhabited except for about 30 Chinese gambier planters (Hon 1989:7), Orang Laut boat people sheltering in rivers, creeks and mangroves, and the small Malay 'fishing' village at the mouth of the Singapore River settled about ten years previously by the Temenggong and a few followers from Riau. There is no evidence to suggest that fishing at this time was for any other purpose than to supply food for subsistence.

The Munshi, who recorded the early contact, described how on landing 'Farquhar gave his people 20 dollars to go and buy some [provisions]' but none could be obtained. 'There was money to buy but there were no supplies to exchange for it, the inhabitants of the two or three huts near the Tumonggong's [sic] house subsisted on fish, sago, and delicate shoots of some trees, with occasionally a little rice' (Abdullah bin Abdul Kadir 1852:590). It would seem that the Orang Laut were responsible for catching the fish. The Munshi relates that it was these shy people who supplied the Temenggong with fish and that they knew no way of catching fish other than spearing. He said that all manner of fish were caught in this way including *tingiri* and *parang-parang* and moreover the fish were very tame. They were caught from the beach. The Temenggong then ordered the Orang Laut to bring fish to sell to the new settlers (Abdullah bin Abdul Kadir 1852:591).

With the arrival of the British, immigrants from many backgrounds swelled the population and eventually the village was displaced. The Temenggong and his people were moved westward to a large area between Tanjong Pagar and Telok Blangah (Liu 1999:20). The Sultan with his family and followers settled at Kampong Glam 'about a mile and a half' from the mouth of the Singapore River further along the coast to the east (Earl 1837:348; Liu 1999:20). As the demand for fish grew to supply the growing local market, both local and immigrant fishermen began to exploit the resources creating a

number of Malay, Bugis, and Chinese *kampong* in coastal areas.

From that time onwards, through the colonial period, sustained fishing activity was a part of coastal activity in Singapore. From a population said to be about 150, the size of the settlement grew steadily after the British arrival; there were 10,000 in 1824, 81,000 in 1860 and 143,000 in the mid-1880s (Turnbull 1972:21). In these circumstances, fishing to supply food to the settlement expanded. In fact, as early as the end of the first year of settlement, a 'fish stake' (*kelong*) was constructed at Telok Ayer by Hajee Mata Mata from Malacca (Abdullah bin Abdul Kadir 1852:597; Buckley 1902:76; Hon 1989:28).

The Munshi stated that '8 months after settlement started the fishing fleet came from Malacca to fish in Singapore waters'. The fishermen caught great numbers of *parang-parang*, 'for at that time fish were very tame, never having been caught there before'. The new arrivals fished about '20 or 30 fathoms from the beach' (Abdullah bin Abdul Kadir 1852:597). It was not long before local people emulated the new arrivals and their methods. The first *kelong* was put up off Telok Ayer before the year was out and 'caught no small number of *tenggiri* fish; in fact, such vast surfeit that the fish could not be eaten and had to be thrown away' (Hon 1989:28).

A *kelong* was a fish trap ideally suited to shallow coasts with a fairly strong tide. It comprised a fixed arrangement of upright poles several hundred yards long, made of *nibong* palm and set into the mud about two feet apart. Attracted by a light at night, fish swam along the line of poles toward a triangular enclosure with a netting floor that was raised from time to time to a platform above. The lift net was worked by men and boys who lived on the *kelong* in huts erected on the platforms. The fish was collected by boats each morning for sale fresh at the market or cooked in brine on the *kelong* for later sale.

Observers throughout the 1830s and 1840s reported fishers operating (Turnbull 1972:21, 43; Mills 1925:200; Bennett 1834, I:409). By 1848 a line of fishing stakes was said to run westward from Tanjong Katong (Logan 1848:616). Malays were especially identified with fishing in this early period; it was said that they 'concentrated on fishing and subsistence farming'. However, Chinese fishers increasingly made their presence felt in the 'industry'; by 1848 there were reported to be 200 Hokkien and 600 Teochew fishers (Siah U Chin 1848:290). By 1865 the presence of the two groups is sufficiently clear for Cameron to report that in the southeast coast fishing villages the distinction was that Malays fished with permanent stakes while the Chinese more commonly used nets (Cameron 1865:134-5).

As late as 1992 there were still Malay fishermen who remembered the construction of *kelong* around Singapore in the 1920s and recorded their memories for posterity. Abdul Latiff bin Ahmad, whose grandfather owned a

plantation, was among those who were able to get trees for their *kelong* stilts. By helping his brother-in-law, he gained some knowledge in *kelong* building. He spoke of *kelong bubu* (a small *kelong* with traps) and *kelong ibong* (a big *kelong* or *kelong ikan bilis*). As for how the site was chosen, Abdul Latiff had this to say,

> Go to sea during low tide and choose a suitable site. Mark it by planting a pole. Go again when it is high tide. Plant a *pancang* (stake or pole). This time tie a string or rattan and let its loose end float. It will show the direction of the current. It helps to get the appropriate position. The *kelong* should then be built parallel with the current. The best time to start work is when the tide is at its lowest. Normally, it takes one and a half months to complete one *kelong*. (Abdul Ghani bin Hamid 1992:40.)

The same fisherman also listed what would be required for the *kelong*'s construction:

> *Nibong* trunks, rattan for tying the poles, wire of different sizes, rope and string of different sizes, planks, attap for the hut, and *takal* (pulleys). Tools include *parang*, axe, pliers, crowbar, chains, wire cutter, and one big boat for poles (trunks) besides a motor boat for workers.

J.D. Vaughan (1879:10-1), who first visited Singapore in 1842, wrote a paper in 1854 (which was finally published in 1879), describing the Chinese fishermen thus:

> The fishing boats [...] are long and narrow, rising at each end high out of the water with something of a keel which the junk class of boats have not. They are rowed by 8 or 10 men in European fashion and are very fast. They use long narrow nets with floats on the upper edge, the weights on the lower to keep them upright which are out athwart the tide so as to enclose the fish brought down by the stream. The water of the straits swarms with fish and the market is plentifully supplied by the Chinese fishermen. Besides these seine nets the Chinese fish with casting nets and nets fixed to stakes, but never with lines and hooks. The capital required to purchase fishing boats and nets is advanced by town fishmongers to whom all the fish has to be delivered at certain prices fixed between the fishermen and the capitalist.

Douglas Hamilton, an early British observer, reported in 1848 that fish were plentiful among the corals and 'so clear is the sea that the Malays in their sampans, a very light kind of canoe, chase and spear the seer fish'. He goes on to describe the skill with which the fishermen handled their boats and spears. 'I have never to my recollection seen a failure. [...] I have seen fish at between 20 and 30 lbs captured in this way' (Wise 1985:45).

Reports also comment on the plentiful supply of fish at the market (Siah U Chin 1848:284; Oxley 1849:597; Mills 1925:200). An 1855 report indicated

that the trade in fish was large enough to warrant regulation; it noted that the police were enforcing sales of fish only at the market (*Straits Settlements Annual Reports* 1855:16). By 1862 taxes were levied on boats (*Straits Settlements Annual Reports* 1862:426). By the 1890s the Straits Settlements Annual Reports saw the fisheries as worth $500,000 per annum (they were, it noted, 'very rich') and giving employment to a large number of people. It was still identified as particularly a Malay occupation (*Straits Settlements Annual Reports* 1898:448).

What this growth of the fishing industry suggests is that, in the period to the end of the nineteenth and early twentieth century, the physical development of the port and the settlement – which was concentrated mainly around the Singapore River, the river mouth, and the area westward to the New Harbour (Keppel) at Tanjong Pagar – had limited interaction with the major areas of the inshore fisheries. The building of Boat Quay on the Singapore River and the associated seawalls along the river, as well as the construction of the New Harbour to the west of the settlement, brought only limited interference with fisheries.

The beginnings of an almost continuous process of reclamation on the Singapore island and along its coasts, however small its impact at this stage, was the forerunner of a much more important development that was to have major effects. Already in this first 80 years, close to and within the city the process began of reclaiming swamps and removing mangroves; this necessarily affected nutrient flows and water quality. The pollution of the Singapore River, from both residential waste and the effluent of processing industries, was marked by the end of the period. Then, in 1900, the new industrial developments – the tin smelter on Brani Island and the bunkering establishments for shipping – ushered in the beginnings of pollution that was to be greatly intensified in the coming century.

By the beginning of the twentieth century the growth in the volume of shipping in the Indian Ocean and South China Sea brought about by the opening of the Suez Canal in 1869 (to which the enlargement at Singapore of the harbour at Tanjong Pagar was a direct response) was dramatic: in 1870 436,000 tons passed through the Canal; by 1913 that had risen to 20 million tons of shipping (Broeze, Reeves and McPherson 1986:4). Dramatic also were demands for ever larger ships with ever more powerful engines that could carry more and dramatically decrease turn-round times. This meant that harbour works, infrastructure, and facilities had to be constantly upgraded and 'modernized'. Singapore was as much caught up in this development as any other port in Asia because these were the conditions that were required by the worldwide trade into which it – as a major entrepôt and as the handler of vital cargoes such as tin and rubber – had been linked.

In this situation, it became increasingly clear that the inshore fishing

traps, particularly the *kelong*, posed problems for shipping. Admiralty charts for Singapore waters, for instance, marked individual *kelong* as 'fishing hazards'. It is perhaps indicative that by 1909 the control of fisheries, in the Straits Settlements, was passed to harbour officials. By 1909, each of the Straits Settlements was empowered by Ordinance IX of 1909 to regulate fisheries in their waters. For this purpose the port officials – the Master Attendant, his Deputy, the Deputy Registrar of Shipping, and the Senior Boarding Officer – doubled as Fishery Officers (Maxwell 1921:5). C.N. Maxwell, in reviewing this fisheries 'management', comments that the rules for the regulation of fisheries in Singapore 'appear to have been framed solely with a view to the prevention of obstruction to shipping by fishing stakes' (Maxwell 1921:6).

Arnold Wright and H.A. Cartwright, in their *Twentieth century impressions of British Malaya*, summarize development of the inshore fisheries by 1908. There were 'nearly 200 fishing boats' and 249 fishing stakes registered; 20,000 tons of fish, worth $ 2,500,000, was taken annually; and they report an extensive trade in salt fish. In addition to licence fees for fishing boats, there were small charges for fishing stakes offshore and for nets (Wright and Cartwright 1908:215-6). Thirteen years later, when Maxwell reported, fishery activity was well established in Singapore. The figures show that 490 licensed boats and 341 licensed fishing stakes (*kelong* and *belat*) were operating in Singapore in 1920 (Maxwell 1921:5).

The 1920s to the 1940s

In the period between the two world wars, the industry continued to expand as Japanese fishers introduced new 'distant water' fishing techniques. The inshore industry supplied only a fraction of the fish needed for the Singapore market. As much as 75% of the fish marketed came from the Netherlands East Indies, and by the 1920s Japanese fishers were established alongside local Chinese and Malay fishers.[1] The Japanese fishers – using new types of gear (especially the *muro ami* in which 'drive nets' were employed) and with a quite different approach to sustained fishing outside the immediate waters of Singapore, introduced a more 'modern' element into the island's fisheries (Stead 1923:18).

The Japanese, in fact, came to dominate the industry in Singapore. They were never the largest group among the fishers – in 1938 there were 1,083

1 Maxwell 1921:1; Stead 1923:18; *Report of the committee* 1933-34:58, 217, 240; Shimizu 1997:324-5. Shimizu 1997 gives the number of fishers in 1920 as: 200 Japanese, 2,100 Chinese, and 450 Malays, a total of 2,750.

Japanese fishers compared to 1,797 Chinese and 1,215 Malay fishers[2] – but they produced over 40% of the fish sold in Singapore.[3] Japanese fishers were recorded as living in fishing *kampong* on Singapore island and on southern islands such as Pulau Sudong (Chew Soo Beng 1981:39; Chou Loke Ming 1977:5). By that point, however, the Japanese element in the Singapore fisheries was about to enter its final phase. Boycotts of Japanese-caught fish in retaliation for the invasion of China after 1937 by Chinese consumers (first in Malaya and then in Singapore), together with growing British concern at the intelligence-gathering activities of the Japanese fishers in Singapore, led to a suspension of Japanese operations in Singapore itself and in the waters near Singapore (Shimizu 1997:338-40). Some of the Japanese fishers returned to Singapore during the wartime occupation of the island (1942-1945) (Shimizu 1997:340-2), but after the war, despite a continuing interest in Japanese methods of fishing, Japanese influence effectively disappeared in the period 1946-1950 (Shimizu 1997:344; *Japanese fishing* 1946:5).

This was a period, in terms of the development of the island, when there was little change to the southern coast between Siglap (in the east) and Pasir Panjang (in the west) that bore directly on the inshore fisheries. But the pattern of reclamation seen in the nineteenth century to enhance port facilities was being extended: the Telok Ayer Basin scheme, on the western side of the river mouth, was completed between 1906 and 1932; the causeway linking the island to Johore was completed in 1923; clearing of mangroves and extensions in the Changi region took place in 1927 and 1928; and by 1938 the naval base at Sembawang – a major redevelopment along the northeastern coast of the island stretching along some 7.5 kilometres of coast line and absorbing mangroves and other coastal vegetation of small river systems (M. Chew 1998:25-41) – was complete.

The causeway, linking the island to Johore, was an important change to water patterns in the Strait of Johore, of course. Moreover, the naval base's location on the northeast coast, facing onto the Strait of Johore, meant that shipping activity into this area, where *kelong* were common, signalled an increase in the interface between inshore fisheries and shipping.

The war and the Japanese occupation severely disrupted fisheries. This left major problems in feeding the people, including providing adequate supplies of fish, after the Japanese surrender (Shimizu 1997:340-2; Kratoska

[2] Note that in 1936 the Japanese fishers numbered just 21 short of the Chinese: 1,752 to 1,773, which made them 36.8% of the fishermen working in Singapore.

[3] Shimizu 1997:324. Shimizu says that the 1937 catch comprised 17% by local fishers, 41% by Japanese fishers, and 42% from the Netherlands East Indies. Shimizu here cites *Malayan Year Book 1937* and *Straits Settlement Blue Book 1937*. Kesteven 1949:72 gives 'pre-war' production figures of 10.7% local, 59.3% Japanese, and 29.1% from 'Rhio' [Riau], but he provides no sources for these figures.

1998:165-6, 339-46). The colonial administration resumed, moreover, in a situation in which, because of the shortage of Crown land, the need for land for developmental purposes became more acute. This led, in the period of self-government and independence, to a more concerted effort than ever before, to develop the physical land resources of the island. It is this effort which ushered in the most significant period of development in which the full effects of the port-city development were to be felt in the inshore fishing industry.

The 1950s to the 1970s: the crucial period of change

In the early 1950s we can see the Singapore inshore fisheries as essentially a locally based industry, continuing to use predominantly the same gear and boats as in the previous century or more (Kesteven and Burdon 1952: Tables III and IV). About two-thirds of the 4,000-5,000 fishers engaged in the industry were Chinese and about one-third were Malays (Kesteven and Burdon 1952: Table II; Burdon 1957:5). T.W. Burdon argues that about 4,000 were 'principally engaged' but that the total group fluctuated and as many as another 1,000 worked in the industry from time to time.[4] It is important to note that these figures represent a doubling of local workers in the industry as compared to the pre-war period. This was not a doubling of effort, however: the local jobs were replacements for positions filled before the war by the Japanese. The need for employment in the post-war situation, however, meant that fishing had some attraction at this time – although, for a number, only as a part-time job.

Burdon indicates that there were, all told, 41 'fishing' villages around Singapore and on its related islands. There seems to have been some clear demarcation of the areas in which Chinese and Malay fishers lived and worked, although, as Burdon claims, probably not more than five of the 41 areas were 'homogeneous' (Burdon 1957:5; compare Kesteven and Burdon 1952: Figure I and Table VI). The Malay villages were said to be concentrated at the eastern tip of the island, on Pulau Tekong and in 'the less accessible parts of western Strait of Johore, the southwest coast and the adjacent islands'. The Chinese settlements were more often within the city limits, in the East Coast Road area and, in what Burdon calls 'straggling communities', at the ends of the road at Upper Serangoon, Ponggol, and Tuas (Burdon 1957:5).

We should note that, in addition to the inshore fishery, there was a small amount of culture fishery practised for the cultivation of prawns and carp in ponds. There were prawn ponds on some 653 acres of marshy land, and

4 For comparative purposes it can be noted that in the mid-1950s about 65,000 were employed in manufacturing; these jobs represented about 14% of the total workforce (Savage 1993:31).

carp were cultivated in specially constructed ponds covering about 300 acres. Annual production of prawns was some 142 tons from some 200 separate pond units (Kesteven and Burdon: Table V; Tan Lee Wah 1967-68; Zalina Kassim 1967-68).

In the early 1950s there was some in-migration of skilled fishers used to fishing in the South China Sea, and some larger boats were brought from Hong Kong (Burdon 1957:3). However, the Singapore industry was still primarily an inshore fishery. In 1947, using G.L. Kesteven's figures, there were just 203 powered boats and 1,301 non-powered boats (Kesteven 1949:54), while fishing gear was distributed among the following types: 315 licensed nets; 423 lines; 386 traps – including 254 *kelong*; and 203 miscellaneous items (Kesteven 1949:54; Kesteven and Burdon 1952: Table IV). Burdon makes it clear that, of these devices, the 254 licensed *kelong* – which produced 60% of the inshore catch landed – were the most important (Burdon 1957:17). They were also very capital intensive; they cost $ 35-40,000 to construct; they required annual maintenance amounting to about 25% of the capital cost; and they often needed to be replaced after five years (Burdon 1957:17). Chinese capital was important in both the *kelong* and the powered boats in the industry (Burdon 1957:5) and over time this allowed Chinese lenders to take over *kelong* from the Malays (Hashim bin Pendek 1963:187-8). On Pulau Sudong, the marketing of fish was handled entirely by two Chinese families (Walter and Riaz Hassan 1974:15, 28).

On the face of it, therefore, the industry had re-established itself after the difficulties of the occupation, and the traditional gear of the *kelong* and the inshore nets seemed to be in a position to continue to provide a part of Singapore's seafood needs. However, at this point the inshore and culture fisheries become physically caught up in the beginnings of the modernization of the island port city's economy. The period from the late 1950s, through to the late 1970s, saw a sustained process of reclamation and the reshaping of the island. What was more, these changes were in precisely the areas where much of the inshore fishery had been located – along the southern coast and in the southern islands. In the 1950s and 1960s, under the plans for economic development drawn up in the late 1950s and early 1960s, reclamation began in earnest. The swamps were reclaimed wherever possible; projects in the Tampines area and for Beach Road, Connaught Drive, and Telok Blangah were completed. Then in the 1960s and 1970s came the reclamations on which the industrial centre at Jurong and the adjacent area of Tuas was developed and expanded; the reclamations began around many of the southern islands, such as Pulau Sudong; the massive East Coast was reclaimed, which significantly changed the coastline along the stretch of coast from Katong to beyond Siglap (Heng 1967); the Kallang and Tanjong Rhu projects were completed; Jurong Island was formed by linking its original five islands; reclamation at

Changi allowed for the expansion of the airport.

The greater part of the southern coastline, from Tuas to Changi, was thus reshaped and many more of the remaining swamps were taken over. This meant that major areas of inshore fishing – off Changi, off Siglap and associated east coast districts, off Pasir Panjang, off Tuas, and around the southern islands – were directly affected (*Straits Times*, 30 March 2002). As a result, there were many fewer wetland areas for culture fisheries.

The effects of such extensive reclamations on coral reefs and on water quality and turbidity were considerable. Also, there were marked effects on the flow of nutrients to fish populations, since it has been shown that, in earlier periods, many of the fish caught in Singapore's inshore waters came to those waters especially because of the food available (Tham Ah Kow 1976:3-9). Certainly the effects in those areas that have been studied are very clear; in the Siglap case, for instance, the need for land for roads and for residential and recreational purposes – land that was won through the massive East Coast reclamation – made the *kelong* a thing of the past (Chou Loke Ming 1977). In addition to reclamation, this period also saw the growth of manufacturing and industry in the city (Cheng Siok Hwa 1991:182-215). And where such industrial development took place in coastal regions – as in Jurong-Tuas, on Jurong Island, and in a number of the southern islands, it was also likely to affect the inshore fishing sector – in part by land reclamation, but also by the increase in pollution in inshore waters (Chan and Say 1979:239; Hanna 1968:111; Chung 1978-79; Lim King Seng 1979-80).

One can argue, therefore, that the fate of the inshore industry was sealed by this very extensive change to the physical environment – all of which was done in order to gain land for industrial, residential, and transport and shipping development.

Such development was the result of the political changes in Singapore in the period after the war and the economic policies that went with those changes (Yeo and Lau 1992:117-53; Chan Heng Chee 1991:157-81; Lam and Tan 1999). With the changes in political leadership came a new set of attitudes, toward fisheries no less than toward other aspects of the island's development. Singapore was to be industrialized (Sicat and Makasiar 1972:2-9) and, as a result, for the first time the inshore fisheries were not seen as being of importance to the island's economy. These fisheries were seen, in fact, as 'backward' and as an obstruction to the 'modernization' of the economy (United Nations Bureau of Technical Assistance Operations 1963:139). At one level, this picked up the concern that had always been there about the hazards which *kelong* created for shipping. But there was an equally strong view that, in the long run, primary industries like fishing had little or no place in the emerging economy of Singapore: over the 1960s, although the monetary value of primary production in the island rose, its share of GDP fell from

6.1% in 1959 to 3.3% in 1969 (D. Chew 1970:3).

In 1953 it was decided that all *kelong* would henceforth be on annual licences and that no new licences would be issued (Chou 1986). The demise of the inshore industry was sealed in this decision: from a peak of 310 *kelong* in 1952, providing 70% of the local catch, the number declined to 93 by 1975 and to some 30 or 40 by the mid-1980s (Chou 1986). Given the importance of the *kelong* in the inshore industry, this meant that a viable industry no longer existed. And comparable moves were made against culture fisheries: in 1975, 200 'illegal' prawn ponds in Lim Chu Kang, Sembawang, Kranji, Seletar and Ponggol were closed, because they were considered 'unproductive agriculture' (*Straits Times*, 23 March 1975).

The new government, however, did not dismiss the possibility of a fishing industry as such. From the late 1950s, the government of Singapore made a determined effort to develop offshore and deep-sea fishing (Tham Ah Kow 1959; L. Teo 1965:13) and to improve landing and marketing facilities for the more 'advanced' sectors of the industry. This was done in the hope that it not only would provide greater input to domestic consumption but would also stimulate ancillary activity in boat-building, processing, and refrigeration – activities that were in line with the new economy of the island (Chan and Say 1979:239; *Fishing port* 1966; *Fishing hopes* 1966; *More fish* 1967). The Jurong fishing port and central auction market, which replaced the former city markets, were opened in 1967 and 1969 (Chan and Say 1979:239; Lim Peck Tee 1969:ii). The South East Asian Fisheries Development Council (SEAFDC) research centre was moved to Singapore (*Fishing Institute* 1967; *DSF Institute* 1967; *Asian nations* 1967) and an $ 8 million United Nations Development Programme (UNDP) Fisheries Training Centre was opened (Chan and Say 1979:239).

These moves, however, had mixed results. Offshore fishing increased the catch (Chan and Say 1979:244) and the new central auction market was judged a success in improving the position of major offshore fishing companies and in eliminating problems that had been evident in the earlier city markets (Lim Peck Tee 1969:24-5). The Training Centre at Changi, however, was poorly received and was closed as a loss-making venture (Chan and Say 1979:243; *Straits Times*, 14 Jan 1976). The SEAFDC research facility received damning praise for its 'impressive' programme of research; but 'the emphasis of the research as applied research has yet to be fulfilled' (Chan and Say 1979:243).

The rapidly developing port city, moreover, fostered new employment opportunities – often at higher rates and without the dangers or the enforced absences of fishing that accompanied offshore and deep-sea fishing – at a time when such offshore and deepwater fishing had become the fishing activities that were considered the most important for Singapore. In the Singapore case, although wages rates in fishing were among the best in the

region, recruitment and the holding of labour became increasingly difficult (Chan and Say 1979:240; Kaye 1982:53-4). Moreover, labour problems did not start and end with wage returns. As the educational and training level of the port city expanded, so the attractiveness of employment had to take account of these educational and skill levels (Chan and Say 1979:239). The fishing industry, if it was to compete, had to transform itself as an industry. Yet, traditional fishermen often lacked the knowledge and skills required by deep-sea fishing and were generally reluctant to take up the new activities.

A study of the depopulation of the fishing *kampong* shows that destruction of habitat of fish stocks was just one of the factors in their demise. While many stopped fishing when land was reclaimed and they no longer lived near the shore and their boats (at Siglap it cost $ 140 a year in rent to keep a *sampan* at the beach), others chose to abandon fishing for more lucrative employment or a secure income. With the rising cost of living, unreliable income solely from inshore fishing could no longer support families. Some used their boats to ferry people to offshore islands, others remained unemployed. The last fulltime fisherman at Pasir Panjong was reported to be Pak Haron, who gave up in November 1985 and then got a job as a gardener (Katini Yayit 1986).

There is a great nostalgia among some Singaporeans for the *kampong* life, although, when fishing, most fishermen claimed it was hard and dangerous work. There were times when they were unable to fish because of the weather or the monsoon. They did not venture far from land. They complained about the lack of fish, about the costs of boats and equipment, and about bureaucratic controls. Many would not encourage the next generation to follow them, nor did they pass on skills. But the memories now are of a time of independence, of a relaxed and leisurely lifestyle with basic needs supplied from the sea and the land around their homes. 'On the island fish is free, vegetables are planted, we breed our own chickens. We only need to buy rice [...] life in the island is better', said one informant (Suriani Suratman 1986:80). Forgotten are the level of poverty, the lack of amenities and poor living conditions, the mosquitoes, the flooding, the hardships, the debt that was incurred, the many obligations to others such as middlemen. Could fish stocks have been protected and fishing have remained a sustainable occupation? Neither the land nor the sea around the port city could sustain both traditional inshore fishing activity and commercial port activities as they developed in the twentieth century. The two were incompatible and Singapore made its choice.

What happened to the fishermen? By the 1980s the numbers were small, 2,800 according to the 1980 census, a figure that declined rapidly by the end of the decade. Relocated into high-rise flats after the clearance of their 'squatter settlements', only a few retained their connection with the sea as fishermen

renting boats or working on bigger boats (Suriani Suratman 1986:34). Those who tried to continue fishing found it hard to survive in a cash economy. Suratman relates that one fisherman still went out to fish three times a week to fulfil his contract with a Chinese agent and tried to get casual work on the other days to supplement his earnings from fishing, which were erratic and dependent on the day's catch. The family income was about $ 500 a month, of which electricity and water took $ 250. The family was 'always plagued with bills' (Suriani Suratman 1986:84). In other areas such as the north coastal area younger men became speedboat operators, shipyard workers, boat drivers and boat rental workers, as well as cleaners, contractors, and factory workers, their opportunities limited by their lack of education. A few turned to fish farming. Others remained unemployed and resentful of their loss of livelihood and sense of place (Katini Yayit 1986:129). The later fishing enterprises were left to newcomers to the industry with access to capital and expertise of a different kind, such as business and marketing.

In terms of capital, also, the port-city developments made it increasingly difficult to attract capital to fishing rather than new investment opportunities holding the promise of higher returns. This was important because capital was vital if the Singapore fishing industry was to be sustained. Traditionally, capital-intensive fish stakes (*kelong*) had been important; after the 1939-1945 war, powered boats with their greater capital costs and the more expensive gear and fuel needed for them became important; deep-sea fishing demanded even greater capital inputs. The deep-sea sector, however, found it difficult to obtain these inputs partly because there were counter-attractions for capital in the rapidly expanding economy of the port city.

There was another aspect to the failure to generate the 'distant water' fishing industry in Singapore, which the government wanted to develop as the inshore industry was phased out. This was the process, from the 1950s, of the 'nationalization' of surrounding fishing grounds under the process of forming the Exclusive Economic Zones (EEZs). Under the auspices of the UN Conference on the Law of the Sea (UNCLOS), the development of EEZs of 200 nautical miles emerged over the 1970s and 1980s. In the international arena, therefore, Singapore was in an impossible position given its closeness to Malaysia on the one hand and Indonesia on the other (Lee Yong Leng 1980:44). There was an even wider effect than the constriction of fishing grounds close to Singapore. The widespread declaration of EEZs meant that even more 'distant waters' were effectively closed to Singapore fishing fleets. As the fisheries close to hand were disrupted, therefore, 'distant waters' were increasingly unavailable.

The demise of inshore and culture fisheries in Singapore

In 1979 F. Chan and A. Say saw 1970 as marking the beginning of 'crisis':

> Rising labour productivity and labour remuneration in several sectors such as manufacturing, commerce, banking, construction and tourism clearly indicated that the local fishing industry had to reach a higher level of technical sophistication and productivity if it were to compete successfully for the increasingly better trained and educated labour force and the higher expected rates of returns on investment. Otherwise, it might cease operations in Singapore altogether as a commercial enterprise. (Chan and Say 1979:239.)

Moreover, they saw the economic imperatives as telling against fishing: 'Just as it is inefficient for Singapore to produce its own rice and that it is beneficial both to Singapore and to other countries that it imports what it requires from countries better able to produce a rice surplus for export, such as Thailand, so it is with fish' (Chan and Say 1979:245; Kaye 1982:53).

The signs of crisis were already clear by the early 1970s. The number of workers in the industry began to decline: in 1960 there were 4,984 workers, in 1974 2,194; and the decline was increasingly taking away the older, traditional elements of the industry:

Year	Non-powered	Inboard	Outboard	Ponds	Total
1960	2,637	1,066	1,128	153	4,984
1974	287	1,471	436	n.a.	2,194

Source: Chan and Say 1979:240.

As we have seen, pond fisheries were always a minor element; pond fishers numbered only 34 in 1969.

Output also was falling by the early 1970s: in 1967 local output was 17,921 tons and it fell to 15,662 tons in 1972 – largely because of the decline in inshore production.

Reports on particular fisher communities underscore the crisis (Hanna 1968:111-2, 115-6). In the fishing *kampong* at Siglap, once situated on the beaches of the east coast, for example, reclamation separated them by up to a mile from the sea. By the mid-1970s, therefore, when they were surveyed, some 49% of the population included in the survey were designated 'former fishers' (Chou Loke Ming 1977:11). Some 37% of the men surveyed still fished full-time – most of them as self-employed or as employers (Chou Loke Ming 1977:11). The *kelong* that had once been important in the area were 'almost non-existent' following the land reclamation schemes along the coast (Chou Loke Ming 1977:22-3); and drift nets, lines, and the occasional beach

seine were the methods followed by the few remaining fishers (Chou Loke Ming 1977:17). Children in Siglap communities were turning away from fishing, and their elders, generally speaking, did not want to encourage them to continue in fishing (Chou Loke Ming 1977:40; Kong and Chang 2001:49).

On Pulau Sudong, where the community was surveyed in 1965 (Walter and Hassan 1977) and then studied closely as it underwent its resettlement to Clementi New Town in 1978 (Chew Soo Beng 1981), the changes were becoming evident in the mid-1960s. Already, by the time of the survey, 60% of the men on the island were working in non-fishing occupations – even though some managed to do some part-time fishing if their employment was still on the island (Walter and Hassan 1977:11). With their resettlement in 1978 – which followed earlier relocations of fishing communities that began in 1965 (Chew Soo Beng 1981:67) – they lost their connections with fishing.

Conclusion

Singapore still has a thriving seafood industry but it is based overwhelmingly on fish from elsewhere. As a market, as a fish-processing centre, as a distributor in the region, this industry contributes significantly to the national economy. But Singapore's inshore and culture fisheries disappeared in the face of the forces set in motion by the development of the island as a multi-faceted port city, especially in the second half of the twentieth century. The pressures from the great increase in shipping, and the priority of shipping over other marine activity; the associated processing and other industries which grew with the port's development; the demand for land for infrastructure, residential, and recreational uses in the burgeoning city; and the problems of attracting capital or labour to 'old' industries in face of competition from those related to the port and the commercial and financial life of the port city – all of these took their toll in particular ways. By the late 1970s there was no basis for viable inshore or culture fisheries in Singapore.

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Notes: Academic Exercise is equivalent to a BA (Honours) thesis.

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ISABELLE ANTUNÈS

The price to pay for political sustainability
Sasi and commercial marine resource depletion in Kei Besar, Maluku, Indonesia

Resource management is at the heart of the debate on sustainable development in Indonesia due to increasing production, rapid fishery development promoted by government, and rising commercial value of marine resources encouraging more and more people to harvest the sea. While concerned about marine resource depletion, scientists have recommended different solutions for the western and eastern parts of the Archipelago: in the west, where the sea is characterized by a continental shelf, shallow waters, and abundant pelagic resources, access to marine resources must be controlled by limiting the number of boats and fishermen (Bailey 1988; Collier et al. 1977). In the east, where the marine environment is characterized by deep sea and coral reefs, resource management must be improved through local initiatives (rather than government policies) allowing free access to resources and a rise in fishing activities. Community-based resource management and traditional management systems such as *sasi* in Maluku have been widely promoted from the perspective of sustainable management on the assumption that they minimize state intervention, offer possibilities for collective actions for the purpose of sustainable development, and combine participatory and equitable ideals.[1] Yet, in spite of all the efforts made by NGOs and donor agencies to work in this direction, marine resource depletion and conflicts over marine tenure persist across the Archipelago.

The studies I have conducted on fisheries, development, and traditional resource management systems in Maluku have led me to question certain concepts which are taken for granted in sustainable development projects, including the politically correct idea of 'traditional societies living in har-

[1] Bailey and Zerner 1991, 1992; Zerner 1990, 1993, 1994a; Nikijuluw 1994a; Ruddle 1994; Rahail 1995.

mony with their environment'.[2] This turns out to be a narrow view, limited to relationships between the economy and the environment. It is not that this view is false, but it must be broadened to take into account the relationships between politics and culture, on the one hand, and politics and environment, on the other. I have found that the reality in the field was often contrary to what one would expect: community-based and traditional management resulting in resource depletion and pauperization of villagers. Several questions need to be raised. How can we explain why community-based and traditional resource management systems are not the ideal way to sustainable development in eastern Indonesia? How is it that some communities jeopardize the very natural resources that are known to be their most valuable economic assets? What approaches and methodologies do we have to better understand the current situation and produce information that would facilitate decision-making moving toward sustainable development in Indonesia taking into consideration local specificities?

In the present article, I offer a case study that I conducted in the village of Watlaar in Maluku (the Moluccan Islands) in 1996 and 1997, which offers a concrete example of such an unexpected situation. The village was chosen because it was famous for its *sasi*, which provided villagers with regular incomes from the sale of trochus, a highly commercial shell, and for its 'strong customary *adat* law'. *Sasi* is a temporary prohibition (in time and space) on the harvesting of commercial communal goods. *Sasi* entails that, for a certain period, people are not allowed to collect any trochus within the village sea territory. The ban is implemented by the village chief. After one or two years, the ban is lifted for three days only, and then implemented again with a ceremony gathering all members of the community. During the three-day harvest the rule is strict: in order to preserve the stock, no shells smaller than 6 cm are allowed to be collected.

Watlaar's resource management system caught the attention of NGOs and scientists who all proceeded to promote *sasi*; they promoted it through Bapak Raja, the traditional village chief, by publishing his work (Rahail 1993, 1995) and by inviting him to various international events. My multidisciplinary study shows, however, that *sasi* was resulting in depletion of trochus stocks, conflicts and poverty among villagers (Antunès and Dwiono 1998) because the local elite was trying to ensure what I call 'political sustainability' – that is, national and local peace as opposed to conflict over power – thus ensuring both local elite's control over the community and its resources and central government's control over this region of the Archipelago (Antunès 2000).

Development is considered to come within the sphere of economics, and

[2] Carrier 1981; Cordell 1984; Johannes 1978, 1981, 1989; Ruddle and Akimichi 1984; Ruddle and Johannes 1985.

this is the reason scientists often privilege an approach whereby resource management is one means of production among others. Instead of integrating culture into economics, I propose to adopt a cultural and social approach in order to show that development is not only a product of economics. As Joël Bonnemaison (1981) and Paul Claval (1999) rightly put it, culture and society, politics and culture are closely linked. For example, to study *sasi* from a cultural angle is to bring to the fore all the effects of social and cultural production relationships in *sasi*.

The geo-cultural approach, a term coined by Joël Bonnemaison, is based on the study of land distribution systems and ritual (Bonnemaison 1981; Antunès 2000). The land distribution system and ritual are two expressions of a local culture. Rituals reveal the power games that are played between the different groups within a community. Rituals reflect a social organization and an accompanying view of the world, while land distribution reveals production systems, social organization, and social trends. These economic and social relationships are the doors through which I then studied the production system organized around fishing. In this sense, and for purposes of comparison, rituals and land distribution offer the advantage of mirroring each other. They can tell us whether access to natural resources has changed and what impact these changes have had on natural resources.

I will first introduce you to Watlaar and its trochus fishery. I will then examine the ritual which reflects a society and its world view, and the landscape as the backdrop to the production system and social organization. Based on this description, I will then proceed to an analysis of the situation in Watlaar. This demonstrates the relevance of the geo-cultural approach to issues related to resource management and local development.

The village of Watlaar

The island of Kei Besar is an uplifted horst of several calcareous terraces from 500 to 800 metres high cut by many creeks which drain rainfall on both sides of the island. The island is exposed to strong southeasterly winds during four to six months of the year, making sea activities and transportation very difficult for half the year. Due to the hot and wet climate, erosion is very high. In most places, the soil is covered by big blocks of stones and many rocks, making agriculture and horticulture difficult. Steep slopes are covered by forest, sago, and coconut trees. The contrast to Java is striking. In Kei Besar there are no big boats but dugout canoes, no city-like houses but simple houses with roofs made of sago leaf, with the exception of Bapak Raja's house in Watlaar, which overlooks the village like a white castle. In 1996, Watlaar had 623 residents, all Catholic with the exception of one Protestant family. Children's

school uniforms and the red and white flag remind the visitor that this is an Indonesian village.

The economy of the village of Watlaar is largely non-cash orientated. Most families work at subsistence level and, as families are engaged in the same type of production, exchanges are minor and infrequent. Villagers go from land to sea activities that take place within the village territory that extends to the sea (Figure 1), allowing each community on the island equitable access to natural resources. Sago and cassava are the mainstays of the local diet. Both require a long preparation time to extract flour from sago and to grate cassava roots. In total, a minimum of three days of work per week is required to meet household consumption needs. Yams, sweet potatoes, fruits, and vegetables are also eaten. The Watlaar coastal area has various marine resources including fish, molluscs, seaweed, crustaceans, and echinoderms. Fishing activities in Watlaar are numerous, but highly dependent on the weather. Fishing techniques are still traditional and there are no motorized fishing boats. Hunting as well as fruit and nut harvesting are complementary subsistence activities. Year-round sources of income are limited to copra, casual daily jobs, and home production of oil and palm wine. Nevertheless, the trochus harvest once a year or every two years ensures a substantial cash income essential to the fragile household budget. Families use the cash for school fees, clothing, and medical expenses.

Trochus shells: people's gold

The topshell (*Trochus niloticus*), known in Maluku as *lola* or *bia susu bundar*, is a tropical marine gastropod belonging to the Trochidae family and Archaeogastropoda order. This gastropod lives on flat reefs at depths ranging from 1 to 10 m with limited movement. This nocturnal animal is active at night and feeds on encrusted algae growing on the hard substrate.

The maximum base diameter is 16.0 cm. Male and female animals are externally indistinguishable. The first maturity is achieved at a base shell diameter of 5.5-6.0 cm (Pradina et al. 1996; Pradina et al. 1997). The main spawning season in the Banda Islands (central Maluku) occurs from March to June, coinciding with the transitional season from northwest monsoon to southeast monsoon (Arifin and Purwati 1993; Pradina et al. 1997). Spawning usually occurs at night during the new moon period, and fertilization is external between dark green eggs and whitish sperm (Pradina et al. 1996). The growth rate during the first three years varies from 25 to 30 mm per year (Dwiono et al. 1997). In order to manage trochus stocks in Indonesia, a size limit of 6 cm has been imposed by national authorities and local official traders. Prices offered for undersized shells usually discourage people from harvesting small trochus.

Trochus niloticus has a high commercial value because of its valuable mother-of-pearl shell. On the local market, the empty unprocessed shell price varied between Rp 10,000 and Rp 15,000 (US$ 4 to US$ 6) per kilogram. The pearly shells, used in the high-fashion button industry, paint industry, and craftwork are exported mainly to Japan, Singapore, Germany, and Italy. Besides its valuable shell, the meat of this animal is used locally as a source of protein. Indonesia, as one of the main producers of trochus shell, exported more than 1,500 metric tonnes of dry shell in 1978. Indonesian production was maintained at this level until 1985, when more than 2,000 metric tonnes was exported. Since 1988, production decreased drastically, and reached its lowest point in 1990, at 195 metric tonnes. Similar tendencies in production decline were observed in Maluku province, another of Indonesia's shell producers.

The risk of depletion for trochus is very high. It takes this mollusc over two years to reach maturity, and the fact that this species hardly moves from the habitat it lives in makes it more fragile and more vulnerable. Anyone can harvest shells found on the reefs. The harvest of shells under the size limit would rapidly lead to the depletion of stocks.

As in other villages of Maluku, commercial exploitation of trochus is managed by the *sasi* system. In 1996, for the first time, Watlaar took the risk of overexploiting trochus stock. Villagers ignored the minimum legal and commercial size limit (6 cm) usually applied in the area, and more than half of the capture was under that size, as shown in Figure 1. A trochus assessment study showed that this practice led to the elimination of future reproductive individuals and brought the whole trochus population to below the carrying capacity of the area (Antunès and Dwiono 1998). Yet in Watlaar, signs of overfishing were not immediately evident, since large trochus were being harvested. But the fact that a very large quantity of undersized trochus were harvested foreshadowed resource depletion of the stocks located within Watlaar's marine tenure (Antunès and Dwiono 1998).

In spite of all that, nothing seems to have been done about this situation. Just as in previous years, Bapak Raja and the whole community gathered by the shore for the *sasi* ceremony which closes the trochus fishing period and marks the beginning of the prohibition period with its *hawear*, a palm leaf that symbolizes *sasi*.

I have not managed to get more recent information about the situation after my last field trip in 1997. Communication and travel have become very difficult in this region since the events of 1998. According to the trochus expert diagnosis, trochus stocks would need a long time to recover after the 1996 harvest (Antunès and Dwiono 1998). If the following harvest occurred two years later, it is most likely that the number of commercial-size shells was far less then that of previous years and would therefore not offer villagers the usual income. Moreover, rapid harvest of commercial size would

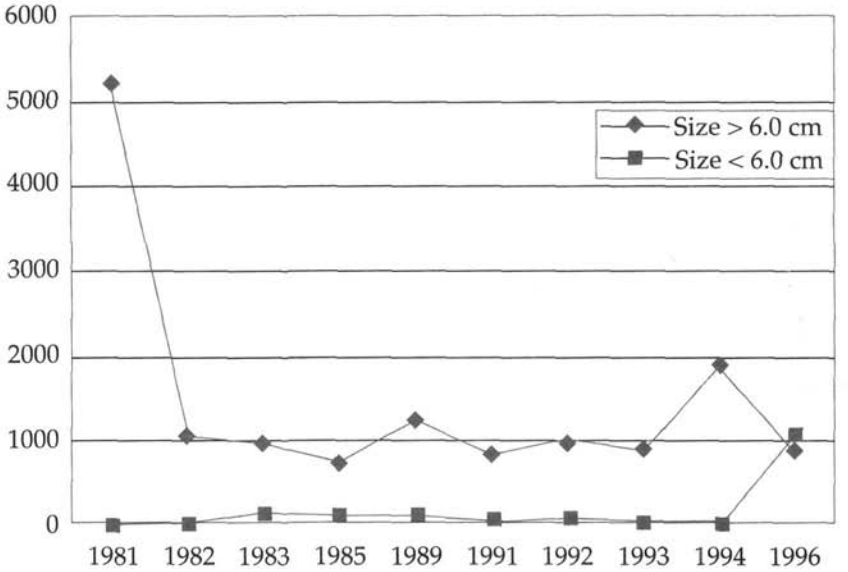

Figure 1. Evolution of trochus production in Watlaar according to size (ton)

mean that the stock would take even longer to recover to the level prior to the 1996 harvest.

Sasi ceremony: an introduction to Watlaar social organization

Misleading appearances

The *sasi* ceremony is conducted by Bapak Raja, the customary leader, by an elderly man, and by the Master of the Land, all of them dressed in red. During the ceremony, the elderly man carries out some rituals for purification. A wild pig is sacrificed and some of its blood is taken to coat the *sasi* palm-leaf symbol. Bapak Raja, standing on a higher rock, then addresses the community and warns that anyone who ignores the prohibition of harvesting trochus will have to pay the equivalent of a year's income. Bapak Raja then passes the *hawear* to the Master of the Land, who declares that as from this day the *sasi* is on. He then places the palm leaf on its stand by the sea for all to see. The ceremony ends with a community feast.

On the island of Kei Besar, *hawear* is a tied palm leaf which is used to mark a prohibition or property, or to prevent people from taking things that do not belong to them. The shape of the sign reveals the nature of the punishment

that will befall anyone ignoring the prohibition. Starting in colonial times, *hawear* was used as a means to control valuable commercial resources and therefore manage their exploitation. It later became known as *sasi*. *Sasi* was invented by the colonial authorities and the contemporary governing elite as a secular, social framework facilitating commerce between traders from distant Asian and European lands, local rulers, and small Moluccan communities. Later, government and scientists saw in *sasi* a method to achieve sustainable development and community equity (Zerner 1994b).

Sasi is still used today to control commercially marketable goods that belong to the whole community, such as coconut and trochus, but only *sasi lola* gives rise to a ceremonial gathering of all the villagers, whereas the other prohibitions are simply announced orally. The ceremony for *sasi lola* is both a way to enforce the prohibition within the village and to let neighbouring villages know that the *sasi* is on. In a way, *sasi* serves the role of police, and its symbol marks out the territory that belongs to each village and the limits within which people may own and exploit resources. According to villagers, the ceremony as described above dates back only to the early 1990s. Prior to this, *sasi lola* was simply announced orally and with a prayer.

Having made that point, I would like to draw the reader's attention to the ceremony itself. Three persons conduct the *sasi* ceremony. These three men are all *mel*, meaning they originate from the immigrant group. This information strongly contradicts descriptions given by authors working on the Kei Islands and their communities, who present power as being shared between the Master of the Land (*tuan tan*, who has control over land), and political and judicial positions.[3] The function of Master of the Land is to organize land use and manage resources. The scholarly literature agrees that the position of *tuan tan* is occupied by a person originating from the Kei Islands, while political and judicial power is in the hands of immigrants.

The fact that both titles are now held by the immigrant group raises the question of social organization in Watlaar today.

A dominating elite

Oral tradition relates the meeting between a native population and migrants originating from the island of Luang located southwest of the Moluccan Archipelago. This meeting was sealed by a marriage between a native man and a foreign woman in exchange for some land, which enabled migrants to settle on the coast. The natives called the migrants 'mel', meaning youngest, and called themselves 'ren', meaning eldest. It was agreed that *ren* and *mel* should live together, while *ren* kept control over land. This is what seems to

3 Geurtjens 1921; Admiraal 1939; Renyaan 1980, 1981; Laksono 1990.

have happened, *mel* initiating *ren* in activities at sea and new cultural practices, and slowly accompanying them in the settling process. The study of old camps shows that *ren* used to practice shifting cultivation around temporary camps whose lifespan depended on soil fertility, sago exploitation, and hunting prospects. *Ren* were hunter-gatherers as well as horticulturists. A third group called *iri*, referring more to their (lower) social status than to origin, was also part of the community. *Iri* were the people working for the *mel* with whom they arrived by boat.

Like the Keieise, the people of Watlaar today recognize social boundaries which divide their community into three endogamous groups, *mel, ren* and *iri*. In August 1996, the census indicated 75 *ren*, 37 *mel*, and 10 *iri* heads of family. Most families live in separate houses, although a house may include several households from the same group. In some cases, *ren* households may also live together with a *mel* household. The differences between these groups are related to social stratification and hierarchy, in which *mel* are considered the upper class, *ren* the middle class, and *iri* the lower class. Despite the three social categories, people belong to a House (*rahanyam*), often defined as a patrilineal kinship group related to the *mel*. A House may contain *ren* and *iri* families, even though they have no kinship ties with the *mel*. In this case, *ren* and *iri* households are considered to be the younger brothers and the *mel* the elder brothers (*ren* and *iri* have no authority on their own). The relationships seem to be mostly related to marriage alliance and to the notion of exchange.

The majority of *ren* and *iri* people in Watlaar today agree that the relationship between *mel, ren* and *iri* is not like that between upper and lower classes or that between master and servant, but is rather considered as a helping relationship. Many *mel* do not see it that way and still keep to the hierarchy and show their authority.

The social organization reveals a dominating elite with a duality of power no longer shared by the two distinct groups, which confirms my observations of the ceremony. I propose now to look at the landscape to see if social spatial organization reflects this role of the dominating elite, and to learn about the system in place in Watlaar that has enabled people to live and maintain social peace. I shall refer to that system as the viability system.

A shattered viability system

For François Doumenge (1983), viability expresses itself both in a static state ('the conjunction of the conditions necessary and sufficient for it to exist and last') and a dynamic state (the conditions 'that need to be present for it to be able to develop, both for the fullest possible use of the natural resources

and for the social and economic advancement of the population'). Land distribution is a useful indicator of viability at local level since it reveals the production system and elements of the social organization that facilitate that particular type of production system. Thus, in Watlaar, both geo-symbols and the distribution of agricultural and marine tenure areas show the architecture on which the viability system rests.

I will begin by presenting the system as it is through a rapid study of the landscape and will then describe the changes that have occurred, using the example of the exploitation of trochus.

Equitable access to natural resources

The territory of Watlaar consists of land and sea. On land, Watlaar territory stretches some 3.7 km from south to north and 6 km from east to west. Its approximate total area is 1,390 ha. It is mountainous, with a steep landscape that goes from sea level to an altitude of 793 m (Mount Boo). This mountain is regarded as the sacred place of native people, the land of their forefathers, of the Master of the Land.

The territory of Watlaar is divided into seven zones. Going from east to west, the settlement (*ohoi*), then the settlement's outskirts (*ohoi murin*), permanent gardens (*rok*), fallow fields (*kait*), forest and hunting area (*varain*), primary forest (*varain vaveon*), and sago areas (*meon*).

The territory at sea is organized symmetrically. Coastal waters are divided into zones. Going from the beach to the sea, villagers have named zones according to topography and biotopes. Thus, we find the intertidal zone (*yafat*), the zone of rocks and dead corals (*hanger*), the coral reef (*hanger soin*), the beginning of the sand (*nurhain soin*), the blurry shallow water and sandy bottom (*vaut buit*), the blue sea as it gets deeper (*stuk el wein*), and the underwater cliff drop of more than 100 m (*faruan*). From *faruan*, the different zones refer to distance to the shore. The angle of the northern and southern frontiers of the sea zones indicates that references are taken from a position on the shore and within the limits of eyesight.

Sacred places and access to natural resources for the various social groups and Houses tell us something about the social organization, the production system, and the viability system of the community.

Villagers indicate where they have gardens by referring to names given to trees, rocks, water streams, or topography. The distribution of gardens among the various social groups and Houses shows that exploitation areas are not spatially separated by group. That is, all social groups have access to all the exploitation zones of the village (*rok, kait* and *meon*). This distribution ensures landowners access to all available resources necessary to their survival as well as to materials necessary for building houses, and to coconuts to

produce copra and coconut oil (cash crops for households). The same applies to the coastal waters, where marine tenure in shallow waters is divided among families to ensure each of them the permanent use of fishing traps at varying depths. The distribution of deep-sea fishing grounds is not assigned to the House but to the family or to groups of families. Here again, families have access to different areas at sea.

Thus, in Watlaar, the land distribution system, both on land and at sea, offers viability based on equitable access to community resources and wealth. However, the present hierarchical social organization structured in three Houses and in three social groups is not obvious in the spatial organization, except in the main residential area, where only Bapak Raja's house and those of House heads are built of cement while *ren* families live in traditional housing.

In access to natural resources in Watlaar, the Master of the Land performs a social function within the group by allocating agricultural and marine tenure areas, and sharing resources necessary to each family. Bapak Raja plays the role of mediator with the outside world, as indicated by the sacred place named Labes, located on the shore where the immigrants first landed. Today, Labes is still considered as the entrance to the village. Symbolically, every time someone important arrives for the first time, he or she has to go through that entrance and observe the proper rituals, for it is the immigrants who have the right of speech and everything from the outside has to go through them.

The sharing of profits from the sale of trochus used to follow that same equitable pattern. However, in 1996, profit sharing was changed to benefit today's elite in the social organization. As shown earlier, these changes have a negative impact on trochus stocks.

Unequal profit sharing from trochus sales

In the Kei Islands, people usually refer to three types of profit sharing. *Sasi umum* means that the profits will be for the whole village and will be spent for the good of the community. *Sasi gereja* means that the profits will go to the church. Finally, *sasi pribadi* means that the profits will be divided among the people.

In many other neighbouring villages, the traditional sharing system was maintained. That is, there are two kinds of *sasi*: *sasi umum* and *gereja* and *sasi pribadi*. In the first case, several divers collected the shells and brought them to the head of the village. The profits would then go to the village and the divers would get a small wage. In the second case, every married man had the right to go and dive. Women were not allowed to dive. If a man was too

old or sick, he would then ask a diver from another village to dive for him; in that case, he would share his profits with him. After two or three days of diving, and once the head of the village and the Deliberation Council members had chosen who would be the trader or traders, each man would then sell his catch directly to the trader(s). His profits would be equivalent to the amount of trochus he collected. Watlaar also applied these rules before 1996 but then decided to change the system, using the argument that it was better to allow everyone to dive, both men and women, and then to share the money between Houses rather then replacing old and sick persons with neighbouring divers, thus allowing part of the profit to flow out of the village. Since the resource belonged to the village, it seemed only natural to divide it among the villagers.

By doing so, however, people did not get as much as previously, and the best divers ended up earning less than they would have if they had sold their catches alone. This led to people only bringing back part of their catch, selling most of the larger trochus on the black market, and bringing back undersized trochus to their House to compensate. The black market was composed of traders originating from Watlaar, all *mel* with the exception of a Chinese family, who did not make it to the sale that year. Information both from the traders and from the villagers showed that about one tonne of trochus of 6 centimetres and above was sold that way and that for the first time a production of over one tonne of undersized trochus was harvested, thus threatening the future of trochus stocks in that area. Prior to 1996, undersized trochus were seldom caught. People were discouraged by the low price offered by traders, equivalent to a quarter of the price offered for 6-centimetre trochus shells, and Bapak Raja encouraged divers to respect the size limit, whereas in 1996 the size limit no longer appeared to be respected.

The decision to reorganize profit sharing from the sale of trochus can be explained by power games and conflict among *mel* persons who all want to profit from the trade in trochus. Trochus trading revolves around a circuit of commercialization in the hands of the Chinese community, based either in Elat, the main town in Kei Besar, or in Tual, the capital of the Kei Islands. Traders (*mel* with the exception of families of Chinese origin living in Watlaar and neighbouring villages) buy trochus from the village. Production is limited, and the more buyers the less profit. All transactions go through the village head and the members of the Deliberation Council, who in the case of Watlaar (as in most other villages) belong to the *mel* social category. Negotiations usually take place prior to the sale in return for a sum of money. That particular year, the village head, who was the elder son of Bapak Raja, had planned to buy the village's catch. To minimize conflicts and create adhesion among *mel*, profit sharing from the sale of trochus was reorganized by Bapak Raja to benefit the House, while most of the profit discretely ben-

efited the village head and his family. This new profit sharing gave the *mel* group the impression of having an equitable share of the profit, which was legitimate since they were all part of the elite. The village head, however, sold the whole catch outside the established commercial circuit at a higher price than that offered by Tual. The buyer bought the whole catch at the same price regardless of trochus size, while the village head had bought undersized trochus from the villagers at a quarter of the price of the commercial size generally offered in Tual!

Thus, for power, money, and the unity of their own group, the elite played their sole economic card by jeopardizing their trochus stocks, and hence the future of the community.

The viability system, once based on equitable access to natural resources, has been shattered, since one of the necessary conditions for the functioning of that system – ensuring the welfare of the whole community – has been replaced by greed, thus conflicting with traditional local culture and politics.

Politics and culture: a binomial in jeopardy

The *sasi* ritual rests on a duality of power, leadership being shared by two persons originating from the two groups composing the community. While the duality of power has been preserved, leadership is no longer shared but is now in the hands of one group only. Looking at the landscape, we observe a social segregation of wealth with respect to houses and highly valued natural resources. However, access to land and sea for subsistence use has remained equitable. The fact that the traditional Master of the Land has been replaced with a *mel* shows that control over the economy leads to political power in the community.

Thus, the source of political power today is not land, but the economy. Dominating both the economy and politics enables a group to have control over the territory and its resources and to organize the people in a dependent relationship from which they cannot escape.

The study of trochus fishing in Watlaar and the unequal sharing in 1996 of the proceeds from the sale of trochus reveal that the system had in fact become highly centralized, with all power now in the hands of one ruling group. These changes threaten the system's viability, trochus being the villagers' main source of cash income, and cash being essential in the modern context, if only to pay the children's government-imposed school fees.

Land was formerly the source of political power, because its reproduction centred on an equitable distribution of wealth, ensuring the system's viability. When egalitarian access to resources threatens the interests of the non-egalitarian current powerholders, the reproduction capacity and the

viability of the system are put at risk. When an elite seizes all wealth for its sole benefit, the other users of the land are dispossessed of part of the natural resources and can no longer ensure their livelihood and are in turn compelled to break customary *adat* rules and to overexploit natural resources in order to survive (resulting in resource depletion, increased poverty, and no sustainable development).

This conclusion contradicts the image of traditional communities living in harmony with their environment and able to manage resources. In this particular case, traditional resource management is not the ideal solution for sustainable development because development goes beyond the issue of resources and economics.

How can we explain this situation?

History transforms culture

The *sasi* ceremony and the land distribution system in Watlaar introduced changes in the community's social organization, particularly in the relationship between *mel* and *ren*. The relationship between *ren* and *mel* began to change with the arrival of the Dutch colonists, who established the *mel* as privileged interlocutors in their commercial relations. By doing this, they placed the *ren*, Masters of the land they coveted, in an inferior position in relation to the *mel*, who became the ambassadors of the colonial power in the administrative layout implemented from Ambon, capital of Maluku, and from Tual, capital of the Kei Islands. These administrative authorities, the *mel*, were ennobled by the Dutch. This position enabled them to control island trade with the exterior and to become wealthier and thus to play a major role in customary exchanges.

Trade was formerly based on a system of reciprocity of exchange among villagers of the same community and between allied villages (Laksono 1990). With the arrival of the Portuguese and then of the Dutch, gold, gongs, and cannons became money to exchange at major events such as marriage, birth, death, and trials. Since the end of the colonial period, no new monetary system has been introduced in the island, and thus the same old stock continues to circulate. This scarcity of money has contributed to reinforcing the power of the *mel*, who from the beginning held most of the village's wealth. On the contrary, the *ren*, who had less and less money for ceremonies, were forced to ask the *mel* for help in the form of credit. Thus, they gradually entered into a dependent relationship because the only thing they could give in exchange was their labour. A customary tribunal also strongly contributed to accelerating this trend. A *ren* who was found guilty and who could not pay his debt would ask help from a *mel* to avoid the death sentence, even if it meant becoming his 'slave' and perpetuating this relationship for all his descend-

ants. Special relationships were thus entered into between certain *mel* and *ren* families. Starting out as purely economic, these ties extended themselves progressively to the social organization when the *mel* decided to restructure the society of Kei Besar based on the 'House' model.

After the independence of Indonesia, the new government reinforced the administrative structure in order to operate down at village level, relying on local authorities put in place by the Dutch administration. The *mel* thus became the local representatives of the Indonesian government and kept control over political and commercial exchanges with the outside world. In the early 1990s, the Kei Islands became a favourite place for international NGOs and scholars with an interest in minorities. Their interest was justified for several reasons. First of all, the brutality with which the Indonesian government established its authority in eastern Indonesia, in Maluku in 1956, then in Timor and in Irian Jaya, caught the attention of international organizations dealing with human rights. The situation also received the sympathy of Western intellectuals for local populations and their representatives, some of them traditional chiefs. Being responsible for the smallest administrative unit in Indonesia, these representatives are at the heart of current reflections on governance and sustainable development and of natural resource management in the world's largest archipelago. The influence of scholars in this field is large. Most have previously worked in the South Pacific, where traditionally structured rural communities have customary chiefs. Arriving in Indonesia, these scholars, searching for an analogy, look for environments similar to those in the Pacific, thus putting customary leaders up front in the resolution of environmental and development problems. This international recognition of customary chiefs has encouraged Indonesian NGOs to make them their privileged allies in order to justify their activities – which to the Indonesian government is just a way of hiding political opposition. Taking advantage of the interest that foreigners have shown in them, *mel* have acquired a high profile, enabling them on the one hand to play a truly collaborative role with central government, of which they are the local representatives, and on the other hand with NGOs and international organizations who see them as defending local interests because of their customary legitimacy.

The problem today is that all *mel* are claiming to have legitimate rights to power and wealth. This explains the restructuring of the social organization, and recent changes in profit sharing from the sale of trochus. Due to the limited sources of income in the region, power games have a negative impact on human and natural resources. Above all, power games and politics have managed to deprive the local community of its notion of power and its own politics, and thus of its ability to manage its natural resources.

Political unity and cultural diversity

When comparing *ren* and *mel*, it appears that *ren* have their own territorial identity and strong setting in space but have no political power. However, *mel*, who have power, do not have a strong territoriality but let people think they have with *sasi*. Natives' power, founded on their privileged relationship with their territory, is opposed to the power of the immigrant group, the *mel*, deriving from a privileged relationship with the outside world. These two groups, who formerly shared power through exchanges and redistribution, are now subordinated one group to another. This situation explains why the local community can no longer express itself and rebel when confronted with inequitable power, except through protests that have negative impacts on the environment. In the case of *ren*, natives of the land, territory generates culture and culture and territory generate power (Figure 2); *ren* have a geographical territoriality. In the case of *mel*, arriving from the outside, it is their relationships with the outside and trading which give them political power, which in turn enables them to generate culture, such as the *sasi* ceremony for example; *mel* have a political territoriality.

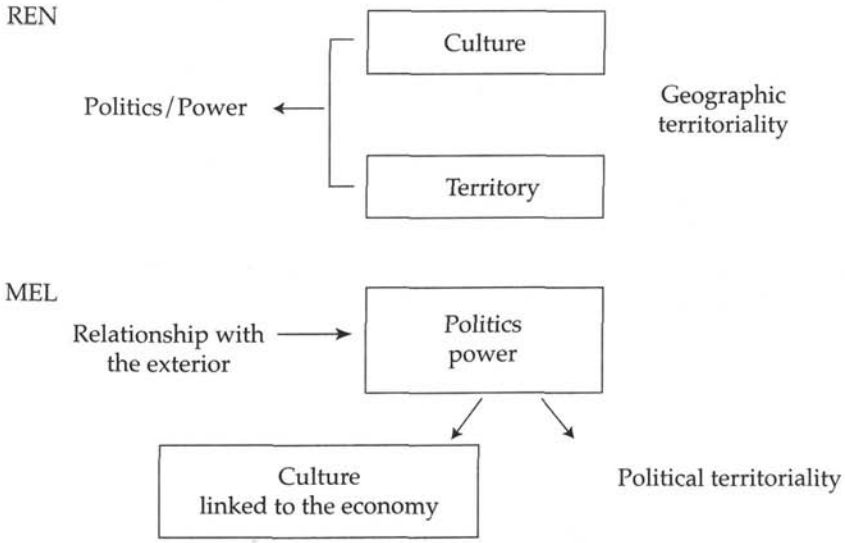

Figure 2. Binomial culture and politics for *ren* and *mel*

Economic power combined with this political territoriality has enabled *mel* to annihilate the expression of political power of *ren* and to place them in a dependent relationship from which they cannot escape. If we change the scale and think in terms of local-national relationships, we notice that *mel* are themselves in a dependent relationship with the state, since it is this privileged relationship which has generated their power at the local level.

The situation in Java is opposite to that of Watlaar. In Javanese communities, there has not been any dissociation between power and culture because villagers are Javanese and share the same conception of power and the same world view of the government. This seems logical in the sense that the elite in place, owing its success to its 'proximity' to the state, must promote this conception of power issued from the centre (Anderson 1972) at the risk of being threatened by rival powers such as new emerging elites who control capital from the profits made from the exploitation of marine resources, for example (Antunès 2000). Here we have an example where politics and culture generate each other, unlike in Watlaar where politics generates culture – *sasi* – but where culture does not generate power except when related to external sources, for example NGOs.

Hence, in Javanese villages, the relationship to community territory remains the same. And territory is the key to accessing wealth and power both at local and national levels because a village's territory is inscribed within Javanese territory. The result here produces a political and cultural unity. On the contrary, in Watlaar, the relationship of the group to territory has changed. Territory is no longer a key to accessing wealth and power as it formerly was. Territory is wealth. Thus, wealth becomes a power and control stake. It is now wealth that is the main instrument of power and the main means of controlling relationships. The geo-political context is the key to accessing wealth and power. Thus, this situation produces political unity and cultural diversity. And Soeharto's motto 'Unity in Diversity' couldn't be more realistic.

Conclusion

This study shows that, in order to understand an economic system, it is essential to take into account the underlying political and cultural parameters. The Watlaar example shows that lack of group coherence and the breakdown of a community's relationship to its territory impacts negatively on the sustainability of natural resources. I also show the importance of considering the transformations within the community and its social system resulting from changing relationships with the outside world. The political context certainly affects the assets available to a community, but it can also

provide an ideal opportunity for some members of the community to acquire exogenous power and then use that power to destabilize the established order, jeopardizing the group's coherence and functioning. In this way, the ruling group may be in a position to limit access to the resources available to the community as a whole and to impede the community from making productive use of those resources. In the Watlaar case, certain members of the elite group acquired power from the Dutch colonial regime and then from the Indonesian government after independence. More recently they were able to further increase their power using traditional culture and management practices being promoted as part of a tradition-based sustainable development policy.

It is obvious from this example that politics, in order to be correctly understood, must be viewed through a cultural prism. For this reason, cultural geography is proving to be a useful tool for a holistic view of production systems at different levels. This holistic view needs to be well understood prior to making any resource management recommendations.

Geo-cultural analysis enables us to assess the relevance of socio-political changes in generating poverty in communities. It can also tell us whether or not a community has maintained its coherence and its relationship to its territory, and enables us to identify the key that gives access to resources and to power at the local level. This kind of information allows us to view local communities in relation to their national context. It provides insights into the relationships between territory, community, and politics that are masked in development processes, which so often culminate in failure and thereby further increase poverty and natural resource depletion.

At the national level, comparative geo-cultural analysis also proves useful in that it shows the architecture on which the national system rests. Thus, referring back to Watlaar, which lies in the Moluccas in a cultural setting that is entirely different from that of the national government (Javanese), the government leans primarily on local elite groups that have held exogenous power since colonial times. Here local power produces culture, but culture does not generate power as it does in Java (because land ownership in Watlaar no longer constitutes a key to power). This state of affairs minimizes the risk of political agitation (for independence) in these outlying regions and the government's power is well secured. On the other hand, socio-political risks and their negative impact on natural resources are much higher here.

My findings show that there are no ready-made solutions for managing resources and that each case should be carefully examined from the start. The present study contributes to the understanding of current situations in Indonesia and the Asia-Pacific region today. The new geo-cultural approach offers a methodology for diagnosing local causes of resource depletion, conflicts, and poverty through evaluation of socio-political risks that are liable

to jeopardize community development and resource management. At the national level, these risks are closely linked to priorities of the government and the strength of its determination to achieve social cohesion and retain power over its territory. Where the goal is to improve sustainable livelihoods, it is important that government strategies do not conflict with achieving a more even distribution of assets at grassroots level. A thorough knowledge of the national government's workings can lead to appropriate recommendations that take specific local features into account so as to minimize socio-political risks, and make it easier to identify appropriate strategies that will be supported by the people so that development aid produces benefits that are felt by the entire community, that really 'make a difference'.

Questions that can be asked at this point: Are communities that have preserved group coherence and its relationship with their territory better able to manage natural resources? Would they risk jeopardizing their natural resources for power? A study conducted in a Javanese community using the same methodology and approach showed the village's ability to develop very successfully because development was based on its original viability system (Antunès 2000). Lack of reliable data on Java Sea fish stocks since 1995 precludes an assessment of the impact on resources. The present study, however, highlights how important group coherence and relationship to its territory are for its ability to develop and to succeed. This first-of-its-kind in-depth research is intended to encourage reflection and further fieldwork on the importance of relationships between territory, community, and politics.

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MANON OSSEWEIJER

The future lies in the sea
Fisheries development programmes in island Riau

Reading about Indonesia, its seas and fisheries, one cannot escape the superlatives: Indonesia claims jurisdiction over an ocean area of 3.0 million km² of territorial sea, 3.1 million km² of exclusive economic zone (EEZ), and the longest coastline of 82,000 km (Kusuma Atmadja 1993; FAO 2000), it is the biggest fish-producing country in the ASEAN region (SEAFDEC 2001) and among the ten biggest fish-producing countries in the world (Tengku Dahril 1998:26).

However, numerous sources contend that Indonesia's marine resources are still under-exploited, as potential fisheries production has been calculated at 6.6 million metric tonnes. In the case of Indonesia's EEZ and offshore waters, the country's too small fishing fleet mostly explains this under-exploitation. Ironically, recent newspaper articles have drawn attention to fleets of foreign ships sailing under the Indonesian flag that successfully fish Indonesia's wealth from the South China Sea and the Arafura Sea. Thus, outside exploitation of the under-exploited maritime riches of Indonesia is considered a problem (PT. Budhi Cakra 2000, II:16). In the case of offshore fisheries, the government is seen as having responsibility for acquiring financial support; in the case of coastal fisheries, accusing looks are also cast in the direction of fishing communities.

More than 90% of the fishing industry can be categorized as subsistence and artisanal, or small-scale, commercial fishing. Small-scale fishermen are broadly described as 'those who, by virtue of their limited fishing range and a host of related socio-economic characteristics, confined to a narrow strip of land and sea around their community, are faced with a limited set of options, if any, and are intrinsically dependent on the local resources' (Charles 2001:46). In addition, other characteristics of small-scale fishermen, who may be tribal or peasant fishermen, are their weak political position in the face of fisheries management policies, their experience of cultural tensions, as well

as economic and political marginalization as a result of the industrialization of fishing (Platteau 1989:568; McGoodwin 1990:9-10).

Productivity and efficiency are perceived by the Indonesian government to be too low, which is explained by the lack of financial support and low educational level of fishers. Low educational level and dependence on fish traders or middlemen are considered to be the main reasons for the underdevelopment or 'backwardness' of fishing communities (Tengku Dahril 1998:28-9). From the government's perspective, these communities should be developed so that fishermen do not just exploit coastal resources, but also start fishing further offshore with better boats and better equipment, and great emphasis is put on fish farming or, more precisely, marine aquaculture. To accomplish this, various plans have been proposed which are discussed in this article. In the light of two case studies in the Riau Islands, I consider Indonesia's marine fisheries development plans in the context of sustainability in all its forms as well as the fishing communities' perspectives on these plans.

Fisheries development

In order to understand what is meant here by fisheries development, it is essential to take a closer look at what is known from fisheries science. By way of definition, one could say that '(t)he essential idea of fishery development [in the world of fisheries scientists] is to initiate a new flow, or improve an existing flow, of sustainable benefits from the fishery system, which is done through a range of developmental measures targeting various stages in the fishery system' (Charles 2001:106). Under this definition, three forms of fisheries development can be distinguished: 1. developing a new fishery; 2. the effort to increase the sustainable benefits from the fishery through improvements at any point in the system; and 3. integrated development. Whereas the first two types of fisheries development focus on the fishery itself, mainly on harvesting and post-harvesting, the third type of development is targeted at coastal communities and their socio-economic environment, which can include other agricultural systems and even non-agricultural sectors (Charles 2001:106-7).

In Indonesia, as in many other countries, the emphasis of fisheries development has been on increasing human and physical inputs in order to benefit from natural resources currently perceived to be under-exploited, on assisting and training fishermen to increase their catches and to improve post-harvest stages, as well as on constructing the necessary infrastructure (wharf, ice facilities). In addition, sustainable development is perceived as an integrated part of fisheries development. According to the minister of fisheries and sea affairs, sustainable development (*pembangunan yang berkelanjutan*) of fisheries

is not a matter of increasing efficiency, which often leads to stock depletion or collapse, but a matter of maximizing the benefits obtained from a given fishery's production and making sure that the fisheries become sustainable and preferably also environmentally friendly, economically sound, and socially fair (Rokhmin Dahuri 2002).

Unfortunately, many Indonesian efforts to develop fisheries and fishing communities have had nothing to do with sustainability or with community-based objectives. As in many other low-income countries, fisheries management and development has focused on raising incomes by increasing the efficiency of fishing, such as giving subsidies for boats and for gear (Allison and Ellis 2001:380; Platteau 1989). An approach very suitable for trying to achieve the above-mentioned threefold goals of sustainability, the 'sustainable livelihoods approach', is in many cases unknown or not yet applied. This concept of livelihood 'seeks to bring together the critical factors that affect the vulnerability or strength of individual or family survival strategies' (Allison and Ellis 2001:379), which is very useful for understanding the situation of small-scale commercial fisher people who are confronted with fluctuating resources.

The assumption of many development programmes designed to improve the well-being of fishing families is that fisherfolk are poor. Christophe Béné (2003) has critically reviewed the existing literature on fisheries and found that the relation between poverty and fisheries is described there in the following ways: first, there are those scholars who believe that fishermen are poor because they are fishermen. In other words, poverty is inherent in fishing so fishermen will always be poor. The belief that fishermen are the poorest of the poor is based on the view that marine resources are common pool resources that are competed for by too large a number of fishers. This view is still widely held by policy-makers and experts. A second group of people believe that people become fishermen because they are poor; in the rural areas to which the fishing communities belong there are few opportunities to earn income, and fishing is a last resort. Fisheries are seen as the last common pool resource that people turn to when they are denied access to other natural resources (in particular land). Both views, which we can refer to as the endemic and the exogenous explanations of the relation between poverty and fisheries, lead to the same conclusion: fishing rhymes with poverty. However, as Béné rightly claims, these views are too simplistic. Not all fishing families are poor, and it is not always easy to get access to fishing grounds and the credit needed for fishing gear (Béné 2003:951-5).

In Island Riau are found both the more static idea of development and the rigid belief that fishing is equatable with poverty. Because of the lack of differentiation between various types of fisheries, types of fishermen, and their livelihood strategies, development programmes often miss their target, and

the objective of 'fisheries for people' (socio-economic well-being for fishing communities) is sacrificed to the government's objective of 'fisheries for the nation' (ensuring that the state benefits from coastal resources).[1]

Fishing communities in Island Riau

Until recently, Island Riau (*Riau kepulauan*) and mainland Riau (*Riau daratan*) in Sumatra together formed the Indonesian province of Riau. Today, Island Riau is a separate province, with its more than three thousand small islands, many uninhabited, that stretch from Sumatra's east coast and the Strait of Malacca across the South China Sea to Borneo. This maritime province is inhabited by 921,610 people (Biro Pusat Statistik 2002: Table 3) and is divided administratively into three districts or *kabupaten*: Karimun, Batam (Batam, Belakang Padang, Bulang, Rempang and Galang), and the Riau Islands (Bintan, Lingga Archipelago, Pulau Tuju, and Natuna).

Due to its history of kingdoms, with thrones in Johore, Lingga, Bintan (Penyengat), and mainland Sumatra (Watson Andaya 1997), Island Riau is populated today by various ethnic groups that came to the region in several migration waves. The people who enter the stage of this article are mainly of mixed Melayu-Bugis ancestry, who distinguish between *orang Melayu asli* (native Melayu inhabitants), *orang Melayu pendatang* (Melayu people who migrated to the islands many generations ago), and *orang dari luar* (outsiders). Orang Suku Laut, or sea nomads, people who used to live on their boats, as well as *orang Akit*, belong to the first group; the Melayu-Bugis fishermen and women I interviewed belong to the second group; and the relatively new economic migrants from Flores, Java, and Sumatra – Minang and Batak – are categorized as outsiders. Melayu fishermen have a derogatory attitude toward this latter group, saying that '*orang laut* hardly ever bathe, they have primitive fishing techniques, and they are [culturally] too different from us, so it is good they have their own communities, outside our village site'. The fairly large Chinese community in Island Riau seems to form a separate, fourth group.

Some 17,000 fishing households in Island Riau struggle to make a living from the sea.[2] Fishing communities in Island Riau, like most Indonesian fishing communities, are characterized by limited financial support and a lack of investment and work force, as well as relatively simple fishing methods.

1 *Banyak investasi* 2000; Charles 2001:109-10, 116; *Modal* 2002; *Negeri* 2001.

2 Dinas Perikanan Riau 2001: Table 2a-2. The statistics from district fisheries services use different figures for the Kepulauan Riau district (12,644 households; Dinas Perikanan Kepulauan Riau 2001) and for the Batam district (4,211 households; Dinas Perikanan Kota Batam 2000).

Here, most of the fishermen have trade relations with Chinese or Melayu middlemen, who provide them with gear and fuel, buy the catch, and, if necessary, provide them with food and consumer products in exchange for fish to be caught in the future. The most regularly used fishing equipment in Island Riau includes the pole and line, long line, shrimp net, shore-operated lift net, intertidal palisade traps, and smaller traps (pots), as well as simple equipment to collect shellfish and shrimp while walking on the tidal flats. The majority of fishermen use the equipment on a small motorized boat, although one-fifth of fishermen do not have a motorized boat; in certain cases, such as in Bintan, it is nearer one-half (Dinas Perikanan Kabupaten Kepulauan Riau 2001). Apart from small-scale fishermen who work independently, there are also fishermen who work as employees for Chinese-owned fishing companies in South Batam and in various parts of Bintan; they use bigger boats (10-30 GT) and fish for species known to be foraging in deeper sea areas.

Bintan

For my argument that the future lies in the sea, I focus my attention on a particular part of Island Riau, the island of Bintan, where I have carried out research and collected examples of fisheries development projects.[3] One of the main islands of Riau Islands district, Bintan, is an island twice as big as Singapore (approximately 110,000 ha) and is home to some 231,000 people (PT. Budhi Cakra Konsultan 2000, II:8). A total number of 6,544 households are involved in fishing.[4] These fisherfolk produce around 8,740 tonnes of fish, including aquaculture (PT. Budhi Cakra Konsultan 2000, II:19-22). The fisheries potential in Riau Islands district is estimated at over 360,000 tonnes of fish per year, originating from the Malacca Strait and the South China Sea; at the moment the total catch is only one-third. Although annual production has been increasing, the provincial government believes that businesses should

[3] This research was carried out under the auspices of the KITLV, Leiden, and LIPI, Jakarta, and funded by the KITLV, the Department of Tropical Research in Developing Countries (WOTRO) of the Netherlands Organization for Scientific Research (NWO), and the Institute for Social Studies (ISS) in The Hague.

[4] In the whole of Kabupaten Kepulauan Riau (Riau Islands district) the number of inhabitants is 318,566 (2000), of which the labour force is one third (99,000; 1999) (PT Budhi Cakra Konsultan 2000). The total number of fishers in the district was 48,372, which means that almost half of the labour force is involved in fisheries. The number of fishing households in the district in 2000 was 12,700 (Dinas Perikanan Kabupaten Kepulauan Riau 2001). A recent economic baseline study held by the Agricultural Institute of Bogor mentions a much higher figure for the labour force in the Riau Islands district - including the informal sector (PT Budhi Chakra Konsultan 2000:184, 401).

be pushed to invest in the fisheries sector so that they can be expanded well into the EEZ of Riau (PT. Budhi Cakra Konsultan 2000, II:19).

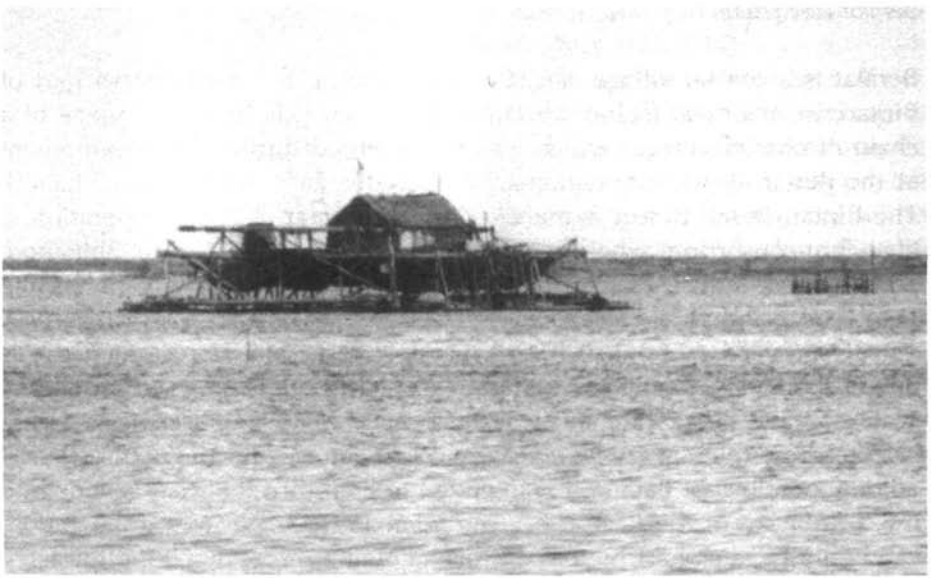
In Bintan, various kinds of fishing activities are carried out by individual, small-scale commercial fishermen as well as by fishermen working as employees (*buruh nelayan*) of Chinese-owned companies. The latter operate from the main administrative centre Tanjung Pinang and from Kijang (on the east coast). They focus on shrimp, squid, and yellowtail fusilier, and sell to some fifteen fish traders (mainly Chinese) in the harbour of Tanjung Pinang. Here, part of the catch is sold at the town's fish market, but a good deal of it is weighed directly and packed in ice boxes to be shipped to Batam, Jakarta, and Singapore. It is believed, in addition, that a considerable part of the total catch of these larger-scale fishing boats is sold at sea and is not registered in any way by the district office of the department of fisheries. The small-scale commercial fishermen of Bintan work independently, and are engaged in a variety of fishing activities, depending on geographical location, season, species targeted, and also on the capital that they need to buy equipment. The main fishing gear used is drift nets, lift nets, traps, and hook and line. The majority of these fishermen are Melayu Muslims, while the Orang Suku Laut (sea nomads) form a separate group of fishing families with their own niche. Orang Suku Laut focus on commercial species, such as sea cucumbers, that are less popular with Melayu fishermen. Both groups have been involved in coastal fishing for many generations, and their activities are described in many historical documents, like travel accounts and administrative reports of colonial officials. These publications usually emphasize the economic importance of fishing to both groups as well as the great variety of fishing gear. No attention was given to livelihood strategies, social relations within fishing communities, or sustainability. As to their former nomadic lifestyle and their special position within society (in the past in the sultanate of Johor and Riau, subsequently in Indonesian society), and their relative adherence to tribal traditions, Orang Suku Laut society and livelihoods have been extensively described in recent decades by anthropologists such as Cynthia Chou (1997, 2003) and Lioba Lenhart (1997, 2002). The livelihoods of Melayu fishermen in Bintan, on the other hand, have not been given much attention by anthropologists.

The case studies in Bintan are taken from the village of Berakit in the subdistrict of North Bintan, and from the coastal villages of the village cluster Dompak (Kelurahan Bukit Bestari), which is included administratively in Tanjung Pinang, the main town of Bintan. In the first case I visited the village in 2002 and have used the official report on proposed development plans; in the second case I stayed for an extensive period in the village of Dompak Seberang and visited the other villages of the cluster in 2002 and 2003.

Berakit case study

Berakit is a coastal village of 1,600 inhabitants in the northeastern part of Bintan, in *kecamatan* (sub-district) North Bintan. It is the only village of a chain of coastal villages which was not resettled during the development of the Bintan Beach International Resort (nowadays referred to as Lagoi). The Bintan Beach Resort is managed by the Bintan Resort Corporation, a blue-chip consortium whose members include the Salim Group, Singapore Technologies Industries Corporation (STIC), Wah Chang, Singapore's Big Four Banks, and Straits Steamship Land (Grundy-Warr and Perry 1996:191). The Resort, occupying 26,000 km² (parks, forests, and hotel premises), is one of the enterprises in the economic growth triangle between Indonesia, Malaysia, and Singapore, and was established in 1992 and envisaged as a card to draw tourism (*Pembangunan* n.d.). Together with the luxury tourist accommodations of Batam, it is intended to help turn the Riau Islands into the 'Caribbean of the East' (Lee Tsao Yuan 1991:13). Visitors to Singapore can easily have a short holiday in this adjoining resort by taking the ferry to Teluk Sebung, 'in addition to the normal Singapore "shopover"' (Smith 1997:370). As a result of this economic development, two complete villages were forced to resettle inland; the coastal fisherfolk were compensated with a small house and a small piece of land where they were expected to grow crops. The resettlement and consequent development of Bintan Beach Resort has stopped at the border with Pengdang and Berakit, where the inhabitants still live from the fishing industry. Although in this post-Soeharto era resettlement is no longer so easily carried out; arrangements have already been made to buy the land of both villages.

The majority of Berakit fishermen are engaged part-time in the 'Tanjung Pinang' anchovy (*bilis*) fishery, and part-time in coconut farming (see Photograph 1). Everywhere along the east coast of Bintan, including the area close to Berakit, the *kelong bilis*, or lift net with light, is the most widely used fishing method, especially during the southeast monsoon season. During that season over two hundred *kelong* are in use. The equipment is owned by Chinese traders in Tanjung Pinang, who receive 50% of the catch. The anchovy is boiled aboard ship and, when completely dried, is sold to local, often Chinese Indonesian, fish buyers. As the number of fishermen with this type of *kelong* has increased, and the *kelong* itself has changed from being a stationary lift net into a mobile one (*kelong terapung*), catches have been falling over the last five years, and many fishermen are looking for alternative fishing methods. In addition, the fishermen use less expensive fishing gear, such as nets, to fish for their daily subsistence or to supplement their income from farming (coconuts and clove) and perhaps a little animal husbandry. Only a few young people have found employment at Bintan Beach Resort hotels.



Photograph 1. *Kelong bilis* (lift net to catch anchovy) in Berakit, Bintan, Riau Islands, 2002

The sea around Berakit has been fished by many groups of fishermen from other areas, from Moro (Karimun) and from Flores (diving for shells and *teripang*), and by fishermen who use dynamite to catch reef fish. In addition, this coastal region has been designated as a major sand-mining area. Therefore Berakit is one of the villages that were included in a special fisheries project by the fisheries service in Tanjung Pinang (see below, PT. Budhi Cakra Konsultan 2000).

During a preliminary development project within the framework of 'Development of Coastal Communities' (Pemberdayaan Ekonomi Masyarakat Pesisir, PEMP) carried out in two villages in northern Bintan (one of which was Berakit), the potential of fisheries along the coast and the reasons for the current under-exploitation of marine resources were investigated. In a project evaluation report, written by a Jakarta-based consultancy bureau, the weaknesses of the current fisheries situation, as far as Melayu fishers are concerned,[5] are described as: low technological expertise of fishermen; limited financial capital; lack of cooperation; too high a dependence of fishermen on

[5] The Orang Suku Laut, or sea nomads, who live in a separate settlement within the borders of Berakit village, were not included in the project. The district office of the Department of Social Affairs in Tanjung Pinang has its own development programmes for sea nomads and other indigenous groups.

capital investors (read: fish traders or *tauke*); low motivational level of fishermen; limited capacity of fisheries service (staff and finances); and lack of facilities and infrastructure (PT. Budhi Cakra Konsultan 2000, II:25). Special government programmes of the fisheries office and related institutes are charged with tackling these problems in the hope that both fish production and people's standard of living will increase, which should include awareness of environmental management (PT. Budhi Cakra Konsultan 2000, II:71).

As a result, the consultants' team set up a PEMP programme with credit offered as a government loan carrying 8% interest; the money should ideally circulate within the community after three years when the first small projects are paid back. The projects were carried out with groups of villagers as a way to share risks and together overcome poverty. Half of the projects started were related to fishing gear; groups were set up such as *kelong* (mobile lift nets), long lines, mackerel nets, and fish marketing and transport groups. The other half consisted of non-fishing projects like poultry farming, pig farming, horticulture, and a fuel oil shop.

Apart from the government attention given to fisheries development projects, Berakit and Pengudang receive various types of aid from the Bintan Resort Consortium as a kind of 'community development' resource. This help is given in the form of construction materials for the building of schools and healthcare offices as well as for festivities and religious celebrations.

Dompak case study

Dompak is a coastal area including an island (Dompak Island) and consists of eleven villages. The area is situated along a bay south of Tanjung Pinang, which can be reached by road as far as the village of Kelam Pagi, on the cape. Most people from the villages along the bay, however, travel by boat. Either in their own boat, motorized or non-motorized, or in one of the local transport boats owned by villagers, for which a small fare is paid. Dompak Island can only be reached by boat. The population consists of 429 families, most of them involved in small-scale coastal fisheries.[6] The coastal zone is still covered with mangroves, although at certain places deforestation has gone quite far. Nearly all villages in this area are built partly on land and partly along the beach, consisting of simple houses on stilts (see Photograph 2). It is believed that the area's name originates from a local story of piracy, describing the period of the Riau kingdom during which Melayu inhabitants and pirates from various ethnic backgrounds were living together on

6 Personal communication Lurah Dompak 2003.

Photograph 2. Fishermen's house in Dompak Seberang, Bintan, Riau Islands, 2002

Dompak Island. Whether because of piracy or not, it is generally believed that the inhabitants of Dompak Island once moved to what is today known as Dompak Lama at the mouth of the river Ungar, one of the eleven villages. The other villages, founded subsequently, are inhabited by Melayu fisherfolk and migrants from Sulawesi (Bugis/Buton), Bawean, and Flores; the Melayu are involved in fishing and the other groups are engaged in horticulture (Refisrul 1996:38-9).

The fishers catch mainly small reef fish, crabs, and shrimp. The men catch reef fish with nets and lines, crabs mostly with traps and pots (*bento*, *injap*), and shrimp with stationary lift nets using lamps to attract them, or with push nets (*sondong*). Most of the catches are sold to fish traders (*penampung ikan*), who work for or sell to seafood restaurants in Tanjung Pinang and other towns in Bintan. In the Dompak area there are two seafood restaurants, and in addition there is a trader operating on behalf of a restaurant in Kijang (East Bintan) who frequently visits the area to specifically buy live reef fish such as grouper (*Epinephelus* spp.), red snapper (*Lutjanidae* spp.), and threadfin fish (*Perciformes* spp.). The fish buyers have set up two landing places to which

fishers sail to sell their catches and where the fish are temporarily kept in floating net cages. These fishing activities are carried out by individual fishermen or sometimes by two men working together. The equipment (apart from the stationary lift net) is relatively cheap. In certain villages, there are fishermen who have decided to cooperate in groups of seven and buy expensive nets (*pukat tujuh*) with which they catch anchovy. The net is purchased with credit supplied by a Chinese Indonesian fish trader (*tauke*) in Tanjung Pinang, to whom the catch is sold. The majority of fishermen in Dompak, however, prefer to work alone and not to be too heavily entrapped in trading relationships with Melayu or Chinese fish buyers.

Women in these villages are also involved in the fisheries, either by processing the catch into products like shrimp paste or cooked and dried anchovy, or by actually fishing themselves. Some women (occasionally accompanied by men) catch shrimp, using ingenious gear (called *sekup*) to catch individual shrimp on tidal reefs, or using smaller versions of the push net. Many women collect *gonggong* shellfish (*Strombus Isabella*) on the mud flats near their villages and close to the river mouth; these shellfish are partly consumed at home and partly sold to seafood restaurant buyers.

Until 2002, the Dompak area fell under the jurisdiction of the East Bintan sub-district, which meant that the designated office for investment in fisheries development projects was the district fisheries office (*dinas perikanan*). This office has been involved in various fisheries development projects, although they focused on other areas (for example in Berakit) than the Dompak area close to Tanjung Pinang. After the Dompak area was incorporated into Tanjung Pinang, in early 2002, the city government office for natural resources (Kantor Sumber Daya Alam) took over responsibility for fisheries development. This office has subsequently started a few projects consisting of loans in the form of boats and nets, loans which fishermen have to pay back on a monthly basis. The investment in fishing equipment comes from both the provincial and municipal governments. Fishing equipment was given to certain fishing families after the survey clearly showed a need for bigger motorized boats and additional fishing gear like nets. According to the office's statistics, the four city districts have each received Rp 240 million, which was used by the Bukit Bestari district to buy five boats (2 GT) and fishing nets. The problems with this loan system, according to both the head of the office and the Bukit Bestari district officer, are threefold: it is difficult to find fishing families who will join the programme; the fishermen who do join are unable (and sometimes unwilling) to pay back the monthly amount of the rent-free loan, as catches are unpredictable and dependent on the season; and the maintenance of the boat requires special expertise. During evaluation visits to the villages that received boats and nets, fishermen declared to the officers that they did not use the boats because they were haunted by evil

ghosts, and they therefore refused to pay back the loans.

Another office involved in fisheries development is the Institute for the Implementation of Fishery Techniques, under the auspices of Indonesia's Institute of Sciences (LIPI) in Jakarta. This institute works independently and, as it is located in Sungei Jang, which borders on the Dompak area, pays considerable attention to the fishing villages of this area. The local head of the village of Dompak is employed at this institute, which provides up-to-date information on fishing families and the fisheries situation there. In addition, the director of the institute visits the villages in this area and knows the fishermen and the problems they experience in their daily lives. He has written various proposals in the context of cooperation with the department of fisheries and community development programmes sponsored by commercial companies like PT Aneka Tambang. His proposals differ from other development projects in two respects. First, his proposals are for small-scale, inexpensive projects that can be carried out by a large group of fishermen in a community. Second, the projects not only focus on the actual fishing sector, but propose to give more attention to the processing and marketing of marine resources, as well as to non-fishing activities to supplement a family's fishing income. Political and institutional friction, however, have often prevented these proposals from being adopted. In addition, fishing communities are hard to mobilize and involve in new projects (Soeharmoko 2001, 2002a, 2002b).

Like Berakit, villages in the Dompak area receive development aid from non-governmental initiatives on a regular basis, in this case from the bauxite mining company PT. Aneka Tambang (Antam), based in Kijang and active on Dompak Island. In exchange for possible future damage experienced by the company's activities, all eleven villages receive 'community development' (CD). So far, this compensation aid has been given in the form of rice and construction materials for schools, mosques, and roads.

Riau fisheries development from the government's point of view

From the perspective of government fisheries offices, both at provincial and district level, the fisheries sector is far from ideal, even though the political and economic situation seems to offer perfect conditions for the development of a flourishing fisheries sector in Island Riau. Statements often heard are: 'Think of the free trade zone, the strategic geographical position, and the development focus of the Indonesia-Malaysia-Singapore Growth Triangle, the fisheries sector could mean so much!'[7] and 'The seas are full of fish, how

7 Personal communication, officer of the Pekabaru fisheries office.

Photograph 3. Government banner used for the campaign to develop inland communities, Batam, 2002

come Indonesia's fishermen do not catch them and Thai fishermen do?'.[8] To induce this sector to flourish, the government needs the input and cooperation of the fishermen themselves, or, as Rokhmin Dahuri, minister of sea exploration and fisheries, mentions in an article on funding of development programmes for fishing communities, 'besides creating facilities of investment and creating a market, the most important part of the empowerment of fishermen is making them familiar with management improvement and the use of technology' (Rokhmin Dahuri 2002). Fisheries officers never spoke of other forms of community development, for example developing non-fishing income-generating activities. The possibility of limiting fishing activities, especially if sustainable fisheries management is the goal (and theoretically it always is, as can be read in the annual plans of the fisheries service), was never brought up during interviews with fisheries officers. Thus, there is undue preoccupation with one particular component of fishing communities' livelihood strategies, namely fishing, to the detriment of other components

8 Personal communication, officer of the Tanjung Pinang office.

that make demands on available resources. There is hardly any attempt by the government to achieve an integrated or livelihoods approach. Especially in the case of Dompak, government officers focus on the development of new techniques requiring a huge amount of credit as well as knowledge, whereas they ignore sustainable benefits to be gained from improvements in processing and marketing or integrated development options adapted for coastal communities' livelihoods.[9]

In addition to increased fisheries production through further technological development, the district government of Bintan emphasizes that coastal communities such as *masyarakat hinterland* (inland communities) must be developed and their poverty alleviated. In 2002, everywhere in the villages slogans like 'Let's empower the inland communities' could be read on banners designed and distributed by the district government (see Photograph 3). Fishing community poverty is defined according to bureaucratic and urban-centric standards of poverty: quality of the house, material possessions, and level of education. However, the fact that these fishing families might have money to spend but have a different pattern of expenditure (they do not spend money on housing or on their children's education) is hardly ever acknowledged. Surprisingly, what is lacking in all campaigns for the development (economic and social) of fishing communities is knowledge of the social and cultural characteristics of Melayu fishermen, such as their fear of venturing far out to sea to catch fish, their frequent unwillingness to work together, their tendency to quickly spend any cash they get, and their tendency to be envious and lazy, which are all important considerations in any attempt to empower fishing communities. Similarly, not enough attention is given to the role of women in fisheries as well as in the household economy.

A recent study carried out in Batam gives some attention to the socio-cultural setting, although still from the usual government perspective, which views fishing communities as 'backward'. The report characterizes the underdevelopment of fishing communities in Batam (and one might as well say Bintan) as: poverty, a low quality of life, and a fatalistic view of life which can be explained by 1. 'individual deficits' such as low educational level, laziness, bad health; 2. 'cultural deficits' such as a culture of laziness, a culture of

[9] This is not because government services are unfamiliar with this other approach. The COREMAP project, sponsored by an Asian Development Bank loan and carried out by NGOs, focuses on the protection of the coral reef environment and tries to help fishing communities to find alternative sources of income outside the fisheries sector. The many proposals written by the head and the staff of the Bureau for Installation of Fishing Technology are examples of projects that take an integrated approach with alternative activities, for both men and women. However, such examples are not taken up by the government nor by the mining companies that provide villages with 'community development' compensation.

extravagance, fatalism; and 3. a community structure that only enriches certain groups of society (Perguruan 2001). Fishermen allegedly do not attach much value to education and prefer their children to assist with the fishing. An understandable reason for this is the fact that fishermen's children from the islands and coastal villages do not have the prospect of finding jobs in the city after finishing their schooling. This has led to a very low number of children finishing high school and a high level of unemployment, along with social problems such as alcohol and drugs use and criminality. The researchers do not condemn this 'culture of laziness and consumerism', but try to explain the rationale behind it. As their informants told them, the fishermen of the islands have always been spoilt by the sea's riches and therefore were able to spend money freely (*Laporan* 2001:47-8, 65-6).

With the exception of the authors of this report, the government views the trading system with a (usually Chinese Indonesian) creditor/fish trader (*tauke*) as one of the most important factors in the underdevelopment of the livelihoods of fishing households. The system, referred to as *hutang pinjam* (debt loan), and based on high-interest debts, lower-than-market fish prices, and higher-than-market prices for consumer products, is advantageous only for the trader and is a serious limitation for the fishing fraternity. However, the proposed substitute for this system, namely boats and fishing equipment on loan from the government, has somehow become problematic too, because fishermen feel hesitant to take part in government projects. Consequently, only a few influential people in the community take advantage of such help. As the head of the Bureau for Installation of Fishing Technology in Tanjung Pinang cynically articulated: 'In practice, the government's slogan *Marilah memberdayakan masyarakat pesisir,* "Let us strengthen/empower the coastal community" unfortunately often becomes *Marilah memperdayakan masyarakat pesisir,* "Let us make a fool of the coastal community"', which is very clear in the case of the 'community development' (CD) or compensation given to villages negatively affected by mining activities.[10]

The fishing communities' point of view

Generally speaking, fishermen in Berakit as well as in the Dompak area have a very negative attitude toward any development plan coming from the government. Their experience with projects in the past has destroyed any respect they might have had for fisheries officers. Fishermen explained that they do not like the officers (or anybody else from the government) coming to their villages and telling them what to do (saying that the current way of

10 Soeharmoko personal communication March 2002.

fishing is not good enough). They think government projects are pointless when they consist of a boat and a number of nets which have to be shared within the community. Most of the time this leads to corruption and conflicts, or at least tension, in the villages. Fishermen expressed their disappointment in the government's top-down approach and were rather pessimistic about their economic situation. However, a few critical fishermen admitted that even if the fisheries office were to come up with a more sensible project to develop fisheries or to promote alternative sources of income, most of the fishermen would not be interested because 'they are just not open to new initiatives and changes. They only like complaining. That is the characteristic of us fishermen.'

However, this negative attitude may well be a direct result of the government's top-down approach, which was so typical during the New Order period. Local fishermen are not used to being given the opportunity to think about their future together with fisheries officers, which would be the way to arrive at a more community-based development strategy. Today, the recent Reformasi has led to people in Tanjung Pinang and other towns sharing their opinions and organizing demonstrations against the local government. However, it cannot be expected that fishermen from coastal communities will easily open up and share their opinions or their wishes for the future, because the majority of fishermen and fisherwomen are still rather modest and unassuming and seem to have low self-esteem when asked to express their views on the local fisheries situation and community development.

The future is in the sea?

The development of fisheries in Riau can be extrapolated from the increase in fish production and export (12% extrapolated growth in production between 1992 and 1999, and a 23% growth between 1999 and 2000; *Jakarta Post*, 18 March 2002). However, this improvement has not yet trickled down to fishing communities. This discrepancy reflects government and university researchers' past lack of attention for fishermen's well-being. Whenever the government, mostly in a centralized way, started development programmes, they were usually not successful.

There are three main reasons for the failure of these well-meant programmes. First, there was no consensus among the different institutions about the desired direction of development for fisheries and fishing communities. Each institution had its own definition of 'development' and its own idea about what fishing communities needed. This top-down approach, with increased production as its only goal, did not take a proper look at the lives of fishing families or consider the characteristics of small-scale fishing

communities stage by stage.

Second, as development strategies have almost always consisted of financial help (for a happy few), fishing communities have developed into communities that easily become dependent on help from outside or from the government. Fishing families expect to be given money or equipment and are disappointed if the programme does not work as they expect it to. Third, while government services and researchers have tried their best with certain development programmes, small-scale fishing communities have suffered from various environmental problems that hinder the catching of fish and other marine products. One such problem is caused by deforestation (both inland forests and coastal mangroves), with negative effects on the coastal zone (silting; vanishing of mangroves and thereby the nurseries of many marine species). The second environmental problem is related to mining (mainly bauxite, granite, and sand mining, of which the latter takes place both on land and at sea). The first two kinds of mining pollute the environment, especially the coastal waters, every time some bauxite or granite falls off the tugboat. Sand mining on the islands leaves behind huge pools filled with fresh water (sometimes mixed with salt water) that become thriving breeding grounds for malarial mosquitoes. Then, there are the negative impacts from occasional oil tanker spills, such as in 2001 from the tanker *Natuna* near the island of Belakang Padang. Development money offered to fishing communities by these environmental polluters and destroyers is usually not invested in special programmes, but ends up in the pockets of government officials and of people who hold good positions in the fishermen's organization (HNSI) or in the fishing communities. Project proposals such as those drawn up by Soeharmoko and by the HNSI are passed over in silence.

In the face of ongoing change in environmental conditions, the regional autonomy which became effective on 1 January 2001 will have an enormous effect on the coastal environment and its natural resources, particularly on the livelihoods of fishing families in coastal villages. The government of Batam and of Island Riau are focusing heavily on marine resources, such as sand, but also fish, which are still under-exploited, especially in the South China Sea. As regional income, locally referred to as *pendapatan asli daerah*, has become of crucial importance to regional governments in order to comply with administrative and political decentralization, it unfortunately seems likely that the few good fisheries development plans proposed by individuals mentioned in this article will not be able to compete with continuing unsustainable exploitation of marine resources.

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JULIA ARNSCHEIDT

Communicating marine conservation in Indonesia

Ever since the early 1970s, when the concept of sustainable development came onto the international stage, the Indonesian government has put much effort into integrating it into its own policy guidelines.[1] In 1991, one year prior to the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, it again showed the same commitment to international environmental policy goals by drafting a comprehensive action plan[2] aimed at conserving the country's biodiversity. This plan confirmed the perceived need for a national system of terrestrial and marine protected areas which the country had already begun to develop in the 1980s. In this, Indonesia followed the internationally widespread belief that protected areas are appropriate tools to conserve biodiversity and to sustainably manage natural resources (Dahl-Tacconi 2002:2).

However, most protected areas in Indonesia, including most Marine Protected Areas (henceforth, MPAs), continue to be evaluated as lacking effectiveness (for instance Burke, Selig and Spalding 2002:8, 59) and therefore falling into the category 'paper parks'.[3]

1 I am indebted especially to Freek Colombijn, Brian Fegan, John Mc Carthy, and Adriaan Bedner for their comments on an earlier version of this article.

2 The complete name of this policy document is 'Biodiversity Action Plan for Indonesia'. It was prepared under the authority of the national development planning board, Bappenas.

3 *Paper parks* 2001:2. According to a recent study by the World Resources Institute, based on information on resources, staff size, and the existence of a management plan, the management effectiveness of Indonesian MPAs is low. The WRI report rated 131 Indonesian MPAs (including a huge number of combined marine and terrestrial protected areas): 3 MPAs had good management, 36 partial, and 35 inadequate management. On the other 57 MPAs no information was available (Burke, Selig and Spalding 2002:59). A rating on the ground of visits to the field would probably have created an even less promising picture. According to estimates by Lida Pet-Soede, the fisheries programme manager at WWF Wallace more than 80% of Indonesia's MPAs are so-called 'paper parks', meaning 'legally established protected area[s] where experts believe current protection activities are insufficient to halt degradation' (*Paper parks* 2001:2). As these examples of evaluations show, one has to keep in mind that there are many possible criteria for the evalu-

What are the factors contributing to the failure of MPA implementation? This article focuses on an often neglected aspect of implementation: communication. My main aim is to analyse where and why bureaucratic communication – that is, the transfer of messages among bureaucrats and between bureaucrats and citizens[4] – in MPA implementation in Indonesia fails and how this affects MPA effectiveness.[5] After having dealt with the history of MPAs in Indonesia and with Indonesian problems of MPA implementation illustrated by the case of Pulau Seribu Marine National Park, the analysis will show that the fact that communication is taking place appears to be more important to most bureaucrats than its effect. The most significant characteristics of bureaucratic communication in Indonesia are that it is ritualistic, often one-way, and that little attention is paid to its result. In many cases, bureaucratic communication serves other purposes than increasing the effectiveness of implementation. Fortunately, however, there are also signs of change.[6]

Short history of MPA policy in Indonesia

While the first terrestrial conservation areas were established under Dutch colonial rule, marine conservation received full attention only after 1980, when consultants of the FAO and UNDP developed a national conservation strategy for Indonesia.[7] It took another ten years before the Nature Conservation

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ation of protected area performance which until now have mostly been determined by outsiders (Dahl-Tacconi 2002:2, 10). In addition, it should be noted that the success of the handful of rather effective protected areas often depends on the involvement of a facilitator from the outside, such as an NGO, or, to a lesser extent, on the idealism and authority of individual government officials.

4 Various definitions of communication exist. However, they all describe communication as a 'process in which an initiator emits or sends a message via some vehicle to some recipient and produces an effect' (Gould and Kolb 1964).

5 Because of the limited scope of this article, I do not deal with the question whether or in what form the Indonesian government should promote MPAs or whether it should manage them itself. The point of departure is that MPAs are part of Indonesian conservation policy and that the conservation department of the Forestry Ministry holds the authority to implement them.

6 The data for this article originate from several months of field research, undertaken in 2000 and 2001, in Jakarta, Samarinda, and Indonesia's oldest marine national park, Pulau Seribu. In 1982, at the Third World Parks Congress on Bali, the Indonesian Minister for Agriculture proposed the establishment of ten national parks, among them Pulau Seribu. Only half a year before, it had been gazetted as a strict nature reserve. Legally speaking, Pulau Seribu held that status until the park's official establishment in 1995. Pulau Seribu means literally 'Thousand Islands'. The park area, situated to the north of Jakarta, covers some 70 islands and a total of 108,000 ha. The decision for protection was taken on the grounds of the area's diversity of corals and turtle populations, and the existence of mangroves (Kepulauan Seribu 1994:2). Tourism development played a role before the park's establishment, but has been increasing ever since.

7 Only three MPAs were declared before 1980.

Act[8] was enacted, finally creating the legal basis for MPAs in Indonesia.[9]

Indonesia's three main objectives for MPA establishment were fisheries management, tourism promotion, and protection of biodiversity (Burke, Selig and Spalding 2002:58). This left room for growth of the fisheries and tourism sectors without neglecting the Indonesian commitment to international conservation targets. Integrating economic and ecological goals was important since, until the late 1990s, the Indonesian seas continued to be perceived as underexploited (see Osseweijer, this volume) and thus as having a great potential for development. By establishing MPAs, the Indonesian government in line with the international conservation discourse sought to create a management tool for local and international fisheries in designated areas. In addition, they were to form a buffer against biodiversity loss resulting from increasing exploitation of the Indonesian seas. In 1984, a subdirectorate for MPAs was established in the conservation department of the Forestry Ministry (Salm 1984a:1). There, however, marine conservation has always been treated like a poor relation.[10] In 1989, the conservation department asked the WWF to start a marine conservation development programme. This programme included surveys, policy development, field projects, and education and awareness activities (Marine Conservation 1992).

The Indonesian government had impressive plans. During Repelita V (1988-1993) it aimed at reserving 85 MPAs covering an area of 10,000,000 ha. By the year 2000 this area was to cover 30,000,000 ha. In 1992, there were 23 MPAs with an area of 2,600,000 ha (Marine Conservation 1992). In 2001, the number of established MPAs had increased to 31, covering an area of 4,626,884 ha (Statistik Kehutanan 2002). These figures show that the Indonesian targets were much too ambitious. Moreover, the initial enthusiasm among experts about the potential of Indonesian marine conservation (see for instance Salm and Halim 1984:2, 15) was soon replaced by criticism that it was not the total MPA area that mattered but their effectiveness.

The overall attitude of the government can best be described as formal, meaning that it tried to fulfil all formal requirements for marine conservation without being overly interested in the matter itself. The Indonesian

8 Undang-undang No. 5 Tahun 1990 tentang Konservasi Sumber Daya Alam dan Ekosistemnya.

9 Before 1990, all MPAs were created by ministerial decree, which forms a much weaker foundation in situations of conflicting interests. The existing colonial regulations only covered the protection of terrestrial areas.

10 Only in 2000 did talks begin about transferring the responsibility over MPAs to DKP (the Ministry for Marine Affairs and Fisheries. It is not clear whether a future transfer to DKP would strengthen MPA implementation. Being a new ministry, DKP first needs to establish a strong base and to build alliances with other actors in the political arena. MPAs could, however, benefit from the educational background in marine sciences of some of the new DKP officials.

MPA categories illustrate this, too. There were differences of opinion about what kinds of MPAs should be created. Despite the recommendation to take over the seven internationally recognized categories[11] (Salm and Halim 1984:5; Weir, Ritchie, Garratt and Syakrie 1995:7-8), the Indonesian government opted for four.[12] This was exactly what marine conservation experts described as '"taking the easy way out" by trying to follow the model of terrestrial protected areas' in spite of their different use and management requirements (Salm and Halim 1984:5). In their opinion, the Indonesian government thus did not think seriously about the consequences of differences between terrestrial and marine environments. This would have included taking into account that fish and other marine species are more difficult to manage than terrestrial species, such as deer or orang-utans. This is due partly to the fact that it is impossible to create effective borders in water. In addition, whereas the (natural or artificial) size of forests itself limits the freedom of movement of forest inhabitants, the seas do that to a much lesser extent. It is also much more difficult to determine the situation of moving marine species and thus to draw conclusions about how sustainable their exploitation is. Although adopting the seven categories for MPAs in Indonesia would not have solved all these difficulties, the mere fact that the Indonesian government chose to simply apply the terrestrial approach to the marine situation did not create much confidence among marine experts.

With this governmental attitude and the limited attention of foresters it does not come as a surprise that MPA implementation in Indonesia proved to be problematic right from the beginning.

General problems of MPA implementation

Vulnerable marine ecosystems face various threats caused by nature and mankind. Natural stresses include a rise in temperature of the sea, which may cause coral bleaching (Suharsono 1990). Examples of human-induced damages are pollution, sedimentation, and the destruction and overexploitation of marine resources.

Nature conservation (henceforth: conservation) is one possible way of coping with some of these threats to the natural environment. The various

[11] These categories are: strict marine reserves, marine national parks, marine parks, managed marine reserves, protected seascapes, resource reserves, and multiple-use reserves (Salm 1984b:12).

[12] The Indonesian MPA categories are Cagar Alam Laut (strict marine reserve), Suaka Margasatwa Laut (marine wildlife reserve), Taman Nasional Laut (marine national park), and Taman Wisata Alam Laut (marine recreation park). There are two more categories for terrestrial conservation areas, Taman Buru (game reserve) and Taman Hutan Raya (grand forest park).

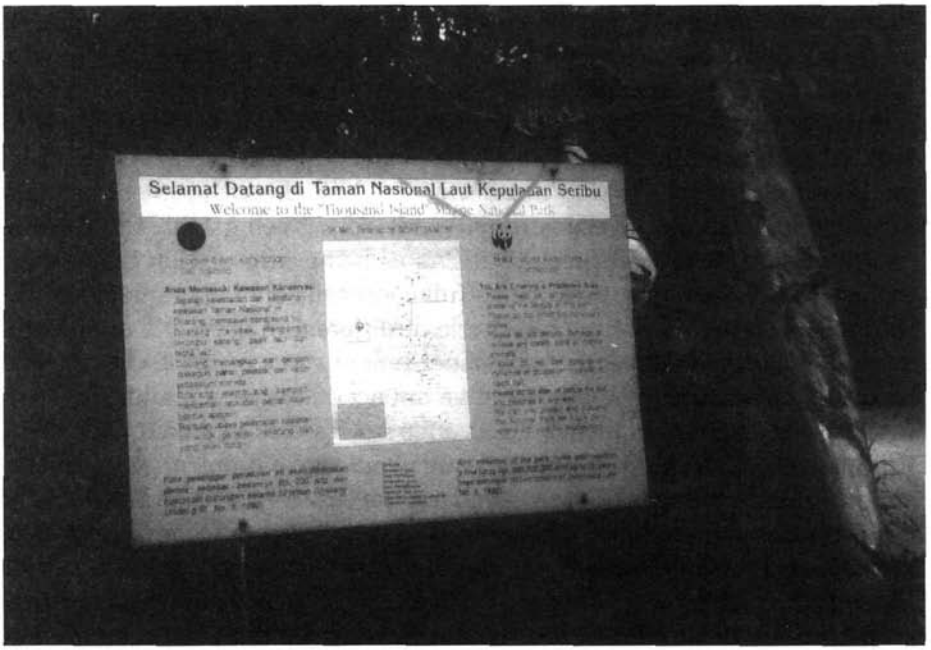
choices that human beings have to make, however, when determining its usefulness, purpose, precise meaning, desirable scope, and form, reveal that conservation is a highly political concept, in the sense that it is subject to ongoing struggle. This is the most fundamental general problem that MPAs face. Often, governments take decisions about MPAs without prior consultation of the people who will be affected by them. In such cases, especially when people are personally affected while disagreeing with the government's choices, they will perceive MPAs as being imposed on them. Even with public consultation, however, a full consensus on all parameters is difficult to reach because of the multitude of different interests. Consequently, there will always be disagreement about one or more of these choices, and such disagreement will have a negative impact on implementation.

Furthermore, MPA implementation often suffers from a marketing problem. Especially in developing countries, many people have problems with conservation since they – rightly – perceive its static character as being opposed to the generally accepted idea of the need for change and economic development. In addition, individuals tend to understand the language of short-term individual economic needs better than that of long-term common-good strategies. In search of a bridge between economic development and conservation, governments of developing countries keep emphasizing the importance of combining the two,[13] and to achieve this end have agreed on the creation of multiple-use reserves. Nonetheless, many people, including residents of such reserves, perceive conservation as something that only costs money instead of creating economic benefits.[14] Fishermen, for instance, often experience MPAs just as some unfair governmental denial to access to the natural resources they depend on for their daily livelihood. Since they do not have alternative livelihood strategies, they tend to ignore the rules of the MPA regime.

Next to these constraints for conservation in general, MPA implementation faces a number of specific technical problems. For instance, MPAs are only designed to control 'direct' human activities, such as the extraction of coral stones, sandmining, logging of mangroves, blast and cyanide fishing, and overfishing. MPA management does not cover other major problems, such as sedimentation and pollution, which may affect the quality of the

13 Interestingly, all such efforts aim at integrating economic development in areas set aside for conservation and not at integrating conservation into the development agenda. Consequently, the idea of conservation erodes, whereas the idea of economic development, a political concept itself, remains unchallenged.

14 A World Bank study on the economic value of the Indonesian coral reefs (Cesar 1996) shows that, from a macroeconomic perspective, short-term profit for individuals does not at all weigh up against long-term cost for Indonesian society. This analysis is, however, not likely to convince an individual to refrain from unsustainable practices, since his daily income is more important to him than any long-term benefit for society as a whole (remember Hardin's 1968 'Tragedy of the commons').



Park rules with reference to sanctions in case of violation. Billboards are the most visible signs of the park's existence.

area in a very negative way (Burke, Selig and Spalding 2002:58). In addition, MPAs are large and have countless entry points. It is extremely difficult and expensive to mark and safeguard their borders. Moreover, the resource users of MPAs always include people from other regions who often have little incentive to protect the natural resources of these areas (Biodiversity Action Plan 1993:40). In conclusion, the management of MPAs is even more difficult than that of terrestrial conservation areas.

This raises the question to what extent MPAs can protect biodiversity at all? This is still highly debated among scientists since there is little evidence that fish stocks will recover after closure of an area. In any case, if there is recovery this is taking place only very slowly, as the former head of the Oceans Campaign of Greenpeace International, Matthew Gianni, noted at a 2003 symposium.[15] However, there seems to be a scientific consensus that MPAs can contribute to protect spawning ground for marine species and to prevent overfishing.

15 The title of the symposium was 'Globalisation and Environment; Diverging Strategies for Policy and Management, Symposium for the 25th anniversary of the Institute of Environmental Sciences (CML)', 23 October 2003, Leiden, the Netherlands.

Problems of MPA implementation in Indonesia

In addition to the general problems stated above, MPA implementation in Indonesia suffers from various country-specific problems.

To start with, a long formal process precedes MPA implementation. It usually takes several years before a proposed MPA is established. In 1995, the ratio of proposed to established MPAs was 10 to 1 (Weir, Ritchie, Garratt and Syakrie 1995:27). After establishment it usually takes at least another three to four years until management starts. In the meantime, the state of the natural environment within the area may have changed enormously. Anticipating this problem, marine experts proposed to install an interim management, starting three to six months after establishment, with the objective of immediate protection. There is no case, however, where this recommendation was implemented (Weir, Ritchie, Garratt and Syakrie 1995:22).

When the implementing agency finally starts its operations, the current use of the newly established MPA often causes problems (Llewellyn and Purwanti n.d.). These problems are not easy to overcome since the agency's authority is limited to matters of the sea.

In Pulau Seribu, this had far-reaching consequences for the park authority's capability to manage the area in accordance with its conservation objectives. According to one official, their limited authority condemned them to a rather passive attitude: 'Low employment rates and an increase in population together with the fact that dynamite is easily available and easy to use to cause people to engage in blastfishing; we cannot do anything about it but send this information to other agencies which are entitled to address such problems'.[16] This also applied to problems related to the issuance and control of licenses for, for instance, building activities within park boundaries. One example of this was the licensing of a communication service (*dinas perhubungan*) for the construction of a pier. This ignored the prohibition to remove coral stones without the park authority's approval. The communication service even failed to inform the park authority about it, which led to a conflict between the latter and the holder of the license.[17]

Most conflicts with resource users in MPAs have their root in the zoning system. This is used in most MPAs because it provides for the allocation of separate parts of the area to different stakeholders and their interests. Next to sanctuary zones, for instance, which are normally closed to the general public, there are often zones open to specified, sustainable exploitation. For instance, Indonesian MPAs normally have a 'traditional use zone' in which fishermen are allowed to fish with traditional techniques. However, although these dif-

16 Personal communication, national park official, 16 October 2000.

17 Personal communication, resort manager, 12 October 2000.

ferent zones are meant to serve interests other from conservation, they are in most cases based purely on ecological considerations and determined without any public participation. Consequently, even if local people had charts and the equipment to determine their position, they would not necessarily respect these – imposed – boundaries. Since most fishermen in Indonesia lack this equipment, the boundaries of the zones, 'marked by points at sea defined by latitude and longitude, and connected by straight lines', are often 'meaningless' (Weir, Ritchie, Garratt and Syakrie 1995:22) anyway. In addition, these straight lines create an impression of arbitrariness.

In Pulau Seribu, the zoning system disregarded the fact that there had been people living there for quite a while and that a number of the islands had already been leased to individuals or companies. These were situated in all zones, including the park sanctuary. To solve this problem of authority, in 1985 the Forestry Minister and the provincial government agreed in principle to 'release' islands (*membebaskan tanah*) for forestry (read: conservation) purposes. However, the actual results of this agreement have been minimal. Another problem was that fishermen frequently ignored the boundaries of the zones either because they did not know their precise location or because they perceived them to be aimed at or at least contribute to their marginalization. Although the park authority acknowledged that this ignorance was probably related to the top-down imposition of the zoning system, participation in recent negotiations about a new system remained very limited.

The controlling mechanisms form another constraint for MPA implementation. Since the resource users of MPAs include people from other regions, control and law enforcement will always remain important. However, there is a general lack of cooperation between agencies in MPAs (Marine Conservation 1992; Weir, Ritchie, Garratt and Syakrie 1995:22). Conflicts between agencies emerge frequently because of their different objectives (Llewellyn and Purwanti n.d.). Experiments of controlling MPAs in cooperation with the local population, on the other hand, are still rare.

In Pulau Seribu, the local population was not involved in any enforcement activities at all. Likewise, joint patrols by the park authority with the police or the military varied from zero to two per year. In addition, the authority's work was frustrated by other government agencies. Park officials complained, for instance, that the communication service when building an office on one of the islands refused to ascertain whether their contracting parties had complied with the rule not to use sand from the park area for this purpose.

In addition, the geographical distance of the office of the implementing agency from the field affects law enforcement and the supervision and coaching of rangers negatively unless there are guarantees for good communication between the field and the office.

The office of Pulau Seribu Marine National Park was situated in Jakarta.

The park director argued that this was necessary to communicate well with other government agencies. The rangers in the field, on the other hand, complained that their director hardly ever visited them and was thus unable to coach them in their daily work. At the same time, they lacked working communication equipment and were therefore not able to regularly contact the office. As a result, the rangers met their director only once a month, when they had to go to Jakarta to collect their salaries.

Other often cited problems are the lack of funds (Yates 1994:243), skilled personnel, well-functioning infrastructure, and efficiency (Llewellyn and Purwanti n.d.; Weir, Ritchie, Garratt and Syakrie 1995:23). However, though it is true that financial resources and skilled manpower are scarce, corruption seems to form the bigger impediment to MPA effectiveness.

In Pulau Seribu Marine National Park there were many allegations of corruption among rangers and among officials working in Jakarta. Some rangers claimed that it was not the number of employees that determined the park's performance but their quality. Thus, they disagreed firmly with the director's call for more personnel.

Furthermore, the government's legitimacy seems to have reached rock bottom due to this ongoing corruption and to conflicts among the new ruling elite. Consequently, at present many people seem to translate democracy literally into 'power to the people'. They refuse any longer to respect the government's authority or any rules imposed by it. The government, on the other hand, fails to realize that a change is needed in the political culture, which at present is characterized by ritual rather than by action.

When on Archipelago Day (Hari Nusantara) in 2000 high representatives of the new marine department made a short visit to Pramuka Island, the whole population had been asked to clean everything in advance and to welcome the visitors. A group of rangers who judged this visit as 'another waste of money' refused to 'line up in front of our office in our neatly ironed uniforms as we would have done in former times'.[18] Instead, they preferred to openly wash their clothes during the visit. Probably due to the low grade of organization on the islands, the Pulau Seribu population, on the other hand, chose not to antagonize the authorities.

With regard to the socio-economic situation of the local population living in or close to MPAs, the main problem is poverty. Coastal communities form one of the poorest segments of Indonesian society. Fishermen receive little money for the fish they catch, no matter how expensive the price at which they are sold on the market. Especially when they are not organized, they depend on a small group of people who rule the trade and provide them with money, orders, and cyanide. Due to this dependency, their poverty,

18 Personal communication, ranger, 23 November 2000.

Seaweed cultivation. 'A baby cannot walk after three months.'

and their low education, fishermen often see no alternative for meeting their daily needs (Sugandhy 1993:780). So, they keep using unsustainable fishing methods, such as blast fishing and cyanide fishing, and refuse to accept and support MPAs.

Although the Pulau Seribu park authority tried to promote seaweed cultivation among fishermen, most of them kept seeing this as an additional income rather than as an alternative. Their main source of income thus remained fish. However, due to dependency on middlemen and traders, they were forced to sell their catches at a price much lower than at Jakarta markets.

The few positive examples of participative approaches in Indonesian MPAs show that increased attention for public participation and for real economic alternatives will raise the awareness and understanding of conservation needs among local people, or at least make local needs less important obstacles to an MPA's effectiveness.[19] Only when locals get the feeling that

[19] In Bunaken Marine National Park in North Sulawesi, for instance, the zoning system was determined together with the local people. They also participate in the touristic exploitation of the area, for example as guides for diving operators, which forms an incentive for them to support ongoing conservation efforts (for further information see http://www.insideindonesia.org/edit65/bunaken.htm). For a more critical evaluation of these participatory approaches in Bundan see Lowe (forthcoming).

conservation pays instead of costs, and only when they have a say in the use of natural resources, do they seem ready to support it.[20]

Communication failures

So far, we have seen that a variety of factors make MPA implementation in Indonesia difficult. The following part examines the role of communication, more specifically where and why officials fail in the use of different instruments of bureaucratic communication. The discussion will start with the communication among government officials and continue with the communication between government officials and citizens.

Speeches

Generally speaking, to disseminate government policies and to give their subordinates directives for their implementation, high government officials use speeches.

Most bureaucratic speeches in Indonesia are highly ritualistic, as expressed in their structure and content. The frequent reference to imported concepts such as 'paradigms' (paradigma) and 'visions, missions and strategies' (*visi, misi, strategi*) results in predictable and boring speeches. Usually, they list well-known facts about a perceived problem and state as their conclusion that this problem must be solved. Many speakers, for instance, emphasize that an 'integrated approach' (*secara terintegrasi*) must overcome the lack of coordination between different sectors. Another beloved conclusion, in MPA implementation, is that law enforcement is weak and therefore 'must be strengthened' (*perlu ditingkatkan, perlu dikembangkan*). Such statements leave open how and by whom a problem should be solved. This general lack of substance in speeches is often due to a lack of ownership and vision, since many conservation policies are imported blueprint models.

Understandably, Indonesians often do not really listen to speeches. At several coordination meetings[21] I witnessed that many participants were preoccupied with personal communication, for example, with their neighbours or on the phone. Others left the room or even slept. If the audience pays attention, it is rather to the person of the speaker than to the content of his speech. In addition, everybody knows that speeches of importance will be distributed

[20] The risk of this approach is, however, that people start to expect certain benefits and will lose their interest in supporting the MPA as soon as these benefits are not forthcoming (*Paper parks* 2001:3).

[21] Such as the National Coordination Meeting on Environmental Management, 9-11 August 1999, in Jakarta.

on paper afterwards, to enable others to quote important statements.[22]

Speakers often show indifference towards their audience, too. Regularly, ministers and other high-ranking officials scheduled for a speech at a meeting send a representative to speak on very short notice or even without prior notice, with the excuse that something more important came up – thereby indicating their priorities. The representative then reads aloud the speech that was prepared for the minister.

Next to functioning as a ritual, speeches serve to legitimize the government. The speaker sends out the one important message that the government is doing its job! Likewise, in the context of international communication, speeches serve this purpose. They are therefore a beloved instrument of declaring to the international community Indonesia's commitment to, for instance, conservation. The Indonesian government's announcement of its goal to have established 30,000,000 ha of MPAs by 2000 demonstrates this well.

Coordination meetings

Considering that meetings are, ideally, a platform for discussions and democratic decisions, many donor agencies frequently have advised Indonesia to hold coordination and stakeholder meetings. At present, such meetings are very popular in Indonesia.[23] They form the newest ritual in Indonesian bureaucratic life.

In Indonesia, some general characteristics of such meetings are a very short preparation, a full programme with a lot of ceremony, and a fast drafting of the results. Finally, the organizing agency has to pay all expenses, from travel costs to daily allowances. This makes coordination very expensive, and agencies outside ministries will think twice before organizing such meetings.

Due to the full programme with a high proportion of ritual, there is little room for in-depth discussions. According to an official working for a provincial environmental-impact control agency (Badan Pengendalian Dampak Lingkungan Daerah, or Bapedalda), only 20% of meeting time is used for discussions of content. The rest of the time is spent on ceremonies and dis-

[22] An example from the meeting mentioned is the 'new paradigm' of integrating environmental concerns into the doctrine of national endurance (*Ketahanan Nasional haruslah mencakup pula ketahanan lingkungan sebagai paradigma baru; Hasil rapat* 1999:4). Likewise, government officials frequently used to quote statements of former president Soeharto, which gave his speeches the status of policy documents.

[23] The discussion in this article is limited to meetings organized and chaired by government officials and does not include meetings initiated by and under the responsibility of NGOs and donor agencies. Likewise, discussions on radio and television fall beyond my scope. Certainly, these have become much more open after the fall of Soeharto.

cussions of the budget.[24] These are further hampered by the fact that the material on which the discussion is based is usually not distributed before the meeting starts. Even panel members sometimes complain they have not received the material in advance and are therefore forced to improvise. In addition, most participants lack experience in discussion and are more used to listening to and repeating what a higher authority says.[25] The amount of attention one receives from the audience is also very much determined by one's social status. The higher the speaker's status, the more the audience take care to at least appear to be listening.

In the area of MPA implementation, meetings take place mostly at the initiative of the conservation department. One example concerns meetings which took place between the conservation and fisheries departments. Analysts recommended from the start that there be cooperation between the conservation department and the fisheries department of the Ministry of Agriculture for patrols in MPAs (Salm 1984b:11). With the management of fisheries being one MPA objective, such cooperation sounded logical. However, although there have been contacts between the conservation department and the regional fisheries office, there was no in-depth discussion or agreement on joint fisheries controls (Weir, Ritchie, Garratt and Syakrie 1995:21).

The character and results of such meetings raise the question what other purposes some of these meetings might serve. According to a Bapedalda official, meetings form a good opportunity to make some extra money. It is, for instance, possible to get more than one travel order (Surat Perintah Perjalanan Dinas) for the same meeting. With fake tickets as a receipt, these form a nice opportunity for earning some extra money. According to a GTZ employee, project leaders even get up to 5% of the whole project budget for certain meetings. Travelling on duty is rewarded with three million rupiah of 'pocket money' (*uang saku*).[26] Besides, meetings are essential for bureaucratic careers, which depend very much on networking. For progressing in one's career, rank (*pangkat*), working experience, educational background, and contacts with high officials are decisive factors.[27]

24 Interview on 10-7-2000, Samarinda.

25 The whole educational system is actually based on this exercise: the teacher explains, dictates, or writes a text on the black-board. The pupils write everything down and try to learn it by heart at home. Discussions, on the other hand, do not form part of the daily routine at schools.

26 GTZ (Gesellschaft für Technische Zusammenarbeit) is a German development assistance agency. Interview on 20-7-2000, Samarinda.

27 Interview on 19-7-2000, Samarinda.

Rangers issue a warning to a man who disobeyed the law by removing coral from the sea

Reports

Meetings normally result in a statement or report. Such reports can include all speeches and notes of working sessions, or only a short list of recommendations. In theory, they serve as guidelines for implementation.

In many Indonesian reports, these guidelines are too vague to be meaningful. Often, they only indicate that something should be done, but – again – not by whom, when, or how. Officials in implementation, on the other hand, usually do not feel authorized to decide such matters and need more concrete directives. This vagueness is one explanation for the general lack of follow-up, but it can also easily result in misinterpretations.

As an illustration, we will have a look at a meeting of 46 conservation department officials and directors of national parks in Bogor in January 1999.[28] The purpose of the meeting was to discuss the (re)zoning of seven national parks, including Pulau Seribu. It resulted in a list of directives for

[28] The conservation department organized the meeting in the context of the project for 'Development, Management and Safeguarding of Conservation Areas'.

each of the seven parks, including the following two for Pulau Seribu:

1. 'The sanctuary zone should not be situated directly at the outer border of the MPA because guarding it would be a big burden.'[29]
2. 'Already for a long time people have been living in the area. Therefore the presence of the people must be taken into consideration when determining the zoning system.'[30]

An official who reads the first recommendation, probably working at the conservation department or at the Jakarta office of the PSMNP, will get the impression that it is only the outer borders of the MPA that are difficult to guard. The guarding of the area within these borders will then possibly receive less of his attention. Such a recommendation is likely to result from the lack of in-depth discussions. The second directive is far too vague. It leaves open what it means to 'take the presence of local people into consideration'. It is certainly not a clear directive to actively involve those people in the zoning process.[31]

In addition to results of meetings, there are reports produced behind an official's desk. Implementing agencies, for instance, have to write and submit plans, budgets, and annual reports. In general, such reports form instruments for the supervision, control, and evaluation of officials.

In the Indonesian practice, the large number of reports seems to serve other purposes. Based on my field data, I came to the conclusion that the production of reports is in many cases an aim in itself. A big part of the budget of each project is spent on the administration, the paperwork (*lembar kerja*).[32] Some reports are definitely a pure waste of money: since 1998, the implementing agency in Pulau Seribu had to produce two separate annual reports each year. According to the head of the conservation section, the Forestry Ministry demanded an 'accountability report' (*laporan akuntabilitas*) in addition to the usual 'annual report' (*laporan tahunan*), which remained obligatory for purposes of supervision by the national finances control agency (Badan Pemeriksa Keuangan Negara, or BPKN). The official himself did not understand the rationale behind this demand and admitted that the only difference between the two reports they submitted was its title.[33] Most likely,

29 The Indonesian text is: 'Zona inti sebaiknya tidak langsung berbatasan dengan kawasan lain di luar taman nasional karena akan besar beban pengawasan oleh taman nasional (high protection)'.

30 *Materi dan hasil* 1999. Indonesian: *Taman Nasional ini memiliki interaksi langsung dengan masyarakat sekitar yang telah lama bermukim di kawasan tersebut, untuk itu dalam penentuan zonasi keberadaan masyarakat tersebut perlu ditimbangkan.*

31 When asked about public participation in this process, one official at the Pulau Seribu Jakarta Office said that the people were indeed represented. Further questions revealed that this representation was limited to the presence of the district leader – who, according to rangers, spends more time in Jakarta than on the islands anyway (interview on 29-11-2000, Pulau Seribu). See also note 37.

32 Interview with Bapedalda official on 10-7-2000, Samarinda.

33 Interview on 18-10-2000, Jakarta.

the Ministry's demand was related to the discourse on good governance and its demands for more accountability from the government.

It is not clear at all what the receiving officials do with the reports, except for storing them on top of a large pile.[34] Reports in Indonesia never seem to elicit any reaction, as long as the budget is not overspent. Apparently, budget realization is the only criterion for evaluations. Personal communication, for example in reaction to a report, does not form part of the routine. As long as there is no bad (media) news about an MPA, the conservation department will not contact its director.[35] Because it is generally known that reports are not being evaluated, lots of opportunities for corruption arise, such as purchasing low-quality equipment with fake receipts listing the price of high-quality products.

In Pulau Seribu, rangers went to their office in Jakarta once a month to collect their salaries and to report on the situation in the field. In the eyes of the rangers, these monthly meetings were not sufficient, since many ongoing problems, such as corruption, were not discussed. According to the rangers, it would have been necessary for their leader to come to the islands at least once a month to see first-hand the developments in the park. By refusing to come to the field, he gave them the feeling that he did not appreciate their work. This feeling was enforced by a continuous lack of follow-up on their reports.

A lot of the reporting system in Indonesia is built on formalism. The general lack of feedback and follow-up are responsible for bad performance, and, on the other hand, for frustration among idealistic officials. The lack of substantial evaluation criteria means that officials have no incentive to achieve results but only to spend money.

So far, the discussion has shown that communication among government officials in present-day Indonesia predominantly serves the purpose of either showing that work is being done (speeches and reports) or of increasing one's career chances (meetings) or making some additional money (meetings and reports).

We will now turn our attention to the communication between government officials and citizens.

34 The lack of a good archive system is another explanation for the general lack of follow-up, since nobody can possibly find anything, except by chance, and there is a general – and understandable – reluctance to look into a report that is at the bottom of a high pile. The heart of the problem, however, is that reports are produced solely because formal rules require their production.

35 Interview with an official of the forestry ministry on 15-5-2001, Jakarta. According to the informant, the director of a national park needs to be proactive to ensure good communication with the conservation department.

Participative meetings

Participative meetings take place especially under pressure of NGOs or donor agencies. They are meant to make policymaking a participative process.

As a number of recent meetings about revision of the zones of the Marine National Park Wakatobi in Sulawesi show, they often fail to achieve democratic decisions.[36] The NGO Yascita states that the 'so-called participative' meeting in Kaledupa did not actively involve the local population. Only the chiefs of the villages were invited,[37] who – poorly informed themselves – failed to keep the village people informed. At another meeting, government officials, members of the regional parliament, NGOs, and some officials working for the park authority were present. Many people wanted to have the reviewed zoning system approved by the local population before its implementation. Although the officials of the park authority agreed to this, the item was not discussed at the meeting at the provincial level. In the meantime, the review was sent to the conservation department in Jakarta where decisions will be taken. According to Yascita, many of the new zones will disadvantage the local population. The NGO suspects certain personal interests are at stake, which are backed by a much stronger lobby than the local population.

Projects

Over the past decades, Pulau Seribu has received lots of governmental subsidies. Countless projects have been implemented aimed at increasing awareness for conservation issues and economic development. Their main result, however, is a change in people's attitude: Nowadays they prefer to wait for governmental action than to take initiatives themselves.[38] What has gone wrong? Apart from a general negligence of the needs of the population, the way in which officials approached citizens has been playing a role.

A 1990 study by the NGO Gugus Analisis among Pulau Seribu residents and fishermen in two Jakarta harbours revealed that the majority of the respondents stated they had never received any information about the

36 The meeting took place in Bau-Bau on 30-11-2001, in Kaledupa on 7-12-2001, and in Kendari. The information on these meetings originates from a local NGO, Yascita, sent on 31-1-2002 to an Indonesian mailing list on coastal and marine affairs (PELA).

37 This is a typical example of the conflicting understandings of the term participation: whereas government officials see participation as involving the chiefs of the village or the members of regional parliaments, citizens would like to be involved themselves, at least in selecting their representatives at such meetings. Apparently, members of regional parliaments and village chiefs often lack legitimacy among the people that they represent.

38 *Data DF* 2002, personal communication, community worker, 28-11-2000.

PSMNP.[39] Those that said they had heard of it, for the first time around 1985-1986, perceived the park not so much as a conservation area but more as a restricted area. Likewise, they described the meaning of the term conservation (*konservasi*) as 'the prohibition to extract certain marine natural resources' (*larangan pengambilan beberapa jenis biota maupun sumberdaya perairan lain*), 'the prohibition to enter the national park area' (*larangan memasuki kawasan Taman Nasional*), or 'the prohibition to use cyanide' (*larangan pemakaian potasium*). Not one respondent laid the link between conservation and its three official components, protection, preservation, and sustainable use (*perlindungan, pelestarian, pemanfaatan secara lestari*) (Nelayan dan Konservasi 1990:49). According to a community worker, even in 2000, the government has not succeeded in explaining the rationale for these restrictions: 'Most people know which activities are prohibited in the park, but they don't know why.' According to the respondent, government officials seem to speak a language that is not understood by the island population: they 'talk law' (*pakai bahasa hukum*).[40]

The officials even fail to communicate well with the conservation cadre, an audience which consists of young local people who are interested in conservation. The yearly training seminars seem to be another exercise in fulfilling formal requirements. According to a participant, the officials 'tell the same story every year even though some of the participants are attending for the fourth time'. In addition, there is a lack of follow-up: 'They do not care whether we do anything with their information [on the need for conservation], we never get any homework. So the participants come, sit down, collect the money and leave.'[41]

Likewise, due to a lack of follow-up, written information seems to be ineffective. In 1993, PSMNP management produced posters and brochures about protected species. An information booklet about the national park followed in 1997. About the effects of such information most informants were rather pessimistic. The head of the conservation section said that they were happy if even one or two percent of the brochures they produced and distributed were actually read. 'The rest ends up as something to sit on, we know that, but after all we can't force people to read them.' The same official admit-

39 *Nelayan dan konservasi* 1990:51-2. The two harbours were Muara Angke and Muara Baru. Interestingly, within Pulau Seribu more women (62.5%) than men (13.7%) said they had received information. In the Jakarta harbours, however, 21.3% of male respondents had heard of it and no women at all (*Nelayan dan konservasi* 1990:48).

40 Interview on 28-11-2000, Pulau Seribu. Similarly, interviews in Wakatobi Marine National Park (by Julian Clifton) revealed that most of the people there were aware of which species were protected, but that they often could not see why.

41 Interview on 28-11-2000, Pulau Seribu. Participants are paid an allowance for their attendance. This behaviour forms a nice parallel to members of the national parliament, who used to be characterized as '5D': *datang, duduk, dengar, diam, duit* (come, sit down, listen, quiet, money).

ted that they had no clue what is done with the posters showing protected marine natural resources that they send to various agencies (among them the police), organizations, and schools. 'That is their responsibility', he added.[42] Evidently, these kinds of projects stop abruptly after sending off the material. No attention is paid to how the posters and brochures are used.

When asking the respondents of the 1990 study to judge the quality of bureaucratic communication about the park, 57.8% described it as 'usual' (*biasa – tanpa daya tarik khusus*), 26.3% as 'interesting' (*menarik*), and 15.9% as 'boring' (*membosankan*) (*Nelayan dan konservasi* 1990:52). To improve it, they suggested using forms of visual arts, such as drama and film, as well as stories and personal meetings (*Nelayan dan konservasi* 1990:53). Considering the tradition of oral literature in the Indonesian Archipelago, such instruments would seem to be promising indeed.[43] Likewise, written promotion material at least would need some further oral elucidation to be effective. According to my data, however, in Pulau Seribu only the suggestion of personal meetings has been taken over to some extent.

Most projects aimed at alternative sources of income for fishermen have also failed. Though seaweed cultivation has become an additional source of income for some families in Pulau Seribu, they claim that seaweed cultivation is not enough to make a living since they don't know where to sell it for a good price. According to a consultant working for the National Planning Agency (Badan Perencanaan Pembangunan Nasional, or Bappenas), projects like those on seaweed do not have the desired effect because they are of too short duration. 'A baby can't walk after three months', he said, referring to the maximum duration of government projects. In addition, each project introduces a new approach.[44] Apparently, the government lacks a clear vision of how to choose a suitable approach.

Patrols

The last, but certainly not the least, instrument of communication in MPA implementation discussed here concerns patrols. Patrols are meant to function as a deterrent and as the first step in sanctioning illegal activities. However, in the PSMNP, cyanide fishing and coral extraction take place throughout the whole area, including the sanctuary zones of the national park (see for instance *Data DF* 2002).

The ineffectiveness of the patrols is due to the low number of patrols, a

42 Interview, 18-10-2000, Jakarta.

43 In other fields of policy, such as the Family Planning Program (Keluarga Berencana), the Soeharto government successfully used such forms of communication (including *wayang*).

44 Interview, 22-11-2000, Pulau Seribu.

lack of uniformity in the application of sanctions, the lack of follow-up, and even a lack of communication equipment.[45] On average, patrols take place once or, at the most, a few times per year. Due to limited funds, the number of patrols is too low to influence citizens to refrain from destructive practices.[46] However, in cooperation with, for example, the fisheries department, this number could increase.[47]

Another problem is lack of uniformity in the application of legal sanctions. Some officials tolerate violations of rules in exchange for money. Others restrict themselves to warnings either because they are afraid of revenge or because they do not consider it appropriate to sanction relatives of their colleagues.[48]

The few cases that were reported to the office lacked follow-up. That is another signal to the public that violations of the law will be tolerated. In 2000, rangers in Pulau Seribu stressed that the communication equipment between the field office and the office in Jakarta had not worked for a couple of years. So they only reported once a month to the office, making investigations virtually impossible.

Furthermore, the rangers in Pulau Seribu lacked supervision and coaching. They perceived their director as the major obstacle to their good performance, and often longed for a return of their first director, who used to stay at the islands and show the rangers how to act in cases of infringement of the regulations.

Signs of change

It was refreshing to note that some of the rangers in Pulau Seribu were determined to substantially improve their agency's performance, without being afraid of breaking taboos or of possible acts of resistance and disapproval from their superiors.

One example of this was the rangers' 'bureaucratic disobedience' on Archipelago Day, described above. Likewise, using an unusual approach, the

45 For a more detailed discussion of enforcement in Pulau Seribu, see Arnscheidt 2001.

46 The apparently successful joint patrol system, which USAID's programme NRM/EPIQ assisted introducing in Bunaken, has a budget which is about thirty times the BTN's budget (*NRM headline news* 2002).

47 Surprisingly, lately many police officers and soldiers have been controlling the licenses of fish collectors, but apparently only to make them pay large amounts (*Data DF* 2002). In terms of marine conservation and the objectives of MPAs, this type of 'control' is extremely damaging. On the other hand, this example of corruption shows that officials can effectively communicate personal objectives.

48 Because of this, some of the rangers opposed local residents' demand to appoint more local rangers in order to increase their feeling of ownership.

rangers lodged their complaints about their director's lack of follow-up with an official of higher rank than their immediate superior. They were said to have been extremely lucky in getting access, which was only possible because one of the rangers had formerly worked at the ministry.[49] Apparently, their action had an effect: the BTN director was replaced in February 2001 and communication between the office and the field began to improve.[50]

Concluding remarks

As early as the 1970s, the Indonesian government made a start in integrating the concept of sustainable development into Indonesian state policies. In line with international discourse, defining protected areas has been the most important tool to keep the exploitation of natural resources at a sustainable level and to conserve the country's biodiversity. Since the 1980s, this approach has led to the establishment of numerous terrestrial and marine protected areas in Indonesia.

However, due to a variety of factors, the implementation of most Indonesian MPAs has produced disappointing results. This study has highlighted the role of communication in this process. It has shown that the Indonesian bureaucracy uses a variety of communication instruments which may contribute to an effective implementation. However, these do not increase the effectiveness of MPAs since bureaucrats pay little attention to the original purpose of speeches, meetings, reports, and the like. Likewise, whenever a new concept rises on the horizon of bureaucratic reform, such as stakeholder meetings and accountability reports, the bureaucracy co-opts the concept without respecting its underlying core considerations and requirements. These concepts then become part of the overall bureaucratic ritual which in the end will result in a further erosion of the government's and the state's legitimacy (Luhmann 1969:38).

Behind the façade of form and ritual, personal interests, such as increasing one's status and earnings, tend to dominate the scene. To satisfy these interests, a bureaucrat needs to achieve a high position rather than substantial results in his work. The two main keys to such high positions are to fulfil formal requirements and to have a good network. This completes the vicious circle.

Indonesian people react ambivalently to bureaucratic performance. On

49 In general, each official is evaluated by his immediate superior, who often – because of geographical distance – does not know what is happening in the field.

50 The former director got promoted to fulltime official at one of his three other jobs at the Sea and Fisheries Ministry in Jakarta (Arnscheidt 2001).

the one hand, there are still many who dream of a bureaucratic career of their own. On the other hand, there is a growing number of people who criticize government officials for not acting in the people's interest. This criticism is, however, more about exclusion from benefits than about a lack of substantial results of the implementation process.

Fortunately, the end of Soeharto's New Order has created a momentum for change. In Pulau Seribu, I found some of the rangers determined to change the bureaucratic culture for the better. They face, however, the resistance of older, hierarchically superior government officials with vested interests. All efforts from the outside should therefore focus on finding and facilitating such young, still idealistic 'change agents' and 'advocate leaders' to influence the powerful Old Guard.[51]

[51] Advocate leaders and change agents are two of the innovational roles for development described by Edward Weidner. The advocate leader uses his prestige and influence for advocating change. The change agent takes care of retraining or even indoctrinating other officials with new approaches (Weidner 1970:402-3).

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FORESTS

PETER BOOMGAARD

The long goodbye?
Trends in forest exploitation in the Indonesian Archipelago, 1600-2000

Over the last five years, the Dutch market has been flooded with teak furniture at bargain prices. Once an expensive and exclusive product, teak is now the material that ordinary Dutch garden furniture is made of. I am not sure that all this teak comes from Java (some of it may have originated in India or Thailand), but I do know that now is a good time to buy teak furniture in and around Surabaya. There seems to be an unlimited supply of this commodity there, and teak products can be purchased very cheaply.

I also know that if you travel around Bali, you will see village after village with row upon row of furniture stores cum workshops overflowing with *meranti* furniture produced for the tourist trade and for the export market. Given the slack tourist season in Bali after the 11 September 2001 crisis and the 12 October 2002 bombing, it may be supposed that this furniture is also being sold at low prices. As Bali does not grow *meranti* itself, the raw materials have to be imported, in this case from Kalimantan.

In both cases we can be pretty sure that the furniture was not made from sustainably produced timber. However deplorable that may be, those who cut down the trees and the carpenters who made the furniture presumably benefited. No one has benefited, however, from the trees that have gone up in smoke in large quantities during recent ENSO (El Niño Southern Oscillation) droughts (1994, 1997-1998), particularly in Kalimantan, but also in Sumatra, Java, and elsewhere. Although ENSO droughts have been around for ages, it seems likely that the scale of the recent destruction is much greater than, for instance, that of the forest fires of 1876-1878. It is generally assumed that the recent conflagrations were partly or even largely caused by legal and illegal logging practices that had left large tracts of forest degraded and therefore more vulnerable to forest fires. It is also widely held that some of the fires were set deliberately in order to make room for plantations.

However, part of the smoke to be seen from a plane flying over Sumatra or

Kalimantan – and not only during ENSO episodes – originates from swidden cultivators. During colonial times, scholars and civil servants condemned such practices (slash-and-burn agriculture) as harmful to forests, but after independence, and particularly since the late 1950s, scholars presented a less negative image of the shifting cultivator. Slash-and-burn cultivation, they argued, could be practised in a sustainable fashion. Nevertheless, there are theoretical limits to this system of land use, and as the most important parameter, population density, has been growing constantly, the sustainability of swidden cultivation under the present circumstances may well need to be re-evaluated.

Over the last 15 years or so, Indonesia's forest cover dropped from a registered or estimated 115 or 120 million hectares to 95 or 90 or even 85 million hectares, a drop of 15 to 25% over the entire period (FWI/GFW 2002:9-13). And although these figures are highly unreliable, the order of magnitude is probably right, and quite alarming. Of the minimally 20 million (but perhaps as much as 30 million) ha that was thus deforested between 1985 and now, 10 million ha may have been logged illegally.[1] Another 10 million ha went up in flames in the forest conflagrations of 1994 and 1997-1998. Although some of this land is regenerating as secondary forest, it has not been systematically reforested, and part of it is now being cultivated. Another 10 million ha is lying fallow, waiting to be converted to timber plantations for the wood-pulp industry or to plantations for estate crops. Clearance for traditional small-scale agriculture during the same period led to loss of forest cover of another 4 million ha, while land for transmigrants was cleared to the tune of 2 million ha (FWI/GFW 2002:23-4).

If no (new) conservation measures are implemented, and if the loss was indeed 20 million ha in 15 years, then Indonesia's forests will have disappeared in 65 years or so; and if the loss was 30 million it will disappear in 45 years. However, this only applies if the rate of deforestation is a constant, and there are indications that the rate is increasing. Therefore, around the year 2050 or 2060 at the latest (some authors even say 2025),[2] Indonesia might be entirely without forests (other than isolated montane forests located too high to be exploited), unless drastic measures are taken. Such measures, however, are hardly to be expected under the present conditions of increasing regional autonomy.

These are just a few examples of the sorry state of the forests of Indonesia, and of the various factors that have contributed to this situation. In the following pages I look at these and other factors in a long-term historical perspective, and I suggest a number of topics for future research.

1 On illegal logging, see McCarthy 2000 and Obidzinski 2003.

2 See Dauvergne 1997:1, citing a publication by the economist Rizal Ramli, dated 1994.

The numbers game

Even to an economic historian accustomed to apologizing for the unreliability of historical statistics when confronted with an audience of agronomists, demographers, economists or economic anthropologists, the poor quality of the present-day forest and forestry statistics of Indonesia comes as something of a shock. For a number of important developments we seem to have nothing better than ballpark figures. The new 'magic box', the Geographic Information Systems [GIS] database, is less than accurate owing to cloud cover, among other factors, and on a number of aspects the Indonesian Ministry of Forestry is either unable or unwilling to provide the relevant data (FWI/GFW 2002:9-16).

The most recent figures for benchmark years for the whole of Indonesia over a period of almost 100 years are given in Table 1.

Table 1. Forest cover in Indonesia, 1900-1997, selected years, in millions of hectares[3]

Year	Area (as published)	Area (my estimate)
1900	170	155
1940-1941	126	140
1950	162 (159)	135
1965	146	130
1985	117-120	na
1997	92-100	na

Note: The figure in brackets for 1950 is the official figure of 162 million minus an estimate for plantations and smallholder tree crops.

It is not difficult to see that the published figures for 1940-1941 (the last years of 'normal' colonial rule) and 1950 (the first estimate for the Republic of Indonesia) are not easy to reconcile. If the 1940-1941 figure for Indonesia's forest cover is correct, the figure for 1950 must be seriously inflated, even if we subtract the area under tree crops, which was included in the 1950 figure. It is entirely out of the question that reforestation on any scale was undertaken during World War II or during the Indonesian Revolution. All reports on that period suggest that protected forests and forest plantations suffered considerably. If, on the other hand, the 1950 figure were correct, the estimate for 1940-1941 would be much too low.

I am inclined to believe that the 1940-1941 figure presented here must be

3 See Boomgaard 1996:140, 165-6; Ross 2001:165; FWI/GFW 2002:4, 7-9. For estimates of plantation area and smallholder tree crops around 1950 see Van der Eng 1993:277 and Booth 1988:213.

Transport of copal, Halmahera, Moluccas, circa 1920. The demand for Non-Timber Forest Products, such as copal, was already increasing almost continuously between 1870 and 1940. (Courtesy KIT, Amsterdam.)

closer to the actual forest cover of that date than is the 1950 figure regarding the 1950 cover. Given that the Colonial Forest Service had been working on improving the figures for the so-called Outer Islands (everything outside Java) ever since the early 1920s, one would expect that they had succeeded by 1940, even though figures for Borneo/Kalimantan and New Guinea/Irian/Papua are doubtless still rough estimates (Boomgaard 1996:164-6). The 1950 data, in contrast, appear to be the product of a one-off exercise, and looking at the details one finds a substantial amount of missing data. As these figures were collected right after the Indonesian struggle for independence, one could hardly expect a carefully prepared and well-executed survey.

The 1965 figure also seems much too high, if one accepts estimates of the annual deforestation rates from the 1970s to the 1990s of between 0.6 and 1.2 million ha (FWI/GFW 2002:9). Calculating backwards from 1997 to 1965, and using the average value of the two figures just mentioned, the forest cover of the mid-1960s cannot have been much more than some 125 or 130 million ha. Given the low rates of deforestation that obtained before the 1970s,[4] this would imply a 1950 figure of, let us say, 135 million, and a figure for 1940 of 140 million ha under forest cover. It would seem that most figures published by post-independence Indonesian governments are much too high, something they have in common with the official figures for the Philippines (Kummer, this volume).

An estimate presented in a source quoted above (FWI/GFW 2002:4) for 1900 – 170 million ha – is almost certainly too high as well. However, it is difficult, in the absence of statistics for the Outer Islands, to judge the value of such a figure. If my estimate for 1950 (135 million ha) and the one quoted here for 1900 (170 million) are taken as the point of departure, then the average annual rate of forest cover decrease between 1900 and 1950 would have been 0.45%. Given the data presented in I. Simmons (1989:303), an average annual deforestation rate of more than 0.3% in the tropics prior to 1975 is unlikely, which implies a forest cover in Indonesia around 1900 of 155 million ha at the most.

The upshot of all this is that the average and total rates of negative growth of the forested area of Indonesia during much of the twentieth century were lower than is suggested by the recently presented figures. My estimates suggest an average annual loss of 650,000 ha, whereas the other figures boil down to 800,000 ha per year. It also implies that the present rate of disappearance of the Indonesian forests, estimated by some at an amazing 2 million ha per year, is even more astounding compared to the mean calculated rate for the twentieth century.[5]

4 On low rates of logging prior to the 1970s see Ross 2001:164-71.

5 The figure of 2 million is from FWI/GFW 2002:xi; a much lower figure, 1 million, is found in Fraser 1998:143-5.

However, as the estimates available for today are probably no more reliable than the ones encountered for 1940-1941 or 1950, we must defer judgement.

Finally, my figures also imply that prior to 1900 the exploitation of forests had been of more importance than suggested by the higher proportion of forest cover around the turn of the century (as published in the often mentioned recent report). Exploring the more remote past is thus called for.

The structural forces of deforestation

Deforestation is a process with strong links to demographic developments. In pre-modern and pre-industrial societies, there was a positive correlation between the trends of deforestation and population growth, the rate of population growth being the main factor influencing changes in the proportion of forest cover. Since the nineteenth century, the factors of industrialization, urbanization, and the growth of international trade have joined the demographic factor, and during the second half of the twentieth century the relative importance of population growth on the rate of deforestation has decreased. Thus, we observe broadly defined phases of deforestation throughout the world, and it seems likely that most areas of the Indonesian Archipelago were no exception to this rule. In this section, I deal briefly with the structural factors that shaped the upward trend of deforestation as well as the phases that can be identified. However, there were and are fluctuations around the trend, reversals even, which are dealt with in the next section.

If we accept that people came to the Archipelago some 1,000,000 years ago, that agriculture arrived with Austronesian-language-speaking groups from southern China some 4,000 to 5,000 years ago, and that the first 'early' states were in place by about AD 500, we also have a basic framework for the earliest phases of deforestation.

Population growth and the expansion of peasant smallholder agriculture were the driving forces behind the deforestation process in most of Indonesia prior to, say, 1970. As a very high proportion of the population consisted of peasant cultivators, and as a very high proportion of 'wastelands' consisted of forests, population growth was tantamount to deforestation in a society where intensification of agriculture was as yet largely unknown. This implies that the rate of deforestation must have been low to very low in the Outer Provinces prior to 1850 or 1900, and in Java prior to 1750 or 1800, as population growth rates before those dates were very low as well, probably not much higher than 0.1% per year on average. If it is accepted that deforestation took place between 1900 and 1940 at a rate of not more than 0.3% per year (see above), during a period that the population growth rate was around

1.5% annually, it is unlikely that the rate of deforestation was higher than 0.02% per year during the period of 0.1% annual population growth.

It is generally assumed that Java's population started to grow somewhat faster after 1750, while a real take-off phase was reached after 1850, with levels averaging 1.5% annual growth. In the Outer Provinces such levels were reached at later dates, but it can be said that by 1900, population growth rates across the Indonesian Archipelago had climbed to relatively high levels. After 1950, the rate of natural increase of the population reached unprecedented levels of 2.5% per year and more. This in itself would make for higher rates of deforestation.

In addition to these high population growth rates, Indonesian society and economy witnessed structural changes that were also conducive to higher rates of deforestation. I am referring to processes of diversification or, in other words, growth of non-agricultural and non-rural sectors of the economy, processes largely stimulated by the growth of international trade. These processes usually go by the names of urbanization and industrialization. I hasten to add that there were indeed non-agricultural and non-rural sectors in Indonesia before 1750, but their phenomenal growth dates from a later period.

Due to diversification, the demand for forest products increased considerably. I distinguish here three types of forest products: timber, firewood, and non-timber forest products (NTFPs).

I can be brief about NTFPs, as it seems unlikely that they contributed much to the disappearance of forest cover. The demand for NTFPs, such as rattan, bamboo, benzoin, camphor, *sapan* wood, sandalwood, *gahru* wood, copal, *damar*, *jelutung*, and *getah perca*, increased almost constantly during the period for which we have reasonably reliable numerical data (1874-1940). In many instances this was also true for the post-Independence period. In a number of cases, demand dropped considerably or even totally due to the invention of substitutes, as happened in the case of *sapan*. The exploitation of some of these products may have been unsustainable, but due to the limited scale of collecting, the effects remained minor for a long time. However, growing demand led to critical supply problems in the twentieth century.[6]

Much more important in terms of deforestation is timber and firewood production. Timber always played a role in the construction of houses, as stone and brick were rarely used for building houses in Indonesia. Even palaces and mosques were often made of wood. During earlier periods bricks and stone were employed for Buddhist and Hindu stupas and temples, and in Bali this tradition lived on, but after 1600 this was exceptional.

6 On non-timber forest products see De Beer and McDermott 1989; Boomgaard 1996:13-5, 41-134.

Boat from Kai Besar, Kai Islands, Moluccas, 1904. Construction of ships and boats, both by indigenous people and by Europeans, was historically an important factor in the demand for timber. (Courtesy KIT, Amsterdam.)

As regards the use of wood for the construction of houses, there is an interesting dichotomy between Java and the Outer Islands which, to my knowledge, has not been properly researched. While the well-known *adat* houses of many regions outside Java, such as the *rumah gadang* of the Minangkabau, were as a rule sturdy structures built entirely of wood, Javanese houses, even the bigger ones, while using wooden posts and frames, had walls and floors made from plaited bamboo or other non-timber material. Usually, the *adat* houses of the Outer Islands were also raised on stilts, at some distance above the ground, whereas in Java the floor of the house was at ground level, or only slightly raised (on piles). The difference has been attributed to the fact that Java had lost much of its forest cover at an early stage, whereas there were no timber shortages in the Outer Islands. It is an interesting hypothesis, but my impression is that the Java type of houses had already been common before any real shortage of timber occurred.

With the arrival of the VOC (the Dutch East Indies Company) around 1600, the demand for timber grew in their main establishments, of which Batavia

(nowadays the city of Jakarta) in Java held pride of place.[7] However, in many of these places additional demand will have been modest until the early nineteenth century, partly because the Dutch, in mortal fear of the many fires that raged in Southeast Asia's wooden cities, banned construction in wood as far as possible in the cities where they held sway. Later, however, particularly with the introduction of the Cultivation System in Java (1830), much more timber was needed for the construction of industrial establishments (mills, factories, sheds, and warehouses). After 1870 this also applied to the Outer Islands.

Shipbuilding was another notable source of demand for wood. Ships and boats were built in many places in the Archipelago prior to 1600, and after that date the shipbuilding activities of the VOC have to be added to this. VOC ships were larger on average, which means that the number of large trees to be felled per ship increased.

Bridges were also usually made of timber, and even when they were constructed from durable species of wood, such as teak, they had to be repaired quite often, or rebuilt entirely after a flash flood (*banjir*). From the early nineteenth century onward, after the construction of Governor-General Daendels's post road (1809-1810) along Java's entire northern coast, this was a constant source of demand for sturdy beams. A similar situation could be found outside Java from the late nineteenth century onward.

The Indonesian Archipelago also exported timber. Prior to 1870, this was a negligible factor, as timber was not a sufficiently valuable commodity to be worthwhile transporting to faraway places. Only with the arrival of steamships and the opening of the Suez Canal did freight prices drop sufficiently for a modest trickle of timber to find its way to areas outside the Archipelago. Around 1880, about 1% of all exported forest products (in terms of value) consisted of timber. By 1929, that percentage had increased to 20. As a percentage of total exports, the value of timber in 1929 was still less than 1%.

It was not until the late 1960s that the export of timber became really important. Japan, Europe and the US were all showing a constantly rising demand for hardwood, and Indonesia, looking for ways to diversify its oil-dependent economy, was only too glad to supply the world market with teak, *meranti*, and other hardwoods. While in 1966 the share of timber in export earnings had been only 0.6%, by 1973 its share had gone up to 18%. This changed in the early 1980s, due to the ban imposed by the Indonesian government on the export of logs. Since then, in international trade, furniture, plywood, pulp and paper have taken the place of timber. By 1997, the earnings acquired from the export of plywood represented over 6% of all export earnings, while pulp and paper constituted almost 4% of export earnings.[8]

7 Elsewhere, I have dealt with this topic in more detail (Boomgaard 1988).

8 Boomgaard 1996:61, 66, 134; Ross 2001:169; FWI/GFW 2002:5.

Firewood and charcoal had of course also been in demand for many centuries, as all households had to cook, while even in tropical areas mountain dwellers have to heat their houses. On a modest scale, firewood and charcoal had also been used by artisans working in the pre-modern 'industrial' sector, such as blacksmiths, goldsmiths, silversmiths, and brickmakers. With the arrival of the VOC, and even more so after the early nineteenth century, this sector grew in importance, which must have meant that demand for fuelwood grew as well. This was partly related to the growth of cities such as Batavia, where the number of artisans using fuelwood must have increased along with the population. But it was also prompted by the expansion of a modern industrial sector, with gunpowder mills, *arak* distilleries, tile and brick kilns. Under the umbrella of the VOC, many Chinese immigrants had played a role in this sector, as reflected by the number of sugar-millers in Batavia and Environs and the producers of *gambier* active on Sumatra's East Coast. It seems that Batavia and Environs was the scene of the first fuelwood crisis in the Archipelago, as witness various reports on the problems of the sugar industry dating from the late eighteenth century.

So far, we have been examining structural changes in the demand side, but of course we have to look at the supply side as well. The first factor to be mentioned in this respect is technological development. It seems to be generally accepted that if people have only tools made of stone, bone, and wood, they cannot have much of an impact on old-growth forests. The arrival of metallurgy, therefore, must have been a motor of deforestation in itself.

The spread of metal technology over the Archipelago was uneven. It seems likely that it came early to most of Java and Sumatra, but late to very late to the interior of Kalimantan and Irian [Papua]. The most important implements were the axe, the adze, and the machete, all made of iron. The saw does not seem to have reached the Archipelago prior to the arrival of the Europeans, and there is no indigenous word for it.[9] Soon after the introduction of the saw, the next wood-processing innovation in Europe was in evidence in Java as well: sawmills powered by wind or water in the seventeenth century, followed by steam-powered mills in the nineteenth century (Boomgaard 2000). The next innovation was the chainsaw and the bulldozer, in the second half of the twentieth century. Their introduction made it possible for a handful of people to cut down large stretches of forest in a short period of time, thereby removing one of the most important restraints on wholesale deforestation.

Perhaps equally important were the developments in the technology of

9 The word currently used, *gergaji*, is a Sanskrit word, which would point to introduction from India, but available sources suggest that the saw was not used in the Archipelago before being introduced by the Dutch.

transportation of logs.[10] Until 1800, logs were dragged by water buffaloes over slipways or timber-slips to the river or to the sea, and then shipped or rafted to their final destination. This was a time-consuming and costly process, and mortality among buffaloes was quite high. After 1800, experiments with other forms of transportation were undertaken, notably with the *mallejan* or *triquebal*, a primitive timber-wagon. After 1850 we encounter on the timber concessions what were known as Decauville railtracks, with carriages drawn by animals, while steam was introduced here somewhat later. Around 1900, there are experiments with steam winches, particularly in areas where buffaloes and labourers were scarce, as on the island of Simalur, off Sumatra's northern tip.

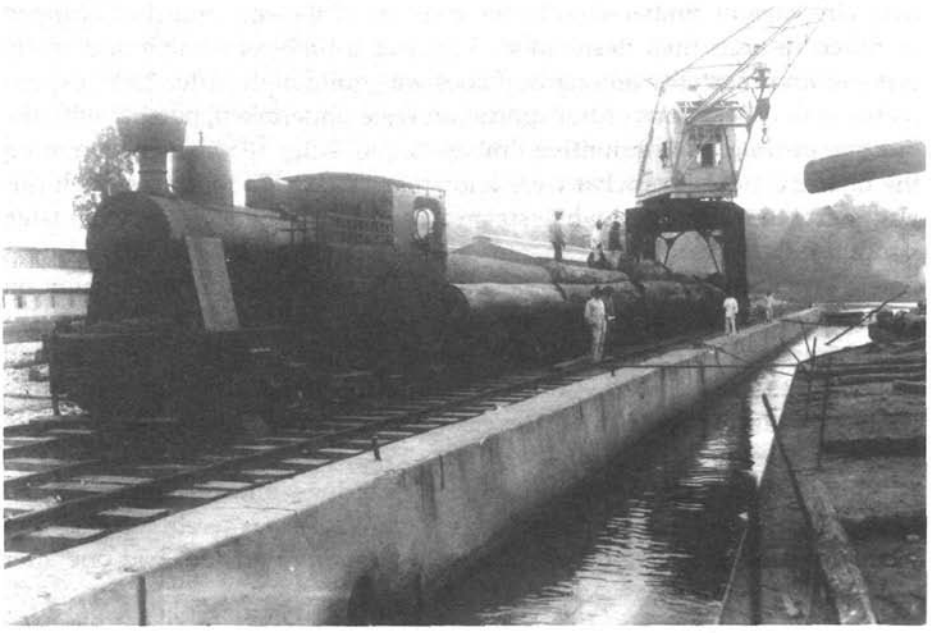
Of course, the regular railway network, construction having started in Java in the 1860s, was also used for transportation from timber-cutting concessions to the cities. After the early 1900s, trucks became the favourite means of transportation of logs.

Clearly, therefore, cutting and transporting logs, and turning them into beams and planks, had become progressively easier, whereby obstacles to increased production, in order to satisfy increasing demand, had one after another been removed.

Finally, I should mention the role of the state, or rather the states. Between 1600 and 1800 there were numerous indigenous states, and in many respects we should also regard the VOC as a state. After 1815, the expanding colonial state took the place of the VOC and various indigenous states, a process that was rounded off around 1910. After World War II the Republic of Indonesia took over.

About the various indigenous states I will be brief, as data on their economic activities are scarce. We know that they undertook building activities for which timber was required, and also that they were instrumental in boat-building activities, but details are lacking. The VOC and the colonial state were arguably the main institutions that facilitated the introduction and spread of modern technology, and in addition created a legal and organizational framework for forest exploitation which facilitated increasing deforestation. Features to be mentioned here are the contracts concluded between Mataram and the VOC for the cutting of teak in parts of Java's northeast coast and the creation of a system of production, transportation, and processing of logs cut in these areas. Later on, the colonial state created networks of roads and railways that facilitated transportation and the opening up of new areas for timber cutting. It also concluded contracts with private enterprise for large-scale timber cutting in Java in the nineteenth century, and in the Outer Provinces in the twentieth century. After the early

10 This paragraph is largely based on Boomgaard 1988:68-71.



Timber train on the quay of Sinabang, Simeulu Island, Sumatra, circa 1915. Export of timber picked up after circa 1870. The photographs shows an example of large-scale exploitation, at that time still rather rare.
(Courtesy KIT, Amsterdam.)

1800s, the colonial state also brought into being a forestry department, succeeded by a more professional forest service, to regulate the exploitation and management of Indonesia's forests. This organization, at least after the late nineteenth century, was instrumental in the preservation of forested areas and the sustainable exploitation of other forests, particularly in Java, and in addition it provided the data on the Outer Islands that facilitated large-scale exploitation by private enterprise.

Finally, the Republic of Indonesia has facilitated deforestation in four ways: by awarding concessions, by allowing forest exploitation in non-concession areas (illegal cutting), by stimulating the construction and operation of plywood factories and pulp and papermills, and by implementing the *transmigrasi* policy.[11]

[11] The term *transmigrasi* refers to the government-sponsored programme that started early in the twentieth century and accelerated during the 1970s, moving large groups of people from one region to another.

Looking at the factors mentioned above, alone and in combination, it is difficult to avoid the conclusion that the rhythm of deforestation in Indonesia was increasing during most of the period under consideration, and particularly during the twentieth century. However, we can also observe a number of counter-currents. Among these are: decreasing population growth rates since the 1980s (demographic transition); replacement of fuelwood by coal, electricity, gas, and oil; replacement of timber for buildings by bricks and cement, and for ships by metals. Interest in and attempts at conservation are another factor, to be dealt with presently.

Nonetheless, the forces of destruction have been stronger than the counter-trends just mentioned. Although, as we have seen, precise figures are lacking, it seems likely that the rate of deforestation has increased every decade since the 1950s.

Economists often assume that, after a certain point in their development, countries will enter a stage of self-sustained economic growth. Such a country has entered a positive feedback loop, and per capita GDP henceforth shows an upward spiral, only temporarily interrupted by periodic (business cycle) crises. One wonders whether something similar might be happening with forests in an advanced stage of deforestation. Have they entered a process of self-sustained destruction or, in other words, a negative feedback loop? This would indeed appear to be the case. After a certain proportion of forest has disappeared, it becomes easier to exploit the remainder. There is by then a good infrastructure for exploitation, transport, and sale of timber and other products. Access to remaining forest has become easier, as those parts of forest that protected the remainder have been removed. The remaining forest is used much more intensively by local residents, either for timber and firewood or for NTFPs. This leaves these areas more vulnerable to livestock intrusions (nibbling and browsing) and forest fires. The outcome of such a process of self-sustained destruction must be that, unless something pretty drastic is done, most forest cover will disappear in a few decades.

Incidental forces

The trend of deforestation, therefore, seems to be inexorably downward. However, it is not a smooth line. There are fluctuations around the trend, the product of incidental forces. Some of these forces are natural and are cyclical in nature, such as the ENSO phenomenon, while other forces, though cyclical, are man-made, as is demonstrated by economic crises. Other forces are not cyclical – or at least they do not appear to be cyclical – including wars, migration, the frequent moving of capital cities, and forest destruction as a form of protest.

I can be brief about the effects of ENSO on the forests. Many of us remember the conflagrations in Kalimantan and Sumatra over the last two decades. These effects recur with sad regularity and changing intensity, and the process has been going on for millennia, although it has to be said that human intervention increasingly exacerbates the destruction caused by these droughts. However, occasionally human intervention has been able to limit the destruction caused by wildfires, as witness the protective measures taken by the Forest Service in Java between 1900 and 1940 (Boomgaard 1996:31-2).

The effects of war are less straightforward. On the one hand wars have been known to be very destructive, as it was not unusual to set fire to the forests of the enemy. During the sixteenth century the Javanese appear to have constructed large numbers of ships to be used in various attacks against Malacca, at that time in Portuguese hands. These ships were largely destroyed, and it must be assumed that this entailed a considerable loss of timber.

Preventive measures could also be quite destructive. During the first half of the seventeenth century the Dutch annually cut down the standing forest around Batavia to prevent a surprise attack from Banten or Mataram, and they did something similar around Aceh in the late nineteenth century. The establishment of permanent military posts and fortresses, almost invariably made of large numbers of beams and palisades, added to the destruction of forests.

However, wars are also known to have put a stop to exports for the duration, including timber exports, which meant a temporary reprieve for forests. Wars could also lay waste to large areas for a long time, thereby compelling inhabitants to leave the area entirely, after which it could revert to forest. This seems to have been the case in eastern Java in the second half of the eighteenth century.

The effects of economic crises are not straightforward either. On the one hand they may have the same dampening effects on exports as do wars, such that logging would temporarily take place at a lower rate. On the other hand we can also observe that lower prices, often the companions of crises, make for increased forest clearing and increased exploitation of NTFPs.[12]

As was the case between 1929 and 1965, a combination of depression, war, and slow economic recovery may be instrumental in low to very low rates of forest exploitation, although there were doubtless local exceptions. Java witnessed a period of deterioration of its teak forests and teak plantations during these years, but large-scale commercial logging by modern enterprise in the Outer Provinces continued at much lower rates than before the Depression of the 1930s.

Migration, both forced and voluntary, is another important incidental factor. Some migration is neither entirely free nor really forced, as was the case in

12 See Boomgaard 1996:14; and Sunderlin et al. 2000:1, 16-7.

Kalimantan with the migratory movement of tribal groups over the last three or four centuries. Forced migration was observed in seventeenth-century Java and Sumatra. Here, Sultan Agung of Mataram (Central Java) and Sultan Iskandar Muda of Aceh each reallocated large numbers of prisoners of war to areas where they would be of more economic utility to these rulers. Voluntary migration occurred when Hindu-Buddhist religious groups established themselves in uninhabited areas of Java. Rulers who wanted to stimulate the settling of 'wild' areas, in order to make these parts of the realm safe for habitation, would give them tax-reduction grants (*sima*).[13] Finally, I must mention modern *transmigrasi* policies. In all these cases 'wastelands', as a rule largely or partly forested, would have to be cleared, often on a large scale.

A specific kind of migration was the habit of various 'Malay' ruling dynasties to move their capitals periodically. This is well documented for the rulers of Mataram in the seventeenth and eighteenth centuries, but it also applied to other ruling houses. This was sometimes in response to 'unlucky' events, such as an epidemic or the sacking of the town. Such a move may also have been undertaken for strategic reasons, as was the case in Riau around 1700. In some places there was the belief that a capital should be moved after a certain period of time, even if there were no special reason to do so. A possibility not found in the historical literature on Indonesia is that courts perhaps had to move after exhausting the (timber and firewood) resources in the neighbourhood. This connection is well documented for pre-modern Japan (Totman 1989:12-6).

Finally, forest destruction, particularly arson, is a form of protest. Both before and after independence, this type of protest occurred in forest areas holding protected status and under the management of the Forest Service.[14]

Although incidental factors could sometimes stimulate reforestation, or at least create a temporary slowing down of the rate of deforestation, most incidental factors appear to have reinforced the downward structural trend of forest cover loss.

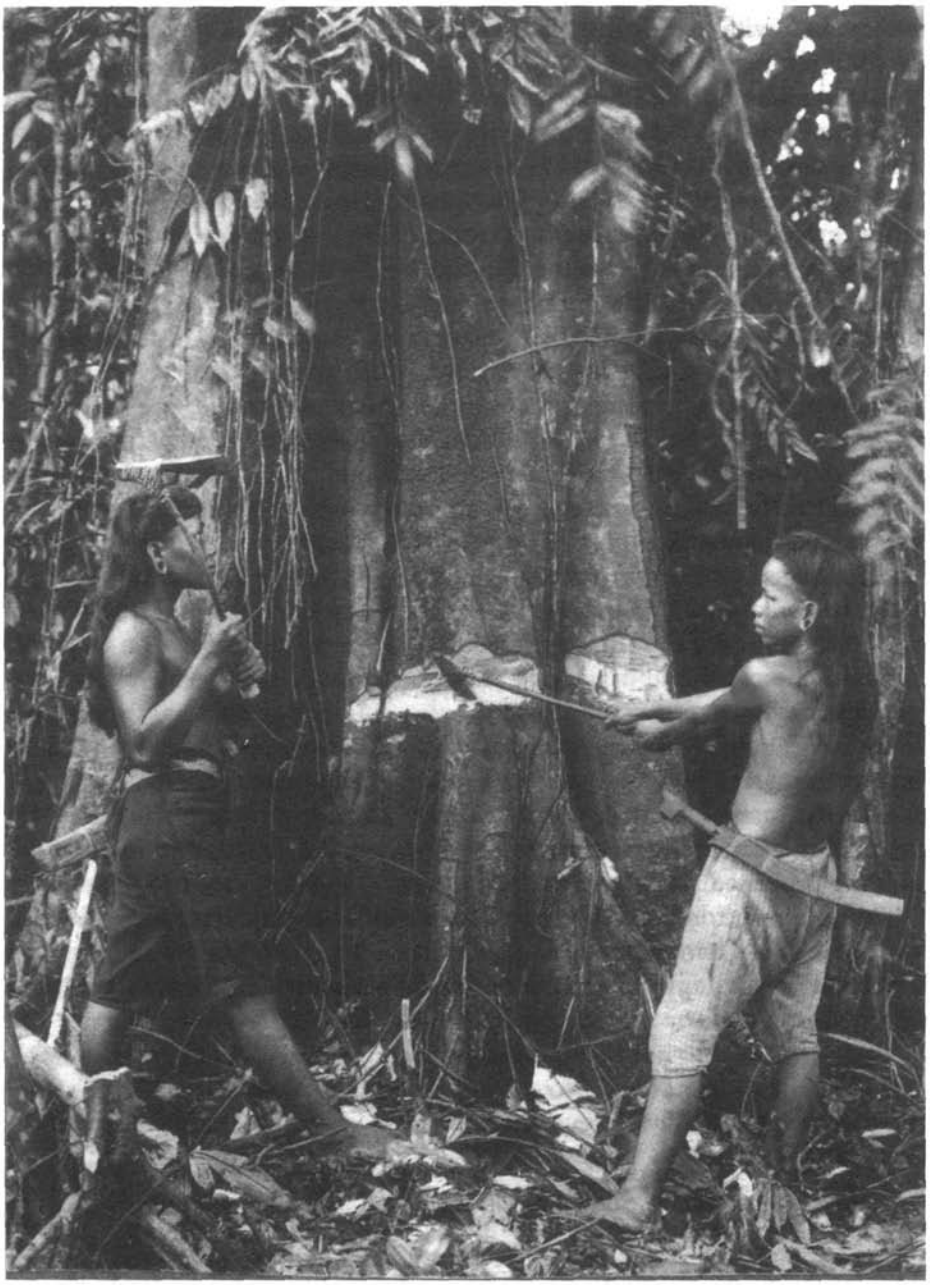
Management of woodlands

> It is widely accepted that forest resources should be managed to meet the economic, ecological and cultural needs of present and future generations. (Dwi R. Muhtaman et al. 2000:1.)

Already during the early decades of the eighteenth century, the VOC discovered to its dismay that certain forests not too far from Batavia (Sumedang in

[13] On state-sponsored forest clearance in the interest of increasing the safety of sparsely settled areas in pre-modern China, see Menzies 1994:29.

[14] Peluso 1992; Boomgaard 1996:32.



Cutting trees in Borneo (now Kalimantan), circa 1910. Before the arrival of the chainsaw and the bulldozer after World War II, trees had to be cut with axes and saws, but even saws were late in coming to some parts of the Indonesian Archipelago. (Courtesy KIT, Amsterdam.)

the Priangan) had been cut down, and that measures had to be taken in order to stop or even reverse this process. The solution the Company came up with (in 1722) in this case, and many similar cases to come, was to declare the forest closed to any form of exploitation.[15]

This appears to be the earliest form of forest management undertaken by the Dutch. The question is now, of course, whether there was some form of indigenous management either before or after this date. There is very little information on this, but there are indications that certain wooded areas were managed in some way. In the first place, there seems to have been an almost universally claimed right, exercised by people who held some form of authority over a certain region, be they kings, village heads, or lineage elders, to a percentage of the value of products collected in the forests of their realm. The term for this right, as encountered in nineteenth- and early twentieth-century sources, is *cukeh*, and it usually represents 10% of the estimated value. In order to levy such a tax, the ruler had, at the very least, to keep an eye on his forests. This is implied in the following quotation from William Marsden, writing about Sumatra around 1800:

> Indeed I have heard a native prince complain of a settlement made by some persons of a distant tribe in the upland part of his dominions, whom he should be obliged to expel from thence, in order to prevent the waste of his old woods. This seemed a superfluous act of precaution in an island which strikes the eye as one general, impervious, and inexhaustible forest. (Marsden 1966:68.)

We also know that villages in ninth and tenth-century Java had functionaries with titles that suggest forest-related duties. Something similar applies to the court of Sultan Agung of Mataram, where we find mention of a *mantri pangalasan* or 'forest overseer'.

There are suggestions that the influence of some rulers went even further. Thus, there is a Javanese charter, dated 1395, where we find references to teak forests that appear to be royal preserves. There is also evidence of a sylvicultural nature suggesting that teak was being regularly planted in Java in the fifteenth century.

Hunting preserves staked out by rulers were another form of management. Although the purpose was hunting and not the preservation of forests as a source of products or of biodiversity, the effect was that fairly large areas were closed to the general public. Such areas were found in Java and southern Sulawesi.[16]

'Forbidden' or 'sacred' forests (*angker, keramat*) can also be regarded as for-

15 Most data in this section are taken from Boomgaard 1988:62, 72-81.

16 Hunting preserves were a world-wide phenomenon; on China see Menzies 1994:55-64.

ested areas under management, as nature reserves avant la lettre.[17] Throughout the Indonesian Archipelago there used to be (and sometimes still are) forested areas where people were either not supposed to come at all, or where any form of exploitation, even collecting fruits, was forbidden. Trespassing would be punished by the ancestors or the gods. Different reasons are given in the sources for the existence of 'sacred' forests. Some such places were viewed as the 'abode of the gods', or regions where the souls of ancestors had gone after their deaths. Other places had been the scene of 'unlucky' events, or were the sites of graves or temples. There are also instances of forests dedicated to the production of timber for the upkeep of temples or palaces, not to be exploited for other purposes. And finally there were cases where a ruler had declared an area taboo for some reason of his own.

There are some, though not many, indications that in late nineteenth-century Java remnants of woodland near villages were managed as village commons by the local population. Perhaps oral history will be instrumental in discovering more about communally managed woodlots.

Having dealt with indigenous forms of forest management, I now return briefly to the much better documented colonial management systems, mainly in Java.[18] During the eighteenth century, the VOC basically continued doing what they had started to do in 1722: closing forests that had been exhausted, in order to let them regenerate. But there were also attempts to stimulate regeneration by burning forests where logs had been cut for some time. This was said to get rid of all kinds of debris and weeds, while teak seeds were supposed to sprout more easily if heated. This was apparently a Javanese method, because trained European (particularly German) foresters, who took over the management of the teak forests in the nineteenth century, were appalled by this system and forbade it immediately. The worst thing that could ever occur to a northern European pine forest is the outbreak of fire! In addition to these 'burns' there were also experiments with teak plantations from 1795 onwards.

However, a centralized forestry department was not brought into being until 1808. After a difficult period during the British interregnum (1811-1816) and a successful attempt to revive the Forestry Department when the Dutch returned, it was finally abolished in 1826 when the governor-general had to implement cutbacks. Another 43 years would pass before a new forest service was established, in 1869. This organization survived until the end of the colonial period, in 1949, and was then taken over by the Indonesian state, so that it can be argued that it has survived up to the present day.

The Forest Service established protected forests for future production,

17 This topic is dealt with in more detail in Boomgaard 1995.

18 This section is largely based on Boomgaard 1988:71-81 and Boomgaard 1994.

mainly of teak. It abolished the system of selective felling that had been employed by the VOC in favour of clear-cutting and then replanting clear-cut areas, a system that functioned well until 1942. From 1884 onward, the colonial state also created junglewood reserves, which were basically watershed-protection forests.[19] After 1900, the Forest Service started to take on the management of the forests of the Outer Islands as well.

How successful was the Forest Service during the colonial period? It should come as no surprise that this is not easily measured. Quantitative information is largely restricted to Java, and then mainly to teak forests. The data, such as they are, suggest that between 1776 and 1840, 40% of the teak forests were lost, and that another 30% were deforested between 1840 and 1870. Therefore, the first Forestry Department, which had been in existence from 1808 to 1826, does not appear to have made any impact. However, between 1895 and 1940, the area designated as teak forest increased by over 15%. This was partly a question of bringing areas under the authority of the Forest Service, but it also reflected the successful lay-out and upkeep of teak plantations, so in that respect the new (post-1869) Forest Service did have some success, although clearly it did not compensate for the enormous losses sustained during previous centuries.[20]

Conservation of nature for its own sake – which can be viewed as the modern Western variant of the 'forbidden' forest – was not originally one of the main tasks of the Forest Service, although it was instrumental, at an early stage, in the creation of one forest reserve for scientific purposes.[21] Conserving plants, animals, and entire biota because they were beautiful and worth preserving in their own right was not written into their charter. The interest in the conservation of nature for its own sake started out as the concern of private persons around the turn of the century. However, the actual establishment of nature reserves, from 1916 onward, was undertaken by the state. By 1939, 118 nature reserves had been established, covering an area of 24,000 sq. km. Most reserves, however, existed mainly on paper, as the actual protection afforded these areas left much to be desired. Between 1942 and 1980, upkeep and creation of nature reserves was largely absent. However, over the last two decades new national parks and other similar areas have been created and maintained.

The various attempts at managing Indonesian forest resources in a sustainable way appear to have been less than successful in the long run, but there is a framework that can be expanded and improved upon.

19 Junglewood is a term that was used by foresters in British India for all non-teak forests. For the same phenomenon the Dutch used the term *wildhout* (literally 'wild wood').

20 Data are taken from Boomgaard 1988:79, 1996:26.

21 I have dealt with conservation of nature in Indonesia in more detail elsewhere (Boomgaard 1999).

Vanishing forest societies

Having given a brief overview of structural and incidental forces of deforestation, and attempts to counter these forces, I will say a few words about a topic that, to my mind, has not received the attention it deserves: vanishing forest societies.

It has been estimated that today about 20 million people live in or near Indonesia's natural forests (Sunderlin et al. 2000:1). That is less than 10% of the total population. If we assume that long ago – let us say around 1500 – 95% of Indonesia's land area was covered with forests, the proportion of people living in or near forests must have been of the same order of magnitude – 95%. Indonesia, therefore, must have been a region entirely dominated by forest societies. Some 500 years later such societies had become minorities, often 'tribal' groups (*suku terasing*), regarded by the majority as rather quaint entities.

What I would like to know is what happened to the groups that lost their forests, and what it means to the society at large that their country has gradually turned from a forest-rich one into a forest-poor one.

How does a group of people – let us say a village or a group of villages – restructure its culture and economy when the forests, upon which their livelihood had been based, have gone? What did peasant-cultivators do, having always had recourse to a nearby wooded area for timber, firewood and fodder, after that area had been logged over? At the very least they must have experienced a drop in real income as they now had to buy the things that used to be easily accessible and free of charge. Conversely, we may have been underestimating the income of villagers in forest areas because income in kind from forests may not have been included in estimates of their per capita GDP. It is also to be expected that the belief systems of people who are no longer surrounded by forests will undergo changes.

It would also be useful to know whether forest societies have attitudes towards nature that differ from those to be found among urban and agricultural societies. Is their culture less destructive, or is it just a case of lower population density and therefore less impact? Why is it that the Batak and the Minangkabau in Sumatra eliminated most of the forest cover in their areas, whereas other Sumatran people such as the Kubu, the Sakai, and the Mamak, kept their forests in good shape? Is this just a question of different natural environments, or are there other issues at stake?

What happens to a larger society – for instance Java as a whole – when its forests are slowly but surely disappearing? As long as there were large tracts of forest, people who had some quarrel with the state could escape into the woodlands. This is a well-known theme in Javanese literature, which can boast of large numbers of – usually royal or noble – protagonists in plays,

poems, and prose texts who went into exile in forested areas. There is also sufficient evidence to suggest that all kinds of bandits, robbers, cattle thieves, and oppressed villagers absconded into the forests. One supposes that such possibilities influence the relationship between the governing and the governed, and that this relationship changes when the forests disappear.

The disappearance of forests must also have a bearing on the prosperity of areas that depend upon irrigation, and on the possibility to expand irrigation networks. How do local societies survive if irrigation systems upon which they have depended for a long time start to fail owing to the destruction of watershed forests?

Concluding remarks

Although the general downward trend in proportion of forest cover may have been evident most of the time in most of the areas of the Indonesian Archipelago, the rate of decrease was not constant over time, and may sometimes have approached zero or even been reversed temporarily. Nor was the rate of decrease the same for all areas at a given time. It does seem likely, however, that there were broadly defined phases of deforestation in most areas of the Archipelago.

We may safely assume that deforestation prior to 3000 BC was negligible, and that it was very low until about AD 500. Between 500 and 1500 it was probably somewhat higher than before, as states are inclined to use more timber than pre-state societies. With the arrival of the Europeans the overall rate of deforestation may have increased a bit, but its impact was restricted to specific localities, such as Java's northern coast. It seems likely that higher rates of natural population increase, in combination with the opening of the Suez Canal and the growing role of steamers, ushered in a new phase after 1870, with higher deforestation rates. Between 1929 and the 1960s demand and supply levelled off, but from the early 1970s onward unprecedented levels of forest exploitation and therefore of deforestation were reached, which as yet show no signs of slowing down.

Attempts to control the use of forests are probably as old as the early states of the Archipelago (see Colombijn, this volume). Prior to the epoch of high population growth rates and of increased commercial exploitation of forests, such attempts were only relevant locally. After about 1870 the centralized Forest Service of the late colonial state seems to have had some success in managing Java's teak forests, but similar successes were, to my knowledge, not repeated later on. Now that decentralization is set to become the dominant force in Indonesia, the central approach does not appear to have a future.

Therefore, lessons for the future are in all probability lessons of a local

nature, which ought to stimulate research into the history of the varying fortunes of local societies that ceased to be forest societies.

The prospect for Indonesia's old-growth forests looks very bleak indeed. In fact, it is inherently impossible to sustainably harvest timber from old growth tropical rainforests, despite all the rhetoric suggesting otherwise. In tropical areas it takes an old-growth forest several hundred years to recover, and it is obvious that not even the most idealistic and rich enterprise is in a position to undertake exploitation on such a time scale. The only sustainable form of exploitation is therefore no exploitation, with the exception of the collection of non-timber forest products. This means that the only way these forests could be saved would be a total ban on cutting in old-growth forests. Ideally, therefore, all production of timber would have to come from tree plantations.

News about Indonesian forests is seldom good news, and this article is no exception. The only reasonably optimistic bit of news is that the average annual rate of deforestation in Indonesia during the twentieth century was in all probability considerably lower than suggested by the most recent (2002) estimates at my disposal.

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DAVID HENLEY

Of sago and kings
Sustainability, hierarchy and collective action in precolonial Sulawesi

Introduction

Most theoretical work on the management of exhaustible natural resources at the local level focuses on more or less egalitarian systems of collective action, in which the members of a community all cooperate to uphold, obey, and if necessary enforce, rules of behaviour which guard their common property against opportunistic overexploitation.[1] In the Indonesian context, such community-based forms of natural resource management are typically contrasted with the centralized, authoritarian (and now partly discredited) systems of entitlement and protection imposed by the state during the colonial and post-colonial periods.[2] In this paper, however, I would like to caution against any overly stark antithesis between state and non-state ('indigenous', 'community') resource management by pointing out that hierarchy, inequality, and the centralized enforcement of property and access rules were already intrinsic to the way in which Indonesian peoples approached the management of potentially exhaustible resources in precolonial times. Any distinction between community consensus and external enforcement, in fact, must be to some extent misleading here. In so far as it can be said that communities tended to reach an internal consensus regarding the management of resources which were vital to the collective welfare of their members, it can also be said that the way in which they often chose to implement that consensus was by deliberately submitting themselves to an authority with the power to enforce it in

1 For instance Anderson and Simmons 1993; Baland and Platteau 1996; Carpenter 2000; Feeny, Hanna and McEvoy 1996; McCay and Acheson 1987; Ostrom 1990; Ostrom, Gardner and Walker 1994.

2 For instance Colfer, Peluso and Chung 1997; Fisher 1999; McCarthy 2000; Peluso 1992; Ngo 1996; Ross 2001:157-89; Von Benda-Beckmann, Von Benda-Beckmann and Brouwer 1995.

the face of opportunistic attempts by individual free-riders to take advantage of it by breaking the rules which others followed. The empirical evidence on which my argument is based comes from some obscure but (I hope) interesting places in North and Central Sulawesi more than a century ago, before this remote part of Indonesia came fully under the influence of the Dutch colonial state. The theoretical material which informs the argument comes from the modern study of collective action, public choice, and institutional economics.

Ownership, ecology and hierarchy: swiftlet nests and maleo eggs

Northern (North and Central) Sulawesi is a rugged and diverse region covering a land area of roughly 90,000 square kilometres and stretching over a maximum straight-line distance (from Palu to Talaud) of more than 1,000 kilometres, roughly the length of Java from tip to tip. In the middle of the nineteenth century its inhabitants, then perhaps 700,000 people in total, were mostly farmers growing subsistence crops on swidden fields, fishing (and occasionally hunting) to supplement their diet, and obtaining the limited quantity of trade goods which they consumed (principally textiles and iron) by selling coconut oil, surplus rice, or gold dust and forest products collected during the agricultural off-season.[3] Dutch colonial power, until the beginning of the twentieth century, was largely restricted to the enclaves of Minahasa and Gorontalo on the northern peninsula. The remainder of the region was controlled by indigenous chiefdoms, often called *rijkjes* or 'little kingdoms' by the Dutch, the leaders of which were typically chosen from and by a class of local aristocrats referred to in Malay as the *bangsa*. Outside this elite the population was further divided into commoner and slave classes, although it should be added that considerable social mobility usually existed across the boundaries of all three groups.

While relatively abundant resources such as land for swidden farming were often under a form of collective control by village communities (Adriani and Kruyt 1950-51, III:27; Schrauwers 1998:116), more valuable and localized economic assets tended to be under the exclusive control of the local elite. These assets included the nesting sites of two types of bird: cave-breeding swiftlets of the genus *Collocalia*, and the ground-living maleo (*Macrocephalon maleo*). Swiftlets produced edible birds' nests, a lucrative export product, and the maleo its very large eggs which it incubates by burying them in warm sand, and which were a popular local food item. On the island of Lembeh off

[3] A detailed account of the geography, demography and economic history of northern Sulawesi in the period up to 1930 is provided in my recent book *Fertility, food and fever* (Henley 2005a).

the east coast of Minahasa, swiftlet nesting sites were exploited exclusively by a chiefly family from Kema on the adjacent mainland, representatives of which kept them under constant guard.[4] In the Sangir Islands, likewise, the various swiftlet caves each belonged to one of the Sangirese *raja* or 'kings' (Van Delden 1844:20-21, 360; Steller 1866:12). In Gorontalo and Bolaang Mongondow, the beaches where the maleo populations buried their eggs were the private property of various local *raja*, and like the swiftlet nests on Lembeh they were guarded continuously by servants of their owners against poachers.[5] A similar arrangement seems to have applied to maleo breeding sites in Banggai on the east coast of Central Sulawesi.[6]

That powerful individuals or kin groups monopolized the supply of valuable natural resources seems at first sight to support a purely predatory understanding of the power and privileges enjoyed by the elite. Two important qualifying observations, however, are in order here. The first is that royal monopolies seem to have been conducive to sustainable resource management. Both swiftlet nests and maleo eggs were acutely vulnerable to overexploitation, especially since both commodities were part of the means by which the species concerned reproduced themselves.[7] Yet under the traditional management regimes sketched above, annual yields of both products apparently remained more or less stable over long periods.[8] Contemporary indigenous perspectives on this achievement are not available, and limited commercial demand undoubtedly played a part in the case of the maleo eggs (Uno 1949:151). But Dutch observers were clear that as far as the swiftlet nests were concerned, the function of the chiefly monopoly was to preclude what Garrett Hardin (1968) would have called a 'tragedy of the commons'. When the chief of Kema requested official VOC support for his customary claim to the Lembeh nesting sites in 1770, the Dutch authorities readily agreed on the grounds that 'if everybody is able to collect the nests at will, then nobody has any significant benefit from them, since the birds are continually disturbed' (Edeling 1919:33).

4 Edeling 1919:33-5; Graafland 1867-69, I:2-3, 1898, I:22; Lengkong 1981.

5 *Corpus diplomaticum* 1907-55, VI:671; Uno 1949:151; Von Rosenberg 1865:114-5. The lake of Moat, also in Bolaang Mongondow, was a private domain of a *raja* whose slaves guarded it for the sake of its eels, from the flesh of which oil was manufactured (Riedel 1901:226; Schwarz and De Lange 1876:155).

6 Argeloo and Dekker 1996:60; Goedhart 1908:462. In parts of the Philippines, comparably, local chiefs claimed the right to 'collect all turtle eggs in a restricted stretch of beach' (Scott 1994:144-5).

7 In the case of the maleo, progressive depletion (under the influence of population growth and improved means of transport to markets, as well as the disappearance of traditional management practices) had already begun before the end of the colonial period (Uno 1949:151-2). By 1990 the survival of this species in northern Sulawesi was threatened (Argeloo 1994).

8 Van Delden 1844:20; Von Rosenberg 1865:114; Uno 1949:151.

Sustainable exploitation, secondly, was not exclusively to the benefit of the exploiters themselves. In Gorontalo, the maleo eggs collected under the royal monopoly were sold directly to the public – albeit very probably at a royal profit – on the local market (Von Rosenberg 1865:114). Swiftlet nests, by contrast, were destined for foreign markets, and in this case the benefits for local consumers other than the monopolists are less immediately obvious. In Sulawesi, however, all chiefly monopolies formed part of political systems which prescribed that rank had to be validated by acts and displays of material generosity. In part this took place during potlatch-like 'feasts of merit', sometimes involving the distribution of valuable import goods as well as food, drink and entertainment (Schouten 1995:11-2, 1998:22-7). In addition, redistribution of chiefly wealth was prescribed by a universal obligation for political leaders to supply gifts or loans of food to the hungry and seed rice to those whose crop had failed – in other words, to provide a certain degree of social security for their subordinates.[9] 'The chief', Bronislaw Malinowski (1937:232-3) once wrote of Melanesia, 'acts as a tribal banker, collecting food, storing it, and protecting it, and then using it for the benefit of the whole community'; his economic functions, in this view, were 'the prototype of the public finance system and the organization of State treasuries of today'. With regard to Sulawesi, where a chief's position often entailed institutionalized economic privileges in terms of consumption as well as control, it would be too much to say with Malinowski that 'in the long run, all the wealth accumulated by him flows back to his subjects'.[10] Nevertheless the chiefdoms of northern Sulawesi were certainly comparable to those of Polynesia, where redistribution underpinned the political order despite the persistence of permanent economic inequality between well-defined social strata.

> In certain islands, Polynesian chiefs controlled great storehouses which held the goods congealed by chiefly pressures on the commonalty. [...] Redistribution of the fund of power was the supreme art of Polynesian politics. By well-planned *noblesse oblige* the large domain of a paramount chief was held together, organized at times for massive projects, protected against other chiefdoms, even further

9 Adriani and Kruyt 1912-14, II:234, 310; 1950-51, I:114; A.C. Kruyt 1938, I:324-5; Nourse 1999:64.

10 Malinowski 1935:47. Among the privileges of the political elite in many areas, for instance, was the exclusive right to wear clothes made from valuable imported textiles (Menopo 1893:485-6, 490-1; Steller 1866:25). Even food security for the temporarily needy, it should be emphasized, was not necessarily provided at low cost: the various *raja* of Sangir controlled stockpiles of food from which their subjects could borrow 'against double or triple repayment after the following harvest' (Van Delden 1844:16), and a Gorontalo *raja* was said to welcome food shortages as opportunities 'to empty his rice barns at high prices' ('Cultuur Verslag Gorontalo 1854', Arsip Nasional Republik Indonesia, residency archive Gorontalo, Bundel 3).

> enriched. Uses of the chiefly fund included lavish hospitality and entertainments for outside chiefs and for the chief's own people, and succor of individuals or the underlying population at large in times of scarcities – bread and circuses. (Sahlins 1963:296.)

Like stockpiles of food and other goods obtained by 'chiefly pressures on the commonalty', the chiefly resource monopolies of northern Sulawesi were for some purposes effectively common pool resources. Here, however, the stockpile was created by nature rather than by human agency. The role of the chief was limited to protecting it from unrestrained, untimely and potentially irreversible dissipation by helping to enforce the kind of restrictive access rules without which no common pool resource can survive.

Ownership, ecology and hierarchy: sago

The common pool and conservation aspects of such monopolies are clearest in the case of a less commercially valuable product than birds' nests or maleo eggs: sago. In contrast to the situation in parts of the Moluccas (Brouwer 1998), sago in Sulawesi was seldom a staple food. One reason for this was the limited distribution of the kind of flat, wet terrain suitable for the true sago palm (*Metroxylon sagu*); another was a general cultural preference for grain crops, especially rice. The processed pith of the sago palm was nevertheless significant for the provisioning of boats on sea journeys, as an item of local trade, and above all as a uniquely reliable emergency carbohydrate source for swidden farmers at such times as their field crops, which were always vulnerable to pests and bad weather, produced inadequate harvests. In several parts of the region the existing sago stands belonged exclusively to the paramount *raja* or other local nobles.[11] In many instances these sago reserves, like the bird nesting sites discussed above, were kept under permanent guard: on the western border of Bolaang Mondondow, for instance, the village of Sangkup was said to have been established 'mainly with the purpose of guarding and exploiting, for the benefit of the *raja*, the extensive sago stands which are present here'.[12] Where the case of sago is special is that in two instances, there is evidence of an explicit obligation on the part of

11 *Corpus diplomaticum* 1907-55, VI:671; Jacobs 1974-84, II:262; J. Kruyt 1924:63; Schrader 1941:125; Wilken and Schwarz 1867a:40; Van Wouden 1941:378. In most areas *Metroxylon sagu* grew only in the wild (*Nota Toli-Toli* 1912:52; Tergast 1936:137), although here and there it was also deliberately planted where the local environment permitted (Adriani and Kruyt 1912-14, II:203-4; Dormeier 1947:246).

12 A.J.F. Jansen, 'Uittreksel dagboek reis naar de noordkust van Celebes 1857', Arsip Nasional Republik Indonesia, residency archive Manado, Bundel 167.

Photograph 1. Sago (*Metroxylon sagu*) trees by Lake Tondano (Minahasa), circa 1890. (KITLV Photograph 10.424.)

the chiefly 'owner' to guarantee the availability of sago to his subordinates under specific conditions.

In Buol in the 1930s, firstly, the pioneer structural anthropologist F.A.E. van Wouden recorded oral traditions (dating from prior to intensive Dutch governmental intervention at the beginning of the twentieth century) in which the management of the local sago reserves figured as a central function of the indigenous political system.[13]

> That the sago stands [*sagobossen*] were shown to the young ruler [on the occasion of his inauguration] is explicitly mentioned in the myth [of Buol kingship]. Here the myth is referring to the communal [*gemeenschappelijke*] sago stands, which are the property of the whole community and which may only be exploited in times of need. The ruler is the nominal owner of these stands. Their management is an integral aspect of the institution of kingship, and can in fact be regarded as one of the most important symbols of royal power. (Van Wouden 1941:378.)

[13] Van Wouden, better known for his publications on kinship and social structure in other parts of eastern Indonesia (Van Wouden 1935, 1956), carried out ethnographic research in Buol and Gorontalo from 1935 to 1939 (Roolvink 1989:420).

Although no doubt somewhat idealized, the perception here is clearly that the royal sago monopoly was not (only) one of the spoils of power, but (also) a collective solution to the problem of conserving a vital common property resource for use when it was really needed. A second account from the same period, this time dealing with the more remote Banggai Archipelago where comparable institutions were partly still in existence, is more explicit regarding the way in which the benefits they provided were shared between the political leaders who underwrote them, the agents responsible for enforcing the access rules, and the sago consumers themselves:

> Near Tabulan on the island of Bangkurung there is a large sago forest for communal [*gemeenschappelijk*] use. Anybody who needs to do so may extract sago here for his own use. This sago may not be sold commercially. Half of the sago extracted was for the [local] village head, who originally split this proportion into three parts: one for the poor, one for himself as his wage for guarding the *sago tano* [literally: sago of the land/polity/community], and one for the *jogugu* [vizier, royal official immediately below the head of state (*raja*) in rank] of Banggai. (Schrader 1941:125.)

The provision against sale here shows that the intention is not (only) to guard the sago reserve against theft by outsiders, but (also) to guard it against excessive exploitation by the same individuals who are regarded as having a legitimate right to extract it in sustainably small quantities.[14]

Of course the motives of the *jogugu* and his dependants in protecting the reserve from depletion are selfish, since for them it represents a useful source of income and their monopoly means that at this level there is no collective action problem to complicate the calculation: the only potential free riders (opportunistic overexploiters) in the game are subordinates who, once identified, can easily be dealt with via the existing political channels, or if necessary by violent means.[15] But it is precisely this convergence of public and private interest which makes the system effective as a way of managing the common property resource. In its absence, sustainable exploitation would depend on large numbers of individual exploiters showing ethical self-restraint and/or monitoring (and if necessary punishing) each other's behaviour – a particularly problematic requirement in this context given that the sago reserve was rather remote from the places where most of its users lived.[16] As things

[14] Dormeier (1947:252-3) adds that according to tradition, this sago stand had been deliberately planted by a past *jogugu* 'with the provision that any members of the Banggai population who find themselves short of food may obtain sago here for their own use'.

[15] The *jogugu*, of course, still faced an 'agency problem' (North 1990:32-3) in ensuring that his enforcers on Bangkurung did their job properly.

[16] Political hierarchy and the use of more egalitarian techniques for preventing free-riding are not, of course, mutually exclusive. In the Palu Valley of western Central Sulawesi, coconut

stand, by contrast, the tasks of monitoring and enforcement are delegated to specialized organs of state – we might say, of the community – which have the power (and the permanent physical presence at the sago site) to perform them effectively. While the need for self-restraint meanwhile is banished entirely except in so far as the power-holders must be capable of distinguishing between their own short-term and long-term interests.[17] In short, the difficulties and costs involved in policing (and perhaps also negotiating) collective action in this context would appear to be lower under a centralized than under a decentralized solution.[18]

A similar but less detailed argument has recently been made by Cristina Eghenter (2000) with regard to the traditional management of primary forest reserves known as *tana ulen* among the Kenyah of Indonesian Borneo.[19] Rich in valuable or useful forest products such as rattan, building timber and game, these reserves were controlled by aristocratic families who permitted access to them only on specific occasions, and excluded them altogether from clearance for agriculture.

> Although we can only speculate on the reasons behind the establishment of *tana ulen*, it can be argued that the main conservation factor in such practices was the desire on the part of the aristocratic families to regulate the use of the forest to prevent depletion of resources needed in collective rituals and other family affairs. [...] Although the system is no longer in place, past evidence indicates a complex form of management where personal benefits were often combined with those of the larger collectivity. Where implemented, the arrangement closely mirrored the role of the aristocratic families as managers and overlords of the community. [...] It appears that rather than full ownership of the reserve, the heads of the aristocratic lineages retained full management responsibilities on behalf of the community as part of their multiple social and economic duties. (Eghenter 2000:339-40.)

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growers sought in two complementary ways to prevent the theft of near-ripe nuts: by paying a local noble and his henchmen to extend their protection over the plantations in question (*Verbodsteekenen* 1923:378-9), and by agreeing with neighbours to synchronize their harvests in such a way that anyone seen with nuts outside the designated picking period automatically identified himself as a thief (Lanting 1939:66-7; compare Popkin 1979:66-7).

17 This formulation ignores the problem of succession, with its attendant risk that a leader might squander public resources in a destructive 'end game' toward the end of his incumbency. In practice this danger was reduced by the fact that descent was always a potential (though never in itself decisive) criterion of leadership, which gave incumbents at least the hope that they would be succeeded by one their children (Van Delden 1844:11; Van Dinter 1899:346; Hissink 1912:96; Van Hoëvell 1893:8; Riedel 1872:565).

18 Besides enforcing the access rules, it is likely that the chiefly authorities also facilitated the negotiation of those rules by acting as mediators between the various interested parties of sago users (Taylor and Singleton 1993:203; Wall and Lynn 1993).

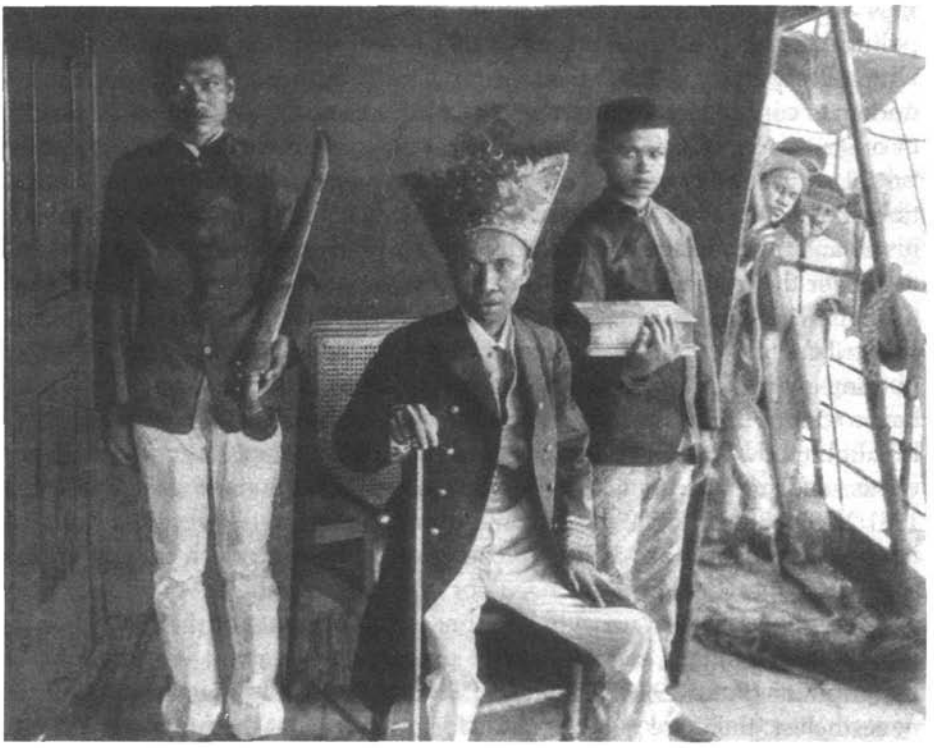
19 Fisher (1999:114) also notes the importance of 'local kings (*rajahs*) and tribal councils' in regulating traditional access to some forest areas in the eastern Lesser Sundas, although without identifying the institutionalized convergence of public and private interests on which this regulation is based.

This kind of argument, of course, implies a functionalist interpretation of political hierarchy, the origins of which are inferred from those of its effects which are perceived (and then perhaps only by a part of the population under its control) as useful once it already exists. Centralization of power, in other words, is seen as the product of some form of (explicit or implicit) 'social contract' between leaders and followers rather than as the institutionalized victory of a predatory ruling class. Among social scientists and historians the contract approach to the state reached a low point of popularity under the influence of Marxism around three decades ago, when Robert Carneiro (1970:733) went so far as to declare that 'no such contract was ever subscribed to by human groups, and the Social Contract theory is today nothing more than a historical curiosity'. In the 1980s, however, the tide began to turn under the influence of the New Institutional Economics, which highlighted the role of modern states in providing the public goods, property rights, and judicial services necessary to sustain economic growth (North 1981:20-32). Since 1990 it has become commonplace to treat even authoritarian political institutions as the outcomes of 'games' in which rational actors seek a balance between the need for centrally organized public services and the 'moral hazard' of elite selfishness.[20] Adherents of the institutionalist school of political science remain uncomfortable about its functionalist assumptions (Bates 1994:53; Hall and Taylor 1998:29). In the present context, nevertheless, there are good grounds for insisting that the functions of what political centralization existed in precolonial Sulawesi, not least with respect to the management of communal resources, were indeed among the reasons for its existence.

Collective action and the contract state

One reason to accept a functional interpretation of hierarchy as an instrument for overcoming collective action problems is the evident difficulty, judging by the evidence from Sulawesi, of overcoming these problems in other ways. It is often argued that free-rider problems hardly occur in traditional societies (North 1990:34, 55, 120, 1997:11), and there are indeed reasons to assume that they are less serious in small communities than in large ones. One is the fact that in small groups, as Mancur Olson (1965:33-5, 43-5) stressed, individuals are at least able to retain for themselves a larger share of any public benefits of their actions than are members of larger groups. Another is that reputation effects – that is, the dissemination of information regarding past instances of uncooperative or dishonest behaviour by particular individuals, leading

20 North 1990; Barzel 2002; Bates et al. 1998; Ensminger 1990, 1992.



Photograph 2. The *raja* ('king') of Buol and his attendants on board a Dutch steamship, 1894. (Kükenthal 1896: Plate 53.)

to avoidance or enmity on the part of others – are more powerful in a small community than in a large population where the chance of anonymity is greater (Platteau 2000:80-1, 192-3, 246-55). Yet the typically limited success of small, politically autonomous communities in providing public goods and generating economic cooperation suggests that even at this scale, the obstacles to effective collective action are considerable.[21]

In remote parts of Sulawesi (Adriani and Kruyt 1950-51, I:97, 150) as in other subsistence-oriented tribal and peasant economies (Platteau 1991:160-2; Sahlins 1972:69-74, 114-5), the pressure to share food and other resources with kin and neighbours was often a serious disincentive to production. While some individuals and households proudly produced a food surplus for redistribution in order to increase their social standing, many others were typically content to free-ride on the labour of their more ambitious

21 Douglas 1986:25-7; Platteau 1991:135-9, 156-61, 1997; Popkin 1979: 34, 46-56, 95-109, 1988.

neighbours, thereby restricting to a sometimes dangerous extent the total size of the resource pool available for sharing.[22] In an analogous way, the low birth rates which characterized tribal societies in Indonesia (Reid 1987:40) resulted at least in part from the fact that in many of those societies children were effectively shared between households, so that whereas their most important cost (pregnancy) was borne individually, their benefits (including their contribution to the economic security of their elders) were more or less collectivized. In upland Central Sulawesi, for instance, couples with several children were likely to receive adoption requests (which were difficult to turn down) from couples who had none.[23] In so far as conception and childbirth were under deliberate control, consequently, the tendency was for children as a public good (or at least, a common pool resource) to be 'underproduced' (Henley 2005b:363-6).

Even such an apparently straightforward form of cooperation as reciprocal labour exchange in agriculture was often surrounded in Sulawesi by remarkable tensions, calling for a delicate balance of individual calculation and democratically regulated coercion not unlike that embodied in the sago management institutions outlined above. In Minahasa an important feature of traditional economic life was *mapalus*, a form of what later became known as *gotong royong* (Bowen 1986; Koentjaraningrat 1961) in which large groups of farmers (sometimes up to 100 at a time) took turns to perform such tasks as scrub clearance, planting and weeding on each others' fields.[24] *Mapalus* groups featured elected leaders who administered punishment in the form of whiplashes to individuals whose work tempo fell behind that of the others, but who at the time of their appointment were themselves ceremonially lashed by each member in order to preserve a degree of reciprocity. The use of corporal punishment, of course, indicates that the inclination to break the rules of cooperation was strong.[25] This in turn reflects a general sentiment

[22] This kind of problem probably contributed at least as much as any 'leisure preference' (Knaap 1987:127; Wilkinson 1973:84) or 'ethic of indolence' (Seavoy 1977:20, 1986:195) to the persistently marginal levels of food production which characterized many traditional Indonesian economies. Another classic indication of unsurmounted collective action problems (Platteau 1991:138; Popkin 1979:49-50, 105) is that individual households often farmed two or more separate swidden plots in order to spread their risks on a private basis, rather than concentrating their holdings for productive efficiency and relying for insurance on the assistance of other households with swiddens in other microenvironments (Adriani and Kruyt 1912-14, II:239; A.C. Kruyt 1932:476).

[23] A.C. Kruyt 1899:81. Compare Alexander and Alexander 1993:270; Marshall 1976:34.

[24] Hekker (1987:108-14) provides an overview of the literature on this and the later forms of *mapalus* derived from it; the earliest description dates from 1825. Particularly significant with respect to the points mentioned here are the following sources: Beck 1922; Graafland 1864:10-3; Supit 1929.

[25] *Mapalus* rules included specific injunctions against such tricks as 'turning over at the wrong time the hourglass used to determine the duration of the work', and 'covering up unturned

of mutual distrust between social equals or near-equals which, although no doubt somewhat exaggerated in the colonial sources, must be regarded as characteristic of Sulawesi societies and which tended to make effective collective action particularly difficult to achieve on a strictly egalitarian basis.[26]

The second major reason for insisting on the utility of a functional interpretation of political centralization in northern Sulawesi is that explicitly according to their own ideologies, and more approximately also in practice, the precolonial chiefdoms of this region were unmistakably 'contract states'. In part this was a straightforward consequence of the broad diffusion of social and economic power within them: while the degree of social stratification varied from area to area, the structure was always more flat-topped than pyramidal. In the more centralized or state-like polities, power was shared by an oligarchy of nobles.[27] Periodically, these appointed one or more of their number to serve as *raja*: in Gorontalo, for example, the two paramount *raja* (in the local language: *olongiya*) were elected from a number of genealogically eligible candidates by a council of more than a hundred local chiefs.

> The relationship of the *negeri* [village or domain] heads to the *raja* was not one of subordinate chiefs to their king, but that of lesser *raja* to a paramount chief whom they had chosen themselves. Indeed, the four most prominent *olongiya* [...] were actually equal in rank to the *raja*, who likewise bore the title of *olongiya*. The *raja*, then, was no more than a *primus inter pares*. (Von Rosenberg 1865:18.)

Such *raja* typically had 'just so much influence over their subjects as is necessary in order to resolve the most minor conflicts which arise among them'; as soon as one party in a more serious dispute refused to accept the royal judgement, noted a Dutch official in 1840, 'the distinction between prince and subject disappears, and both stand as equals' (Scherius 1847:400).

The essential equality of power between the ruler and his closest peers, and the explicitly contractual nature of kingship, are clearly evident in the ceremony (at least as remembered by local informants in the early twentieth century) by which each new *raja* of Banggai was installed in his function by a council of nobles including the *hukum tua* (supreme judge or oracle keeper), the *jogugu* (chief minister or vizier), and the *basalo sangkap* or '[council of] four chiefs'.[28]

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ground with earth in such a way as to give the impression that it has already been worked' (*Mapaloes en tuchtrecht* 1926:268).

26 Adriani and Kruyt 1950-51, I:101, II:169; A.C. Kruyt 1938, II:275; Renwarin 2000:280, 284; Schouten 1998:263; Van Spreeuwenberg 1845-46:308; Wilken and Schwarz 1867b:330, 338-9.

27 As in other parts of Southeast Asia (Reid 1988-93, I:120-1), these nobles derived their power mainly from political backing and labour resources in the form of kin, personal followers, and especially slaves.

28 In connection with the fact that in the ceremony as described here the new king sits on the

> When the king had been carried to this place, one of the *basalo sangkap* [...] sat down on the [ceremonial] stone [...]. The king then sat on the lap of this *basalo*. [...] The *hukum tua* positioned himself in front of the king, the *jogugu* to the king's left, and the other dignitaries stood around them in a circle. Then the *hukum tua* addressed the king, all the time menacing the head of the sovereign, as it were, with the staff which he held in his hand. He advised the king to govern his subjects justly, for in that case he would be blessed and enjoy long life; but if he failed to follow the prescriptions of the ancestors, he would know nothing but adversity, and quickly die. (A.C. Kruyt 1931:613.)

In Buol, as already noted, the equivalent ceremony included a specific admonition to the new *raja* regarding his duty to manage the communal sago reserve.[29] How well this sort of explicit social contract worked in practice to deter abuses of power is not clear.[30] But in case the almost equal power of other members of the nobility – or the supernatural curses included in the contract (Van Wouden 1941:378) – did not serve to cement it adequately, there was another circumstance which helped: the possibility at all social levels of what Michael Adas (1981) calls 'avoidance protest'. In the more sparsely settled areas it was often feasible for small groups of disaffected people to escape chiefly authority entirely – albeit usually at considerable cost in terms of military security, not to mention access to common property resources like sago stands – by moving to a new location (Adriani 1916:119; Von Rosenberg 1865:18). Where such a radical 'exit option' was not available, there was usually still the possibility of moving from the domain of one leader to that of another, or even of changing allegiances *in situ* in the manner of Adas' (1981:218) 'contest state'. On the densely populated Sangir Islands, for instance, it was a constant Dutch complaint that the *raja* 'take pride in governing their subjects in the gentlest possible way' (Valentijn 1856-58, III:184) in order to attract defectors from other chiefdoms and prevent defections from their own.[31]

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lap of one of his subordinate chiefs, it is worth noting that in some parts of the region the *raja* was typically chosen from a relatively junior descent group and addressed in ritual speech as a child (Bastiaans 1938:237, 1939:33-4, 40, 45, 64-5, 69; Nur 1979:44-5, 80; Van Wouden 1941:335-6, 377-8).

29 He was also told in more general terms that although everything in the kingdom was his, it was not his to dispose of arbitrarily (Tacco 1935:83; Van Wouden 1941:378).

30 In precolonial times the ultimate sanction, well described by Marshall Sahlins (1972:144-7) for Hawaii, was presumably an armed rebellion led by dissident nobles. As the Dutch extended their power through Sulawesi, they often made this sort of control easier by helping to remove unpopular leaders. Following 'numerous complaints' by other chiefs, for example, in 1879 the incumbent *raja* of Bolaang Mongondow was arrested by the Dutch during a visit to Manado and sentenced to permanent exile for maintaining a 'robber band' which had killed at least 27 of his own subjects (*Koloniaal verslag* 1880:18; *Rijkje Mongondo* 1880).

31 Chabot 1969:97-8; Van Dam 1931:66; *Generale missiven* 1960-97, V:395; Steller 1866:26.

Besides 'gentleness' in terms of his fiscal demands, however, the successful Sangirese chief was also expected to show aggression in the protection of his subjects' interests against those of other chiefdoms, and also to be 'a man of powerful personality, experienced in leadership and in adjusting internal conflict' (Chabot 1969:97-8). If the contract state still seems improbable, an instructive analogy for the way in which free individuals may choose to submit themselves to a coercive and economically privileged authority in order to secure the benefits of collective action is provided by the *arisan* or rotating savings and credit association (ROSCA) of modern Java. To minimize the risk that members who have already had their turn to draw the kitty will default on their periodic payments, participants in these groups often deliberately select as *arisan* organizers 'tough individuals' who are 'well suited to keep malevolent participants under control'; to minimize the risk of fraud on the part of the organizer, they also prefer one 'who is either rich enough to be uninterested in fraud, or who has more to lose than to gain' (Lont 2002:192, 194).

Conclusion

Most work on the management of potentially exhaustible natural resources in traditional societies focuses on more or less egalitarian systems of collective action, in which depletion of the resource pool is prevented by various combinations of community ethics, mutual surveillance, and supernatural sanction. But there is also another solution to the same kind of problem: hierarchy, or rather, the delegation of responsibility for common pool resource management to a specialized authority with both the power and the motivation to protect the resource in question from overexploitation. In modern societies this authority is typically the state; in tribal societies, members of a chiefly elite often played a similar role. In precolonial Sulawesi, one important function of the local *raja* or chief was to manage the stands of sago trees on which his followers depended for emergency food supplies when their field crops failed. For the community as a whole there was a practical trade-off here: the fact that exploitation of the sago stands was a monopoly of the chief made for high sago prices in normal times, but the incentive which this monopoly gave him to manage his sago reserves sustainably, and the effectiveness with which he guarded them from illicit felling, ensured that sago was always available in times of need, when he was expected to display largesse. The problem of collective action was thus displaced from the sphere of resource management, where the greatest danger was free-riding in the form of abuse of common property by unethical citizens, into the sphere of political organization, where the greatest danger was free-riding in the form of abuse of power by unethical rulers.

'Like most of us', political anthropologist Elizabeth Colson (1974:113) once wrote of the citizens of new but failing African states shortly after independence, 'they do not want Utopia. They want good government and the honoring of the Social Contract.' The successful management of natural resources (and of course much else besides) in Indonesia will depend precisely on the creation and honouring of a new contract between people and government (national and local) in which the state serves the public interest while retaining the powers of coercion which it needs in order to do just that. If the lessons of the past as inferred in this paper are anything to go by, one element of the said contract ought to be that remote, localized and readily depleted wild resources should be under the direct control of the state, guarded by government agents who are provided with strong economic incentives to enforce restrictive access rules effectively. This is, of course, a simplistic generalization. Its value, I hope, lies in the fact that it is generalized *not from ideological or theoretical principles, or from Western experience,* but from some concrete evidence of how effective resource management actually worked in the Indonesian past.

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FREEK COLOMBIJN

Dried-up dragon's blood and swarms of bees' nest collectors

Non-timber forest products in Sumatra 1600-1870

This article treats the exploitation of non-timber forest products and their level of sustainability in Sumatra between 1600 and 1870.[1] It is part of a long-term research project on anthropogenic environmental change in central Sumatra, covering the present-day provinces of Riau, Jambi, Sumatera Selatan, Bengkulu, and Sumatera Barat. Some environmentalists have put their hopes on emphasizing the economic value of non-timber forest products as an argument for halting logging and so conserving tropical forests; this line of reasoning assumes that non-timber forest products are exploited in such a way that timber is preserved. The best way to put the argument to the test is a diachronic analysis of exploitation.[2] Non-timber forest products are of significance, however, even without reference to today's issues. Until at least 1870 the rich stands of Sumatran timber were mostly used locally, and for the general populace the commercial importance of resins, rattan, beeswax, and other products was far greater than that of timber.[3] Even on the eve of the Second World War, exports of non-timber forest products from the Outer Provinces had twice the value of timber exports (Cohen 1939:886).

In this article I explore two questions. The first question is to what extent the exploitation of forest resources on Sumatra was sustainable. Insofar as this question can be answered, the second question that arises is why certain

1 Research in Indonesia was financed by the Koninklijk Instituut voor Taal-, Land- en Volkenkunde (KITLV) in Leiden and the Stichting Wetenschappelijk Onderzoek in de Tropen (WOTRO).

2 Cronon 1993; Dargavel 1988:12; Peluso, Vandergeest and Potter 1995:208.

3 P. le Clercq, 'Statistiek administratief overzicht van Nederlandsch Indië 1836', Arsip Nasional Republik Indonesia, Jakarta (ANRI), Statistiek 6; J.F. Swent, 'Belangrijke aanmerkingen over de Komering 1823', ANRI, Palembang 70-15.

forms of exploitation seemed to be sustainable and others were not. Factors that have an impact on the probability that a particular resource will be locally exhausted include: the speed of natural regeneration; geographical distribution; composition of the market; mode of collecting; and the resource management system, particularly exploitation rights.

My research is based on reports of the Dutch Verenigde Oostindische Compagnie (VOC) and, to some extent, the English East India Company (EIC) for the seventeenth and eighteenth centuries. The VOC and EIC opened permanent offices in Padang, Bengkulu, Palembang, and Jambi in the late seventeenth century. The Europeans were interested only in export products; exploitation for domestic use has eluded historians completely. Direct Dutch colonial administration was initiated in Padang, the main settlement on the west coast, in 1819, and in Palembang, the main town on the east coast, in 1821. In order to levy export duties, colonial civil servants attempted to record all trade and that is the reason we are better informed about production in the nineteenth century than that of earlier centuries. I aim here to make data that were collected in archives accessible to interested readers in a condensed form.

The economic importance of non-timber forest products was significant. Chinese, Persian, Arab and European travellers in the early modern period unanimously marvelled at the richness of Sumatra's forests, and produced long lists of its non-timber forest products. Non-timber forest products are as diverse as any negatively defined category, but what all these products have in common is their high price per weight unit. Non-timber forest products were collected on jungle tours and had to be carried on people's backs to a convenient waterway for onward transportation. Only small quantities could be carried in this way. From the collector's point of view, a certain product was only worth the effort if a small weight fetched a high price.

The composition of the market naturally had an impact on the sustainability of the level of resources. The most expensive products (bird's nests, ivory, rhinoceros horn, tortoiseshell, camphor, *kayu laka*, dragon's blood and bezoar stones) were used as medicines, delicacies, incense, and dyes and found stable outlets in China and Java. They were collected during long tours through the forest and it seems to me that despite annual fluctuations output remained at a fairly stable level.

The cheaper products were found near villages and were largely consumed domestically (and therefore remain invisible in export statistics). For example, rattan, a popular building material, came in many different kinds and was found abundantly throughout Palembang. Everybody could take what he needed. The rattan that was exported, and thus, by contrast, was transported over long distances, had a more limited origin, namely in the forests at the downstream ends of rivers, where water transportation was easiest.

A third category consists of products that were not particularly popular (and did not fetch a good price), until suddenly an industrial use for the product was discovered. Such a product tended to go through a boom-and-bust cycle. After a boom came the bust, because the market was quickly oversupplied, or because industry found a cheaper substitute. For example, thick rattan sticks (*simambu*) suddenly became popular in the weaving industry in Singapore; exports from Palembang jumped in 1844, but collapsed after two years;[4] thereafter, every few years a certain number of sticks was exported. If the boom continued for a while, the resource could be exhausted before the bust occurred. Probably the best-known example of such a boom was the demand for gutta-percha, a form of latex which was successfully applied as a coating for telegraph cable in 1843, and its popularity increased after the first submarine cable was laid (under the English Channel). Between 1845 and 1848 an estimated 270,000 gutta-percha producing trees were felled around Singapore. Already by 1853 the Riau-Lingga Archipelago had been depleted of most of its full-grown trees and three decades would pass before the newly planted saplings would be producing again (Potter 1997:284-5). Demand then shifted to mainland Sumatra, where colonial civil servants had erroneously assumed that gutta-percha, and its companion, India rubber, did not exist. Nevertheless, the product suddenly appeared from the forest.[5]

Production volumes

The best empirical test for sustainability is a diachronic analysis of production volume. Table 1 gives average annual purchases by the VOC for the period 1701-1744, the years that the company bought up the biggest volumes of non-timber forest products.[6] Years showing no data for certain products have been treated as missing data and not as years with zero purchases. As there were other buyers than the VOC, this table gives the baseline of what central Sumatra could minimally produce at that time.

The maximum figures in Table 1 can be compared to a report from a VOC

4 AV Palembang 1844, ANRI, Palembang 62-7; AV Palembang 1845, ANRI, Palembang 62-8; AV Palembang 1846, ANRI, Palembang 62-9.

5 AV Palembang 1853, ANRI, Palembang 63-5.

6 In addition to the usual caveats that apply to VOC figures, it should be noted that the VOC did not aim at a monopoly in non-timber forest products and did not care to get an overview of total production. The local staff's official correspondence used imprecise measures, such as a basket and a bundle, or, the quantitative historian's nightmare, merely speaks of 'some', say, beeswax. The modern editors of the published *generale missiven* (*Generale missiven* 1960-88) shared this lack of interest in the small things of the world and have usually not selected the pieces of information that are available. Somebody interested in non-timber forest products would be advised to read the original *generale missiven*.

Table 1. Annual VOC export of non-timber forest products in Padang, Palembang, Jambi, and Siak 1700-1744

	Padang		Palembang		Jambi		Siak	
benzoin (ton)	32 (41)	119						
camphor (ton)	0.16 (33)	0.42						
camphor oil (jug)	33 (26)	150						
dragon's blood (ton)			0.40 (26)	0.95	0.44 (1)	0.44		
beeswax (ton)			1.11 (4)	3.68	0.63 (4)	2.34		
India rubber (ton)			14 (1)	14				
bindrotan (x 1000 pcs)			56 (11)	168	92 (4)	180		
handrotan (x 1000 pcs)			3.2 (18)	15.0	1.9 (5)	2.0		
jurnang rotan (x 1000 pcs)					12 (2)	18		
ivory (pcs)			5 (2)	6	4.6 (7)	6		
pedro porco (pcs)					1 (1)	1	1 (2)	1
ambalo plank (pcs)			3 (2)	4				
gaharu (kilo)			57 (23)	198			85 (1)	85
yellow gum (kilo)					90 (1)	90		

The first figure is the average amount (with *n* between brackets), and the second figure the maximum amount between 1700 and 1744.
Binding rattan (*bindrotan*) is calculated from bundles of 40 canes each (Knapen 2001:354).
Source: Generale missiven (both published and unpublished, at the Nationaal Archief, The Hague (NA).

employee on the economic opportunities of Palembang in 1636. According to this official, who was perhaps overly optimistic in an attempt to impress his superiors, Palembang had the potential to deliver each year: 0.7 ton of bird's nests, 8.4 tons of dragon's blood, 28.2 tons of beeswax, 22.6 tons of *sapan* wood, some elephant's tusks, and a big quantity of *kayu laka*, timber, and rattan (*Dagh-register 1636* 1899:190). In 1699 a VOC official estimated the annual yield of benzoin in Baros at 49.4 tons, and in 1737 another official reported the yield of the whole coast to be 55.6 tons.[7] I believe that the maximum figures in Table 1 and the 1636, 1699, 1737 figures are respectively the lower and upper limit of what could be produced in the seventeenth and eighteenth centuries, with the then existing population, technology, and transportation facilities. It is clear that the VOC in no way put a strain on the available resources.

7 'De radicaale beschrijving van Sumatra's Westkust door Ht. van Bazel', 13-4-1761, Koninklijk Instituut voor Taal-, Land- en Volkenkunde (KITLV), H167; 'Consideratie van Willem Maurits Bruijnink wegens de vrije vaart op Sumatra's Westkust', [1737], ANRI, (Sumatra's Westkust) SWK 5-1.

Table 2. Average annual VOC purchase of dragon's blood at Palembang, and benzoin and camphor at Padang, 1661-1795

	dragon's blood		benzoin		camphor	
1661-1680	0.11	(6)	17.2	(19)	0.23	(18)
1681-1700	0.48	(3)	31.9	(9)	0.22	(9)
1701-1720	0.26	(11)	13.0	(19)	0.19	(15)
1721-1740	0.50	(13)	51.7	(19)	0.14	(15)
1741-1760	0.43	(1)	39.4	(17)	0.25	(16)
1761-1780	0.92	(8)	9.2	(18)	0.15	(7)
1781-1795	1.06	(5)	1.3	(4)		(0)

All values in metric tons (with *n* between brackets).
Source: 1662-1682: *Dagh-register* 1896-1931; 1683-1791: Generale missiven (both published and unpublished, at the NA); 1792-1795: Generaal verslag 1792, 1794-1795, NA, Comité Oost-Indische Handel en Betrekkingen 1791-1799, 60A, 62, 63.

Although the VOC demand could not exhaust forest resources, it is conceivable that VOC purchases reflected a general decline of available resources. A decline in yield would cause a rise in price, with the likely effect that the VOC would step out of the market altogether. There are only three kinds of goods in which the VOC had a continuing interest that may possibly show such a decline: dragon's blood in Palembang, and benzoin and camphor in Padang (Table 2). Benzoin and camphor were exported from Padang, but actually came from Barus and Tapanuli, a region that strictly speaking does not fall under the scope of this article. The impression that benzoin and camphor production collapsed at the end of the century is spurious. After 1771 the VOC must, for some reason, have lost interest in camphor and bought the product in only one later year. Until 1771, the export of camphor fluctuated sharply, but the trend line was almost flat. The decline of benzoin must first be attributed to a change in VOC policy to buy only the exclusive first-rate white produce and to ignore the dark second- and third-rate benzoin. After the Fourth Anglo-Dutch War (1780-1784) the VOC outpost at Padang was left to itself with reduced financial means. Between 1661 and 1780 the trend line of benzoin was also almost flat. The trend of dragon's blood was rising, but in this case there is a disquieting number of missing values. There are no dates to tell what really happened on the ground, but the figures suggest that production did not decline for over a century, and that exploitation of these resources was sustainable by all standards.

The nineteenth-century figures were collected by the state in order to assess the export tax. Tables 3 and 4 give the products with the biggest volumes. Contrary to the VOC figures, these statistics show the complete export

Table 3. Average annual export of selected non-timber forest products from Palembang, 1822-1866, and Jambi, 1851-1860

	binding rattan	benzoin	damar	dragon's blood	beeswax	ivory	India rubber	gutta-percha
Palembang								
1822-1830	259	41	56	3.3	13	0.28	0	0
1831-1840	277	43	70	4.5	18	0.66	0	0
1841-1850	342	127	96	0.9	10	0.64	0	0
1851-1860	557	101	195	1.5	19	0.27	85	33
1861-1866	449	155	207	0.0	12	0.28	19	17
Jambi								
1851-1860	205	16	4.4	8.1	3.8	0.02	0	31

All values in metric tons.
Palembang: for the years 1844-1852 and 1864 the archival reports give only the values and not the volumes; the volumes have been calculated using the average value and volume of 1840 and 1853 (for 1844-1852), and of 1865 (for 1862 and 1864). The years 1841-1843, 1848, and 1860-1861 are missing.
Jambi: there are no data before or after the 1850s; also the years 1854 and 1860 are missing.
Source: 'Statistiek van de handel te Palembang 1823', ANRI, Palembang 60; Jaarverslag (JV) Palembang 1832, 1834-1835, ANRI, Palembang 62; AV Palembang 1836-1841, 1844-46, ANRI, Palembang 62; 'Staat van de uitvoer te Palembang 1847', KITLV, H297; AV Palembang 1849, 1851-1853, ANRI, Palembang 63; Maandverslag (MV) Palembang januari 1855, ANRI, Palembang 73; AV Palembang 1855-1859, ANRI, Palembang 63; AV Palembang 1862-1864, 1866, ANRI, Palembang 64; Cultuurverslag (CV) Palembang 1863, 1865-1866, ANRI, Palembang 64.

figures of the products.[8] Not included in these statistics is the important kingdom of Siak, which produced rattan, damar, *kayu laka*, ebony, gaharu, ivory, camphor, and, according to the ruler, no less than 124 tons of beeswax annually (Anderson 1826:353; see also Kathirithamby-Wells 1997:237).

Several conclusions can be drawn about the nineteenth century. First, production levels were far above the levels in precolonial (VOC) times, which lends support to the idea that carrying capacity was not the constraining factor for the collection of non-timber forest products in the precolonial period.[9] Second, the trends were rising. The expansion might be explained

8 Transit trade hidden in locally collected products sometimes inflated export figures ('Beknopt overzicht van de handel en scheepvaart te Padang over 1851', ANRI, SWK 125-14); contraband had the reverse effect.

9 The production level of 1870 would in its turn be far surpassed by the output of 1938 (Cohen 1939:918).

Table 4. Average annual volume of export of non-timber forest products from West Sumatra, 1821-1869

	benzoin	camphor	cassia	damar	India rubber	gutta-percha	rattan
1821-1829	27	0.48					
	23		0	0			
1836-1845	111	0.27	90		0	0	
1848-1852	402	1.16	346	36	18	30	650
1860-1869	432	0.44	425	47	169	90	1196

All values in metric tons.

Source: 'Handel van Padang', KITLV, H600a; 'Vergelijkend overzicht van de handel in Padang', ANRI, SWK 144-7; 'Nota Resident H. MacGillavry 21-4-1830', no. 315, ANRI, SWK 144-2; JV Sumatra's Westkust 1819-1827, ANRI, SWK 125; AV Sumatra's Westkust 1849, 1851, ANRI, SWK 125; 'Beknopt overzicht van de handel en scheepvaart 1851', ANRI, SWK 125-14; AV Sumatra's Westkust 1852, ANRI, SWK 126; AV Sumatra's Westkust 1860, ANRI, SWK 127; AV Sumatra's Westkust 1861-1863, ANRI, SWK 127; Politiek verslag (PV) Sumatra's Westkust 1864-1865, 1867-1869, ANRI, SWK 123.

by population increase and improvement of communications between the interior and the coast. Increased security as a result of colonial improvements in law and order allowed the expansion of trade in rattan in Southeast Borneo (Knapen 2001:357-64) and may have played a role in Sumatra as well. Another cause may have been the development of the cultivation of benzoin and cassia. Third, output fluctuated, although not as sharply as VOC purchases. Successful products also showed a temporary decline. Fourth, a few products suffered a declining trend: India rubber and gutta-percha, after an initial silence and brief boom, and dragon's blood, which after a long steady flow was reduced to a trickle.

Do the short-term fluctuations of all products and long-term decline of dragon's blood suggest respectively a short-term and a prolonged overexploitation? There is no single answer that explains all of the changes. Gutta-percha and India rubber indeed became locally extinct. Fluctuations in the yield of beeswax and honey, by contrast, were not a sign of temporary overexploitation. The yield depended on how well the trees had flowered, which was in its turn dependent on the weather. On Bangka the bees used the blossom of the trees *pulas*, *pelawan* and *perpats* (Bangkanese names). The *pulas* tree gave the best honey, but only when the other two trees did not flower; *pelawan* honey was bitter and *perpats* honey could not be preserved for long periods.[10]

10 CV Bangka 1856, ANRI, Cultures 1644; CV Bangka 1863, ANRI, Bangka 127; CV Bangka 1872, ANRI, Cultures 1644.

Table 5. Average annual value of export of non-timber forest products from Palembang, 1822-1866, and Jambi, 1851-1864

	binding rattan	benzoin	damar	dragon's blood	beeswax	ivory	India rubber	gutta-percha
Palembang								
1822-1830	12.7	9.2	3.9	1.5	18.5	0.6	0.0	0.0
1831-1840	16.5	13.5	4.5	1.7	21.0	2.3	0.0	0.0
1841-1850	27.2	43.6	15.1	0.5	16.5	2.6	0.0	0.0
1851-1860	44.8	34.8	44.1	1.3	33.9	1.8	42.0	19.1
1861-1866	59.3	72.4	40.4	0.6	25.3	3.7	44.4	11.8
Jambi								
1851-1860	25.0	5.7	0.2	4.3	5.4	0.0	0.0	13.1
1864	35.9	7.8	0.0	10.2	10.1	0.0	0.0	175.2

Value in thousands of Dutch guilders.
Palembang: the years 1841-1843 and 1860-1861 are missing values. Jambi: the years 1851 and 1860 are missing values.
Source: see Table 3.

I believe, however, that most of the fluctuations cannot be explained by the ecological factors of exhaustion or harvest failures. Economic reasons were predominant. Collectors of forest products responded quickly to market changes. To cite one example, when the price for rattan in October 1865 increased just a little, the supply from the Batu Islands, Airbangis and Tapanuli rose 'immediately' (*dadelijk*).[11] But when the price slumped a decade later, the collection of rattan was much reduced (Van Hasselt 1882:311).

So far this section has cited volumes rather than values of products, because volumes tell more about environmental impact. At this point, however, it may be wise to note that in monetary terms other non-timber forest products became popular (Tables 5 and 6). The great and continued importance of beeswax is striking. The entries of gutta-percha and India rubber (*gomelastiek*) are spectacular. Rattan, dragon's blood, and cassia are less important in economic terms than the exported volumes suggest. Despite the small quantities marketed, the economic importance of camphor is significant.

[11] MV Sumatra's Westkust 1865, ANRI, SWK 152-13. The price increase noted by the Dutch civil servant may have been small in absolute terms, but considerable as a percentage increase. The price for rattan rose from *f* 12 in 1862 to *f* 19 in 1865 and dropped in 1871 to *f* 12 again (Korthals Altes 1994:108-9).

Table 6. Average annual value of export of non-timber forest products from West Sumatra, 1821-1863

	benzoin	camphor	cassia	damar	India rubber	gutta-percha	rattan
1821-1829	29.9	17.2	6.0				
1836-1845	75.4	19.6	20.0				
1851	315.5	148.7	112.4	0.5	8.9	26.8	10.1
1860-1863	241.7	30.7	53.6	10.3	291.8	57.5	27.1

Values in thousands of Dutch guilders.
Source: see Table 4.

The management of common-pool resources

Recapitulating the preceding quantitative section, it seems that up to 1870 most non-timber forest products were exploited in a sustainable way. There is no uniform answer to the question why this was the case.

It is ironical that one of the products that caused Dutch civil servants the most headaches, camphor, was well protected by its own biological features. Camphor (*Dryobalanops* sp.) is an exceptionally tall forest giant which gives good timber, because insects avoid it. Its greatest value, however, lay in the camphor, a white, almost translucent substance, which sometimes develops in the trunk's fissures. The tree was felled, split, and cut up into smaller pieces to get out the camphor interior. Collectors claimed to use special knowledge and dreams to select trees that contained camphor, but in practice they had to fell trees at random, because no outward sign betrayed whether a tree contained the treasure (Marsden 1811:149-51; De Vriese 1851). The fact that many trees had to be felled to find one tree with camphor greatly alarmed Dutch administrators, who, with characteristic colonial scorn, called the indigenous camphor searchers 'very reckless' (*zeer roekeloos*).[12]

How many camphor trees were actually felled in the nineteenth century? Contemporary observers wrote that one out of 10 to one out of 30 trees contained camphor and of those trees the reported average yield was between 3 and 4.9 kg.[13] In order to get the 0.44 ton of camphor exported in the 1860s, between 900 and 4,400 trees were felled annually; around 1850 the figure may have been more than 10,000 trees per year.

12 AV Sumatra's Westkust 1851, ANRI, SWK, 125-13.

13 Marsden 1811:150; Nahuijs 1827:72-3; De Vriese 1851:22. 'Verslag over de gewezen bezittingen van de VOC op Westkust van Sumatra', [1828], ANRI, SWK 151-31; AV Sumatra's Westkust 1850, ANRI, SWK 125-12.

Contrary to Dutch colonial predictions, actual production of camphor increased during the nineteenth century. It is not surprising that camphor survived so easily. Only the old trees were cut down, while the young and middle-aged trees were left in peace to mature. Where a tree was felled (either by humans or by a natural cause), the camphor saplings got the space they needed to grow. Saplings stood so densely around a parental tree that no other tree could grow between them (*Kamferboom* 1872:94, 107; Van Zon 1915:223). I believe therefore that the 'reckless' felling of camphor trees in reality promoted the natural regeneration of camphor stands, instead of destroying them. What is more, according to the 'intermediate disturbance hypothesis' (Connell 1978), camphor collection must have contributed to biodiversity. Undisturbed tropical rainforest moves to a state of low-density equilibrium, but when a giant tree like camphor was felled, no doubt other trees were torn down in its fall and diversity increased because of the chance offered to species that needed space and light.

Two other products hidden in the interiors of trees may have fared less well. *Gaharu* (also known as eaglewood, lignum aloes, and aguila wood) is the decayed xylem of certain diseased trees (*Aquilaria* sp.) which emits a fine fragrance when burnt in Chinese joss sticks. In the Malay world *gaharu* was also used as a talisman and for medicinal purposes (Barnard 1998:28; Marsden 1811:160). The VOC procured small quantities of *gaharu* throughout the first half of the eighteenth century, but it is rarely mentioned in the nineteenth century. The natural safeguard that only old trees must be felled to get camphor may not have been operative for *gaharu* (although, I presume, older trees are more likely to be sick than young ones). Even less is known of bezoar stones (*pedro de porco, batu geliga*). Bezoar are concretions in the gall bladder of porcupines and grey langurs. The stones were used in Chinese medicine but were also precious items in Southeast Asia as talismans and for royal regalia. One out of a hundred monkeys carried a bezoar, and for porcupines the figure is even smaller (Barnard 1998:26-7; Knapen 2001:320). Perhaps – but this is sheer speculation – the chance of finding a bezoar was so slim that it was not worth going after.

When a resource begins to suffer depletion, one possible path for non-timber forest products is the domestic market (Potter 1997:299). This is what happened to benzoin (*kemenyan* or *benjuin* in Dutch sources), a resin that is taken from trees of the Styrax family. Benzoin was used as incense, perfume, and medicine. Seeds were planted in *ladang* fields and grew up with a minimum of maintenance. After seven years holes were made in the bark up to the crown, from which the resin flowed. After the resin had hardened, a lump was cut off, and every four months a further incision could be made. After the tenth year the quality diminished and in about the twentieth year of the tree's life the resin stopped flowing altogether. The tree was then cut down

and opened up, and the remaining resin was scraped from the interior. There were thus three grades, proceeding from a light to a dark colour, and from pure (at the high end) to contaminated with wood (at the low end).[14] The best benzoin came from Tapanuli and was cultivated by Batak, but it was also grown in Jambi and Palembang, and on Bangka, where it was collected from wild trees.[15] The regular flow of benzoin from Tapanuli starting in VOC times suggests that benzoin may have been cultivated there since as early as the seventeenth century.[16]

Cassia (*cassia vera, kayu manis*) was domesticated during the period under consideration in this article. Cassia is an indigenous kind of cinnamon, sold in sticks of curled, dried bark. Its collection destroyed the tree, because the stem was cut first, before the bark was stripped with a knife. New sprouts would come out, which could be harvested after two years.[17] The first reference to cassia I have found dates back to 1721, for Kerinci, and cassia was also found in South Sumatra.[18] The core production area was, however, in West Sumatra at 300 m above sea level (everywhere but the coast). Since it grew abundantly, nobody felt the need to replant.[19] After the Pax Neerlandica had been violently imposed on West Sumatra, the forests became more secure and a growing number of people ventured into the forest to collect cassia.[20] By then cassia may already have been extinguished locally; at least J. Olivier (1838:20) mentions Bukit Kayumanis, a hill named after the tree which had disappeared by the time of his visit.

Production increased further after 1847, in which year the colonial gov-

14 The first quality was the rarest and the second and third qualities were encountered in about the same quantity ('De radicaale beschrijving van Sumatra's Westkust door Ht. van Bazel', 13-4-1761, KITLV, H167; AV Sumatra's Westkust 1849, ANRI, SWK 125-9). The three qualities were called head, body and foot, and the same terms were applied to the three different qualities of camphor (of which the 'foot' (*kaki*) was also scraped off and mixed with woody parts). A division into three qualities was common for cassia, bird's nests, and perhaps also for other products (Müller and Horner 1855:23).

15 'Verslag over de gewezen bezittingen van de VOC op Westkust van Sumatra', [1828], ANRI, SWK 151-31; AV Palembang 1836-1838, ANRI, Palembang 62-4; CV Tapanuli 1866, ANRI, SWK 128-3; Schnepper (1923).

16 A Chinese man named Tsingh has left us a unique impression of the life of a trader in the Batak region ('Relaas van de Chinees Tsingh over zijn omzwervingen in Ankola', 3-2-1701, NA, VOC 1648, pp. 5-8). Malay traders bought up the benzoin ('Notitie van de aangebrachte goederen van Padang, Batavia', 31-12-1779, NA, VOC 3534, f. 1581).

17 CV Padangsche Bovenlanden 1863, ANRI, SWK 127-18.

18 'Memorie van Overgave voor Sumatra's Westkust van Abraham Patras', 18-1-1721, NA, Verenigde Oostindische Compagnie (VOC) 1946, p. 77; Charles Miller, 'An account of a journey to the Moosee Country', 1771, India Office Records, London (IOR), Sumatra Factory Records 14.

19 'Verslag over de gewezen bezittingen van de VOC op Westkust van Sumatra', [1828], ANRI, SWK 151-31.

20 JV Sumatra's Westkust 1819-1827, ANRI, SWK 125-3.

ernment ordered peasants to deliver all coffee, the predominant cash crop of the region, to the government. At a stroke, private wholesale coffee buyers went looking for other forms of commerce and discovered cassia. The oldest reference to the cultivation of cassia dates from 1849.[21] The appearance of cultivated cassia two years after the ban on the private coffee trade is significant, for it takes two years before a newly planted cassia tree can be harvested for the first time.[22] It might be a coincidence, but I interpret the timing as proof of the quick response to changing markets that characterized early modern Sumatran peasants (see also Table 4).

Most of the cassia continued to come from wild trees, and by 1861 Tanah Datar and the Danau area (also centres of coffee production) remained the only regions where the tree was cultivated. Cassia was planted in *ladang* fields (Van Hasselt 1882:315). In the disparaging words of a colonial official, these fields were not worth calling an 'orderly plantation' (*geregelde aanplant*).[23] When the price rose just a little, peasants began to pay more attention, and when in 1866 the price rose further, the division into three grades was also made more attentively.[24] From personal observation I know that the trend towards cultivation, individualization of ownership, and increase in cassia output has continued until today.

The cases of camphor, benzoin, and cassia are fascinating but somewhat atypical. Most non-timber forest products were exploited as common-pool resources that, according to the parable of the tragedy of the commons, must inevitably be overexploited (Hardin 1968). Policy analysts have recommended either a strong supervising state or privatization as the means to avoid eventual destruction of a common resource (Ostrom 1990:8-15). Privatization was successfully applied to the benzoin and cassia trees, but only when they were cultivated. Hardin's other solution, a supervising state, was found in the precolonial state, which imposed control on some forest resources.

The sultans of the east coast states either held a monopoly of several products or they enjoyed the liberty, as the sultan of Siak did, to buy ivory, rhinoceros horn, and bezoar for half the market price.[25] Apart from the economic advantage, the royal reason for maintaining the monopoly was no doubt political: to retain the privilege of the use of certain prestigious goods and to enhance the status of some goods used to reward followers. An

21 AV Sumatra's Westkust 1849, ANRI, SWK 125-9; AV Sumatra's Westkust 1850, ANRI, SWK 125-12.

22 CV Padangsche Bovenlanden 1863, ANRI, SWK 127-18.

23 CV Sumatra's Westkust 1863, ANRI, SWK 127-18a.

24 CV Padangsche Bovenlanden 1863, ANRI, SWK 127-18; CV Sumatra's Westkust 1866, ANRI, SWK 127-8. The region just east of the West Sumatran mountain valleys also began to produce cassia then.

25 PV Riau 1859, ANRI, Riau 58-2.

unsought side-effect was resource management. For instance, the inhabitants of Jambi did not actively try to get elephant's tusks. If they found a pair on a dead elephant, they had to hand it over to the sultan,[26] so that there was no incentive for people to hunt and collect these goods.

The royal monopoly was not maintained by policing the resources, but was supported by popular fear of supernatural royal power. The Dutch colonial government revoked the Palembang sultan's monopoly, and after they had deposed the last sultan they liberalized trade in ivory and ironwood. The case of ironwood reveals something of what might have happened with non-timber forest products. It took some years before indigenous inhabitants dared to use the axe on ironwood trees, but once they did, the precious timber was quickly exhausted in the most accessible spots. The colonial administration saw the risk and in 1845 imposed a decree prohibiting the felling of ironwood. The ghost, however, could not be put back into the bottle. The Dutch decree lacked the supernatural sanction of the sultan's rule and ironwood stands were increasingly depleted (Colombijn 1997:434). Unfortunately, I do not have the data to tell a similar story about the non-timber forest products protected under the sultan's privileges. Nevertheless, it is telling that ivory had never been important in VOC times nor in the early nineteenth century, when there was little trade in ivory, although it would be easy to obtain (Nahuijs 1827:81) and fetch a high price. But ivory was to be found in considerable quantity by the mid-nineteenth century.[27]

The ecological impact of colonial export taxes on non-timber forest products is hard to estimate. During the British interregnum, for example, the citizens of Padang complained that the taxes on camphor, bird's nests, and damar were exaggerated.[28] This may have reduced demand for these products, but also may have induced the inhabitants to exploit the resources more relentlessly.

Elinor Ostrom has made a strong argument that there is an alternative to the two recognized ways (privatization, and a controlling state) to prevent a tragedy of the commons from taking place. Ostrom proposes a third way: under favourable conditions people build institutions (sets of working rules) through which they manage resources collectively. Such institutions may operate in situations where resources are renewable and scarce, and where participants cannot invoke external parties to keep other participants in check (Ostrom 1990:26, 51). The forests of Sumatra constitute such a situa-

26 'Missive van onderkoopman Jacob Schouw over de inkoop van olifantstanden, Jambi', 1-1-1728, NA, VOC 2073, Jambi pp. 128-9.

27 AV Palembang 1851, ANRI, Palembang 63-3.

28 Letter from Coles to Parr, Padang, 24-12-1805, IOR, Sumatra Factory Records 108, p. 156.

tion. Long-lasting common-pool resource institutions, following Ostrom's model, are characterized by: clearly defined boundaries; appropriation rules adjusted to local circumstances; participation of appropriators in the occasional modification of rules; monitors of the fair distribution of the resource who are accountable to appropriators; graduated sanctions; conflict-resolution mechanisms; and appropriators' acknowledged right to organize themselves (Ostrom 1990:90-101).

It seems to me that as far as the historical evidence permits drawing any conclusions, most non-timber forest products in Sumatra were managed according to an Ostrom-type institution. The first systematic information on these rules dates from the 1870s.[29] Boundaries were clear: the whole forest was divided between villages (each consisting of several settlements), called *nagari* in West Sumatra, and *marga* in South Sumatra. Access to the resource was thus limited to a group with known members who also had certainty over future rights. The inhabitants, or, in Ostrom's terminology, the appropriators of the resources, did have a say in the change of rules. In West Sumatra the villages were led by a council of elders representing the families composing the population. At the southern fringe of West Sumatra and in South Sumatra the villages were led by one man (called *rajah* or *pasirah*), whose authority rested on the ability to reach consensus (and not on autocratic rule). Village leaders monitored the resources. People from the village who wanted to exploit forest resources had to inform the leaders, but the request could not be refused. Although village leaders usually had nothing to gain in material terms, their prestige was at stake. When outsiders wanted to exploit non-timber forest resources, they had to pay a gift, or a share of the harvest, such that there was an extra incentive for village leaders to monitor resources. For example, the first *kati* (0.6 kg) of camphor found was due to the local village head's having granted permission to look for camphor (De Vriese 1851:26). Ordinary appropriators too were inclined to monitor resources, because they all had equal rights to the resources and would suffer from free-riders. No supravillage institutions contested the right of villagers to organize themselves. Precolonial rulers did not overtly interfere with village affairs and the supravillage structure sometimes even broke down when the state collapsed (Colombijn 2003). I do not have data that lay an explicit link between common-pool resources and the existence of appropriation rules adjusted to local circumstances, graduated sanctions, and conflict-resolution mechanisms, but it seems more likely than not that these were in place. In short, the common-

[29] 'Rechten op onbebouwde gronden: afdelingen Ogan Ilir en Blidah, Komering Ilir', 1-10-1871, ANRI, Palembang 65-20; 'Rechten op onbebouwde gronden: afdeling Musi Ilir', 4-9-1871, ANRI, Palembang 65-20; 'Rechten op onbebouwde gronden: afdeling Lematang Ilir', 2-9-1871, ANRI, SWK 142-3; Van Hasselt 1882:302-5.

pool resource was certainly not an open-access resource.

The management of non-timber forest resources was helped by the fact that many resources were not scarce with available technology. An example will help to make the point. Somebody who discovered a damar tree added some distinctive marks to claim it and cut notches from which the resin would flow. He would return after a few months and in the meantime a spell functioned as supernatural sanction. If somebody robbed the damar, he would fall ill (Forbes 1885:136-7). This system worked well, because damar was found in many trees near villages, so why would somebody take the risk of breaking the spell?

Institution building takes time and can only be done by trial and error (Ostrom 1990). Villagers were not prepared when suddenly gutta-percha and India rubber became valuable products. Until then, the *balam* tree, which was the first species found able to provide gutta-percha, was always left in peace, because it was a preferred place to make the precious bees' nests. When gutta-percha became valuable the people knew no other method to collect the substance than to cut down the tree and make incisions all over the trunk and branches. Estimates how much gutta-percha comes from one tree are in the range of 0.02 to 0.1 *pikul* per tree.[30] Production peaked at 1,149 *pikul* in Jambi (1853), 1,654 *pikul* in Palembang (1855), and 4,350 *pikul* in West Sumatra (1864).[31] In West Sumatra between 44,000 and 217,000 trees were felled in 1864 alone! It is not surprising then that Van Hasselt (1882:311) remarks that gutta-percha production was much diminished because there were no trees left. However, the various species that produced gutta-percha were not completely extinct, because saplings got the chance to grow up when the parental tree left a gap in roof foliage.[32]

With the advent of colonial administration the conditions for successful institutions worsened. The pedantic and paternalistic attitude of the Dutch reduced appropriators' freedom to manoeuvre. The inclination to standardize and to adopt standard solutions throughout large administrative units reduced the leeway for adjusting rules to local circumstances. The authoritarian style of colonial administration strengthened the power of village heads and reduced appropriators' grip on the rules. Village heads were no longer

30 AV Sumatra's Westkust 1852, ANRI, SWK 126-6; *Mededeelingen* 1866:55, 69; Meijs 1851; Oxley 1847.

31 AV Palembang 1853, ANRI, Palembang 63-5; Bijlagen bij AV Palembang 1855, ANRI, Palembang 63-6; PV Sumatra's Westkust 1864, ANRI, SWK 123-1. A tribute to the market orientation of Sumatran peasants is the fact that these three top years in volume all followed on a top year for gutta-percha prices. The peak in Jambi followed on a price increase of 86% (from 1851 to 1852), Palembang's peak followed a price increase of 11%, and West Sumatra's peak followed on an increase of 45%. (Price increases based on Korthals Altes 1994:107-8.)

32 CV Bangka 1872, ANRI, Cultures 1644; *Mededeelingen* 1866:63.

accountable to villagers, but to the colonial overlord who could appoint and depose them. Finally, the creation of the *landraad* (a lower-order court of justice) introduced an external authority that could be used by one party to settle a local conflict.

Products that may have suffered from weakened institutional control were honey and beeswax. The honey was consumed locally and the beeswax sold to outsiders. Bees' nests are found in groups in certain trees, called *sialang*. These trees are private property and their ownership was carefully guarded. If somebody was allowed to open a new patch of forest land, extant *sialang* were excluded and arrangements concerning the exploitation of known nests were made in the presence of the village head as witness. Someone who discovered a new *sialang* in the forest marked his ownership by clearing the ground around the tree and cutting distinctive signs in the bark. He would return later to collect the beeswax and honey.[33]

This system collapsed in the 1860s. To understand this, it is important to know how the honey and beeswax were collected. The act of gathering destroyed the resource, because the nests were cut from the tree. A *sialang* could be harvested only once.[34] Swarms produced three new generations of bees in January, February, and March (and sometimes an additional one in August). After the first generation the yield was 0.5 *kati* of beeswax per nest, after the second 0.75, and after the last 1.0 *kati*. To maximalize the resource, it was obviously best to wait until the last generation had left the nest. In the 1860s however, appropriators no longer felt secure of their ownership and harvested a *sialang* as soon as it was found, afraid that somebody else would take the beeswax. Harvesting early not only reduced the yield, but what was worse, it also killed the young generations of bees, so that in the course of years the regenerated volume declined. This happened for example in Way Berogah, Lampung, where the yield diminished from 40 to 4 *pikul* per year (Van Cattenburgh 1864).

Conclusion

In this article I have brought together the most important data on the sustainability of non-timber forest products in central Sumatra between 1600 and 1870. The quantitative data are interesting because they cover an unusually

[33] For details on the collection of beeswax, see AV Palembang 1836-1838, ANRI, Palembang 62-4; CV Bangka 1856, ANRI, Cultures 1644; Van Hasselt 1882:308-11.

[34] A curious detail is that it is not so much the man who climbs into the tree who runs the greatest risk, but the man who is waiting at the foot to receive the nests lowered to the ground, because tigers like honey and can be encountered near the *sialang*.

long period of time, even though the quality of the data does not permit any firm conclusions. It looks as if almost all the products were exploited in a sustainable way and that production significantly increased in the nineteenth century (when there was a bigger market for these products, better transportation, and perhaps it was less risky for collectors to leave the safety of the villages). Exceptions were the supply of dragon's blood, which for unknown reasons slowly dried up, and gutta-percha and India rubber, which went through a boom-and-bust cycle.

Non-timber forest products formed a diverse group and various factors may explain why production was sustainable in some cases and not in others. It seems things had changed for the worse by 1870, the end of the period under scrutiny, even though this had not yet become apparent in the export figures.

Speedy natural regeneration made it easier to sustain exploitation of these resources. Benzoin and cassia were two products that were domesticated. Thinking of the Bukit Kayumanis, which was bereft of cassia trees, it is possible that these products were becoming scarce, and that people therefore began to cultivate them. More important as a factor for their successful domestication seems, however, to be the fact that they became productive rapidly: within two to seven years after being planted. Cultivation ensured their sustained production.

An even geographical distribution of a resource made extinction of that resource unlikely. Rattan and damar were products that both came from a range of tree species, all of which reproduced relatively quickly. Even if one species became locally extinct, another species could produce the desired product. Bezoar stones, by contrast, were found with a very low frequency, which also contributed to sustainable production. The chance that a lemur or porcupine contained a bezoar stone was too small to make it worthwhile to collect the precious good systematically. The problems surrounding the transportation of heavy timber actually gave some protection to valuable tree species in that they were simply not felled. However, transportation was less of a problem for non-timber forest products because of their high value per unit of weight.

The stable Chinese market for forest medicines and odoriferous products contributed to their continued exploitation. Over the years collectors had time to work out common-pool resource management systems and knew roughly how much they could expect to sell. The sudden demand for an industrial product like gutta-percha and India rubber, by contrast, had a disastrous effect. The sultan's monopolies on certain goods tended to preserve them, but after the initial introduction of liberal policies, the colonial state lacked the will or the authority to regulate and restrict the overexploitation

of gutta-percha and India rubber (and ironwood).

The mode of collection could either promote or impede sustainable production. The collection of benzoin and damar did not kill off the resource. The collection of camphor wasted a huge number of trees that actually did not contain the substance, but because only old trees were felled, production was sustained. Selective felling even provided for the intermediate disturbance that prevents the emergence of a climax vegetation and promotes forest biodiversity. The collection of gutta-percha, India rubber, and beeswax could potentially kill the resource, so that sustainability was dependent on an effective resource-management institution.

Elinor Ostrom (1990) has given the conditions for a successful common-pool resource management system. The precolonial villages of Sumatra seem to meet these conditions, as far as the available evidence permits drawing such a conclusion. When the colonial state began to interfere in village life, appropriators were no longer free to arrange their own affairs, and monitors (village heads) were no longer responsible to appropriators but to the state. It is perhaps no coincidence that swarms of beeswax collectors rushed at bees' nests, so that the previous system of dividing *sialang* broke down, after colonial rule began to make an impact. The last example suggests that the ecological sustainability of non-timber forest production under modern conditions of a meddlesome state today is unlikely.

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From forest realm to cultural landscape

Economic development, forest loss, and conservation in Peninsular Malaysia, circa 1850-2000

Tropical rainforest is the characteristic natural vegetation of Peninsular Malaysia. A long-term perspective on the human interaction with the region's forests reveals many centuries of very slow anthropogenic forest change; a quickening of the process in the nineteenth century following the imposition of British rule and the adoption of resource-oriented development policies; and a great acceleration of the pace, scale, and intensity of change in recent decades. As late as the mid-1850s, some 95% of the region's land area was still under forest (Brookfield, Potter and Byron 1995:23). Today, virtually all of the species-rich lowland forests are gone, the remaining forests cover less than half of the land area, and the greater part of the region has been transformed into an extensive mosaic of cultural landscapes. How has this remarkable transition come about, and what have been some of its more important ecological consequences?

This article looks at selected aspects of human interaction with the forests of Peninsular Malaysia during the period circa 1850-2000. Specifically, it 1. outlines changes in the political economy of forest exploitation; 2. describes some of the ecological consequences of deforestation and forest degradation; and 3. looks at attempts to conserve and protect the forests and their wildlife. It is shown that two phases of rapid economic development – the rubber boom during the first three decades of the twentieth century, and land development (accompanied by logging) from the late 1950s to about 1990 – eliminated virtually all of the region's lowland forests; that the consequences of rapid forest removal include soil erosion, stream sedimentation, and declining biodiversity; and that conservation efforts, including the creation of protected areas (parks and reserves), have been inadequate to protect habitat and species diversity.

Setting the scene

Malaysia is a federation of thirteen states.[1] Formed in 1963, it comprises the eleven states of Peninsular Malaysia (formerly the Federation of Malaya, which became an independent country in 1957) and the two Borneo states of Sabah and Sarawak (East Malaysia). Singapore was part of the Federation until 1965, when it became an independent republic. This article focuses solely on Peninsular Malaysia (hereafter simply 'the Peninsula').

Malaysia is a constitutional monarchy, with the Agong (king) as paramount ruler. The Agong serves a five-year term and is elected by and from the hereditary state rulers. Malaysia has a two-chamber parliament consisting of an elected House of Representatives or Dewan Rakyat and an unelected Senate or Dewan Negara. Federal and state powers are set out in the Constitution in three lists: the Federal List, the State List, and the Concurrent List, the last stipulating subjects on which both the federal government and the state governments may legislate. Land, forests, agriculture, and onshore minerals are on the State List, a matter that has considerable significance for resource exploitation and conservation. The states have elected state assemblies and chief ministers. Very considerable powers are 'vested in the chief ministers, who head the states' Executive Councils. These function as state-level cabinets and have particular authority over natural resources, especially land and timber' (Vincent et al. 1997:8).

Malaysia's economy has grown rapidly in recent decades; within Southeast Asia, only Singapore has enjoyed faster growth. Since the 1970s, when the country was still heavily dependent on the export of tin, rubber, timber, and other primary commodities, its economy has been radically transformed by the rapid growth of export-oriented manufacturing, which emerged as the leading sector of the economy in the early 1980s (Taylor and Ward 1994; Airriess 2000:357-62). Featuring mainly electronic, electrical, and textile goods, industrial production has propelled Malaysia 'from being merely a high-growth economy to becoming one of the world's most outstanding economic performers' (Brookfield 1994a:v). During 1991-1995, the economy grew at 8.7% per annum, with manufacturing, which grew at an impressive 13.3% per annum, providing the main stimulus for growth; by comparison, the agricultural sector grew at only 2.0% per annum during the same period (Government of Malaysia 1996:140-3). The base of the manufacturing sector, however, remains rather narrow, and the industries themselves are largely confined to three areas of the country, all of them on the west coast of the Peninsula: Pulau Pinang, the Klang Valley conurbation, and Johor Bahru.

[1] There are also two federal territories: Kuala Lumpur, the national capital, annexed from Selangor in 1974, and Labuan, annexed from Sabah in 1984.

Although the economy was adversely affected by the 1997-1998 currency crisis, it soon rebounded, and by 2000 it had 'reverted to the growth rate of the pre-crisis level' (Government of Malaysia 2001:3). Malaysia aims to achieve the status of a fully industrialized country by the year 2020.

The Peninsula is the most populous and developed part of Malaysia. In 2000, close to 80% of the country's total population of more than 22 million lived there. Like Malaysia itself, the Peninsula is divided into two rather contrasting parts: a highly developed western lowland region and a less developed eastern region. With more than half of the nation's total population, as well as the great majority of its towns, cities, and modern industries, the western lowland 'corridor' forms the heartland of Malaysia. Extensively and comprehensively transformed from a forest realm to a cultural landscape, virtually all of the region's forests are gone. The eastern Peninsula is less developed, largely rural, and more sparsely populated. Since the early 1970s, however, much of this region has been transformed by land development schemes, logging, and other forms of primary production, with the result that it has, in its capacity as a 'resource frontier', been incorporated into the national economy. Here, as in the western lowlands, only a few remnants of the original forest cover still remain. In short, most of the Peninsula's lowland forests have been excised.

The Peninsula's characteristic natural vegetation is tropical rainforest. Situated within the perhumid tropics of Southeast Asia, its forests belong to the Indo-Malayan rainforest block of the Asiatic tropics, which is centred on the Malay Archipelago, the region known to botanists as Malesia. In western Malesia, where the Peninsula is located, most of the forests are dominated by timber-rich species of the tree family Dipterocarpaceae. According to T.C. Whitmore (1988:21), there 'are no other forests anywhere in the world which have so many genera and species of a single tree family growing together in the same place'.

Numerous forest types (called 'forest formations') are represented in the Peninsula. They can be differentiated on the basis of their particular structure and physiognomy and grouped according to the habitats they occupy, a basic distinction being between dryland and wetland sites or habitats. Below an elevation of about 750 metres there are species-rich lowland and hill dipterocarp-dominated forests in dryland areas and mangrove, peat-swamp, and freshwater-swamp forests in wetland areas. Lower montane and upper montane forests occur above elevations of about 750 metres and 1,500 metres, respectively. Whitmore (1984a, 1984b, 1988) has classified the formations and described them in considerable detail.

The flora of Malesia is believed to include at least 25,000 species of flowering plants, of which about 8,000 are represented in the Peninsula; some 2,650 of the latter number are trees, many of them local endemics – that is, species

of very limited range (Ng and Low 1982; Whitmore 1998:32-3). Among the typically forest-dwelling fauna of the Peninsula are 203 species of mammals (with bats making up about half the total), some 460 resident bird species, and a butterfly fauna totalling 1,014 species. The mammals include ten primate species, as well as the large and rather spectacular elephant, tiger, tapir, seladang (or Malayan gaur), and the rare two-horned Sumatran rhinoceros. In short, tropical nature in the Peninsula is rich and diverse (Cranbrook 1988). Most of this natural wealth, it should be noted, is heavily concentrated in the dipterocarp-dominated forests of the lowlands. As already intimated, however, it is precisely these forests that have borne the brunt of human activities.

All forests are dynamic and those of the Peninsula are no exception; like forests elsewhere, their 'species mix is constantly fluctuating between gaps, building phases and maturer blocks of trees' (Stott: 1999:38; see Whitmore 1998:25-9). Although change is the norm, stability illusory, notions of 'balance' and 'harmony' still largely guide environmental management. What are needed instead are land-use models, zoning regulations, risk-management strategies, and other procedures that are sufficiently flexible to accommodate and adjust to change (Stott 1997, 1998).

Forest exploitation: the colonial period

Although forests clothed about 95% of the Peninsula until well into the nineteenth century, it would be a mistake to assume that they were 'virgin' or 'pristine' forests. On the contrary, thousands of years of human agency on the part of the aboriginal Orang Asli, whose activities included hunting and gathering of forest products for subsistence and trade, shifting cultivation, and widespread planting of fruit trees, had altered their genetic composition (Dunn 1975; Rambo 1979a, 1979b). It should also be kept in mind that Malay farmers had cleared areas of forest before the impact of colonialism got under way. In parts of Kedah and Province Wellesley, for example, there were extensive clearings devoted to wet-rice cultivation that had been won at the expense of the forests (Aiken et al. 1982:102-5). Virtually everywhere else, however, the forest realm remained intact. It was the force of advancing colonialism, the many consequences of which included a steeply rising demand for and a growing investment in the production of a rather narrow range of primary commodities, that ushered in a period of increasingly rapid forest change.

The pace of forest change began to pick up speed in the late eighteenth century, when the British arrived on the scene. Until the 1870s, however, they largely confined their interests to the Straits Settlements (Pulau Pinang,

Malacca, and Singapore, which were acquired between 1786 and 1824), where a variety of crops, among them cloves, nutmeg, and pepper, were grown for export. More interested in fostering the China trade than they were in acquiring territory, the British remained largely aloof from the affairs of the neighbouring Malay states, which remained largely *terra incognita* to most Europeans until well into the nineteenth century. On the other hand, the British presence in the Straits acted as an economic magnet to a growing influx of mainly Chinese immigrants, many of whom quickly gravitated to the lowlands in the western Malay states. It was Chinese settlers who initiated the first substantial impact on the Peninsula's forests.

The activities of the Chinese in the Malay states included tin mining and shifting plantation cultivation of mainly pepper, gambier, and tapioca. Both were environmentally destructive: mining devastated parts of Selangor and Perak, leaving behind denuded and eroded hills and sediment-clogged streams and rivers; and the cultivation of commercial crops produced eroded soils and abandoned lands that were colonized by tough grasses or dense scrub (Aiken et al. 1982:105-16; Aiken and Leigh 1992:51-4).

Britain adopted a new 'forward policy' in the early 1870s, and between 1874 and 1914 colonial rule was extended over the entire Peninsula.[2] The British forward movement paved the way for economic development. After about 1880 the colonial government began to establish the framework for a profitable export economy based on tin and plantation agriculture, its central goal being to erect an economic edifice in which private enterprise could flourish. Success was achieved by implementing several institutional and administrative arrangements to support resource-based enterprises: the Torrens systems of land tenure (imported from Australia) was adopted, thereby providing undisputed title to land, as well as creating a land market; permanent reserved forests were established, in part to supply fuelwood to the mining industry; the export duty on tin was ploughed back into building railways, roads, and other infrastructure; cheap labour, most of it from India and China, was made available to planters and miners; generous loans were extended to pioneer planters; and experimental agricultural stations were established (Chai 1964). These various measures were rewarded 'by a vast infusion of European capital, enterprise and management skills without which the economic development of Malaya in the twentieth century would not have occurred' (Andaya and Andaya 1982:209).

[2] London's fear that another power, particularly Germany, would intrude into the region probably prompted this departure. Economic considerations, however, also played a role, because violence and chaos in the tin-mining areas threatened to spill over into the Straits Settlements; the quickening pace of industrialization at home whetted appetites for raw materials and foreign markets; and the opening of the Suez Canal in 1869 proved a boon to British business interests in Southeast Asia.

Photograph 1. Four-year-old rubber trees, Carey Island, Selangor, circa 1910. Note the general absence of ground cover. So-called 'clean weeding' on early rubber plantations often resulted in high rates of erosion. The practice was eventually phased out. (Wright and Reid 1912: facing page 290.)

By 1900, the Peninsula's mines were the largest producers of tin in the world. Plantation agriculture, on the other hand, had not fared nearly so well. Numerous commercial crops were grown in the western lowlands during the nineteenth century, but none achieved widespread or lasting success (Jackson 1968). All that changed following the introduction of rubber (*Hevea brasiliensis*), which was widely adopted after about 1900 (Photograph 1).

Cultivation of the new boom crop spread like wildfire along lines of communication that had been developed to service the tin mines, and subsequently into other areas as they were opened up. First grown on estates and then increasingly by smallholders after about 1910, the area devoted to rubber increased from about 2,400 ha in 1900 to some 0.9 million ha in 1921 (Barlow 1978:26; see also Drabble 1973:215), when more than three-fifths of the total agricultural area on the Peninsula was under this one crop. Although the main phase of expansion was over by the early 1920s, the area devoted to the crop continued to increase, reaching about 1.4 million ha in 1940, when rub-

ber trees covered close to 11% of the entire area of the Peninsula. Following the Japanese occupation of the region in late 1941, planting and production of rubber ground to a halt.

Following an initial stage when it was intercropped with coffee or grown on annual-crop lands recently abandoned by Chinese commercial farmers, rubber cultivation spread at the expense of the rainforest, which was often recklessly swept away in the frenzied rush to bring more land into production. Already by the 1920s, voices of concern were being raised over the deleterious impact of forest loss on a steadily growing list of birds and mammals (Aiken 1991-92:2).

During the colonial period, a Forest Department for the Straits Settlements and the Federated Malay States was established in 1901, scientific procedures for sustained-yield forest management were introduced, forest-related legislation was passed, and forests were reserved to maintain an adequate supply of timber (mainly for railway sleepers and for use as firewood in the tin mines) and to protect steepland areas from erosion (Kumar 1986:65-9; Flint and Richards 1992:95-8; Kathirithamby-Wells 2000:21-7). As in most other colonial states, scientific forest management provided both the motives for and the means of 'claiming territory and expanding the state's jurisdiction, as well as providing revenue, exports, and raw materials for other economic activities and infrastructure' (Peluso and Vandergeest 2001:768; see also Bryant 1996:176-7; Dauvergne 2001:34-40). Colonial forestry practice privileged expert scientific and technical knowledge over indigenous knowledge, timber over non-timber forest products, and forest-industry development over forestry for community development and the well-being of forest dwellers (Cooke 1999:34-5, 48, 207).

Forest reservation continued apace during the interwar years, and by 1937 some 27,000 km^2 of forest (roughly equivalent to 20% of the Peninsula's entire land area) had been set aside as productive and protective forest reserves, the former comprising about two-thirds of their total extent. Mostly confined to upland areas, the protective reserves were mainly intended to prevent soil erosion (Troup 1940:382; Rahman-Ali 1968). Timber cutting in the productive forests was still not mechanized, and its impact on soil erosion and wildlife was probably not very great (see below).

Although much of the western lowlands had been transformed into an extensive humanized landscape by the 1920s, approximately 80% of the Peninsula 'was still under forest of some kind or another' in 1935 (Troup 1940:380), and in 1958, a year after the Federation of Malaya became an independent state, about 74% of the region's total land area remained forested (Wyatt-Smith 1958:40). Much has changed since then.

Forest exploitation: the post-colonial period

The pace of deforestation picked up speed in the post-colonial period, and extensive areas of the remaining forest cover were fragmented and variously degraded. Estimates suggest that the area under forest decreased from about 68% of the total land area in 1966 to under 47% in 1992, and then to about 44% in 1997, a drop of some 24% over the 30-year period (Bernard and De Koninck 1997:2; Vincent et al. 1997:115; Tuck 1999:10). Meanwhile, the region's rich stocks of timber were largely depleted.

Two processes mainly account for what has amounted to a frontal assault on the Peninsula's forests in recent decades: government-directed land development for tree-crop agriculture, and logging.[3] Land development was the major cause of deforestation, and by about 1990, when the process virtually ceased, it had eliminated almost all of the remaining species-rich lowland forests. Logging proceeded on two fronts: on forest lands alienated for conversion to agriculture, and in permanent forests.[4] A pell-mell pace of over-harvesting was frequently the order of the day.

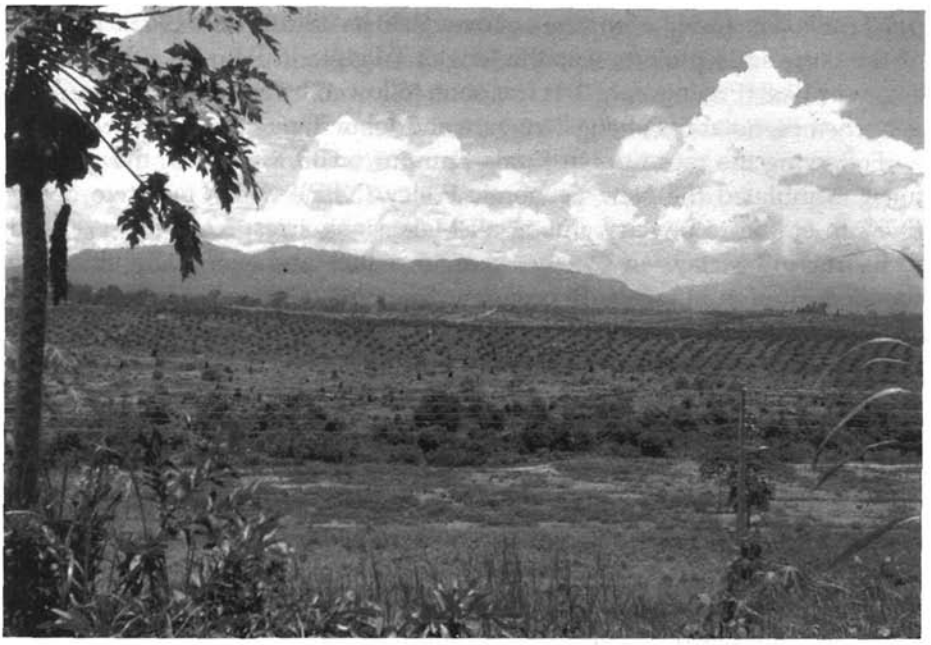
It is important at this juncture to recall that the constituent states of the federation have jurisdiction over lands and forests. Consequently it is within their purview, for example, to alienate land for development purposes, to gazette (or de-gazette) forest reserves, to grant timber concessions and issue logging licences, and to levy royalties on the volume of extracted timber. Cutting to the nub of the matter, it has been observed that state governments 'were responsible, in an administrative sense, for the rapid deforestation and timber depletion, as they had authority over land alienation and the granting of timber concessions'.[5]

Land development in Malaysia has been motivated by a combination of social, economic, and political factors. Most, though certainly not all, of the rural poor are Malays, and since the mid-1950s, the governing Malay elite has stressed the importance of improving the socio-economic well-being of

3 These are certainly the main processes; others include urban growth and expansion of the road network. I find little or no evidence to suggest that population growth or the cultivation of annual crops, including paddy rice, have contributed significantly to deforestation in recent decades (Airriess 2000:356-7).

4 Logged conversion forest is eventually cleared and replaced by permanent agriculture or some other land use. The result is deforestation. A selective logging system is employed to extract timber from permanent (production) forest. Although only the commercially merchantable timber is selected for felling, selective logging normally leaves behind extensive areas of damaged residual forest. The result is forest degradation, not deforestation.

5 Vincent et al. 1997:141. Although the autonomy of states is 'borne out by the fact that land (and the forests on them) are state responsibilities [...] decision-making processes in Malaysia show a tendency towards increasing centralization [...]. The centre exercises leverage over states via its financial powers, especially control over development funds' (Cooke 1999:79).



Photograph 2. Recently established oil-palm plantation at Sungai Tekam, Jengka Triangle, Pahang, 1973. Vast areas of species-rich lowland tropical rainforest have been replaced by uniform, serried rows of oil palms. Malaysia is the world's largest producer of palm oil. Photograph by Colin H. Leigh.

the landless and the unemployed. With this goal in mind, the Federal Land Development Authority (FELDA) was created in 1956. Now one of the largest agro-industrial corporations in the world, FELDA is at one and the same time a profitable plantation company and an agent of poverty relief and modernization. It has been suggested that these two roles are inherently conflicting (Mehmet 1986:63). FELDA is charged with opening up new agricultural areas, bringing in settlers, and supervising the transformation of undeveloped land into settlement schemes devoted to the production of mainly rubber and oil palm for export. The Authority's various activities and its changing approaches to land development have been described in detail elsewhere.[6]

Prior to the mid-1960s, most FELDA schemes were relatively small, averaging about 1,620 ha and accommodating some 400 settler families. Beginning in the late 1960s, however, development policies called for very much larger

6 Tunkul Shamsul Bahrin and Perera 1977; Aiken et al. 1982:130-51; Tunkul Shamsul Bahrin 1988; Tunkul Shamsul Bahrin and Lee Boon Thong 1988.

integrated regional development projects because 'scale economies for oil palm mills demanded a crop area of over 8000 ha' (Sutton 1989:343). The first of the large-scale projects was the Jengka Triangle in Pahang, where work began in 1968 (Photograph 2). It was soon followed by a number of even bigger schemes, notably Pahang Tenggara and Johor Tenggara.

Following the race riots in Kuala Lumpur on 13 May 1969, the government formulated the New Economic Policy (NEP), which had two objectives: to eradicate poverty among all Malaysians, irrespective of race; and to restructure Malaysian society 'so as to reduce and eventually eliminate the identification of race with economic function' (Government of Malaysia 1971:1). The NEP's emphasis on poverty alleviation stimulated further land development and led to a proliferation of new federal agencies entrusted with the task of promoting the rural economy. In addition, state governments adopted a more active role in agricultural land development.

Led mainly by FELDA but also involving the participation of various other federal as well as state agencies, the pace of land development in the Peninsula increased rapidly 'from about 80 square kilometres per year in the early 1960s to over 350 square kilometres per year in the late 1970s' (Brookfield 1994b:63). By 1987, the area of cropland developed by FELDA alone had increased to over 6,600 square kilometres, of which some two-thirds was devoted to oil palm (Sutton 1989:342; Vincent and Yusuf Hadi 1991:14-6). In addition, extensive areas 'were cleared and developed by other national agencies, state bodies and the Regional Development Authorities, often in "joint ventures" with their own settlers, so that between 1971 and 1990 a total of over 15,025 square kilometres [including a small area in East Malaysia] had been developed by the state or with its active participation' (Brookfield 1994c:83-4). Virtually all of this development of the 'resource frontier' occurred at the expense of the forests of the central and eastern lowlands. In large and hitherto heavily forested Pahang, for example, forest cover declined from around 83% of the state's land area in 1972 to just over 60% in 1992; and in the Peninsula as a whole, change in forest cover – from 64% of the total land area in 1972 to 53% in 1982, dropping to under 47% in 1992 – very largely mirrored the rapid pace of land development (Bernard and De Koninck 1997:2-4). Not since the great rubber boom of the earlier part of the century had so much forest been swept away in so short a time.

Quite unexpectedly, however, the pace of new land development – and hence of deforestation – began to slow down after about 1985, eventually stalling almost completely by about 1990. There is space for only a brief explanation. After about 1970, urbanization and industrialization created numerous better-paying jobs than those available in agriculture. Largely as a result, the proportion of the labour force engaged in agriculture dropped sharply, the rural labour market tightened, agricultural returns fell, and

increasingly FELDA schemes failed to recruit settlers. Among other factors that placed a brake on land development were slumping commodity prices in the mid-1980s and increasing costs of land preparation (Brookfield 1994b:90-4; Vincent et al. 1997:121-4, 173-5, 352-4). With the exception of projects already underway, it was announced in the Sixth Malaysia Plan 1991-1995, 'no new additional land will be developed by FELDA' (Government of Malaysia 1991:117, 1996:237-9, 252-4). In future, the main thrust of public-sector involvement in agriculture, the plan declared, would be on *in situ* development programmes in established rural areas.

The abrupt cessation of virtually all new land development apparently signalled the closing of the agricultural frontier and the beginning of the end of deforestation in the Peninsula. If, as now appears to be the case, the region's forest area has indeed been stabilized by economic development, this 'would be a remarkable achievement, given that its deforestation rate in the late 1970s was so much higher than the average for Asia' (Vincent and Yusuf Hadi 1991:30-1; Vincent et al. 1997:124). There has, however, been no comparable slowdown in the logging and depletion of timber.

The Peninsula possesses forests of great commercial value, none more so than the dipterocarp-dominated, timber-rich forests of the lowlands and hills.[7] Prior to the 1950s, most timber was cut for local use, timber exports were of minor significance, and various non-timber forest products continued to be prized. Axes and handsaws were the main harvesting tools, and power was supplied by humans and animals. Soils and vegetation generally suffered little damage (Wyatt-Smith 1987:12). After World War II, however, the logging industry was transformed by the introduction of mechanized equipment, including the one-man chain saw and the winch lorry. The trend was for equipment to become heavier and more powerful – and a lot more environmentally destructive.

Stimulated largely by rising demand in Japan, log production for export increased rapidly after about 1960. The local market also expanded and the domestic processing industry, especially saw milling, grew apace. Logging and land development went hand in hand because land, as already noted, is a state matter, and the governments of the states 'will only vest land rights in FELDA and other agencies after all economic minerals and timber have been extracted' (Brookfield 1994c:86). Most logging in forests earmarked for agriculture proceeded in a helter-skelter fashion, causing much environmental damage. Increasingly from the 1960s, as more and more of the lowland

7 Dipterocarp forests 'have special attractions for the logging industry. The harvest intensity of commercial timber is much higher than in other tropical rainforests [...]. In addition, dipterocarps have the unique, commercially useful attribute that they can be grouped for sale into just a few end-use classes [...] and this suits the users' (Whitmore 1998:204).

forests were converted to agriculture, selective logging moved progressively further into the hill-dipterocarp forests, although no adequate silvicultural system for the management of these forests had been devised.[8]

The (federal) Forestry Department prescribed annual allowable coupes but had no power to compel the states to adhere to them, because the enforcement of forestry rules and regulations is a state prerogative.[9] Timber fees are an important source of revenue for timber-rich states like Pahang, Kelantan, and Trengganu, and during the 1970s and 1980s, substantial overharvesting was allowed to occur: in 1972, for example, the harvesting rate 'was about five times above the annual allowable cut' (Kumar 1986:77). In addition, it is known that states permitted conversion fellings when in fact no land development was intended (Cooke 1999:78). Specific factors that appear to account for the excessive levels of harvesting include low rates of rent capture by state treasuries (implying that enormous windfall profits were 'siphoned off' by other parties involved in the concession system) and insecure tenure of concessions resulting from short and uncertain concession contracts (Vincent et al. 1997:129-30; Cooke 1999:117-8). Patronage and corruption appear to have played important roles in timber depletion (Kumar 1986:84-7; Cooke 1994, 1999:96-108, 119-34).

Government policies contributed to timber depletion. Beginning in 1972, log export restrictions increasingly came into force, and much attention was given to the promotion of 'integrated timber complexes' focusing mainly on saw-milling. The main purpose of these policies was to build up the domestic wood-based industry (Gillis 1988:159-60; Vincent and Binkley 1992:102-5; Vincent et al. 1997:133-41). Log prices were kept artificially low, the number of mills increased greatly, and sawn timber 'replaced sawlogs as the principal timber export of the Peninsula; by 1987 Peninsular Malaysia supplied 31% of all sawn tropical timber entering world trade' (Brookfield 1994c:98; see also Brookfield and Byron 1990). Plywood exports also increased substantially after 1972. As the rapid growth of the wood-processing industry continued, log production in forest reserves and stateland forest mounted sharply, further depleting timber stocks. Before the end of the 1980s, supply was inadequate to meet domestic needs and the industry faced a severe shortage of timber.

The mounting assault on the forests drew attention to the need for a

[8] Vincent et al. 1997:107. Logging on steep slopes was made possible by technological innovations such as the crawler tractor and high-lead winching. Soil erosion is a major problem.

[9] The states are empowered to formulate independent forest policies. The federal Forest Department provides advice, training, and technical assistance to and coordinates and supervises the activities of the Peninsula's state forestry departments. Senior forestry officers in the states of Peninsular Malaysia 'are federal officers in state government employ but the forestry agencies they work in are state government bureaucracies' (Cooke 1994:425; see also Gillis 1988:119; Cooke 1999:124-5).

Peninsula-wide policy that would establish a truly permanent forest estate (PFE). The Forestry Department had long pressed the federal government to adopt such a strategy (see Salleh Mohd Nor and Lim Hin Fui 1996:84-9), but it was not until 1978 (by which time most of the lowland forests were gone) that an agreement was reached between the central government and the states on a National Forestry Policy (NFP) for Peninsular Malaysia. Coordinated by the National Forestry Council and endorsed by the National Land Council, the NFP provided for a PFE consisting of Protective, Productive, and Amenity forests.[10] The federal government considered it desirable to incorporate the new policy in legislation, and eventually the National Forestry Act was proclaimed in 1984 (Aiken and Leigh 1992:72-3, 150-1). By 1987, the Act 'had been gazetted as a state law, a requirement for it to come into force [...] by all states in the Peninsula except Perlis, which followed suit soon thereafter' (Vincent et al. 1997:120). As of about 1997, the PFE's extent was about 4.7 million ha, of which some 60% was classified as productive forest and the remainder as protective forest (Tuck 1999:10). It should be noted, however, that the so-called PFE lacks security of tenure, because under the National Forestry Act states retained unilateral authority to excise land from the PFE for development purposes.

The NFP was revised in 1992.[11] Reflecting the then growing interest in sustainable development, there was a shift from the earlier rather narrow emphasis on sustained-yield production of timber to a broader focus on sustainable management of forests for multiple purposes, including not only timber but also tourism and recreation, agro-forestry, plantation development, production of non-timber forest products, and conservation of biodiversity (Salleh Mohd Nor and Lim Hin Fui 1996:94-6; Cooke 1999:71-2).

In about 1997, approximately 5.8 million ha, or about 44% of the Peninsula's land area, remained under forest, with the PFE (4.7 million ha) comprising close to 81% of all forest cover, most of it hill forest. For the most part, however, these rather bald statistics tend to disguise much more than they reveal because, among other things,

i. virtually all of the species-rich lowland forests are gone, those of the eastern Peninsula having been excised in little more than two decades;
ii. most of the remaining hill forests have been variously degraded and fragmented by the twin processes of logging and road construction (see Brown, Iverson and Lugo 1994:125, 134-5);
iii. even the still largely intact forests in mountainous areas are increasingly

10 Amenity forests are mainly for recreation and tourism.

11 In addition to what are referred to as Protection, Production, and Amenity forests, the revised policy called for the PFE to include Research and Education forest.

threatened by road building and the development of hill stations (upland resorts);

iv although lowland and hill forests in dryland areas have borne the brunt of human activities, other forest formations have also been substantially modified or transformed: for example, freshwater-swamp forests have been cleared for paddy cultivation, and mangrove forests have been 'reclaimed' for building sites and agricultural land, converted to pond aquaculture, and used for woodchip production (Aiken and Leigh 1992:86-7; Richards and Flint 1994:38); and

v. the parks and reserves that form part of the remaining forest cover comprise only some 6% of the total land area of the Peninsula (Aiken 1994).

Environmental consequences of forest loss

Malaysia, especially the Peninsula, is an economic success story and the envy of many of her neighbours. Thanks to rapid economic development, a good deal of poverty has been reduced or eradicated and the growing middle class enjoys considerable prosperity. The gains are real, the achievement impressive.[12]

Although urbanization and industrialization are now the major drivers of socio-economic change in the Peninsula, the exploitation of natural resources – land, forests, minerals – has fuelled much of the region's economic success. Particularly in recent decades, however, the rapid, often rampant pace of resource exploitation has all too often caused severe environmental damage, much of it a direct consequence of the two processes discussed above, namely, deforestation for land development and overlogging, although increasingly the effects of road construction and the growth of urban areas bite ever deeper into the remaining forests. In short, there has been a steep environmental price to pay for economic success. I take a look at selected aspects of the damage, focusing mainly on hydrological and erosional change in rural areas and on loss of biodiversity.[13]

The dense canopy of intact tropical rainforest intercepts much of the rainfall, and the 'available information indicates that rates of soil erosion and transportation are generally relatively low in rainforested areas in Malaysia' (Douglas 1999:1727). Processes that replace or significantly alter the rainforest cover, however, result in changes to hydrological and denudational

12 While this is generally true, much rural poverty persists in the eastern part of the Peninsula, especially in Kelantan and Trengganu (King and Parnwell 1990; Government of Malaysia 1996:137, 150).

13 Urban-based environmental problems are not discussed here; see Sham Sani 1993.

regimes (Bruijnzeel 1990; Douglas et al. 1993:247-9). Where rainfall interception has been substantially reduced, which is generally the case under rubber, oil palm, and other land uses that have replaced the forest, raindrop impact is greatly enhanced and the rate of erosion increases. Rates of erosion vary considerably, however, depending on type of soil, ground cover, slope, and the quality of resource management, among other factors.

Exceptionally high rates of soil erosion resulted from tin mining in the latter half of the nineteenth century, and even today, watercourses in mining areas still carry considerable loads of sediment, in large part because little attention has been given to rehabilitating old worked-out mining land. The practice of 'clean weeding' on early rubber estates also resulted in high rates of erosion, especially on steep slopes (see Photograph 1). Sediment caused siltation of watercourses, leading to periodic flooding, and some downstream paddy lands were overspread with sand and silt, resulting in their abandonment (Aiken et al. 1982:122). Clean weeding also reduced the productivity of rubber trees, and the practice was eventually phased out after the mid-1920s (Barlow 1978:148-50). On private rubber and oil-palm estates and on government-sponsored land development schemes, cover crops are now universally planted and steep slopes are invariably terraced. Nevertheless, rates of soil loss from these areas are almost certainly higher than they are from rainforested slopes (Aiken et al. 1982:175).

Catchment studies conducted at Sungai Tekam in Pahang demonstrated that land clearance for agriculture leads to increases in water yield following forest removal. Both total annual water yield and storm run-off were shown to increase. Clearfelling followed by replacement of the forest cover with oil palm and cocoa resulted, predictably, in marked increases in stream-sediment loads. It was convincingly shown, however, that establishing a groundcover crop in newly cleared areas can eventually reduce sediment loads to predevelopment levels (Douglas 1999:1728, 1732; see also Bruijnzeel 1990).

The many generally baleful consequences of mechanized selective logging and related road construction include serious soil erosion and sedimentation of watercourses (Photograph 3). The widespread use of heavy machinery, including crawler-tractors to skid out the logs and bulldozers to make roads and tracks, leads to 'soil compaction, loss of topsoil, destruction of soil structure, major reduction of percolation, and exposure to erosion. Roads additionally impede drainage and become pathways for overland flow in which gullies form once constant maintenance has ceased' (Brookfield, Potter and Byron 1995:85). The vast majority of logging roads are poorly constructed and aligned, and they play a major role in supplying sediment to streams (Bruijnzeel 1990:119, 141-4). More attention to their alignment along contours and to the provision of proper drainage would go a long way towards reducing erosion and stream sedimentation (Douglas 1999:1733-4).

Photograph 3. Logging damage at Sungai Tekam, Jengka Triangle, Pahang, 1973. Felled trees often cause severe damage to seedlings, saplings, neighbouring trees, and other plants. Careless road construction is a major cause of soil erosion. Photograph by Colin H. Leigh.

Declining biodiversity is the most serious consequence of anthropogenic forest change in the Peninsula, one of the most biologically diverse places on earth (Myers et al. 2000). Unlike soil erosion and sedimentation, which can, with careful management, be brought under control and eventually reduced to manageable levels, the many unknown species that almost certainly have already been expunged cannot be redeemed – and it may now be too late to save many others.

The lowland forests in dryland areas harbour the great majority of the Peninsula's wild species. As already noted, however, these forests have been extensively destroyed. Extinctions, especially of the many species that occur at low densities, are inevitable, although it is impossible to predict how many with any degree of accuracy (Whitmore 1998:214). While outright loss of habitat caused by deforestation is obviously the major threat to biodiversity, the Peninsula's species also suffer from several other processes, including ongoing fragmentation of the remaining forests by road construction, dam building, and other activities (Brown, Iverson and Lugo 1994:134-5); forest degradation resulting from careless selective logging; excessive hunting and collecting for the marketplace; pollution of watercourses by effluent from rubber-processing factories and palm-oil mills; and the widespread use of agricultural chemicals (Aiken and Leigh 1985, 1992:85-97).

The human impact on many of the Peninsula's plant and animal species has risen dramatically in recent decades. A few examples will serve to make the point:

- Owing mainly to loss of habitat and hunting pressure, the populations of several of the larger mammals have declined sharply. Reports suggest that the tiger population, which has long been in decline (see Photograph 4), dropped from about 3,000 in the 1950s to about 250 in the 1980s.[14] As of the latter date, there were some 480 seladang, about 670 elephants, and only 50 to 80 Sumatran rhinos in the Peninsula.
- Loss of habitat is also a growing threat to an increasing number of plant species. Two examples will suffice. First, of the 654 endemic species of trees that they identified in the Peninsula, Ng and Low (1982:5-6) considered 343 to be endangered. Second, many palms are considered to be threatened; only nine of 194 species recorded in the Peninsula are believed to be in no danger (Aiken and Leigh 1992:90-1).

As already mentioned, most of the remaining forests are confined to hilly and

[14] There is some good news, however, because recent population estimates suggest that the number of tigers in the region has increased to approximately 600-650 (see Boomgaard 2001:13; Kawanishi 2002:2-3).

Photograph 4. There was no Pax Britannica for many wild creatures, including the tiger (*Panthera tigris*). This one was shot in an unknown location around 1905. Although tigers in the Peninsula are threatened by poaching and loss of habitat, they have proven much more resilient and tenacious than many observers previously thought. (Wright 1908:157.)

mountainous areas. Compared with the lowland forests, however, those of the uplands are less rich in species, and they lack most of the 'charismatic' lowland fauna, such as primates, elephants, and seladang (Whitmore 1998:195).

Conservation

Although it was always low on the colonial government's agenda, conservation was by no means ignored, and it is generally not appreciated that the history of conservation measures in the Peninsula can be traced back to the 1880s (Aiken et al. 1982:127-9). Included among those measures were the following: legislation was introduced to protect certain overexploited birds and game animals; some of the more deleterious environmental consequences of

tin mining were curbed; several game reserves were established; a large and magnificent area of rainforest was set aside in 1938-1939 as King George V National Park (now called Taman Negara); forest reservation, including the designation of protective forest reserves, continued apace; and a network of small protected areas, called Virgin Jungle Reserves (VJRs), was established.[15] Most of the colonial government's conservation decisions, however, were taken only after much environmental despoliation had already occurred. As is still generally the case, reaction, not anticipation, was the order of the day. Thus, for example, the rubber boom of the early twentieth century was essentially over before much thought was given to its impact on the biophysical environment (Aiken 1991-92).

The rapid retreat of the forest cover after about 1960 and the continuing degradation of much of the remaining forests by selective logging resulted in increasing calls from conservationists for the creation of more specially protected areas (parks and reserves) and for greater attention to the plight of a growing number of individual plant and animal species. I take a brief look at the recent conservation record.

The remaining forest cover (as of 1997) can be divided into three main components: the reserved forests (mainly for production and protection) that comprise the PFE (4.7 million ha); so-called stateland forest (0.43 million ha), most of which is scheduled for conversion to agriculture and other uses; and forests in protected areas (0.74 million ha), most of which are located outside the PFE (Ministry of Science, Technology and the Environment 1998:7). Each of these components has a role to play in the conservation of biodiversity.

There are presently more than 20 protected areas in the Peninsula, most of them of colonial origin. Three pieces of federal legislation, the Protection of Wild Life Act of 1972, the National Parks Act of 1980, and the 1985 Fisheries Act, all provide for the creation of protected areas. But in spite of these provisions, and notwithstanding the fact that forests were vanishing at an alarming rate, only a handful of parks and reserves have been established since the end of the colonial period. (A number of marine parks have been gazetted but they are not discussed here.) Although numerous proposals for additional protected areas have been advanced by conservationists since the 1960s, relatively little has been achieved. This is most unfortunate because studies show that 'creating new parks and addressing the tractable problem of making existing parks perform better will make a significant contribution to long-term biodiversity conservation in the tropics' (Bruner et al. 2001:127).

[15] In existence since the 1940s, VJRs serve two main goals: first, to provide undisturbed areas of natural vegetation for scientific research; and second, to protect representative areas of most types of forest and vegetation as nature reserves. Altogether, '108 areas have been declared, ranging in size from 2 to 2,744 ha. In 1992, 79 of these areas were in existence' (Laidlaw 1998:83).

Why have relatively few protected areas been established since the mid-1950s, and why have no new national parks been created? A large part of the answer lies in the constitutional division of powers between the federal government and the state governments. The states, as already noted, have control over lands and forests. There have been no new national parks because the states have been unwilling to relinquish control over land to the federal government, while the latter in turn has been reluctant, for mainly political reasons, to invoke certain of its constitutional powers in order to acquire state land for federal purposes. As for other kinds of parks and reserves, few have been created because the states, which rely heavily on the exploitation of timber and other natural resources for much of their revenue, have been unwilling to 'lock up' lands and forests in 'unproductive' protected areas.

In 1992, protected areas (excluding VJRs) covered some 0.83 million ha, or about 6.3% of the Peninsula's total land area, with Taman Negara, the region's only national park, making up about 52% of the total. As of the early 1990s, if my calculations are correct, the 'effective' protected-area coverage probably did not exceed 5% of the total land area, making it roughly equivalent to the coverage that existed as long ago as circa 1940 (for details, see Aiken 1994). The situation is considerably worse than the foregoing figures imply, however, for the following reasons:

- Species-rich lowland forest (little of which remains) is poorly represented in the protected-area coverage; other critical habitats that are underrepresented include peat-swamp forest, freshwater-swamp forest, mangrove forest, and forest over limestone.
- Many of the protected areas 'do not cover the home ranges of the species they were created to conserve. Many are far smaller than the required minimum area of 100 km^2 (10,000 ha). Buffer zones are non-existent' (Mohd Khan bin Momin Khan 1988:259).
- Most of the protected areas have long suffered from excisions and encroachments. In short, they lack security of tenure (Aiken 1994).
- Because many of the conservation areas increasingly resemble isolated islands in great seas of developed land, it can be expected that the smaller ones in particular will continue to suffer from various edge- and area-related effects.
- And, not to be forgotten, the remaining forests that harbour most of the Peninsula's wildlife lie outside the parks and reserves.

Considering that 1. reserved forests comprise by far the greater part of the Peninsula's remaining forest cover; that 2. it is these forests that harbour most of the region's biodiversity; and that 3. the prospects for the creation of new protected areas are not good, it would appear to follow that the role

of reserved forests in protecting species should be accorded greater importance. On this matter there is some good news because studies conducted by Andrew Johns (Johns 1986, 1987) at Sungai Tekam, in Pahang, on the impact of selective logging on animal life, reveal that most species can adapt to the altered conditions of logged forest; or, more precisely, that this appears to be the case following a single logging operation (Whitmore 1998:206-7). The conservation value of production forest can be enhanced by adopting low-impact logging techniques; by retaining blocks or patches of unlogged primary forest as a source of seeds and animal colonizers; by maintaining unlogged corridors of mature forests along watercourses; and by protecting and managing VJRs, most of which are located within selectively logged natural forest (Laidlaw 1998).

Now that public-sector involvement in agricultural schemes is focused on programmes in established rural areas rather than on clearing forest for new land development, the potential exists for stateland forests (see above) to play a role in the conservation of biodiversity. Some of these forests might, for example, be incorporated into the PFE, where they could, at least in theory, be managed sustainably for timber production and other purposes.[16] Although the future of the stateland forests remains uncertain, they continue, if only temporarily, to provide much-needed habitat for wildlife.[17]

Deforestation and forest degradation have taken a heavy toll on individual species of fauna and flora. Recognizing that the 1955 Wild Animals and Birds Protection Ordinance had outlived its usefulness, the government introduced the Protection of Wild Life Act in 1972. Whereas the 1955 legislation provided protection for only 15 mammal species, the new law placed 34 mammal species on the 'totally protected' list and a further 35 on the 'protected' list; in addition, 465 'totally protected' and 60 'protected' bird species were listed (Aiken et al. 1982:279-81). No similar kind of protection, however, has yet been extended to plant and fish species that are endangered. Nor has adequate attention been given to the conservation of genetic resources, some of which – for example, landraces of indigenous species of fruit trees and rice – are rapidly being eroded. There is clearly a need for more comprehensive legislation to protect the whole spectrum of species at risk. Any such legislation, however, is likely to be ineffective unless it provides for the protection of the critical habitats that species depend upon for their survival. At this

16 The total extent of tropical rainforest worldwide that is currently being successfully managed for the sustainable production of timber is negligible. For the most part, however, the technical management constraints 'are much less important than those that are political, economic and social' (Poore 1989:8). A major problem is that silvicultural rules are generally ignored.

17 Salleh Mohd Nor and Lim Hin Fui 1996:97-8. There is much idle or abandoned agricultural land on the Peninsula, some of which might be devoted to tree plantations or encouraged to return to natural forest, thereby providing some additional habitat for wildlife.

juncture it should be recalled that the state governments have jurisdiction over lands and forests and that consequently the fate of the region's biodiversity rests largely in their hands.

Malaysia is a party to the Convention on Biological Diversity.[18] It signed the treaty at the 1992 Earth Summit and ratified it in 1994. The deliberations of policy and technical committees established under the direction of the Ministry of Science, Technology and the Environment eventually resulted in the formulation of a National Policy on Biological Diversity (NPBD). Endorsed by the government in 1997, the NPBD outlines 15 strategies, each accompanied by an 'action plan', for the effective management of the country's biological diversity (Ministry of Science, Technology and the Environment n.d.). How vigorously the government will attempt to implement the policy remains to be seen.

Closing remarks

The Peninsula's species-rich lowland forests are all but gone, and the remaining forests are largely confined to upland areas. An extensive cultural landscape, much of it devoted to vast areas of oil palm and rubber, has replaced most of the forest realm. Since circa 1850, the forest cover has been reduced from about 95% of the region's total land area to no more than 44% today. Two great phases or waves of economic development were responsible for most of the forest loss: the rubber boom in the western lowlands during the early decades of the 1900s, and land development (accompanied by logging) in the eastern and southern lowlands from the late 1950s to about 1990. Taken together, the duration of the two phases was some 50 to 60 years, during which time about 50% of the forest cover was eliminated, most of it in the relatively brief post-colonial era. Although land development – and hence deforestation – appears to have run its course, timber depletion continues. The major consequence of deforestation and forest degradation is loss of biodiversity, and numerous extinctions are probably inevitable. There is an urgent need to give greater attention to the conservation of the Peninsula's remarkable natural wealth.

18 The Convention established three main goals or objectives: 'the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits from the use of genetic resources' (UNEP 2002:18). Malaysia has also ratified the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) and the Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar). Tasek Bera in Pahang, an excellent example of a 'blackwater ecosystem' supporting high species diversity, has been designated a Wetland of International Importance.

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DAVID M. KUMMER

Deforestation in the Philippines, 1950-2000

A major problem in discussing forest cover change in the Philippines since 1950 is the relative lack of accurate data. On the other hand, for the period before 1950, we have virtually no meaningful statistics; rather, we only have estimates from contemporary observers. As such, all that we can do is present a very sketchy outline of forest cover change in the Philippines in the period before and immediately after the end of World War II.

F. Wernstedt and J. Spencer (1967) report that the Philippines may have been 90% covered with forests at the time of contact with the Spanish in 1521 and that this had declined to approximately 70% by 1900. The two major causes of this decline were most likely the increase in population and the rise of commercial agriculture. The spread of commercial crops at the expense of lowland rice was so extensive that by the second half of the nineteenth century, the Philippines began importing rice. If, as I argue below, forest cover was about 50% in 1950, then fairly rapid deforestation must have been occurring during the 1900 to 1950 period. The most likely causes were the rapid increase in population and consequent spread of subsistence agriculture, the very rapid increase in commercial logging which followed the American occupation of the Philippines in 1898, and the continued spread of commercial agriculture. At the moment, however, it is impossible to provide a detailed history of forest cover change in the Philippines before 1950.

Forest cover, 1950 to 1987

This section will rely heavily on previous work (Kummer 1992). The agency in charge of Philippine forests has changed its name twice since World War II. The Bureau of Forestry (BF) became the Bureau of Forest Development (BFD) in 1973 which became the Forest Management Bureau (FMB) in 1987. Since 1968, these agencies have published Philippine Forestry Statistics (PFS), forming the official source of forestry data in the Philippines (see Forest Management Bureau). The major source of forest data in this section comes from the Philippine-German Forest Resources Inventory Project (P-GFI)

(Forest Management Bureau 1988).

A history of forests from 1500 to the present would be difficult to recreate. Records were incomplete throughout the entire period and many of them have been destroyed. Most of the Spanish records were lost in a fire in 1897 (Tamesis 1948:321) and the Bureau of Forestry and the College of Forestry at Los Baños were destroyed in 1945 (Sulit 1947:46). Unfortunately, lost data is not restricted to the period before 1945. For example, from 1954 to 1961 survey crews inventoried 1.65 million hectares of forests (Agaloos 1976:34). Information was collected on area, timber volume, and species composition; however, these surveys cannot be found and seven years of work has disappeared. A more recent example occurred in the 1980s. When the FMB moved offices in 1987 at least 10% of their records were lost. As such, it is impossible to determine what logging firms owned what concessions for years as recent as the 1970s. Additional difficulties include the accuracy of data from the FMB and the fact that there have been cases where statistics have been manipulated. Overall, any attempt to describe Philippine forests in the twentieth century runs up against the following: 1. many records are incomplete; 2. much data has been lost; 3. the data is often of dubious quality; and 4. there is evidence to indicate manipulation and destruction of data by officials.

Any analysis of deforestation in the Philippines must deal with the situation that until the late 1980s there was little data available and this was often ignored by the government. This was especially the case during the Marcos years (1965-1986); the author agrees with Walden Bello (1988:215) that the government of the Philippines at that time was a form of 'institutionalized looting'. This looting is most likely best demonstrated in the forestry sector; the primary cause of the decline of the primary forest has been logging, followed by some form of agriculture. As the World Bank (1989:7) states: 'It is mainly due to logging (licensed or illegal) that the old-growth dipterocarp forests, the most valuable commercially, have shrunk from 10 million hectares in the 1950s to only one million today'. This commercial use of the forest was sanctioned by the government. The material below only makes sense in the context of vested interests who benefited from the process of deforestation (for a detailed examination of logging, see Vitug 1993).

Accurate forest cover data for the pre and post-war periods will never be available. For 1937 and 1948, Florencio Tamesis (1937:9, 1948:316) claimed that the Philippines was 57% and 58% forested. It is understood that Tamesis was simply presenting estimates; however, I have estimated that forest cover in 1950 was 49% of land area (Kummer 1992:50-1). This raises a very disturbing question: How is it that the Philippines could claim that forest cover was 57% in 1937 and 59% in 1948? Given that logging increased rapidly after 1945, and that farming in forests increased after the war due to the shortage of food, it is difficult to believe that forests had not declined between 1937 and 1948. In

other words, soon after World War II, forest statistics were already inflated.

In a study for the US Mutual Security Agency, Winslow Gooch (1953:14) states that 55.4% of the country was under forest cover in 1951. This figure is also given in Tamesis (1956:519). This would mean that, between 1951 and 1956, according to the sources above, no deforestation occurred in the Philippines. The National Economic Council (NEC) (1959:150-1) was the first Philippine group to document a serious timber drain. The NEC report was an assessment of forest lands based on reports submitted by district foresters and the Bureau of Forestry central office. Based on the data, the NEC expressed alarm at the rate of deforestation. The difference between the 1953 data on forest cover by the Bureau of Forestry and the 1957 data used by the NEC is substantial and indicates a decrease in the area of forests of 2.7 million hectares. In 1959, Tom Gill conducted a study of Philippine forests for the NEC. In his report (Gill 1960), he deplored what he considered to be the rapid destruction of Philippine forests. Soon after, Tamesis (1963:73) presented data indicating that forest cover was 44% of land area in the early 1960s. At the same time, the Food and Agriculture Organization (1963) published data indicating that forest cover was 40% and since this figure included lands without forests, actual forest cover was less than 40%.

The First National Forest Inventory was from 1962 to 1968. The Philippine Air Force took aerial photographs of the Philippines every 15 kilometres at a scale of 1:15000 (Aranas 1973:73). The output was publications which analysed forest cover for Palawan and Mindanao (Agaloos 1965; Agaloos and Santos 1968). Inventory results were compared to aerial photographs taken by the US Army at a scale of 1:46,000 from 1946 to 1953 and changes in forest cover were calculated. Rates of deforestation were presented for Palawan and Mindanao in the reports cited above and for Luzon and the Visayas in various issues of PFS. Unfortunately, the studies for Luzon and the Visayas were never published and forest cover in those areas was never made public. As such, an inventory which took six years to complete did not produce any data on national forest cover because the work for Luzon and the Visayas appears to have been lost.

The Presidential Economic Staff (1968:8) issued a report based on the inventories for Palawan, Mindanao, and Luzon and on estimates for the nearly completed survey of the Visayas. Their findings indicate that forest cover in 1967 was 55.5% of land area. This figure is obviously difficult to reconcile with any of the data discussed above and is larger than forest area in 1953. It is also the figure reported in the 1968 PFS in its first year of publication.

The Second National Forest Inventory was conducted between 1965 and 1972. Aerial photographs were taken of 89% of total land area by Certeza (Agaloos 1976:36). The results were published as Tables 6 and 7 in the 1973 PFS. Most researchers take 1969 as the midpoint of the study, but even this is

open to doubt.[1] In addition, the data presented in Tables 6 and 7 often does not agree with the data presented in Table 2 of the same report. Given these caveats, a comparison of the 1972 and 1973 PFS is revealing.

The 1972 PFS indicated 15,671,104 hectares of forest while the 1973 PFS reported 13,893,963 hectares. In other words, between 1972 and 1973, according to the official source on Philippine forests, 1.8 million hectares of forest was lost and this most likely explains the history of the 1973 PFS. According to anonymous sources, the 1973 PFS was withdrawn almost as soon as it was released and the fact that martial law was declared in September 1972 may have made this easier. The FMB and DENR do not have a copy of this report. According to Armando Aranas (1973:76), Certeza, the firm which took the aerial photographs for the 1965-1972 forest inventory, published a report in 1972 based on these photos. Unfortunately, no library in the Philippines has this publication. In general, the 1965-1972 inventory is rarely mentioned, such that two national forest inventories and ten years of continuous inventory taking failed to provide us with solid data on forest cover. The second national forest inventory seems to be an example of what R. Callaham and R. Buckman (1981:56) have observed: 'In some cases the efforts to provide an inventory of forest resources have been thwarted because accurate information might prove embarrassing or cause undesirable changes in the viewpoints of policy makers'.

The first satellite-assisted forest inventory was conducted jointly by the BFD and General Electric using LANDSAT images from 1972 and 1973, with 1973 taken as the midpoint (Lachowski et al. 1979). This inventory showed that forests amounted to 38.0% of land area in 1973. The authors admit that their calculations provide only an estimate of forest cover. Difficulties encountered include: cloud cover, overlap of images, shadows in areas of high relief, and problems with interpreting some of the classification categories. It is now obvious that this inventory overestimated forest cover by some 25%.

Between 1976 and 1980, three estimates of national forest cover based on LANDSAT imagery were published by Filipino researchers: Manuel Bonita and Adolfo Revilla (1977:105) calculated that forest cover in 1976 was 30% of total area, Romeo Bruce (1977:2) on the basis of 1973-1975 LANDSAT imagery claimed that forest cover was 30% of land area in 1974, and the Forestry Development Center (1985: Table 1) estimated that adequately stocked forests were 26% of total area in 1980. None of the above studies were government sponsored and they were never incorporated into any official reports. The official country report of the Philippines to the World Forestry Congress in 1978 claimed that forests covered 57% of total area (Myers 1980:98). As remarkable as this claim may seem, an equally incredible claim was made the

[1] Adolfo Revilla, personal communication 1987.

next year. In 1979, the Natural Resource Management Center (1980:9) of the Ministry of Natural Resources estimated that forest cover was 55% of land area. This finding by a government agency is surprising and raises serious questions as to the honesty of the exercise. After 1980, two major national forest/vegetation studies were conducted: the P-GFI which took six years to complete (1982-1988) and the World Bank funded study by the Swedish Space Corporation (1988). Table 1 summarizes the major findings of all these inventories with inflated government statistics highlighted.

Table 1. National Forest Cover, (% land area).

Date	%	Source
1948	*59.0*	*Tamesis (1948)*
1950	49.1	Kummer (1992)
1956	*55.4*	*Tamesis (1956)*
1957	44.3	National Economic Council (1959)
1969	34.9	P-GFI(1988)
1972	*52.2*	*PFS(1972)*
1973	*46.3*	*PFS(1973)*
1973	38.0	Lachowski et al. (1979)
1974	29.8	Bruce (1977)
1976	30.0	Bonita and Revilla (1977)
1978	*56.8*	*Philippine government (Myers 1980)*
1979	*55.0*	*NRMC (1980)*
1980	25.9	Forestry Development Center (1985)
1987	23.7	Swedish Space Corporation (1988)
1987	22.2	P-GFI (1988)

The data presented in Table 1 demonstrates the decline in forest cover since 1948. However, this decline was rarely accepted by the Philippine government. Statistics from the P-GFI and, to a certain extent, the Swedish Space Corporation are accurate but from 1945 till the overthrow of President Marcos in 1986, nearly all official statistics of forest cover were overestimates and more accurate figures were simply ignored. As the World Bank (1989:10) points out, there has been a 'reluctance to acknowledge the extent of deforestation which has occurred'.

Forest cover, 1987 to 2000

The post-1987 period differs from the 1950-1987 period in several ways. First, with the ouster of President Marcos in 1986, there was more political space to talk about environmental issues. Second, and quite unexpectedly, there is

now very little data on which to base a discussion about current deforestation. The result is that there have not been any meaningful discussions about national forest cover in the Philippines for at least a decade. Third, deforestation has become more complex than previously thought and reforestation has now become a significant process in and of itself. I will address each of these issues in turn.

From 1950 to 1987, the Philippine government lied about the extent of deforestation. The discussion during this period was actually a screen behind which unregulated commercial logging could continue to the benefit of the politically well-connected. This period came to an end when Marcos went into exile in 1986; the regional results of the P-GFI were published between 1986 and 1988; and the national results of the P-GFI and the Swedish Space Corporation survey were published in 1988. With this increase in openness, it was impossible to avoid the fact that deforestation had been extensive. The end result is that since 1987 there has been virtually unanimous agreement among all foreign and domestic observers that deforestation is continuing. However, there is no hard evidence to support this view and some evidence to indicate that it is not accurate.

Since the results of the P-GFI were published in 1988, there has not been a national forest inventory conducted in the Philippines. Local inventories have been undertaken, particularly in regions designated as 'protected areas', but the P-GFI was the last national forest inventory in the Philippines. In essence, discussions regarding contemporary deforestation are taking place in an environment that is characterized by the lack of any hard knowledge; at the same time, the deforestation numbers used by observers are remarkably similar.

Michael Bengwayan (1999:1) claims that during the 1990s deforestation was approximately 800 km^2 a year. According to the Department of the Environmment and Natural Resources website (DENR 2002), deforestation between 1991 and 1996 was 875 km^2 a year. Environmental Science for Social Change (1999:18) estimates that deforestation between 1987 and 1999 was 1,000 km^2 per year and that forests in 1999 covered 18.3% of land area. This is almost exactly the figure of 18.2% reported by the FMB in 1997 (FMB 1998: Table 1). Lastly, the World Bank (2000:20) reports that deforestation between 1989 and 1995 was 1,300 km^2 a year. In short, virtually all participants to discussions regarding forest cover are agreed on one thing regarding the 1987 to 2000 period: the area covered by forest is decreasing. In fact, the reason that there has not been any critical discussion about national forest cover in the Philippines in the past ten years or so is because everyone seems to accept the above 'fact' as incontrovertible.

Unfortunately, there is evidence that suggests this consensus view on deforestation may be inaccurate. While a national forest inventory has not

been taken since the 1980s, during the years 1993-1996 and 2000 a national forest survey was undertaken by the Japan Forest Technical Association (JAFTA) in cooperation with the National Mapping Resources Information Authority (NAMRIA). NAMRIA is the remote sensing and mapping division of the Department of the Environment and Natural Resources (DENR). The project was based on LANDSAT-TM imagery and involved some ground truthing; however, the island of Mindanao was not included. According to JAFTA (2001:11), in the two-thirds of the country surveyed, forest cover increased during the 1990s and now covers 27.2% of land area.

The JAFTA results have not been made public in the Philippines and the PFS does not incorporate them. The most recent issue of PFS (FMB 2001) does not include any data on deforestation and its national forest cover figures are from 1997. The last time the PFS contained data on deforestation and national forest cover was in 1998, when it claimed that forest cover in 1997 was 18.2% of land area. Even though the preliminary JAFTA results were available in early 1997, NAMRIA has not gone public with them and the FMB has stopped publishing any data on deforestation since 1997 because the JAFTA results directly contradict their numbers.

Keeping in mind that NAMRIA and FMB are both part of DENR, there are most likely two reasons why DENR has not gone public with the JAFTA results. First, since the views of NAMRIA and the FMB are at such variance with each other, DENR realizes that the reputation of the agency would be damaged if there were a public airing of their differences. Second, and more important, given the predatory and venal nature of the Philippine Congress, any data which showed forest cover increasing would most likely translate into intense political pressure to increase the number of logging concessions. In short, a very understandable complete lack of faith in the integrity of the Philippine Congress means that there is nothing to be gained and everything to be lost by going public with data which may demonstrate that forest cover is increasing.

The end result is that since 1997, the Philippine government has been paralysed on the issue of deforestation and national forest cover. The DENR cannot say how much forest cover there is and whether or not deforestation or reforestation is taking place. NAMRIA feels that the JAFTA data is correct and that reforestation is occurring at a very rapid rate. The FMB feels that the NAMRIA survey results are incorrect and that forest cover is declining. JAFTA (2001) claims that the forest survey was a great success from the viewpoint of forest management; actually, nothing could be further from the truth: since 1997, it would appear that no one knows what is happening to the macro state of Philippine forests.

Sometime after the preliminary JAFTA results became available in 1997, the DENR convened an internal committee to reconcile the figures of the FMB

and JAFTA. These results were never made public and it is my understanding that they did not satisfy any of the participants. As a result, the DENR initiated a National Forest Assessment Project funded by the FAO in 2002 with preliminary results due by the end of 2003. Funding for this project is only US$ 96,000 and it will involve approximately 200 sample points of one square kilometre each throughout the county. Virtually every person I spoke to in the Philippines during my seven-month stay from 2002 to 2003 felt that the FAO assessment was mostly an exercise in data sampling and no one thought that it would yield reliable data on forest cover. As a result, it is doubtful that the FAO results will resolve the issue of how much forest cover is in the Philippines.

To make matters worse, both JAFTA and NAMRIA made a major mistake when analysing the LANDSAT-TM data. The imagery was for the years 1993-1996 and 2000; unfortunately, when JAFTA published their findings in 2001, it forgot to include the results for the year 2000. These covered parts of Luzon and the Visayas. Both these areas have been deforested for a long time and if they are included with the results for 1993-1996, then the area forested declines to 24.7% (based on my own rough calculations). In short, there is a good possibility that the JAFTA results do not show a rapid increase in forest cover from 1987.

As mentioned, the JAFTA data does not include Mindanao. This is a serious shortcoming because it represents about one-third of the area of the Philippines. In addition, most of the logging in the Philippines (legal and illegal) is in Mindanao and has been since the end of World War II. While logging is presently banned in most areas of the Philippines today (including Mindanao), illegal logging on a fairly large-scale still continues in Mindanao. If forest cover in Mindanao is less than the national average, then the 24.7% figure is too high. An additional consideration is that the P-GFI data just includes forests on government lands whereas the JAFTA data includes forests on government and private land. Since some forests are on these private lands, an exact comparison between the P-GFI and JAFTA data is not possible unless a correction is made for this.

A more fundamental criticism of the JAFTA data is that it appears the interpretative work was not very well done. While ground truthing was part of the project, it is obvious that major mistakes were made. During the 1990s, there was a great deal of mapping work done by local groups in the 20 or so major 'protected areas' in the Philippines; Giacomo Rambaldi, Marlynn Mendoza and Fernando Ramirez (2000:16) report that this work uncovered numerous classification errors with the JAFTA results. Environmental Science for Social Change[3] reports the same for a project of theirs in northern Luzon. Lastly, the Cagayan Valley Program on Environment and Development (CVPED) in

3 Personal communication 2003.

northeast Luzon reports significant problems with the classification categories of the JAFTA data both within and near the Sierra Madre National Park (CVPED 2003). With regards to CVPED, I was able to confirm widespread misclassification by JAFTA in a three-day trip I took to the area in 2003.

In short, there are four major problems with the JAFTA data: it does not include the survey results of 2000, and thus overstates forest cover; it only covers two-thirds of the country and it is difficult to generalize to the entire nation; since it covers forest and non-forest lands, it is not exactly comparable to the P-GFI which covered only forest lands; and, major mistakes were made in the interpretation of the images. The end result is that the JAFTA results provide us with very little knowledge to further our understanding of Philippine forests and they have had the perverse result of virtually paralysing the DENR in discussions of national forest cover since 1997.

Assuming that 1995 is the midpoint of the JAFTA survey and that the 24.7% figure is correct and if we use an eight-year straight-line projection, then reforestation in the 1987 to 1995 period was approximately 65,000 hectares a year (assuming forest cover of 23% in 1987). Projected to 1997, this would give us a forest cover of approximately 25%. In contrast, the FMB projected that forest cover in 1997 was approximately 18%. The difference between the two sets of figures is 2.1 million hectares and that is for 1997. The difference today would be close to 3 million hectares.

As of 2003, the situation for national forest cover in the Philippines is as follows: 1. it would appear that no one in the world knows how much forest cover there is and whether it is increasing or decreasing; 2. regardless of the first point, everyone involved with environmental issues in the Philippines is convinced that forests are continuing to decrease; and 3. in the Philippines, NAMRIA is the only agency that feels the JAFTA data is correct, even though their sister agency, the FMB, feels they are not trustworthy.

My view of recent forest change

Given this state of affairs, it may not be useful to spend a great deal of time talking about national forest cover; however, since the topic is important, I would like to offer a few observations.

For the past 50 years, discussions about forests in the Philippines have been dominated by one word: deforestation. While there has been an awareness that reforestation was possible, and indeed occurring in some instances, most observers have not talked about net forest loss; rather, they have only emphasized deforestation. Unfortunately, forest change today is not such a simple story. It is obvious that 'reforestation' of some sort is happening all

over the Philippines; as such, changes in total forest cover are the result of the interaction of two trajectories (deforestation and 'reforestation'). Changes in forest cover are much more complex today than they were a few decades ago. I would suggest that at least four trends are discernible within the category 'forest cover' at the national level.

1. Primary forests are declining as a result of legal and illegal logging, especially in Mindanao but also in Luzon and Samar. In addition, frontier agriculture is still occurring in some areas;
2. Secondary forests with a commercial value are continuing to decline because of logging;
3. Poor-quality secondary forests are increasing because of the abandonment of farms which is occurring throughout the Philippines (in the case of Bohol, Cebu and Siquijor in the central Philippines, the Bureau of Agricultural Statistics (2002) reports a 70% decrease in the area devoted to corn over the past 12 years).
4. 'Artificial forests' are increasing at a rapid rate. The reasons are many: large-scale reforestation projects by the government, NGOs, and forestry firms; small-scale reforestation projects by many community groups; small-scale fuelwood plantations primarily by farmers in the central Philippines[4] and 'natural regeneration' in areas that were deforested decades ago.

I have used quotation marks above because it is obvious that forest is no longer the straightforward word it was a couple of decades ago; at the same time, this should not obscure the fact that some sort of 'regrowth' is happening in the Philippines on a large scale. In my view, the overall result of the above four trends is that 'forest cover' is no longer declining in the Philippines and, in fact, is most likely increasing slightly. The corrected JAFTA figure of 24.7% is plausible for forest cover in the Philippines today; however, that should not be interpreted as an endorsement of the JAFTA study on my part. The apparent increase in 'forest cover' conceals the fact that natural forests are still declining.

It is difficult to generalize about the nature and quality of the reforestation. Some is natural regeneration in forested areas; some is the result of planting and, as such, may range from small-scale fuelwood lots on an individual hillside to thousands of hectares planted within a logging concession; and some will be a combination of natural and artificial regeneration. Some reforestation will be with indigenous species but much of it will be with exotic, fast-growing species. Some trees will be harvested in three to four

4 Terry Bensel, personal communication 2002.

years; some in eight years, and some never. The reforestation may or may not take place with crops or animals present. In short, at this point, it is almost impossible to come up with any meaningful statements about reforestation in the Philippines today other than to say that it is very diverse, geographically widespread, and covers a large and growing area.

Implications

The implications of this analysis are relevant to the Philippines, to other countries, particularly in Southeast Asia, that share similarities with the Philippines, and to larger discussions regarding global environmental issues.

1. Philippine history of deforestation. Deforestation is obviously not a new phenomenon, but the rapidity with which it has occurred in the Philippines is unusual. I have often felt that the best that could be said about the Philippine experience with deforestation was that it was a good example to other countries in Southeast Asia of how not to manage natural resources; unfortunately, this does not appear to be the case. Peter Dauvergne (2001) and Michael Ross (2001) discuss the forces that have led to the commercialization of old-growth forests and the corruption that has facilitated this process throughout Southeast Asia. Dauvergne (2001:151) pessimistically (but realistically) concludes that: 'Other tropical timber producers have apparently learned little from the history of the Philippines. At recent rates and under current practices, loggers could largely deplete the old-growth forests of commercial timber in Cambodia within five to seven years, East Malaysia within ten years, the Solomon Islands and Papua New Guinea within 15 years, and Indonesia within 15 to 20 years.' In short, one of the most remarkable features of the deforestation phenomenon has been how ineffectual virtually all attempts to control it have been. Central to any discussion of tropical deforestation must be this 'ineffectiveness'. One way to approach this topic would be to start by asking the question: Who benefits from deforestation?

2. Corruption. Corruption in forestry is widespread throughout Southeast Asia. The corruption flows directly from the commercial value of the forest resource (Ross 2001). In fact, one could argue that corruption is actually greater now than it was 30 years ago. In addition, it has become obvious to many observers that once corruption becomes institutionalized, it is very difficult to eliminate. I do not know of any cases in the tropics where large-scale corruption in the forestry sector has been reduced while the forests have a high commercial value.

3. Reforestation. It is obvious that some sort of regrowth is occurring throughout the Philippines. In parts of the Philippines, such as Bohol, Cebu, and Siquijor, regrowth could be the dominate land use; that is, even more widespread than agriculture. This begs the question of what we mean by 'forest' and 'agriculture'. It has been my experience that these terms are usually used in a First World context where the distinction between the two is clear; however, in most tropical countries the situation on the ground is much more complex. At one end of the spectrum you may have primary tropical rainforest, and on the other, irrigated rice with three harvests a year. However, in between these two well-defined endpoints, there is a multiplicity of land uses that defies easy categorization. This 'grey area' encompasses the multiple and often overlapping land uses of natural forests, artificial forests, pasturage, permanent and non-permanent agriculture, fallow, and fuelwood production. In the Philippines, I would guess that most land use change is occurring in this grey area and that includes regrowth of some sort. The language that we use today is inadequate to meaningfully describe what is happening in many areas of the Philippines.

A dramatic example of the importance of categories comes from the JAFTA study. Assume for a moment that the corrected JAFTA figure of 24.7% accurately represents national forest cover. That figure is the sum of four forest categories: old growth, pine, residual, and mangrove forests. The next category is 'reproduction brush' which represents 19.4% of total land area and is vaguely defined as including regrowth, grassland, and shrubs. A senior official at NAMRIA told me[5] that he thought reproduction brush should be included in the forest category. If that were done, the Philippines would then have national forest cover of 45% and, in the eyes of many people, that would mean that the Philippines did not have a forestry problem.

A related issue has to do with biodiversity. Since much of the regrowth that is occurring is either directly or indirectly the result of human intervention caused by the planting of a small group of fast-growing, mostly exotic tree species, it may be the case that reforestation is now as great a threat to biodiversity as deforestation. Given the large scale of reforestation in the Philippines, this is no longer an academic issue. In terms of total area, reforestation is now a more widespread process than deforestation, at least in certain parts of the Philippines. The most successful examples of reforestation in the Philippines are in the Visayas, where thousands of people have planted trees for the commercial fuelwood markets (Bensel 1995; Kummer et al. 1994). The areas reforested cover tens of thousands of hectares. In short, reforestation is now an important land use in and of itself, with important implications for biodiversity.

5 Personal communication 2003.

4. Remote sensing. The JAFTA survey was a major project. It took a total of 11 years. Tragically, the results are of dubious value. While I do not want to unfairly single out the JAFTA survey, I think it illustrates some very real problems with the claims that have been made by the remote sensing community. Besides the problems of interpretation and land use categories that have been discussed above, the advocates of remote sensing have consistently overlooked the fact that it is expensive, images are hard to come by, remote sensing surveys (at least in the Philippines) have the irritating habit of using different categories than previous work so that comparisons over time are almost impossible and there are, on occasion, serious technical problems. In many cases in the Third World, these problems are virtually insurmountable.

Another aspect of remote sensing is that the desire to use the most recent and sophisticated imagery can actually paralyse ongoing attempts to acquire data. Projects will not take place unless imagery is available. This can become an excuse to do nothing. For example, it is most likely the case in the Philippines that district foresters know less about their districts now than they did 50 years ago simply because they do not go to the field. A knowledgeable local forester could most likely tell us more about his/her area than any remote sensing 'expert'. Sad to say, there is a good possibility that the most accurate survey of forest cover in the Philippines was done in 1957 based on the reports of district foresters. The availability of remote sensing imagery in the Philippines over the past 30 years has not had any appreciable effect on management of forests and, indeed, has contributed very little to our understanding of forestry issues. I have a suspicion that the emphasis on remote sensing has led to a decrease in forest inventory work. In short, the advantages of remote sensing in the Philippines have not been apparent.

5. National forest cover. Given that so much ground cover in the Philippines is not natural forest, the value of a single percentage figure for national forest cover may be of less importance than previously. It still could be important for discussions regarding biomass production or carbon sequestration, but for purposes of biodiversity it may be useless. In other words, it is conceivable that Country A could have a higher percentage of national forest cover than Country B, even though Country B's forests contain more biodiversity.

6. The fate of the Philippine forests. Even though national forest cover in the Philippines is increasing (in my opinion), this should not obscure the fact that natural forests are still declining. Some legal logging of the natural forest is still allowed and illegal logging still continues. There are about 20 major protected areas in the Philippines that are receiving substantial funding from foreign donor agencies, but most of these areas are under intense pressure

from a variety of sources ranging from mining interests to frontier agriculture. More disturbing is the fact that the only significant projects involving protected areas are all foreign funded.

Philippine 'forests' will continue to increase in the future; unfortunately, natural forests will continue to diminish in size and diversity. At the same time, the change in forest cover that is presently taking place is very different than the process that prevailed in 1950-1987. During this period, deforestation was caused by large-scale commercial logging followed by some form of agriculture. The process after 1987 (the date is arbitrary and is a function of the availability of data) is much more complex. First, since the primary forest is almost gone, there is little large-scale logging today. Second, valuable secondary forests are now larger than primary forests and most logging is occurring in these forests. Third, agriculture is continuing to spread into previously forested areas but it is difficult to generalize about the forms this takes: some is permanent, some transitory; both annuals and perennials are being grown; some is for subsistence, and some is large-scale commercial agriculture. Compared to 1950-1987, I think it is safe to say that the spread of agriculture in the recent period is more complex, more commercialized, and more dependent on modern inputs (Top 1998). Last, reforestation (natural and artificial) is now a large-scale process in and of itself.

Change in forest cover is clearly not a monolithic process and, in the Philippines, change in forest cover in the 1990s was a different process than what occurred from 1950 to 1987. The 1950-1987 process is similar to what we are presently seeing in Indonesia.

Conclusion

After studying forestry issues in the Philippines for a good part of the past 25 years, I was stunned to realize in early 2003 how little we know about forest cover at the national level. Even more impressive is that this situation has existed for at least a decade. My guess is that the FAO survey will not resolve the data issues regarding Philippine forests and, hence, the uncertainty regarding forest cover and forest change will be with us for a long time.

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GERARD A. PERSOON and ERIC WAKKER

The forests of Sumatra
Use, conversion, and conservation, 1950-2000

Introduction

A recent overview of the state of the forests of Indonesia presents a dramatic picture. In just 12 years (1985-1997), more than 20 million hectares of forest was lost to conversion into plantations, transmigration sites, and other forms of land use including expansion of agricultural land by smallholders. Within the country as a whole, Sumatra experienced the most serious degree of forest decline, 29%, while the overall figure for Indonesia was 17%. Though there is some debate on the exact figures, the general trend of forest decline is not subject to serious disagreement among observers. It is impossible to deny the dramatic decline in forest cover. Present-day satellite images support the statistical figures. The visual image of forest-cover maps has a dramatic impact, even though there may be room for dispute in the interpretation of these maps and the reliability of the figures used for comparison with previous periods.[1]

In FWI 2002 a number of key findings are presented:

- Indonesia is experiencing one of the highest rates of tropical forest loss in the world.
- Deforestation is largely the result of a corrupt political and economic system that has regarded forests as a source of revenue.
- Illegal logging has reached epidemic proportions.
  Most of the deforested land has not been put to productive alternative use.
- The Indonesian government needs to take action, but not all actions will result in better management of the forest. (FWI 2002:xi.)

1 FWI 2002. In this report ample attention is paid to the nature of the data on which these conclusions are based and how the authors have come to their conclusions.

In recent decades the extensive forests of Sumatra have been subject to rapidly changing patterns of use and protection. All of these patterns and processes have roots in preceding historical periods. Early stages of commercial logging, harvesting of non-timber forest products, clearing of land for plantations for industrial export crops, and construction of road infrastructure all date back to the late nineteenth and early twentieth century (Boomgaard 1996:13-5). Due, however, to technological changes and the scale of operations, the process of forest degradation and deforestation speeded up rapidly after World War II. The process is in itself the result of complex socio-economic and political factors, leading to a lot of debate over who is to be held responsible for the present state of affairs. Numerous deforestation studies have examined the social mechanisms behind this process.

Lowland forests and mangrove forests in particular have been converted into settlement areas and most recently into plantations for the cultivation of rubber and oil palm. Centrally issued rights of exploitation and conversion have replaced local forms of management. In addition to legal and illegal logging and official transmigration schemes, spontaneous migrants from Sulawesi and other parts of the country have converted large tracts of swampland into agricultural land. The construction of the Trans-Sumatra Highway and the web of connecting roads to provincial capitals have facilitated access to forest resources, including mineral resources, even though all modes of exploitation had a long previous history. Technological innovations have had an accelerating effect on the scope of forest exploitation and its impact.

Though conservation of forest resources started in colonial times, a large number of protected areas were added to the list of reserves in the 1970s and 1980s. In most cases, however, there is severe pressure from outside. Encroaching farmers, traders in illegal timber, and poachers of wildlife force forest guards to remain alert, and in many cases they seem to be fighting an uphill battle for which external support is essential. In this article major forms of forest use are described, as well as the changing patterns of land use and land use planning that have a direct influence on the forest. The second part of the article presents two case studies.

Forest cover and land use

Though sources vary in how they classify land use patterns and vegetation types, in general tendencies the most recent figures as published by the Indonesian authorities, the World Bank, and the Global Forest Watch are almost identical (Table 1). An overview of deforestation is presented in Table 2.

Table 1. Overview of land use in Sumatra in 1950 based on vegetation maps (in hectares)

Primary forest	Tidal forest	Secondary forest	Total forest	Grassland	Irrigated rice	Total area
33,400,000	570,000	3,400,000	37,370,000	8,600,000	900,000	46,900,000

Source: FWI 2002:8.

Table 2. Forest area and deforestation, 1950-1997 (GOI/World Bank estimates)

Year	Forest cover	Forest as % of land area
1950	37,370,000	80
1985	23,323,500	49
1997	16,632,143	35

Source: FWI 2002:12-3.

The situation is even more dramatic if we focus on lowland forest. Of accessible lowland forest, more than 60% was lost within 12 years. In general, montane forest, which is more difficult to access and has fewer valuable timber species, is less attractive to exploit. The loss of lowland rainforest over 1985-1997 (Table 3) is more than twice the overall forest decline.

Table 3. Decline in lowland forest cover in Sumatra

Forest cover in			Estimated loss	
1900	1985	1997	1985-1997	1985-1997 (%)
16,000,000	5,559,700	2,168,300	3,391,400	61

Source: FWI 2002:14.

Causes and actors in the process of deforestation

Behind these figures is a wide range of causal chains and actors involved in various ways in forest decline. In present-day deforestation studies it is customary to differentiate between immediate and underlying causes, all of which have their implementing agents (primary and secondary actors).[2] The most direct and most visible cause of forest decline is the destruction of for-

2 Sunderlin and Resosudarmo 1996; Kaimowitz and Angelsen 1998; Van den Top 2003; Cleuren 2001; FWI 2002.

est through clear-cutting or burning. Such destruction is often the final stage of a gradual degradation process that started many years earlier. Underlying causes may be related to the widespread attitude toward primary forest as 'empty land' (*tanah kosong*), ready to be turned to better uses such as plantations, transmigration sites, and intensive agriculture.

Agents that can be identified at one end of the spectrum as primary and secondary or even tertiary actors involved in deforestation range from forest-dwelling communities, to expanding agriculturalists, to logging companies, plantation owners, and governmental institutions. At a greater distance are financing institutions within or outside Indonesia and the purchasing power of consumer markets in other parts of the world. At the other end of the spectrum are agencies and institutions that are fighting for the protection and conservation of resources. In addition to local people resisting forest destruction, these groups of actors include national NGOs, governmental agencies, religious organizations, and international agencies.

Non-corporate forest users range from traditional hunter-gatherers and shifting agriculturalists, to expanding agriculturalists who combine subsistence farming with cash crops, to those practising intensive (monocrop) agriculture. Surprising for this kind of tropical forest area is the absence of cattle, or extensive grasslands used for grazing. Cattle do not play a large role in dominant land use patterns in Sumatra. Many individual farmers own cows and buffalo, but the number of animals per owner is small and they do not have a big impact on land use.

A model dividing the process of forest degradation into different stages seems to be applicable to the way deforestation has taken place in Sumatra in the past as well as during the last few decades when mechanized large-scale logging started to dominate. Another important aspect is the influence exercised in Sumatra by the international market for forest products, timber in particular. Interestingly, the various stages can also be linked with ideas and perceptions of forest users about the characteristics and productive capacities of the forest. Is the forest considered the 'home' of the people, as is the case with indigenous forest dwellers? Or is forest considered to be a 'wild' resource to be domesticated and used in radically different ways, as is the case with plantation owners? The deforestation stages that can be differentiated in the various types of forests are the following:

Primary (natural) forest. This stage is characterized by closed canopy cover, little human influence, possibly low-intensity (extensive) use by indigenous communities, for example exploitation of non-timber forest products. There are no significant changes in forest functions, and forest regeneration capacity is optimal. Concessions for selective logging may be allocated but are not yet operational.

Logged (natural) forest. Road construction is often the first industrial activity in primary forest, followed by selective logging of variable intensity, depending upon the presence of commercial tree species and accessibility of the terrain. This stage provides the bulk of timber production in the tropics, much of which is export oriented. After logging, a partially degraded logged-over or residual forest remains. Natural restoration processes are still largely intact, although the regenerating capacity of valuable timber species may be limited. Secondary forests provide little commercial timber, but still provide many forest products, have a high biodiversity, and sequester large amounts of carbon dioxide. Hunter-gatherer communities tend to move deeper into the primary forest, while some community members may be hired by logging companies. Commercial hunting pressure tends to increase significantly. Along logging roads clear-cut forest, soil erosion, and the first signs of shifting cultivation may be observed.

Degraded forest. This stage is a second wave of forest degradation as a result of (unsustainable) logging. A rapid influx of migrant settlers (newly unemployed logging crews) may occur, using the infrastructure left behind. Logging companies move deeper into the primary forest but sawmills obtain logs produced in the conversion area, much of it for local markets. Investments in sustaining forest resources are minimal. Conversion forests have been cleared and burned for small-scale subsistence agriculture. Commercial agriculture is increasingly introduced, sometimes after legal reclassification of logging concession areas to other land use categories. In this stage, logging is highly unsustainable and often considered illegal. Wildfires are more widespread and contribute to further forest degradation. In this stage, relatively stable semi-traditional subsistence agricultural and mixed agro-pastoral systems with varying degrees of integration of trees and forest functions may consolidate for a longer period of time. Natural restoration processes are still intact to some extent. In this stage the area does not generate substantial export revenue.

Converted forest or non-forest stage. In the final stage, the last remaining forests are completely deforested. Significant loss of biodiversity occurs and most natural forest functions are affected temporarily (during conversion) or permanently (for example biodiversity). The landscape transforms from patchy small-scale agriculture to large-scale agro-industrial monocultures. Uses may include ranching, tree-crop plantations, annual crops, and pulpwood plantations, and these may be introduced within a certain sequence (for example rubber being converted to oil palm, ranches being converted to soybeans). Landless workers are thus pushed into the conversion forest or to urban areas. As in stage 2, the area generates substantial export revenue.

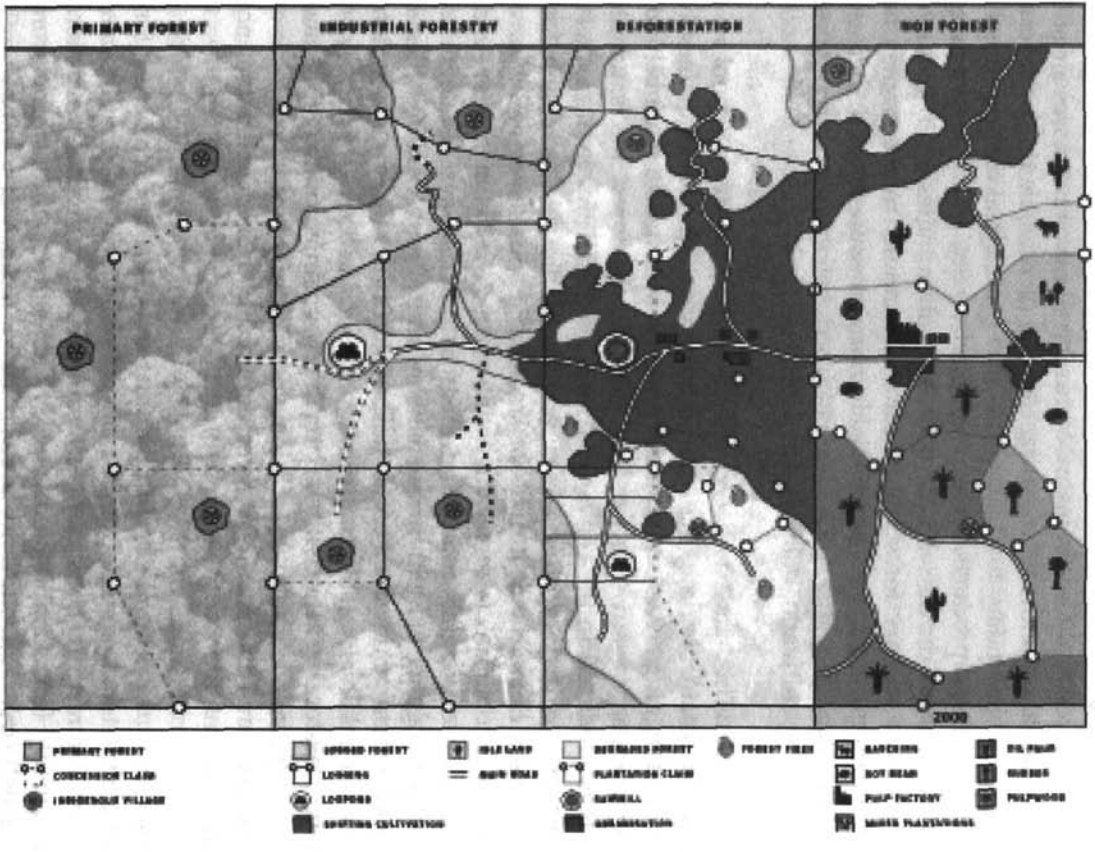


Figure 1. The deforestation process in four stages

Major capital and management inputs are required to develop and maintain the productivity of large-scale monocultures, though land use is labour extensive compared to the previous stage. Natural restoration processes have been largely destroyed; shifting back to (natural) forests requires major investments.

Frequent travellers in the tropics may recognize the geographic pattern of these four stages (Figure 1) from the air while flying from an urban centre to a forest-rich region. Several frontiers characterize the transition from one stage to another: the logging frontier (from stage 1 to 2), a colonizing frontier with mixed activities (stage 2 to 3), and an industrial agricultural frontier (from stage 3 to 4).[3]

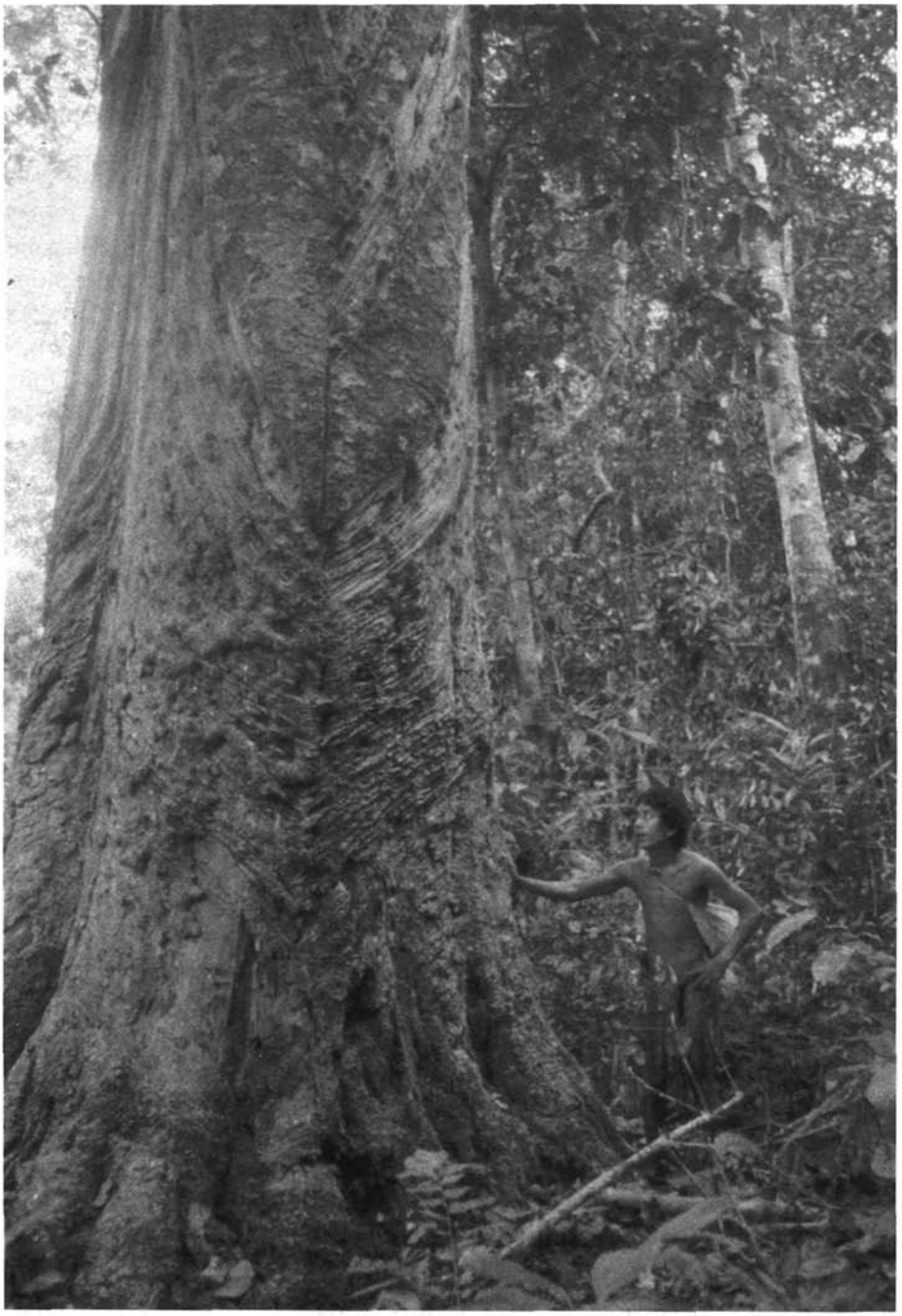
Of course forest conversion does not always follow this pattern of all four stages, but it appears to be valid in the case of Sumatra if one takes a closer look.

Traditional and small-scale forest users

In the complexity of the actors' field involved in the process of deforestation, it is possible to differentiate between small-scale forest users and large-scale forest users. In most cases deforestation is the result of the combined effects and interaction of both categories of actors (see Sandbukt 1995). In a brief article it is impossible to present a detailed picture of this interaction; we will present an overview of the first category of forest users, that is small-scale forest users, as expressed in terms of impact by individual people. This is not to deny that collectively these small-scale forest users can have a big impact on forest resources. Various categories of traditional and small-scale forest users can be differentiated by the type of impact they have on the forest ecosystem.

- *Hunter-gatherers* are still to be found in a number of provinces. They are known by a variety of ethnic names like Sakai, Talang Mamak, Bonai, Petalangan and Kubu or Anak Dalam (or Orang Rimba). These are traditional hunters and gatherers. As yet it is still debated whether they are original or secondary hunter-gatherers who have adopted a hunting-gathering lifestyle. Though reports on these peoples dating from the early twentieth century have always predicted their complete assimilation and integration, they have succeeded in surviving until the present day in a

[3] The general pattern of this process is inspired by the work of the nineteenth-century German geographer Von Thünen. For an elaborated version of this model see De Groot 1999, for a detailed application of the model in three different countries see Cleuren 2001.



Kubu man under a *jelutung* tree

strongly modified version of their traditional lifestyle. Over the years they have been subject to all kinds of integration and assimilation policies of the colonial and Indonesian governments as well as religious organizations. But so far they have survived (Hidayah 1994; Persoon 1994; Porath 2003).

- *Traditional shifting agriculturalists.* In large parts of Sumatra, shifting agriculture has been a dominant form of land use for a very long time. Combination of cultivation of rubber, maize, cassava, and upland rice with collection of non-timber forest products including some hunting of forest animals has been a dominant form of land use. It has also been and to some extent still is the initial phase for farmers after opening up a new area for agriculture and before they engage in other types of agriculture. There are also some ethnic groups that combine extensive agriculture with hunting and gathering and domestication of animals. If sago is available to people as a staple, they are usually not engaged in the cultivation of annual crops like maize or rice as sago is much more efficiently grown and harvested (Angelsen 1994; Ostergaard 1994).

- *Expanding agriculturalists.* In many areas traditional shifting agriculturalists have gradually expanded their way of 'farming the forests' for subsistence purposes along with commercial crops. Tree crops like rubber, coconuts, cinnamon, cloves, and various kinds of fruit trees have become popular. In recent years oil palm has become the most popular tree crop. But other crops such as *nilam* have become more popular as well (Angelsen 1995).

- Some *permanent agriculturalists* have also become shifting agriculturalists through processes of village segmentation, largely along the newly developed road systems. A clear case has been the spread of Minangkabau in the direction of Riau and Jambi (Kato 1982). The same applies to Batak people who have moved southwards.

- *Transmigrants.* Since the early 1900s efforts have been made to move people from Java, Madura and Bali to the Outer Islands through transmigration projects. Particularly in the 1970s and 1980s large numbers of transmigrants were relocated in all of Sumatra's provinces. The most common pattern was to clear-cut a large piece of 'empty forest', and prepare this for human settlement with the entire necessary infrastructure: roads, houses, schools, and markets. The minimum size of a transmigration site was typically about 1,500 households. Usually this process of land clearing was done in combination with large-scale logging operations. Most

As a result of large-scale logging the traditional forest dwellers are displaced

of the projects were located in the lowland forest and foothills of the Bukit Barisan mountain range. However, from the 1980s large conversion projects were also carried out in the swamp forests of Riau, Jambi and South Sumatra. The digging of huge drainage canals was usually the first step in preparing these sites. In most of the projects farmers were allocated a couple of hectares for private use. Some projects had about one hectare as the lot on which the house was built while another piece of land was cleared in the forest at some distance from the settlement. Hundreds of thousands of transmigrants were moved in this way to new homes in Sumatra. In spite of severe criticism from environmentalists and other groups, the Indonesian government continued its policy even without external funding (*Banking on disaster* 1985). It was only in 1999 when the decision was finally taken to stop the transmigration projects. Promotion of permanent and intensive agriculture was certainly the purpose of these projects, but faced with infertile or insufficiently drained land, and wildlife 'pests' like monkeys, wild pigs, and occasionally even elephants, many transmigrants were unable to make a living in their new areas (Rye 2000:105). They went into the surrounding forest to clear new pieces of land, or engage in shifting cultivation. They also engaged in other activi-

ties like wage labour, small-scale industrial activities, and collecting of non-timber forest products, putting them in direct competition with other groups of forest dwellers (Holden and Simanjuntak 1994:105).

- *Spontaneous transmigrants.* An interesting group of non-native forest occupants came from Sulawesi and to some extent also from Kalimantan. People of Buginese and Banjarese origin settled in the tidal forests of Riau and Jambi and started to practise their familiar agricultural techniques. By draining the tidal swamp forests and by putting devices in the canals to prevent seawater from flowing back to the swampland, they succeeded in making the land ready for agricultural use. Coconuts and rice were the main crops. In some areas they succeeded in settling in formal transmigrant areas which were still in a preparatory phase, that is, only the main drainage canals were dug. But the Buginese farmers themselves took care of the remaining work to prepare the land. In some case the government had to give up the area for the transmigration of Javanese, because it would not be feasible to move the spontaneous settlers out of the area.

- *Intensive agriculturalists in the uplands.* There are a number of areas in Sumatra that are characterized by intensive agriculture in upland areas. These are areas with a relatively long history of settlement. Examples are Kerinci, central highlands of West Sumatra, and parts of North Sumatra. Intensive and irrigated rice cultivation is often combined with complex agroforestry systems with a wide range of products. The forest area is used for collection of non-timber forest products and small-scale timber extraction. As a result of improved roads and infrastructure, changes in land use also take place. The increase in cultivation of fruits and vegetables for distant urban markets is evident in areas like Kerinci and the West Sumatran highlands.

Commercial forest exploitation

Commercial logging operations have a long history in Sumatra but from the early 1970s this form of forest use began to have a major impact on the quality and size of the remaining forest. Initially the department of forestry granted large-scale logging concessions to foreign companies (Filipino and Malaysian), but within a couple of years domestic companies were founded and took over the job. Many of them used their earnings from logging to develop diversified and vast industrial conglomerations (Raja Garuda Mas, Sinar Mas, Barito Pacific, Astra).

Within a short period large areas of primary forest were selectively

The wide rivers flowing eastwards facilitate the transport of logs

logged. At the same time some of these areas had already been designated as transmigration sites, so loggers and full-scale land-clearing operations were closely linked. Other parts were designated as areas for the establishment of tree plantations for industrial cash crops such as rubber and palm oil. Though plantations were well established in the early twentieth century in the northern part of Sumatra, large parts of Riau, Jambi, Bengkulu, and South Sumatra were basically exploited by local people. Logging roads provided these isolated communities access to major markets. However, from the 1970s and 1980s, conversion to private or state-owned plantations for industrial crops like rubber and palm oil became a major driving force behind forest conversion. Large areas were turned into plantations.

The most important reason why the timber industry had such a great impact on the forest was that it was developed in a large-scale and organized way. Exploitation rights were granted to concessionaires for easily accesible non-protected forests. The dominant forestry model was selective logging, which did not involve clear-cutting but rather 'forest creaming', which meant that only the economically most interesting trees were taken. The logging roads built for this purpose attracted spontaneous settlers, thus opening up large forest areas. The oil and gas industry (in Riau, Jambi) has had a similar impact on the forest.

Logging companies certainly were not the only ones to open up primary forest. Many forest areas continued to be used by local communities for a variety of land uses involving *ladang* (often integrated with rubber) and hunting/gathering. Commercial exploitation in these community forests brought prosperity as well as resistance. Whatever impact dominated, these communities usually realized that logging brought about temporary change as the loggers continuously moved deeper into the forest in search of logs. Local communities were for many years the dominant producers of rubber until other producers took over and alternative products became available.

From the 1980s onward, the World Bank and the Indonesian government began to heavily push palm oil. The success of oil palm cultivation in economic terms has led to the belief that this crop will bring quick benefits for smallholder farmers too. In many areas in Sumatra this crop is considered to be a miracle crop requiring little investment of money and labour. In fact, all types of small-scale forest users, (former) shifting agriculturalists, transmigrants, and even former hunter-gatherers are planting oil palm seedlings as the way forward to economic prosperity. However, in contrast to rubber, which was mostly community-based production, palm oil could not be integrated into traditional farming systems, and as a result, the private sector became the dominant palm oil developer in Indonesia.

In recent years the demand for roundwood to feed forestry industries has grown rapidly. Since the early 1980s when the export of roundwood was banned, there has been a rapid growth of the Indonesian wood industry. Large and small-scale sawmills, plywood industries, and pulp and paper factories have grown dramatically. They are to be found in all major wood-producing provinces. Usually they are located close to an export harbour. A large part of the growth of provincial capitals in Sumatra is to be attributed to the expansion of industrial capacity based on forest exploitation and related industries and services.

Investments in these wood-processing industries necessitate the permanent flow of wood and wood products to these centres. It is no secret that the collective consumption of these industries far exceeds the sustainable forest supply. For many years figures on available logs, their area of origin, and the remaining forest cover were produced by various offices but by now it is clear that many of these offices were underestimating the total processing capacities of the industries while overestimating the quality of the remaining forest.

It is also clear that the wood-producing industry will not be able to continue its present scope of operations: gradually the supply will shrink as a result of exhaustion of forest resources. At present wood-processing industries still continue to operate due to the continuing flow of illegally cut wood, but in the long run this source too will dry up.

Logging the tree: cutting a forest giant

Roads

The development of the road system in Sumatra has been a major influence on the mode and intensity of forest exploitation. The design and construction of the road system are to a large extent determined by the needs of large-scale commercial exploitation of forest resources. Initially forest exploitation developed along major waterways. However, when land transport became more important, this pattern changed. In many parts of Sumatra this process started in the early twentieth century when early versions of a new Sumatra-wide road plan were designed. New areas were opened up for human settlement and for agricultural purposes in addition to administrative and military purposes. Due to the new transportation system the marketability of forest products rapidly increased. Gradually, powerful markets for forest and agricultural products from distant and even upland areas could exercise their influence. Particularly after the official opening of the Trans-Sumatra Highway in 1983 and the fast-growing network of new roads connected to it, land use patterns changed dramatically. Logging roads facilitated the process of occupation of arable land by migrants from other parts of Sumatra or by spontaneous migrants from Java. Often these logging roads were turned into all-weather roads after a couple of years. Inaccessible and remote jungle

areas were turned into pioneer settlements for hundreds of newcomers. Once bridges across the major rivers running to the eastern side of Sumatra were constructed as part of the Trans-Sumatra Highway, transport was greatly facilitated, substantially cutting time and costs. As in many other cases in tropical forest environments, this improved road network has had an incredible influence on the intensity and modes of forest exploitation. Direct and indirect effects, both social and ecological, have had a major impact on the forest and they will determine to a large extent the fate of the remaining forest in the years to come (see FAO 1999).

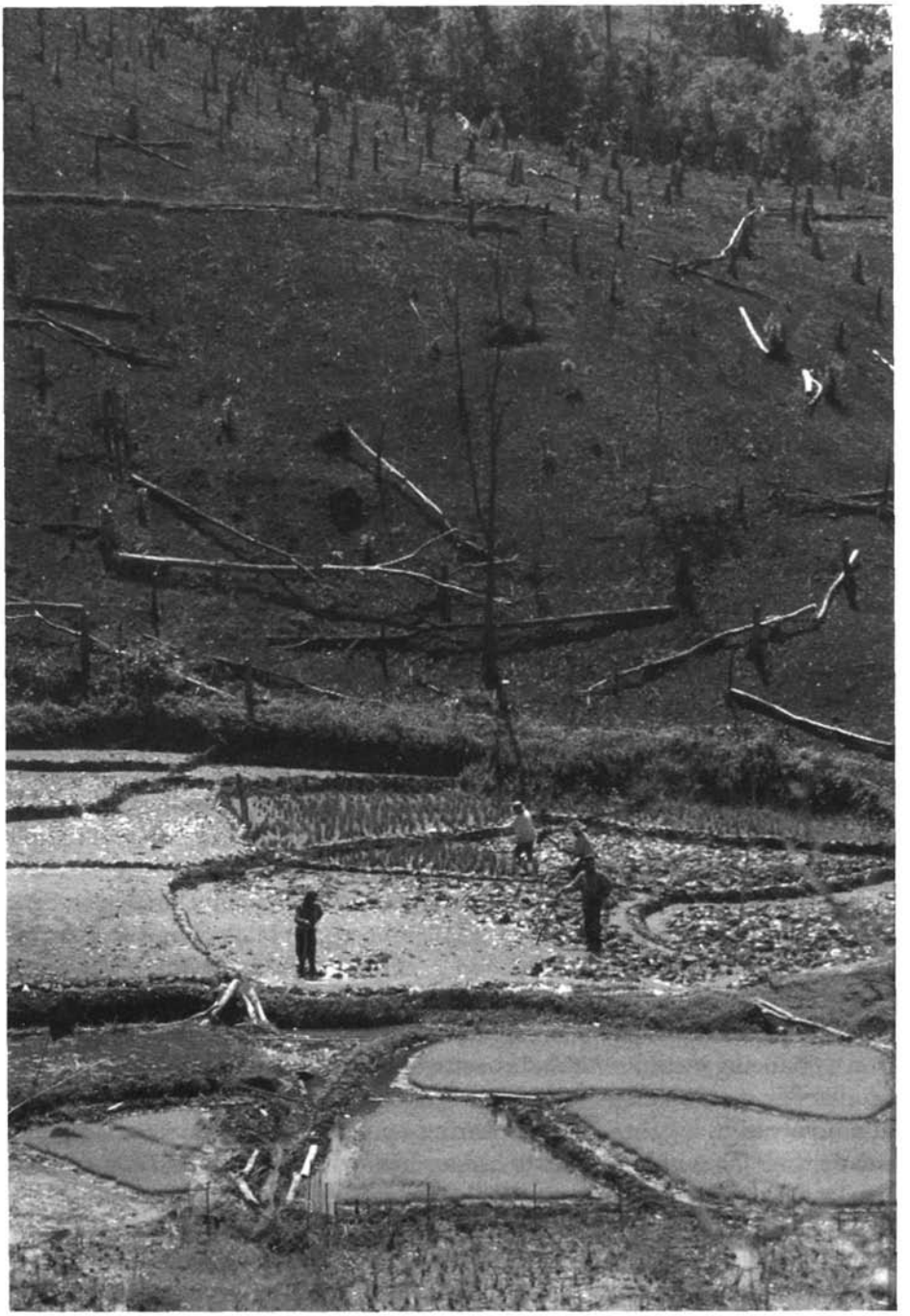
Forest fires

The use of fire in converting forest to agricultural land has a long history. In fact, throughout history fire has been the most powerful instrument in changing the forest landscape. Small-scale fires have been used by shifting agriculturalists throughout history. In the process of clearing land, fire has always been a useful instrument to get rid of all the leftovers in the forest after the valuable timber has been moved out. The 1980s and 1990s, however, saw increasing occurrence of heavy forest fires, especially during the El Niño phenomenon (1982-1983, 1991-1992, 1997-1998). Virtually all the forest fires associated with El Niño, it is now believed, are man-made. They are predominantly caused by companies involved in rapid expansion of oil palm and pulp tree plantations, and by arson.

Commercial exploitation of forest resources is largely export oriented. Sawn timber, plywood, paper, and industrial crops like rubber and palm oil are produced mainly for external markets. As raw materials they leave the area of origin and are transported to harbour towns, where most of the processing takes place. Over the years most of the sawmills have been concentrated close to harbour towns like Palembang, Jambi, Padang, Sibolga and Pekan Baru.

Behind these export-oriented industries and companies there is of course a whole world of private and collective stakeholders, governmental institutions, financing institutions, and consumer markets. Though in the discourse on deforestation blame is often placed entirely on companies that are actually involved in logging or land-clearing operations, these companies could not do their job without intimate connections with financial and commodity markets.

One case study revealed that all major Dutch commercial banks have been substantially involved in financing the oil palm subsector in Indonesia (see Wakker, Van Gelder and Telapak 2000). Between 1994 and 1999, all major Dutch banks were found to have financial ties with several of the main plantation company groups in Indonesia. Many plantation subsidiaries of



If the landscape allows, Malay farmers start cultivating wet rice

the company groups in which Dutch banks are involved contribute to environmental and social problems, such as forest fires, deforestation, illegal land clearing, and social conflicts.

Conservation

Forest conservation has a long history in Sumatra. Beliefs and practices contributing to the protection of sacred sites and sacred forests are to be found among numerous ethnic groups. Modern-style nature conservation in Sumatra goes back at least as far as the early twentieth century. Efforts to protect the Gunung Leuser, for instance, began as early as the 1930s and the area still receives a lot of attention and money because it continues to be under severe pressure. After the initial interest from nature conservationists, many areas were added to the list of protected areas in categories ranging from national parks to protected forest areas and wildlife reserves.

The major forest conservation areas in Sumatra are:

1. Gunung Leuser National Park (9,500 km^2)
2. Singkil Barat (851 km^2)
3. Dolok Sembilin (339 km^2)
4. Siberut National Park (1,920 km^2)
5. Kerumutan Baru (1,200 km^2)
6. Seberida (1,200 km^2)
7. Bung Hatta Reserve (?)
8. Bukit Besar (300 km^2)
9. Jabung (30 km^2)
10. Berbak Reserve (1,900 km^2)
11. Kerinci Seblat National Park (9,985 km^2)
12. Kembang Lubok Niur (1,000 km^2)
13. Bukit Duabelas Reserve (290 km^2)
14. Bukit Tigapuluh National Park (1,270 km^2)
15. Banyasin-Musi/Sembilang (900 km^2)
16. Barisan Selatan National Park (3,568 km^2)
17. Way Kambas National Park (1,300 km^2)
18. Teso Nilo Elephant Conservation Area (proposed)

In addition there are many small protected areas of only regional significance or areas with no official status. In general, however, there are not many areas that are not seriously endangered from outside. Foreign support for these conservation efforts can be instrumental in establishing protected status. Few,

Expanding agriculture with upland rice and young rubber trees

if any, of these areas were established without some kind of external support. In many cases management plans were written by foreign experts. And in some cases large amounts of money were and continue to be invested. This is not surprising, as encroaching farmers, illegal logging, poaching of wildlife, or the most fundamental of all, revocation of protected status, continues to be a permanent danger. These threats can only be successfully countered by ongoing attention and action, and projects that take away some of the pressure on the protected area. Over the years WWF, World Bank, European Union, Asian Development Bank, UNESCO, and the governments of many donor countries (Canada, Germany, Norway, and the Netherlands) have supported individual protected areas for certain periods of time. The standard procedures and time horizon of projects of these so-called Integrated Conservation and Development Projects (ICDPs) (usually three to five years) and the practices of conservation bureaucracies do not, however, coincide with the 'real world' and the needs of protected areas, which simply do not allow for an early retreat. Outside involvement is often phased out after a number of years, with the expectation that Indonesian staff will take over the responsibilities and maintain the infrastructure, and that funding for all the activities will be generated from Indonesian sources. This is rarely the case. Many projects suffer from lack of committed staff sufficiently equipped to face the challenges and able to address the permanent threats. They also lack

adequate funding once foreign donors phase out.

Most donors only take an interest in particular conservation areas for limited duration. Because of the internal rhythms of development and conservation bureaucracies, they rarely extend their funding and support beyond a period of five years, after which their interest gradually diminishes and they go off in search of new battlefields. After a gap of a couple of years another donor sometimes takes up the challenge of protecting whatever there is left to be protected.

We would now like to present two lesser-known case studies from Sumatra that illustrate the combination of various types of forest users, the changes in land use planning, and the efforts to protect forest areas from further degradation.

Forest use, forest conversion, and forest conservation on Siberut

The island of Siberut off the west coast of Sumatra has a history of forest use that is representative of many areas of Sumatra. It shows a dynamic history of forest use and planning, rapidly changing actors, and recently a changing role of local people.

Siberut is the largest of the Mentawaian Islands. It is inhabited by about 26,000 Mentawaians and a small number of migrants, mainly of Minangkabau origin. In relation to its total land area (4,480 km^2) the island is sparsely populated. Hills rise steeply, though the highest peak on the island is less than 400 metres. Many rivers dissect the dense forest. The Mentawaians are traditionally organized in patrilineal groups of approximately 30 to 80 people living in small settlements along the banks of the rivers. These groups are autonomous political units. Hunting, fishing and gathering provide most of the daily food. Sago starch obtained from the sago palm is the staple food. Sago stands on the island are abundant. Unprocessed sago is used to feed free-roaming pigs and chickens.

Annual crops like corn or rice are absent. This is directly related to the local form of agriculture, which does not use the regular slash-and-burn technique. After clearing the undergrowth in the forest, Mentawaians plant the seeds and seedlings of a great variety of plants, trees and shrubs. It is only then that the large trees are felled. This vegetation is not burned but is left to rot. Gradually the leaves and branches will wither while the seedlings start to grow. In this way the soil is never exposed to the sun or the rain. Over the years a new forest dominated by fruit trees and many other useful plants will have replaced the original forest.

The tropical rainforest of Siberut is well known for its endemic wildlife including four endemic primate species. The numerous birds and plants

have made Siberut an important island in the country's natural heritage, receiving ample attention from international conservation agencies.

The first organization to identify Siberut as an important target for conservation was WWF at the end of the 1970s. This was at a time when the entire island was granted to logging concessions. It was then that the 'battle for Siberut' was started. WWF soon presented a 'master plan for a tropical paradise', and this plan received the explicit support of the Indonesian minister for the environment. Soon thereafter, a protected area was declared of about 50,000 hectares in addition to a large 'traditional use' zone. No commercial logging was allowed within these two zones. WWF started implementation, but two years later responsibility was handed over to the Indonesian authorities without the continuation of foreign assistance.

For a number of years logging continued in spite of numerous public efforts to expose the dangers to people and wildlife. Though various conservation agencies expressed their interest in the island, none of them actually took action until the early 1990s, when the Asian Development Bank (ADB) launched its Indonesian biodiversity programme. Siberut was selected as one of two target areas for a multimillion-dollar project. In 1992 all logging concessions were cancelled, the protected area was expanded to 192,000 hectares, and its status was changed to that of a national park. The ADB project brought in foreign consultants. An impressive five-volume management plan was prepared and project implementation to safeguard the biodiversity on the island started. A huge national park headquarters was constructed on the island with all kinds of facilities. There were great expectations of ecotourism, bioprospecting, handicraft development, and new agroforestry crops. These were supposed to generate new sources of income for local people. In the meantime other large-scale development plans such as transmigration and oil palm plantations were shelved.

The implementation of the project, which lasted until the late 1990s, turned out to be more complicated than had been envisioned. It was difficult to keep project staff on the island. Communication with local people was problematic, as the message of nature conservation with lots of prohibitions after a few decades of commercial logging without any benefits for the local people was not well received. Tourist arrivals did not increase, and after the forest fires of 1997-1998 and widespread political unrest, tourism even declined. This and a certain amount of project mismanagement finally led BAPPENAS, the national planning agency, to cancel the ADB project. Spending more money on this project could no longer be justified.

After a period of uncertainties and with a new provincial government aiming to revoke the national park status of the area, it was UNESCO that renewed interest in the island. Though UNESCO had declared Siberut a Man and Biosphere project in 1981, it had done very little to follow up. Now, with

no other major international players involved in 'saving Siberut', UNESCO started to become active in the area with committed staff. However, the political climate on Siberut, within the province of West Sumatra and the rest of Indonesia, has changed a great deal. Mentawai has now become a *kabupaten* in itself: Mentawaians want to have a bigger say in land use planning on their island. Possibilities of establishing local cooperatives and obtaining small-scale logging concessions have been grabbed up by local people. Many of them now see a chance to acquire some benefits from the forest land that they have always considered theirs but to which they were basically denied access. External agencies had always determined the scale of logging operations and now imposed nature protection. By now many local people believe that converting parts of their forest into oil palm plantations would bring valuable money for the timber, and within a couple of years the harvest of a cash crop that is really beneficial to them. They do not want to wait for another powerful outside force to come and tell them what is good for them and how their island should be 'saved'.

The Bukit Duabelas Reserve (Central Jambi)

In the central part of the province of Jambi is a vast area that used to be covered by lowland rainforest. The triangle formed by Muara Tembesi, Muara Bungo, and Sarolangan was a large swamp forest except for a small mountain range in the centre, the Bukit Duabelas. On the banks of tributaries of the Tembesi and Batang Hari rivers a number of villages were located, inhabited by Malay farmers. They made a living from cultivating irrigated rice on the flood plains, upland rice in the hills, and rubber trees. Additionally they would collect various products from the forest such as rattan and honey, while the numerous rivers and streams provided a surplus of fish.

In that vast area lived several thousand Kubu (or Anak Dalam), subsisting on hunting and gathering. It was also from this area that the first images of Sumatra forest dwellers were published, rousing the interest of colonial ethnographers and civil servants. Between 1910-1930 it was debated how best to deal with these people: should they receive special protection against abuse from more powerful neighbours or would it be better to promote integration and assimilation into the Malay community?

The Kubu lived with the Malay farmers in a kind of symbiosis. The Kubu worked as wage labourers. They also practised 'garden hunting' and exchanged a wide range of forest products for bush knives, tobacco, cloth, and salt.

From the 1970s most of the area was granted to logging companies and part of it was cleared for large-scale transmigration sites. In the early 1980s

the area was booming with activity. Foreign contractors were building the Trans-Sumatra Highway including the numerous bridges across the wide rivers, logging companies were moving further into the forest every day followed by clearing operations, and construction workers were building thousands of houses for transmigrants from Java and Bali.

In the meantime the department of social affairs was trying to persuade the Kubu to give up their 'miserable' life in the forest in exchange for mainstream Indonesian village life, with community facilities and exposure to the market, under direct supervision of government officials. Special resettlement villages of 50 to 100 houses each were constructed for them. Efforts were also undertaken to integrate them in transmigration sites by allocating them a number of houses, a certain amount of agricultural land, and other facilities. The Kubu refused, however. They declined both the offer to give up a free life in the forest and the offer to become 'local transmigrants', and they also did not want to become a kind of Malay farmer. They returned to the forest even though they had to adjust their lifestyle because of changes in the forest environment.

The massive transmigration sites of Air Hitam and Margoyoso had a big impact on their lifestyle. Basically all good forest was removed and turned into transmigration sites and agricultural land, most of which was planted with oil palm. The rapidly worsening conditions of the original forest-dwelling people, who in fact were turned into highway nomads, and the endangered remaining wildlife including tigers, sun bears, and elephants, which were still present at that time, alarmed government officials at the *kabupaten* level and the provincial head of the Indonesian department of nature conservation. Jointly they took action and in 1984, with the help of the governor, they succeeded in establishing a small protected area around the Bukit Duabelas (29,485 ha). Though the area was much too small to provide a safe environment for the Kubu and for the large mammals, the logged-over forest north of the small mountain range still offered possibilities for survival. It was considered a success that part of the area that had already been logged and cleared for transmigration was officially given up for the purpose.

There has been support for the cause of the Kubu by a Bangko-based Indonesian NGO (Warsi), which also received support (and an expert) from the Norwegian government. Over the years they have worked hard to improve the fate of the people who were faced with rapidly diminishing forest resources. Proposals were also submitted to expand the small reserve to include the logged-over production forest north of the hills. At the same time, logging roads were improved and turned into all-weather roads. A large factory for the processing of the fruits of oil palms was constructed in the area and new waves of migrants kept on coming. In addition there were also internal troubles among the Kubu themselves, in deciding how to deal

with the encroaching outside world. Some Kubu decided to give in to outside pressure and became Muslims. They started imitating the lifestyle of the surrounding Malay farmers and transmigrants, including their way of using land, by planting rice, rubber trees, and oil palms. Other Kubu, however, were firm in their decision to maintain the lifestyle of their ancestors as forest dwellers with minimal material possessions.

In 1994-1995 the Kubu received additional support from the department of forestry. They obtained almost exclusive rights in the reserve area, which was also declared a Cagar Budaya Suku Anak Dalam. Early in 2000 a local Kubu headman of the Bukit Duabelas mountains, Temenggung Tarib, was invited to Jakarta. He received the Kehati Award for his efforts to protect the reserve and maintain a lifestyle in harmony with nature.

While proposals for expansion of the reserve to the north are still pending, the spirit of regional autonomy and local cooperatives engaged in logging activities has also reached the area. At one of the log ponds where a big logging company used to direct its operations, local cooperatives have now taken over. Ironically, one of the cooperatives now active in the area operates in the name of the Anak Dalam, even though it is destroying the resource base of the people. Forestry officials have returned to the provincial capital, as it turned out to be impossible to execute their duties. In one of the Malay villages adjacent to the reserve, Sungai Ruan, all kinds of construction work is going on: house improvement, road construction, and a new mosque. Money is generated from the forest, and once the trees are removed, oil palm seedlings will dominate the landscape.

Conclusion

Though forest conversion and logging have a very long history in Sumatra, the scope of these operations during the past three decades is not comparable to earlier phases in the environmental history of the island. Scale and intensity have multiplied during this most recent phase, while conservation efforts have not been able to offset the trend.

Surveying the present situation, it is difficult to be optimistic about the fate of the remaining forest of Sumatra. Patches of montane and swamp forest might survive for some years to come. About the fate of the remaining lowland forest fragments outside a number of protected areas it is difficult to be optimistic. Across the island there are no forces that seem to be able to halt further conversion of forest land into agricultural land. The economic crisis, the growing population, the influence of distant financial and commodity markets, and above all the present spirit of 'regional autonomy' in all its manifestations, point in the same direction: exploitation and conversion

of the remaining forest resources to other land use types. Forces to offset this tendency to a significant degree through protection are simply too weak to be effective. Either they offer too little in terms of alternatives for the local income generated from forest conversion, or they are condemned as undesirable foreign interference. More and more foreign agencies, like the European Union, GTZ (the German Development Agency), USAid and WWF, are losing interest in conservation efforts because it is considered a tough, uphill battle. Taking a wider perspective, many of these institutions conclude there may be more promising battlefields for forest conservation than present-day Indonesia. At the same time, forces from urban centres within Indonesia voicing a different message are hardly heard and comparatively powerless.

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SUSENO BUDIDARSONO and PAUL BURGERS

Forestry and local communities of Java in times of and turmoil, 1942-2000

On the island of Java, the total area classified as forestland is estimated at three million hectares (Perum Perhutani 2001:10). This constitutes 23.7% of the total land area of the island. It is striking that current data seem to show that the area classified as forestland has remained relatively stable since the early 1940s. However, the term forestland is not only used to designate land that is covered with forest. Forestland refers to state land that is designated by law as forest area and it may or may not be forested (see Colfer and Resosudarmo 2002:2-3). Taking this knowledge into account, it is not surprising that the forested area has, in fact, changed dramatically, dropping from an estimated 5.07 million hectares in 1950 (Hannibal 1950 as cited in FWI/GFW 2002:8) to an estimated 1.3 million hectares in 1985 (spatial analysis based on digital spatial data of World Conservation Monitoring Centre/UNEP-WCMC 1996). In fact, there is a huge difference between what is classified as state forestland (administered by Perum Perhutani (State Forest Company) and the Directorate General of Forest Protection and Nature Conservation) and actual forest cover (data derived from UNEP-WCMC).

The discrepancy between state forestland and actual forested area is particularly interesting as most of these state forestlands and forested areas are fringed by village communities that managed these lands as an integral part of their livelihoods long before the lands came under the control of state agencies. Ever since the first village *adat* territories were converted to state forestland, state agencies have tried to prevent these newly developed state territories from becoming breeding grounds for conflict between local communities and the state. From the period of Dutch colonial rule onwards, specific programmes were established that aimed to integrate forest protection and the eradication of poverty through community management. Unfortunately, these programmes and regulations had only limited success, and poverty and forest degradation continue to persist. Recently, since the economic crisis and the era of Reformasi, poverty and forest degradation have increased dramatically.

This article reports on changes in forest cover in the state-controlled lands of Java that have occurred as a result of severe economic and social hardship. In particular, we aim to provide insight into the response mechanisms of local communities during periods of severe hardship. As most of the current policies have their roots in (colonial) history, we will start with a discussion of the major historical events that have affected forest cover and forest management on Java. The article will then shift its focus to the programmes that were set up to help communities in the forest margins and to improve rural livelihoods through community participation in forest management. Then, starting from the period known as the Reformasi and the economic crisis, the article will focus on the most recent developments and changes that have taken place in forest management and poverty eradication programmes as well as look at the responses of local communities. These turbulent times brought about a dramatic change in the way the forests are perceived and valued by local people and government agencies. Finally, a case study from Lembang, West Java, is presented with the aim to demonstrate the effects of recent political and economic changes on the way local communities perceive state forestlands in the vicinity of their villages.

Tracing back the management of Java's forests

Early Java forestry: free access, state domain and forest degradation

In pre-colonial times, the forest provided enough timber and other forest products to satisfy the needs of the kings and the local people of Java. With low population densities, there were no constraints on the use of the forest and its products (Pigeaud 1962:456-7, 509-10). When the Dutch East Indies Company (VOC) came to Java around 1600, they used the apparently inexhaustible supply of teak trees for the VOC's shipbuilding industry in northeast Java as well as for export (Boomgaard 1996:17; Peluso 1992:36-7). During the early period of Dutch occupation, forestry operations were characterized by intensive tree felling (particularly teak) from a standing stock of trees without a replacement programme. These practices resulted in waste and overexploitation, due not only to the misconception of inexhaustible supply, but also to a lack of knowledge of how to grow teak trees. By the second half of the eighteenth century, most of the finest teak forests along the north coast of Java had disappeared. The damage inflicted on teak forests was so severe that 20 years after the VOC folded in the late eighteenth century, they still had to be left untouched in order to regenerate (Cordes 1992:239).

Under the Dutch administration, a more systematic way of managing stands of teak trees on Java developed, which included selective felling, bans,

and reductions in the log quota. On Java, a number of regulations regarding the management of forestland and labour were enacted to conserve and ensure a sustainable use of forest resources. Gradually, a state-based forestry developed (Peluso 1992:44-67). State control over forest products (teak in particular) was gradually tightened, and local people were increasingly prevented from having access to the forest in what were now state-controlled areas. In 1926, a Teak Enterprise was established as part of the Forest Service to manage state forestland. By 1940, the Dutch Forestry Service had brought some 3,057,200 ha of Java's land under its control (Dienst van het Boschwezen 1948 as cited by Peluso 1992:76).

The Japanese occupation, 1942-1945

The Japanese occupation had deleterious effects on Java's forest and forestry. Initially, Indonesians welcomed the Japanese army to oppose Western occupation and capitalism in 1942. However, the Japanese soon imposed a highly destructive wartime economy, which exploited Indonesia as a major supplier of both food and raw materials for the Japanese army. Every available piece of land, even the backyards of private residences, had to be cultivated with staple crops such as rice and sweet potatoes to feed the Japanese army (Himawan 1980:208). To boost food production even further, forest areas were increasingly converted into agricultural land. Standing stocks of trees and forests were important for building purposes, for example military ships, while firewood and charcoal served the industrial and transportation system (the railway system in particular). The lack of forestry management plans during this period resulted in unsustainable levels of tree felling. During the Japanese occupation, the area of forest cut down doubled from 1,241,424 m^3 in 1939 to 2,162,812 m^3 per annum while reforestation rates decreased by almost 50%. Between 1931 and 1940 reforestation was estimated at about 10,000 ha per annum. The annual rates during the Japanese occupation, however, dropped from an already low figure of 5,166 ha in 1942 to 7,473 ha in 1943, 4,418 ha in 1944, reaching a record low of 2,769 ha in 1945 (Yunus Kartasubrata 1992:17).

The Republic of Indonesia

Early independence until the late 1960s

Although the Japanese occupation lasted for only three years, it had a devastating effect on the forests and the economy; effects that reverberated well into the 1950s. When the Indonesian Forest Service (Jawatan Kehutanan,

The *tumpang sari* system was and still is a major component to achieve sustainable community forest management and poverty eradication in villages surrounding State Forest land (photograph by Gamma Galudra).

Kementrian Kemakmuran) took over the forest administration from the Japanese, the establishment of a proper forest management was difficult, not only because of the abominable state of the forests but also because of conflicting ideologies on how forest areas should be managed. There was a desire to return to the top-down, orderly and well-planned work system of the colonial Forestry Department, Dienst van het Boschwezen, but this conflicted with the more egalitarian philosophies held by the independent Republic of Indonesia (Peluso 1992:97-9). This impasse created a 'vacuum' in forest regulations, which allowed poor communities to claim state forest areas and convert them into agricultural land for household use. By 1952, on Java the estimated total area of forestland destroyed as a result of the Japanese occupation was about 500,000 ha (Yunus Kartasubrata 1992:18).

On 24 September 1951, the Minister of Home affairs and the Minister of Agriculture (forestry was part of the Ministry of Agriculture) issued a joint ministerial decree to establish a committee to evaluate the situation. They wanted to assess which land areas had been designated as production forest or protected forest during Dutch colonial rule and how much the forest had deteriorated since the Japanese occupation (Perum Perhutani 1976:13).

The Indonesian government felt it needed to get a stronger hold on land issues. This wish was soon supported by several regulations, of which the Agrarian Law No. 5/1960 and the old Forestry Law No. 5/1967 were the most important. The forest area inherited from the Dutch colonial administration remained under state control,[1] and the government obtained the right to designate any area as state-controlled land, despite the growing need for agricultural land by a growing population.

The period from 1970 to 1997

During this period, under Soeharto's New Order, the control over state forestlands on Java became more repressive and more militaristic (Peluso 1992:124). However, it could not prevent an ongoing destruction of forest resources and forestlands by various actors – including local communities in search of agricultural land. The State Forest Company on Java, Perum Perhutani, initially established as a state corporation (Perusahaan Negara) in 1960,[2] was reorganized in an attempt to strengthen its control over the forests on Java.[3] Strong state control over forestlands did enable timber production to increase but this was partly a result of classifying protection forest as production forest. By the mid-1990s, the State Forest Company controlled about 2.6 million ha of production forest (teak and non-teak consisting of 1.9 million ha) and protection forest. Nature reserves constituted another 43,000 ha, administered by the Directorate General Forest Protection and Nature Conservation, bringing the total to 3,043,000 ha. However, other information suggests that only about 1,300,000 ha was forested.

Reformasi and the economic crisis, 1997-2000

In 1997, Asian countries succumbed to a regional economic crisis from which Indonesia suffered the most (Sunderlin et al. 2000:1). The crisis affected

1 The state assertion of natural resources control is expressed in the Indonesian constitution (UUD 45). Article 33, section 3 says that 'The land, the water and the natural richness contained therein shall be controlled by the state and exploited for the greatest state of the people'.

2 In 1960, the government of Indonesia established Badan Pimpinan Umum Perusahaan Kehutanan Negara (General Executive Body of State Forestry Corporation). As a state corporation, BPU Perhutani was given a mandate to manage forests on Java and Kalimantan. In 1972, Perhutani became a more autonomous state forestry corporation (Perum Perhutani).

3 Two bodies are responsible for forest management on Java at present: 1. The State Forest Company controls and manages the island's production forest and protection forest. In its development, some forest classified as 'protection forest' (*hutan lindung*) changed to 'limited production forest', where low-impact use such as resin collection is allowed; and 2. the Directorate General Forest Protection and Nature Conservancy administers forest reserves (national parks, nature reserves, and wildlife conservancies).

the whole economic system of Indonesia.[4] It developed into a full-blown institutional meltdown, leading to the downfall of Soeharto in May 1998 (Kusumaatmadja 2000:208). A socio-political transition followed, known as the Reformasi. Although it initially arose in urban areas, the Reformasi soon reached the countryside, triggered by an emerging food crisis brought on by the effects of El Niño, and aggravated by rising prices for agricultural imports. The ensuing political turmoil encouraged the people to begin voicing demands for changes in property rights that would allow them to acquire arable land to complement their small landholdings. Communities living adjacent to state forestlands, in particular, began to resist their position as passive recipients of programmes set up by the Ministry of Forestry and by firms who had been granted forest concessions. However, extreme measures were taken to suppress these demands.

Increasing evidence, made public by non-governmental organizations, local and international newspapers, and other agencies, showed that the forests on Java were under immense pressure again and destruction was on the increase. For instance, case studies of theft and destruction in Central Java and East Java showed that villagers were carrying out illegal logging activities on state forest plantations and were clearing teak forests for agricultural purposes. This reflected a lack of sufficient land for forest village communities to make a living. A selection of news items related to forest destruction and tree theft, compiled during 1999-2001 from various local, national, and international newspapers, shows that local people were not the only perpetrators of 'forest crimes'. In many cases, local villagers took part in illegal logging activities only as labourers. Apparently, these illegal enterprises were often organized by military and police personnel, or *cukong* (term normally used to refer to a person sponsoring business-like activities), and State Forest Company personnel themselves. An underlying factor behind timber theft is also thought to be the huge demand for wood for the uncontrollable and booming furniture and crafts industries of Central and East Java.[5] Between 1998 and 2000 on Java, the figure for illegal tree felling was reported to be around 6.7 million trees, while the amount of lumber stolen was thought to be about 166,155m^3. The estimated financial loss due to tree and lumber theft in 2000 alone was estimated at US$ 68 million (see Appendix 1). The

4 Statistics of Indonesia show that the growth of GDP during 1998 was minus 13.13% and the 1998 inflation rate reached 77.63%; the crisis also increased the number of poor people in Indonesia from 34.5 million (17.7%) in 1996 to 49.5 million in 1998 (24.2% of Indonesia's population) (BPS 2000:563).

5 For instance, the installed capacity of the wood furniture industry centred in Jepara, Central Java, requires 900,000 m^3 timber per year. Against this need for raw material, the total production of the State Forest Company's Central Java unit is only around 600,000 m^3 per year. (Bratamihardja et al. 2000).

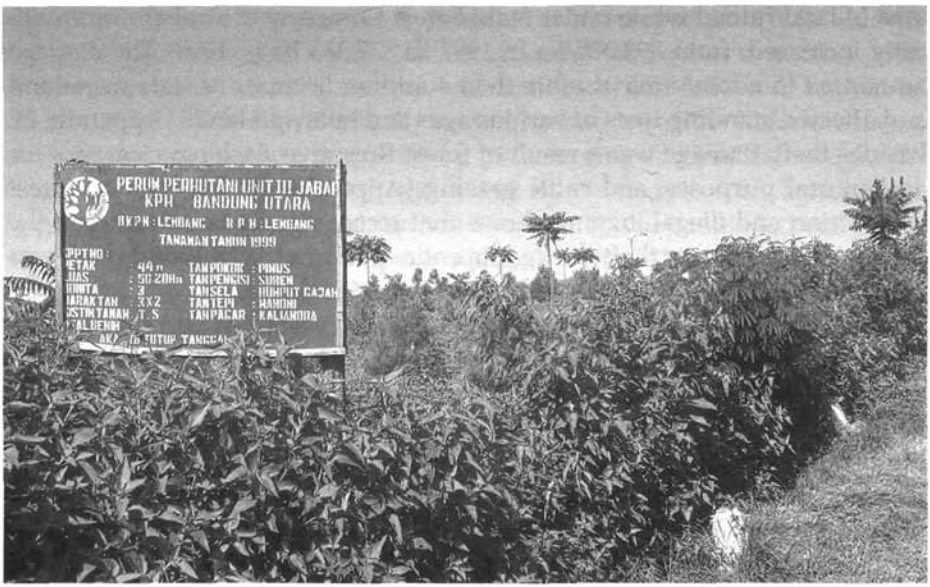
area of land ruined while under State Forest Company control also dramatically increased: from 392,384 ha in 1997 to 727,333 ha in 1999. The damage amounted to a total area of more than 4 million hectares of state forestland and affected standing trees of various ages and fallowed lands (Appendix 2). Besides theft, damage was a result of forest fires, tree slashing, clearance for agricultural purposes, and cattle grazing (Appendix 2). The data on forest destruction and illegal logging shows that recent figures largely exceed the highest figures of tree theft during the entire period of 1918-1986, which was estimated at 263,699 trees (as stated in Peluso 1992:148).

Summarizing, it seems that periods of severe economic and social stress have accelerated forest and tree destruction on Java. The most recent period of unrest on Java, the Reformasi and economic crisis, illustrates that the annihilation of Java's forest is more than just a quantitative indicator of the human capacity for destruction. It seems to reflect the impact of poverty and the effect of denying local communities access to the resources on which they depend for survival. This process continues despite the fact that social forestry programmes have tried to minimize destruction by encouraging local communities to participate in forest and tree management.

Community participation in forest management on Java

In densely populated Java, forestland is typically located in hilly areas with poor soil. With a population of around 120 million (or 912 persons per km^2), the population of Java constitutes nearly 60% of the total population of Indonesia. Livelihoods in rural areas of Java have to be sustained on small pieces of agricultural land, on average 0.6 ha of land per household. In most cases this is inadequate to keep a household's livelihood even at a subsistence level. This particularly holds for villages located on the fringes of state forestlands where a large portion of the original village administrative territory (*adat*) is now classified as state forestland. In 2000, the area designated as state forestland comprised about 24% of the total area of Java. Approximately 6,000 villages with a total population of 30 million people are located in the vicinity of state forestlands and 20% to 30% of them are classified as poor (Bratamihardja et al. 2000:8; Sunderlin 1993:5).

For a long time, the state has recognized that, in the absence of alternative ways to make a livelihood, being excluded from access to the resources on state forestlands would push communities further into poverty and induce poverty-related strategies, such as forest clearance for agricultural purposes. Dutch colonial rulers acknowledged the possibility of such conflicts as early as 1873, which led to the development of a system of community participation in tree management, known as *tumpang sari*. Under this system, communities



A Perhutani signboard. With recent privatization of Perhutani and with salaries of Perhutani officials having to partly rely on profits from the plantation, trials are being set up to look at more intensive and more profitable use of State Forest land. The various fodder species (*rumput gajah* or elephant grass and calliandra trees) in this trial are intended for sale to surrounding dairy farmers. (Photograph by Paul Burgers.)

were allowed to cultivate agricultural crops between rows of reforestation trees on state forestland. In exchange, participants were obliged to protect adjacent trees (Sunderlin 1993:7). The *tumpang sari* system formed the basis along which a number of social forestry programmes have been initiated by the government agencies in Indonesia. The main objective of these social forestry programmes was to increase national revenue from timber harvest through reforestation of degraded lands while at the same time improving the economic and social welfare of communities living in and around state forests. Another key goal of these programmes was to alleviate conflicts over land and control over forest resources that had been going on for a long time between forestry officials and local communities.

In its early years, the *tumpang sari* system was meant to obtain cheap labour for the development of new forest plantations, while at the same time allowing local people to benefit from the use of state forestland for several years. However, a continuously expanding population meant that more people had to be accommodated on the same land area, causing a decrease in average plot sizes. The State Forest Company had to acknowledge that a

social programme was necessary. The *tumpang sari* system had to shift from being primarily profit-oriented towards becoming a more integrated system, which included poverty alleviation.

In 1974, the State Forest Company launched its Prosperity Programme, in which the *tumpang sari* system was supplemented by on-farm silvicultural practices. Mulberry trees were promoted for the production of silk worms and for bee-keeping, while the distribution of seedlings among villagers was intended to secure a future source of fuel wood, fodder, and timber.

By the late 1970s, the success and lack of success of this programme resulted in a further shift in focus as it was increasingly recognized that community welfare had to be viewed in terms of broader and more integrated socio-economic dynamics at a regional level. The Program Masyarakat Desa Hutan (PMDH) or Forest-Village Community Development was developed in 1982, with the aim to alleviate poverty in forest villages, in coordination and cooperation with other government offices and agencies at various levels, including the district planning agencies (BAPPEDA), district and sub-district administrative offices, and village heads (*kepala desa*). The PMDH evolved and began to take a broader approach to forest management known as social forestry (*perhutanan sosial*). Universities became involved in conducting socio-economic surveys while NGOs began setting up training schemes to teach State Forest Company staff more participatory methods and approaches. The main goal was to understand the needs of various social groups in the local community and merge them with the objectives of the State Forest Company. Forest farmer groups were established with the purpose of channelling possible community-based interventions. Innovations were made in agro-forestry, such as the incorporation of multipurpose tree species whose fruits, branches, or leaves could be used without having to cut down the trees, thus allowing farmers to make use of forestland for agricultural purposes throughout the entire tree-rotation cycle.

In the mid-1990s, further refinement of the programme led to the introduction of another concept, known as Integrated Forest-Village Community Development. Forestland was divided into three zones, ranging from a forest area without significant social and population pressures to forest areas with very high social and population pressures. This last category consisted of a buffer zone, which would cover 20% of the reforested area, and would mainly consist of multipurpose tree species, to be managed by local people.

Unfortunately, these well-intended programmes have done little to improve the situation in local communities. The programmes tended to refer to the community forestry model implemented in Indonesia as simply populist types of forestry activities with some social characteristics. The limitations of these policies are that they are founded on the historical tradition that forests on Java should be under state control, a stance that has

not changed since the first Forestry Law (Ordinance of 10 September 1865/ Staatsblad No. 96). Legal access to forests continues to be restricted for local people once the saplings have been planted, and regulations are increasingly based on and regulated by national laws rather than originating from within the local community. It must be noted, therefore, that these programmes were never intended to transform the rights of the local community to regain and develop their ability to manage resources sustainably.

However, the most recent factors disrupting the management of state forestlands, the Reformasi and the economic crisis, triggered a process through which local communities began to put forward their own demands and needs. In combination with decentralization processes, local communities began to claim and use the land for their own purposes, thereby forcing the government to develop an agenda of policy changes, as shown in the following case study.

Social forestry and local communities during the crisis: the case of Lembang, West Java

The small-scale farming areas on the slopes of the Tangkuban Prahu volcano in Lembang, West Java, consist of intensive and diversified farming systems. Here, two villages were selected for research, namely Cikole and Jayagiri, both surrounded by state forestland with pine trees as the main perennial crop. The only way villagers were able to use this state forestland was through the *tumpang sari* system. However, from 1986 onwards, *tumpang sari* was abandoned. Provincial Decree No. 521.22/8066/Binprod, of 16 September 1986, stipulated that the *tumpang sari* system caused too much erosion and increased water run-off, which could endanger the water supply of Bandung.

The reason we selected these villages for study is that it seems highly likely that such drastic measures would have caused a great deal of conflict between the villagers and the State Forest Company, Perhutani. A second selection criterion was that these villages both had an integrated farming system consisting of horticulture, vegetable cultivation, and small-scale dairy farming. In addition, pressures on state forestland may have been lower as the city of Bandung was close-by and provided alternative employment. It was hypothesized that because the economic crisis hit the cities of Java hardest, family members who had previously worked in Bandung and became unemployed would have to return to their home village. These developments may have affected the use of land because these returning family members had to be supported, thus increasing pressure on the family budget and possibly increasing the need to claim state forestland. Small commercial farming enterprises may also have been affected by the economic crisis, as

prices of imports increased tremendously while prices of high-quality products for the domestic market (such as flowers and milk) may have dropped. The capacity of individual households, of differing social backgrounds, to cope with these difficult situations is reflected in the variety of demands made on state forestland.

During the economic crisis, 4.2 million people above the age of 15 lost their jobs on Java, while in the same period, unemployed people returning to agriculture caused the work force to rise by 4.6 million in this sector (Bratamihardja et al. 2000:14; Soetrisno 1998:163). In the district of Lembang, many individuals had found work in the city of Bandung. When they lost their jobs, unemployed workers returned home in search of agricultural land to live on. For this reason, the agricultural sector was hailed as the saviour of the Indonesian work force (*Kompas*, 3 March 1999). However, this huge increase in the agricultural workforce on Java increased the pressures on an already overburdened sector (Bratamihardja et al. 2000:14). Returning residents combined with food crises and severe land shortages resulted in local communities deciding to 'reclaim' state forestlands for their own use. In-depth interviews we took revealed that the locals interpreted land occupation as a legal act. There are two reasons for this. Firstly, large areas of state forestland were historically designated as part of village *adat* territory. Illegal logging became an important survival strategy for villagers and returning migrants, although respondents argued this was merely taking back what was rightfully theirs. Data from West Java as a whole showed that local and well-organized thefts together amounted to 17,917 trees in 1998, an increase of 181% compared to 1997. Secondly, according to respondents, President Habibie himself seems to have suggested in one of his speeches that abandoned state forestland could be converted to grow food crops. On 18 September 1998, the Ministry of Forests and Estate Crops did indeed release an Instruction Letter no. 1130 Menhutbun-1/1998, which stipulated that all abandoned plots on state forestland could be cultivated. However, it also stipulated that this was restricted to the kind of practices used in the *tumpang sari* system. A number of respondents considered land that had been left fallow for the purpose of regenerating soil fertility after tree harvesting to be abandoned fields, which could therefore be taken and used to cultivate vegetables. In an effort to coordinate and control these 'spontaneous land occupations', the State Forest Company, Perum Perhutani, re-introduced the *tumpang sari* system as an official policy, to be implemented through forest farmer groups. In 2001, a total of 59 hectares was officially managed under the *tumpang sari* system. However, the majority of villagers continued to use land outside of the official Perhutani procedures.

Several factors contributed to the lack of interest in the official Perhutani programme of *tumpang sari*. Firstly, the formation of forest farmer groups

Farmer initiatives provide possible starting points for a more supportive farmer perception of Perhutani lands in Lembang: spontaneous cultivation of forages under pine trees for dairy cattle, without Perhutani involvement and equally without deforestation (photograph by Gamma Galudra).

was problematic, as it tended to increase rather than decrease social differentiation within villages. Members were mainly chosen on the basis of their connections with village heads and Perhutani officials. Consequently, instead of helping the poorest with the lowest incomes and smallest farms, the programme favoured rich farming households and forest labourers (*blandong*).

Secondly, the plots given out under *tumpang sari* were far too small for a subsistence livelihood (around 0.25-0.30 ha), because the State Forest Company felt they had to satisfy the demand for land for every household.

Thirdly, because entitlement to the land was temporary (usually two years in Lembang), the same socio-economic constraints remained after the cultivation period ended.

Fourthly, the State Forest Company dictated which crops should be grown (vegetables at the time of research). However, the huge social differentiation within villages meant that the various social groups had different needs and different constraints. Households owning dairy cows, for instance, also needed arable land to grow cattle fodder. However, under the *tumpang sari* system, Perhutani did not permit forages (mainly grasses) to be grown,

as it was believed that these crops would compete with the growing trees for water and nutrients. Similar reasons were given by Perhutani officials with regard to growing tuber crops and banana trees, although most villagers wanted to plant these crops because they required low-input investments and met their daily needs. A number of dairy farmers decided to set up their own group without the permission of the State Forest Company. They called themselves a forest farmer group and started to cultivate grasses under mature pine trees.

Finally, as tuber crops were not allowed in the *tumpang sari* system, vegetable cultivation faced a number of serious constraints. Although people were promised financial assistance from Perhutani to buy raw materials and so on, this never really materialized because of huge financial deficits within Perhutani. Some groups were able to secure funds from other sources, such as the credit scheme of the provincial government, Kredit Usaha Tani (KUT). This organization also began to claim state forestland as a result of processes of decentralization. At the time of our research, agricultural development within the *tumpang sari* system focused on the cultivation of tomatoes and chillies. Unfortunately, prices for these products usually collapsed at harvest time, leaving most households with nothing but a loan that could not be repaid. The result was that most participants (illegally) sold their *tumpang sari* site to businessmen (*cukong*). Besides getting instant cash from the sale of the cultivation rights, they could continue to cultivate their own plot as paid labourers. The advantages for the farmer labourer were a daily cash income while leaving the new entrepreneur to foot the bill for all the costs and carry all the risks of crop failure. In this way, villagers could start to repay debts and buy necessary food items at the same time.

The opportunities that did develop with the reintroduction of *tumpang sari* had a domino effect on other villages. Other villagers and nearby communities also started to encroach onto the forest plantations to ensure that they did not miss out on an opportunity to claim land during the power vacuum that existed while Perhutani struggled to redefine its policies in a more socially oriented way. The problems discussed here for the villages we researched in Lembang were also seen in other areas on Java as well, such as Central Java and East Java. These problems forced the State Forest Company and the Forest Department to increasingly acknowledge the importance of socio-economic constraints of local communities as the key to setting up successful and sustainable management plans in forest areas. By 2000, the Forest Department began to develop more people-oriented solutions in forestry.

Post-crisis forest management: people-oriented forestry?

The vacuum in forest management regulations connected to the Reformasi, the economic crisis, and the chaotic parallel processes of democratization and decentralization (*otonomi daerah*) has resulted in the highest rates of forest encroachment and tree felling in Indonesia for 60 years. The Forestry Department, in particular, has been faced with pressures to change in the light of the immense problems in forest management. From 1999 onwards, a more active participation in forest management of local people was encouraged and developed. Within one year, several measures of reform were taken, leading to the enactment of Local Government Law (Act No. 22/1999) and, closely linked to it, the Revenues Allocation Law (Act No. 25/1999), followed by the enactment of the new Forestry Law (Act No. 41/1999) replacing the 1967 Forestry Law (Act No. 5/1967).

Act No. 22 directs political power to the provincial and district administrations (*kabupaten*) to manage their natural resources such as forest, land, sea, and minerals. However, central government retains planning and policy authority for national economic and development planning, natural resource utilization, and conservation. Under the allocation systems formulated in Act 25/1999, regional governments would receive 80% of tax revenues from fisheries, forestry, and mining. Meanwhile, the new Forestry Law (Act No. 41/1999) gives more recognition to the existence of the *adat* community. Chapter II, Article 5, of this Act recognizes the category of traditional forest (*hutan adat*) but can be problematic because *hutan adat* has been defined as state forest that happens to lie within the territory of a 'traditional law community'. It means that the government ought to respect the rights of communities which are truly 'traditional', as long as these rights are not in conflict with 'national interests'. Since the government determines which communities qualify as 'traditional', additional problems may develop as the government also decides on what community rights ought to be respected. The implication of these regulations can be summarized as follows.

Firstly, with regard to decision authority on what is forestland and how it may be used, the revised Basic Forestry Law of 1999 specifies that the central government retains the right to 'determine the forest estate' and 'plan the use of the forest' and need only 'pay attention' to the local land use plans made under the 1992 Spatial Use Management Law. In contrast, there is a significant shift in power over natural resources to the regions in the so-called *otonomi daerah* (more autonomous rule of the provinces) processes. For example, 80% of state income from resources (including forests) must go to the regions. These newly developed laws still lack tools for implementation, however, and many lawyers and government officials regard these new laws as essentially inoperable. The regional autonomy policy has also fanned disputes about which

level of government has the authority to change the status of forestlands.

Secondly, in pursuit of a more active participation by local people in forest management, the State Forest Company has also undergone some changes. In 2000, the State Forest Company introduced a new social forestry programme, called Pengelolaan Hutan Bersama Masyarakat (PHBM), or Joint Forest Management. It entails the joint cultivation of forest areas with the local people,[6] by using participatory planning methods. In this regard, Perhutani initiates and agrees with local people who would like to cultivate a forest area. This agreement is discussed before the start of the cultivation period. It covers the cultivation plan, which consists of tree species, secondary crops, and the sharing of benefits. Farmers will obtain the full benefit from the secondary crop, while timber-yield sharing is formulated as follows. Profits obtained from the first thinning of the plantation are given to the farmers. A second thinning is shared, whereby the farmers obtain 25%, while after the final harvesting Perhutani receives 80% of the profits, and the farmers receive 20%. In a response to this, the district of Wonosobo in Central Java initiated a district regulation on Community Based Forest Resource Management (Peraturan Daerah Kabupaten Wonosobo No. 22/2001). This regulation designates the forest area that can be allocated for Community-based Forest Management, under the authority of the *bupati* (head of the district or *kabupaten*).

In West Java, the provincial government, the parliaments, and NGOs formulated a Provincial Decree on Protection Zones (Panitia Dialog Partisipatif Kawasan Lindung Jawa Barat dan Dewan Pemerhati Kehutanan dan Lingkungan Tatar Sunda 2002). For this purpose the document uses the term *leuweung* (the Sundanese word for forest) instead of *hutan* (the Bahasa Indonesia word for forest). Local people always associate the Indonesian word *hutan* with state-controlled land, whereas *leuweung* is usually perceived as forest belonging to the local community. It is proposed that each water catchment area (DAS) must consist of *leuweung larangan* (protected forest) that prohibits any human activity; *leuweung tutupan* (reserve forest: wild life, biodiversity) that can only be used under strict regulations to prevent the disturbance of wildlife and biodiversity; and *leuweung baladaheun* (protection forest) that may be used to plant timber. The division was made in the proportion 25:10:10 respectively. The most important category is *leuweung baladaheun*. As a buffer zone, *leuweung baladaheun* is designated for non-market-oriented tree cultivation and non-timber extraction activities, and will be managed by the local community (Article 10). The document provides a set of criteria to designate an area as a protection zone and puts forward an implementation body

6 In 2000, the State Forest Company released a Managerial Decree (No. 1061/Kpts/Dir/2000) on the implementation of Joint Forest Management or PHBM (Pengelolaan Sumberdaya Hutan Bersama Masyarakat) and then revised it on 29 March 2001 (No. 136/KPTS/DIR/2001).

to carry out assessments. A fully participatory approach is applied at every step of implementation. It means that all steps in the implementation of the proposed provincial decree (the legal draft), such as the zoning plan and the management plan of the protection zone, have to be carried out through public consultation in a forum. This forum is called the Forum Dialog Partisipatif Kawasan Lindung (Participatory Forum for Protection Zone Dialog) representing all stakeholders of West Java province.

A final interesting development is the revival of the plan that the State Forest Company must change its management status. Under Governmental Decree No. 14/2001, the State Forest Company changed from a public enterprise (PERUM or Perusahaan Umum) to become a private company (PERSERO or Perusahaan Perseroan). Although the government remains a major shareholder, other parties will control management as well, while Perhutani salaries are linked to profits from timber production. Time will tell whether this means that local people's active involvement in management and profit-sharing to prevent further destruction will increase, or whether it will, in fact, lead to even more 'fencing off' of forests.

Conclusion

This study began with a short overview of some major historical periods of severe social and economic disruption that have affected forest cover and forestland on Java, Indonesia. A brief description of the major objectives of forest regulation from the Dutch occupation to the present day showed that increasingly more systematic and commercial forest management methods have developed over the years. In its earliest stages, village forestlands became state forestlands in order to get control over wider areas that could be used for timber harvesting. This increasingly restricted communities in their ability to sustain their livelihood, as the forest, which had always been their safety net, was no longer accessible to them. By setting up community management programmes, the state hoped to decrease poverty in these communities. Initially, these programmes were organized mainly as a way to get control over local labour and trees. Over the decades, the programmes evolved to encompass a broader concept of poverty eradication under various social forestry programmes. With a growing population in need of arable land to survive, and increasing encroachment into forest areas, the government felt the need to tighten control over the land. By setting up highly organized and strict community forestry programmes with forest farmer groups set up by Perhutani, it was hoped that the pressure on the forest could be controlled.

Continuous disappointing results increased efforts to develop social

forestry programmes that also alleviate poverty in villages on the fringes of state forestlands. However, as this article shows, during times of social, political, or economic crisis or change, the ensuing power vacuum and changes in regulations directly cause acceleration in the degradation and conversion of forests by poor agricultural communities claiming arable land in order to survive. Recently, the Reformasi proved that programmes often fail to address the most important issue in overcoming conflict situations, which is to eradicate poverty and land tenure issues at the same time. The latest approaches, which encourage profit sharing with the community, seem encouraging but they must allow for local communities to find their own solutions to problems. The case study in Lembang shows that local people can be very innovative in making their own adjustments to cultivation plans, in ways (for example, the practice of intercropping) that are beneficial to them while not necessarily causing degradation of the forest. A real participatory approach can only develop when local solutions for local problems are incorporated into the often overly rigid management plans of the State Forest Company.

Participatory management plans, however, will remain unsuccessful if they are not accompanied by a resolution of land tenure issues. The enormous discrepancy between the area designated as state forestland and the actual area forested on these lands (about one third of total state forestland), and the fact that huge areas of former village land have been designated as state forestland, makes one wonder whether the State Forest Company really needs to control 24% of the land area on Java. If such land tenure issues are not resolved, and if programmes are not focused on the active participation of local communities in designing and implementing the management of state forestlands, this article indicates the situation this may produce.

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Appendix 1. Records on tree theft evidence in the State Forest Company, selected years, 1962-2000

Year	Theft				
	Tree (no. of trees)	Lumber (m^3)	Firewood (m^2)	Other commodities (US$) *	Monetary value (US$) *
1962	664,255	12,961	4,578	na	na
1963	650,807	17,422	8,243	na	na
1964	1,085,092	14,669	6,792	na	na
1965	638,660	45,274	4,618	na	na
1966	402,345	10,267	2,625	na	na
1967	406,466	16,128	2,114	na	92,548
1968	247,259	8,790	3,440	na	67,635
1969	344,350	8,413	2,838	na	118,795
1972					
1973	153,515	na	3,519	13,366	394,270
1974	153,838	na	5,315	19,135	583,347
1975	142,622	na	4,071	12,260	604,740
1976	132,738	na	3,504	25,935	698,542
1977	127,256	na	3,949	29,063	655,976
1983					
1984	64,727	143	153	na	857,750
1985	72,816	412	373	na	879,721
1986	126,419	902	392	na	921,594
1987	157,718	159	523	na	1,053,016
1988	232,415	0	0	na	1,535,267
1989	151,144	0	0	na	1,258,714
1990	128,635	34,591	0	na	1,123,827
1991	182,396	111	0	na	855,034
1992	154,926	287	0	na	1,292,662
1993	193,382	100	0	na	1,467,667
1994	204,252	18	0	na	1,697,201
1995	200,273	5	0	na	1,567,496
1996	202,192	36	0	na	1,440,448
1997	202,947	11	0	na	1,017,877
1998	1,097,716	155,246	0	1,798	4,926,612
1999	3,179,973	285	46	4,515	7,116,717
2000	2,584,603	10,624	33	6,339	68,007,028

* Based on the Rupiah exchange rate of the respective years; na: data not available

Sources: BPU Perusahaan Kehutanan Negara (1968, 1969); Djawatan Kehutanan Propinsi Djawa Barat (1969); Direktorat Jenderal Kehutanan (1976); Dinas Kehutanan Propinsi DT I Jawa Barat; Perum Perhutani (1976, 1978, 1979, 1989, 1993, 1994, 1996, 1998, 2001).

Appendix 2. Records on forest area destruction in the State Forest Company, selected years, 1962-2000

Year	Area damage					Monetary value (US$) *
	Squatting (ha)	Forest slashing	Forest fires	Grazing (ha)	Total (ha)	
1962	2,163	279	9,970	563	12,975	na
1963	2,309	268	22,008	848	25,433	na
1964	3,621	1,047	7,549	852	13,069	na
1965	3,720	2,242	18,812	80	24,854	na
1966	477	526	5,605	55	6,663	na
1967	348	116	38,152	249	38,865	211,583
1968	908	68	2,741	133	3,850	29,897
1969	62	232	37,111	498	37,903	142,773
1970						
1973	na	na	na	na	7,814	89,561
1974	na	na	na	na	9,461	136,147
1975	na	na	na	na	9,733	256,214
1976	na	na	na	na	44,908	279,829
1977	na	na	na	na	43,269	236,737
1983						
1984	928	69	6,099	674	7,770	206,640
1985	1,116	162	9,010	208	10,496	108,952
1986	2,057	24	4,124	469	6,674	109,936
1987	3,342	91	34,841	335	38,609	234,815
1988	1,236	188	14,820	349	16,593	95,509
1989	1,568	49	3,639	311	5,567	41,242
1990	697	0	10,559	309	11,565	56,978
1992	408	357	4,816	786	6,367	71,924
1993	513	3,995	9,969	177	14,654	64,683
1996	715	109,263	5,686	145	115,809	55,290
1997	1,849	16,662	373,782	91	392,384	169,620
1998	15,104	110,827	7,063	53	133,047	233,290
1999	15,378	336,168	374,944	843	727,333	290,183
2000	9,900	592,789	8,585	712	611,986	1,560,216

* Based on the rupiah exchange rate of the respective years; na: data not available

Sources: BPU Perusahaan Kehutanan Negara (1968, 1969); Djawatan Kehutanan Propinsi Djawa Barat (1969); Direktorat Jenderal Kehutanan (1976); Dinas Kehutanan Propinsi DT I Jawa Barat; Perum Perhutani (1976, 1978, 1979, 1989, 1993, 1994, 1996, 1998, 2001).

LESLEY M. POTTER

Commodifying, consuming and converting Kalimantan's forests, 1950-2002

Introduction

This chapter presents an overview of the fate of Kalimantan's forests from Indonesian independence to the present, with a backward glance at the development of forest practice during the previous half century under Dutch colonialism. Following the historical sketch, the chapter is divided chronologically into three periods: the Soekarno years; the New Order period of Soeharto's government (which represents the core of the chapter); and the recent, post-Soeharto era. There is justification for this arrangement, as until recently forestry activities have been very much directed by the central government, with policies from Jakarta impacting on Kalimantan's forests. It is only since decentralization in 2001 that there have been concerted attempts by local districts to generate their own policies and by local populations to influence these, an activity which is still evolving.

Background: Dutch forest practice in Borneo from 1900 to 1949

Until the mid-1930s, Dutch interest in the forests outside Java was mainly focused on various non-wood forest products, especially rattans, wild rubbers, and resins.[1] The wild rubbers were initially most valuable, with gutta-percha,[2] the prima donna in 1900, being displaced by *jelutong*[3] in 1909. It was to protect the south coastal supplies of *jelutong* that moves were made in 1914 to establish special forest police in the Southern and Eastern Divisions of Borneo. A forest officer was established in Banjarmasin the following year

1 Dutch holdings in Borneo were subdivided into the Southern and Eastern Divisions (roughly modern East, South and Central Kalimantan) and the Western Division (West Kalimantan).
2 *Palaquium* and *Payena* sp.
3 *Dyera* sp.

and the *jelutong* police brought under his management two years later (Potter 1988:134).

Official knowledge of the timber resource was limited to specialty woods, such as the famous Borneo ironwood (*Eusideroxylon zwagerei*), which was in demand for government buildings and indigenous longhouses, in addition to its widespread use for roof shingles. The first serious attempt to explore and map the dominant dipterocarp forests took place during the 1920s, using the strip survey method, later criticized for exaggerating the size of the resource.[4] It was realized that the Mahakam basin in the east had the greatest potential for forestry development, and in 1923 a forest officer was located at Samarinda. Pontianak in the Western Division also received a forester in 1924, although the major population centres along the Kapuas River had experienced forest decline, especially of ironwood. J.P. Schuitemaker (1932:1, 4) blamed the deforestation on shifting cultivation and the spread of rubber planting. The introduced Para rubber (*Hevea brasiliensis*), grown largely by smallholders, had penetrated even the most remote Borneo districts by the 1930s and was the most important income source in the settled areas.

Exports of non-wood products were generally shipped to Singapore, while the timber trade had two components: a small international export to China and Japan from Samarinda, and a spasmodic trickle of wood to Java from Banjarmasin and Pontianak. Both the volume and value of forest products traded from Dutch Borneo remained considerably below those of Sumatra throughout the period, with the exception of occasional boom years for non-wood products (Boomgaard and De Bakker 1996:30, 105-6, 168).

The gathering of timber for export was organized by merchants using local labour. Woodcutters travelled into the forest areas along major streams, financed by traders in downstream towns or at river junctions. Logs would be floated downriver or towed in large rafts. Considerable risks would be incurred, as a drop in river levels would produce disruption to supplies. Traders were said to prefer non-wood products, which were easier to handle (Wind 1929:546). Low timber prices during the 1930s depression resulted in numbers of logs left lying in the forests (Potter 1988:141). Dipterocarp logs were subject to attack by termites and woodworm, so had to be moved quickly.

Attempts were made by private interests to establish timber concessions, but until the mid-1930s these were unsuccessful (Potter 1988:135, 137-8). The

[4] The technique consisted in running a series of strips at right angles to a stream; along these transects the nature of forest species was tabulated, with some indication of potential timber volumes. As initial explorations were designed to find the best timber complexes, the criticism is that these results were then extrapolated to an entire region, which may not have had such a good forest cover.

entry of Japanese interests near the Tarakan oil fields in 1934, buying timber locally and shipping it directly to Japan, caused security concerns among Dutch authorities. The Japanese were offered a concession further south near Sangkulirang, and regulations were introduced confining commercial logging to registered cutting plots or large concessions. In a rapid shift, most export timber came to be cut on concessions. The Japanese Nanyo Ringyo Kabushiki Kaisha employed 3,500 workers with a partly mechanized production of 200,000m^3, while other Japanese firms had smaller holdings or controlled several cutting plots. All this timber was exported in Japanese ships. Government enterprise was also involved, operating a sawmill at Tarakan and engaging in commercial production of ironwood from a complex at Batu Licin on the southeast coast. A stand of *Agathis borneensis*, accessed by light railway on the swampy central-south coast at Sampit, was worked for plywood and pulp. After the disruptions caused by the Second World War, only the relatively remote Sampit operation survived (Potter 1988:141-3).

Despite several attempts, a set of forestry regulations applying to the entire Outer Islands was never passed during the Dutch period. However, individual administrations reserved some mountainous areas in Kalimantan for hydrological purposes (such as the Meratus mountains in the south), while 'nature monuments', notably Gunung Palung in West Borneo and Kutai in the east, forerunners of present national parks, were recognized for their special qualities. Forest reserves presumed restrictions on indigenous activities, especially swidden cultivation: such moves remained politically contentious and the foresters moved cautiously.[5]

The Dutch laid the foundations for future forestry administration, especially in south and east Borneo, during the late 1930s, even though money and personnel remained limited outside Java. The Japanese involvement and the preference for mixed private and government concessions were to have echoes in later policies. Dutch unwillingness to confront the question of indigenous rights in the forest meant that that particular problem was passed to the new administration after independence. Although the 1960 Agrarian Law was promising in its recognition of traditional (*adat*) rights, in practice these became downgraded and often ignored after the passage of the stronger Basic Forestry Law of 1967. These issues are only now beginning to be fully addressed.

5 See Potter 1988:138-41 for the debate over indigenous land rights.

Kalimantan's forests in an emergent Indonesia, 1950-1965

Departing Dutch foresters warned their Indonesian counterparts that Kalimantan's[6] timber resource was not unlimited, nor should it be the subject of 'thoughtless optimism' (Ottow 1952:177, 183). The value of the dipterocarp forests was stressed, especially those of the Mahakam basin (Verkuyl 1952:164, 169). The Kalimantan section of L. Hannibal's 'Vegetation map of Indonesia' provided details of forest and non-forest vegetation (Hannibal 1950: Map 1). Large 'reserved' areas were described as closed to shifting cultivators. Of 4.3 million ha reserved, 1.4 million were available for production and 2.9 million protected. While such exclusions appeared discriminatory, the prohibition was apparently observed neither by the population nor by other government agencies (Ottow 1952:211). This early attempt at regulation by central forestry authorities was, it seems, ignored on the ground.

The 1950 map was accompanied by a land-use table, which indicated that Kalimantan had 47.5 million ha of 'forest',[7] covering 86.5% of the area. While retaining the map, a 1957 publication used different figures: 41.5 million ha of forest on 77.4% of the area. Those numbers originated from Dutch forester F.H. Endert: first published in 1929, they were repeated by others such as J. Beversluis.[8] J. von Monroy, an FAO consultant, pointed out serious deficiencies in the data on land use outside Java and suggested that a complete aerial survey was needed (Von Monroy 1958:4-6, Appendix A1). At that time the Javanese teak forests still formed the backbone of Indonesian forestry. The yearly expenditure per hectare on forest management in Kalimantan was a mere Rp 0.6, as against Rp 80-100 for Java. To develop Kalimantan's forest resources, with Japan a potential customer, the only answer appeared to be some kind of joint enterprise (Von Monroy 1958:9-10, 15).

The Japanese South Seas Forestry Development Committee, representing timber, pulp, and trading companies, surveyed Kalimantan's forests and in 1961 recommended their systematic exploitation (Nectoux and Kuroda 1989:79). Though opposed to foreign direct investment in forestry, the Soekarno government adopted the idea of production-sharing. State Forest Enterprises (Perhutani) were established, including three in Kalimantan

6 In 1950 the former Dutch holdings on Borneo were administered as one large province of Kalimantan with its capital in Banjarmasin, which was soon found to be unworkable. The present four provinces of West, East, Central and South Kalimantan were constituted in 1957.

7 The table was reproduced in Goenner 1985:82, supposedly derived from detailed forest inventories. Subsequent contemporary discussion and the rapid substitution of older figures casts doubt on that claim. It was reproduced again in Barber et al. 2002, and used as a baseline without comment.

8 Beversluis 1940:9. In 1978 they were quoted again, with the comment that Indonesia lacked data on 'the accurate extent of our forests' (Hamzah 1978:73).

(*Sejarah kehutanan* 1986:76-7). Agreements were made between Perhutani companies and Japanese firms, using loan funds from the Japanese government and private capital. Though large-scale and mechanized, the ventures were unsuccessful. Log production was insufficient to repay the loans, leaving Perhutani with considerable debts (Manning 1971:36). Failure was attributed to labour shortages, runaway inflation and cultural differences (Nectoux and Kuroda 1989:79).

Although the fledgling Forestry Department retained the colonial preference for Java's teak forests, postwar international demand for cheap construction timber brought Kalimantan's dipterocarps once more into sharp focus. In 1965 the new Soeharto administration, discarding Soekarno's left-wing ideology, positioned itself to benefit from that demand.

Kalimantan's forests in the Soeharto era

Developing the logging industry, 1965-1979

Soon after taking power, the government passed important forest legislation. The Basic Forestry Law (No. 5 of 1967) was followed by the foreign and domestic investment laws of 1967 and 1968, encouraging private investment in forests outside Java and ending Perhutani's monopoly. The Kalimantan companies continued as parastatal organizations, renamed Inhutani I, II and III. The Basic Forestry Law defined forests as 'lands [...] which are declared as forests by the Indonesian government' (Bohlander 1977:22). With boundaries based on elevation and slope rather than timber coverage, the lands were basically subdivided into production, protection, and conversion forests, together with reservations for other purposes. Protection forests coincided in general with lands above 500 metres. Much conversion forest was already cleared and considered 'non-forest' by other users, while production forests were not concretely defined, their boundaries difficult to locate on the ground (Bohlander 1977:23).

Inventories of timber species judged East Kalimantan's forests to be outstanding, especially in the volume per hectare of dipterocarps. Forest cover was believed to average 82%, reaching 93% in the northern districts of Bulungan Selatan and Berau. However, in more populated and accessible Pasir (39%) and Balikpapan (31%), cover was reduced by human activities. Experts mistrusted the inventory's conclusions as the sample was small: they considered that suggested stocking rates were too high (Bohlander 1977:10-2, 21, 24-5).

Central Kalimantan's southern districts had extensive swamp forests. As in West Kalimantan, the most sought-after product was the valuable white

Large newly-felled log of yellow meranti, in concession on border between West and Central Kalimantan

wood, *ramin* (*Gonystylus bancanus*), exported as sawn timber. Rails laid across the swamps secured access to the trees, which were floated downstream to the sawmills. There was a rapid expansion of ramin exports from West Kalimantan from 1967-1972, after which production declined due to overcutting and attempts to enforce regulations on sustainable yield (Snowy Mountains Engineering Corporation 1973:4, 9; Dami 1982:14). Concessions to work dipterocarps meanwhile penetrated the remote interiors of both Central and West Kalimantan, and covered South Kalimantan's Meratus mountains.

Most of the post-1968 increase in Indonesian timber production, however, came from East Kalimantan (Manning 1971:30-1). Exports, primarily to Japan, had come mainly from direct purchases, with buyers extending credit to inland log producers, as in colonial times. In a series of major changes, logging teams were assisted to acquire mechanized equipment, with all non-mechanized producers being eliminated by 1971. The provincial government's power to grant concessions was reduced to a mere 100 ha, rather than the 10,000 ha previously sanctioned.[9] The minimum concession size

[9] Manning 1971:37-8, 50. Provincial governments were granted autonomy in managing their forests in 1957; this was rescinded in 1971.

was later set at 50,000 ha (Wiersum and Boerboom 1977:11). However, the new logging companies regarded central regulations as existing on paper only, while the local Forest Service was understaffed and under-equipped. Logging was found to be taking place on steeply sloping lands and in parts of Kutai Nature Park (Wiersum and Boerboom 1977:8-9).

While clear felling was permissible in conversion forests, in production forests the Indonesian Selective Logging System (TPI) on a 35-year rotation was universally adopted. Loggers were only permitted to remove trees with a diameter at breast height of 50 cm or above, and were expected to leave 25 medium-sized 'core' trees (diameter 35 cm) per hectare for the succeeding rotation. However, East Kalimantan's forest structure did not conform to that model. Many forests were considered 'over-mature', dominated by a few very large trees (Bohlander 1977:90; Hamzah 1978:79). Their wide crowns damaged others during logging operations, affecting up to 50% of the stand (Tinal and Palenewen 1978:91). To add to the problem, the heavy machinery compacted the soils, inhibiting seedling production (Hamzah 1978:80-4). Re-logging within five years was frequently practised, leading to more damage and retarding rates of recovery (Kuswata Kartawinata 1980:121). The only rule obeyed was that of minimum girth. As leases were only for 20 years, there was a temptation for loggers to 'cut and run' after removing the big trees (Djamaludin 1991:98-9).

In 1977 the government began to enforce local processing of raw logs, levying a tax to finance plywood plant construction. Anticipating the coming restrictions, Indonesian log production achieved a new record in 1978-1979, with the four Kalimantan provinces together reaching 16 million m^3, $^2/_3$ of the national total (FAO/GOI 1990:128). By 1985, when log exports were finally banned, Kalimantan had 60 plywood factories, with the largest concentration (17) along the Mahakam River near Samarinda (APKINDO 1986). This rapid industrial development saw the beginnings of consolidation of the timber industry into fewer, larger firms, with eventual control over huge areas of forest and multiple processing plants.

The 1980s: the fire and two acronyms, TGHK and RePPProT

The severe El Niño event in 1982-1983 brought an eleven-month drought, causing disruption throughout Kalimantan. Extensive forest fires closed airports and blanketed large areas with smoke, especially in East Kalimantan, where 3.5 million ha is estimated to have burned. This comparatively dry region (for Borneo) had experienced historical burning episodes, especially in the great drought of 1877-1878, and in 1914. As in 1877-1878, 1982-1983 produced two separate fire periods, the second (in the early months of 1983) being the more severe (Brookfield et al. 1995:170). Although shifting cultiva-

During the height of the logging 'boom', hundreds of timber trucks carried the felled logs to the nearest stream, where they would be floated down to plywood factories near the coastal cities

tors were first targeted as responsible, the evidence pointed to a different source. Beyond the fragile swamp forests (which it destroyed), the 1982-1983 fire burned most fiercely in districts recently logged, where trash on the forest floor and ample road openings provided both fuel and wind corridors: 'it was not the drought which caused this huge fire, but the changed condition of the forest' (Schindele et al. 1989:71). Much of the burned area was under concession, affecting 44 firms, 11 of which later withdrew. A survey of affected villages noted that people had suffered serious losses of both crops and forest products. However, they had recovered and begun developing agroforests of planted trees as sources of perennial crops and timber. It was concluded that the indigenous communities were capable of acting as partners to co-manage rehabilitation (Mayer 1996b:190-1).

The TGHK

In 1980 the government began to implement the 1967 forest classification more strictly, through the establishment of the Agreed Forest Land Use Plan (Tata Guna Hutan Kesepakatan, TGHK) (Map 2). When the Basic Forestry

Law was passed in 1967, 26 million ha was classified as permanent forest. By 1982 that had grown to 113 million ha, nearly 60% of Indonesia's land area. An additional 30 million ha of conversion forest increased the 'forest land' to 143 million ha (World Bank 1990:22). Following this enormous land resumption, villagers found their lands traversed by new boundaries limiting their access or activities. Settlements were not allowed in protection/conservation areas unless specifically 'enclaved'; traditional farming, hunting, and gathering were permitted in production forest, but logging had priority and was not to be impeded. Kalimantan led the country in production forest, with 67% of the land being classified as either protection/conservation or production forest, therefore restricting local activities in these areas (Table 1).

Table 1. The original TGHK classification for Indonesia, 1982

Area: island or province	Protection and conservation forest '000 ha	Production forest '000 ha	Conversion forest '000 ha	Non-forest areas '000 ha	Total area '000 ha '000 ha
Sumatra	10,839 (23%)	14,412 (31%)	5,049 (11%)	16,649 (35%)	46,949 (100%)
Java	999 (8%)	2,014 (15%)	-	10,206 (77%)	13,219 (100%)
Kalimantan	*11,025 (20%)*	*25,650 (47%)*	*8,293 (15%)*	*9,857 (18%)*	*54,825 (100%)*
Sulawesi	5,273 (27%)	6,003 (31%)	1,602 (8%)	6,783 (34%)	19,661 (100%)
Bali	116 (21%)	10	-	438 (78%)	564 (100%)
NTT and NTB	1,426 (21%)	1,123 (17%)	2,998 (44%)	1,207 (18%)	6,754 (100%)
Maluku	1,991 (23%)	3,105 (36%)	436 (5%)	3,040 (35%)	8,573 (100%)
Irian Jaya	16,960 (41%)	11,856 (29%)	11,775 (29%)	474 (1%)	41,066 (100%)
E. Timor	474 (32%)	216 (15%)	10	761 (52%)	1,461 (100%)
Totals	*49,125 (25%)*	*64,390 (33%)*	*30,164 (16%)*	*49,414 (26%)*	*193,072 (100%)*

Source: Ross 1984:45. (Percentages and italics added). Figures do not always add up to 100 due to rounding.

Land allocation to either conversion or production forest was supposed to be agreed by consensus between provincial Departments of Agriculture, Forestry, and Public Works and the Directorate of Land Use. In 1982, the only consensus was over criteria for protection and conservation forests.[10] The production/conversion forest boundary remained in dispute and caused a 'bottleneck' for the allocation of land, especially for transmigration (Ross 1984:46). The needs of transmigration were urgent in Kalimantan, where the number of sponsored settlers between 1980 and 1985 was 388,600, nearly

[10] Lynch and Harwell (2002:184) note that requirements for participation and consent of affected community members were routinely violated.

four times that of the previous decade (World Bank 1986:59). In 1986-1990, 80% of transmigration sites were scheduled to be located in 'primary forest'. One study commented: 'The legislation regarding land use is conflicting and this has led to a competition for land between various Departments, particularly the [...] Directorate of Land Use [...] and the Department of Forestry. This competition [...] has been further exacerbated by the introduction of Transmigration as a national priority' (Goenner 1985:27).

The RePPProT project

The perceived unwillingness of the Forestry Department to release production forest for transmigration led the Transmigration Department to embark in 1985 on a national mapping project. The aim of the 'Regional Physical Planning Program for Transmigration' (RePPProT) was to find suitable areas for transmigration settlements in either production or conversion forest. With aid from the British government,[11] three series of maps at scale 1:250,000 were constructed to cover the entire country. The maps, using aerial photography and some satellite imagery, represented the position between 1982 and 1985. The first series transposed the TGHK boundaries from 1:500,000 to the larger scale and indicated general land use and vegetation, including forest types. They were accompanied by reports for individual provinces.

Table 2. Land use in Kalimantan by province, circa 1982 ('000 ha)

	Land-use Type Province Overall									
	West Kal.		Central Kal.		South Kal.		East Kal.			
	Area	%	Area	%	Area	%	Area	%	Area	%
Natural Forest	8,701	59.0	11,188	73.1	1,796	48.6	17,900	84.7	39,585	72.1
Scrub	2,846	19.3	518	3.4	495	13.4	482	2.3	4,341	7.9
Grass	340	2.3	282	1.8	616	16.7	200	0.9	1,438	2.6
Shift. cult.	2,085	14.1	2,472	16.2	237	6.4	664	3.1	5,458	9.9
Wet-rice	146	1.0	224	1.5	426	11.5	135	0.6	931	1.7
Tree crop	425	2.9	42	0.3	64	1.7	8		539	1.0
Water, settlement, other	196	1.3	18	0.1	64	1.7	236	1.1	514	0.9
No data	–		556	3.6			1,519	7.2	2,075	3.8
Total area	14,751		15,300		3,698		21,144		54,893	

Source: RePPProT (1985:51, 1987a:169, 1987b:175). NB Total areas of each province have been adjusted to conform with those in Table 3, and percentages adjusted where necessary. Figures do not always add up to 100 due to rounding.

11 The ODA Land Resources Development Centre.

Table 2 provides a summary of provincial land use in Kalimantan according to RePPProT. Particularly significant are the relative areas of land under forest and scrub or grassland (higher in West and South Kalimantan), the claimed extent of shifting cultivation (10% overall) and, except in South Kalimantan, the limited impact of 'permanent' cropping, measured by wet rice and tree crops. Despite a decade of logging, the forest remained the dominant vegetation cover in East Kalimantan before the 1982-1983 fire.[12]

Thanks to the RePPProT mapping exercises, there was for the first time accurate information about the condition of land and vegetation within the TGHK boundaries, providing a firm basis for their revision. A major finding in the first province mapped, Central Kalimantan, was that the boundaries were over-generalized, the maps inaccurate, and much land misclassified (Goenner 1985:30-1; RePPProT 1985:6). While providing numbers for potential transmigrant settlement, mainly for tree-crop production, the RePPProT team noted that there had been no local consultation or detailed ground-truthing. The IIED group, appointed by the State Ministry of Population, Environment and Development to advise on sustainable development of the forests, was critical of the overall impact of transmigration, arguing that it led to considerable damage. The authors queried whether agricultural settlements were needed outside Java, suggesting a halt to forest-based transmigration as the best option (Goenner 1985:55).

Both studies discussed the role of shifting cultivators as deforestation agents. The IIED study blamed shifting cultivators for higher rates of annual clearing than transmigrants.[13] However, a distinction was made between traditional swiddeners and 'wild settlers', who followed logging roads and destroyed forests. The RePPProT reports called such people 'pioneers', noting with alarm that in West Kalimantan 'Pioneering shifting cultivation penetrates far into the remaining forest areas and threatens to fragment and consume all remaining non-swampland lowland forests' (RePPProT 1987b:30). To defuse conflicts between local people and loggers, the IIED team suggested that a proportion of concession lands be allocated to local communities for small-scale timber-based industries (Goenner 1985:112-20).

Another contributor to this discussion was a World Bank report on sustainability of forests, lands, and water.[14] While 'smallholder conversion' in Kalimantan was listed as a leading cause of deforestation (350,000 ha per year from 1980-1986), among the recommendations was a radical suggestion:

12 The maps marked the limits of the burned area in East Kalimantan, but forest status was pre-burn.

13 They were said to clear 400,000-500,000 ha annually as against 200,000-300,000 ha by transmigrants.

14 This report, by Gloria Davis, was completed in 1988 at the request of Emil Salim, Minister for Population and Environment.

Heavy equipment used to drag logs from the forest caused much damage to surrounding tree stands and compaction of soil, impeding seedling growth

> To recognise the basic rights of local people, to encourage investment in perennial crops and permanent production systems and to protect that forest needed for production and protection purposes, it is critical that security of tenure be given to local people wherever possible. [...] relatively large areas must be allocated per family (at least 20 ha) if subsistence needs are to be met on low-fertility soils (World Bank 1990:22-3).

Gloria Davis emphasized the diversity of local agricultural systems, including shifting cultivation. She observed that forcibly relocating people away from the forest had not worked in the past and that production systems must be improved *in situ*. She noted that resettlement of shifting cultivators away from the production forests or into transmigration schemes, the preferred option of the Ministry of Forestry, was culturally inappropriate (World Bank 1990:24-6).

Such messages attracted a lukewarm response. The Pembinaan Masyarakat Desa Hutan or 'Forest Village Community Development Program' (1991)[15] put the onus on logging concessions to encourage permanent agriculture, which meant little more than giving forest dwellers fertilizer and hoes[16]

15 Regulation of the Minister of Forestry 691/Kpts-II/91.
16 Source: fieldwork, Bukit Baka-Bukit Raya, 1992.

and did not address tenure issues. The Ministry of Forestry was seeking to control shifting cultivation in the forests to make way for plantations of fast-growing exotics. In 1989 the recommended logging system changed its name to TPTI, the Indonesian Selective Logging and Planting system.[17] All logging companies had been expected to replant a portion of their concessions, either with natural forest trees or exotic species, such as eucalyptus or acacia. They paid into a reforestation fund to finance regeneration activities. However, only 11% had fulfilled that obligation by 1987, mainly because the costs were higher than the reforestation fund could meet (Djamaludin, 1991:101). Under the TPTI system the reforestation fee was raised to $ 10 and became a tax to be used in development of industrial timber estates, both on and outside concessions (Potter 1996:378). In both East and South Kalimantan, priority was to be given to reforesting grassland areas, and several timber estates were established in *Imperata* areas outside concessions. Fieldwork in villages near one such estate revealed the social problems caused by this policy. Villagers were harassed by forest police to cease burning for new swiddens, and their grassland, perceived as useless by the company and simply taken over without consultation, had previously provided them with cattle grazing and additional agricultural land when needed (Potter 1997:41-5). Meanwhile there were worrying signs that the plywood industry faced raw-material shortages. It was hoped that the forest plantations, and the wonder timber, *Acacia mangium*, which could produce high fibre yields in seven years, would provide the answer.

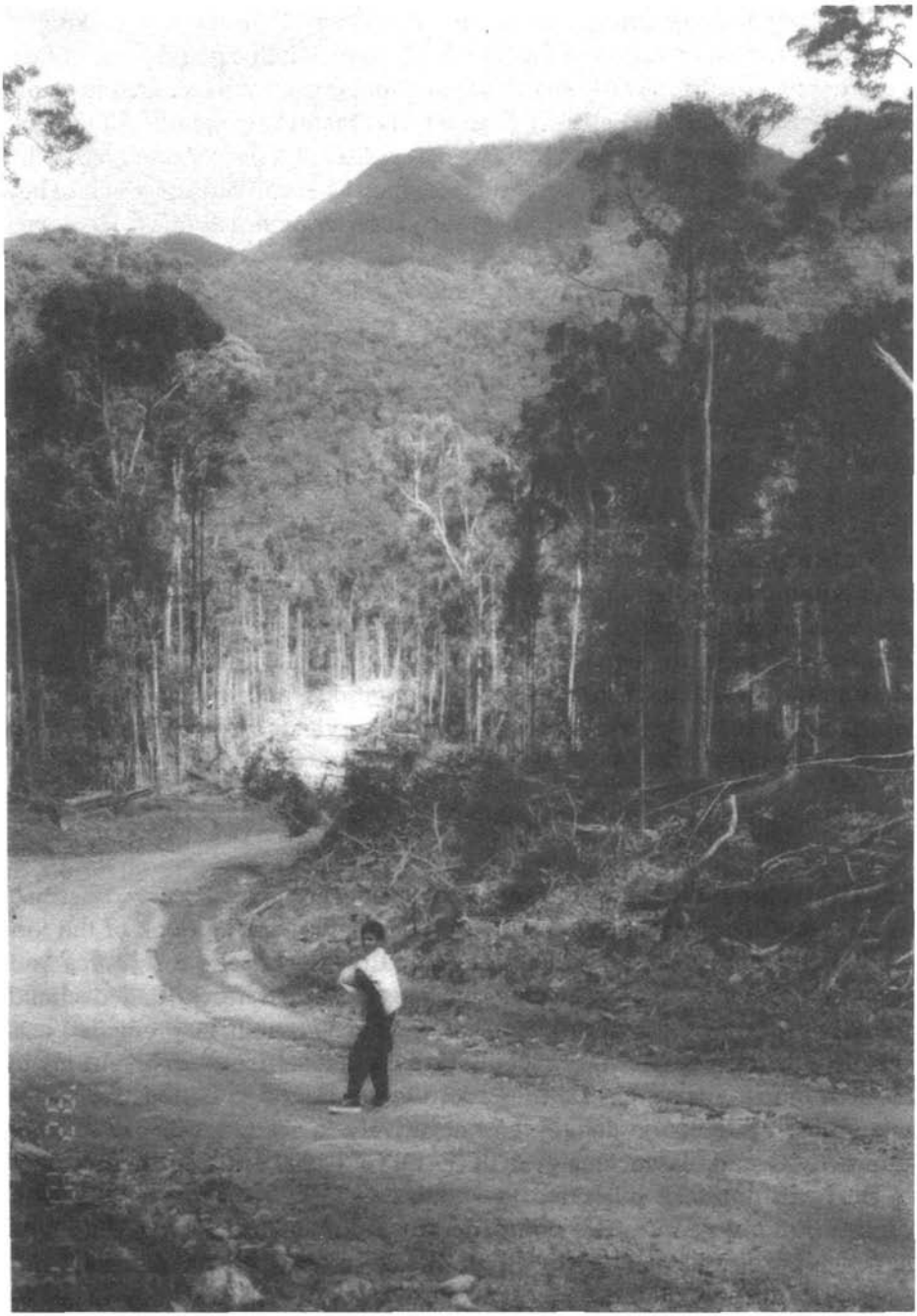
1990 to 1998: from the FAO studies to the economic crisis

The five-volume FAO/World Bank study, published in 1990, was described as 'The most comprehensive review of the situation and outlook of the forestry sector ever undertaken'. It highlighted the decreasing forest area and increased demand for forest goods and services. The forest had declined from 74% to 56% of Indonesia's land area within 30 years. The prediction was that by 2010, plantation timber would be the main source of wood supply in Sumatra and Kalimantan. Deforestation was believed to be positively correlated with population density, and negatively correlated with agricultural productivity and real income growth (FAO/GOI 1990:9-12).

Such assumptions reiterated the notion that deforestation was entirely caused by local people. The population of Kalimantan more than doubled between 1961 and 1990,[18] especially in the forest-rich provinces of East and Central Kalimantan, but even by 2000 the average density was only 12 per sq

17 Djamaludin 1991:102-10. Presidential Decree No 13/1989.

18 From 4.1 million to 9.1 million.



Logging roads penetrated deep into mountain forests, opening them up to spontaneous settlement

km. South Kalimantan, with its long-settled Hulu Sungai rice bowl, was the only province with a moderately high density (81 per sq km). Much of the growth in East Kalimantan was in urban areas, as people flocked to wood- and petroleum-based industries. Kalimantan's population in 2000 (10.9 million) was just over 5% of Indonesia's total, on 30.4% of the land area (BPS 2002:5, 46). According to FAO, annual deforestation rates in Indonesia had doubled each decade: 300,000 ha in the early 1970s, 600,000 ha in the early 1980s, and in 1990 between 900,000 and 1,300,000 ha[19] (Sutter 1989:12-3). It is unlikely that this exponentially increasing deforestation could simply have resulted from population growth.

Table 3 shows the decline in the area under forest in Kalimantan between the RePPProT studies of 1982 and the 1990 FAO figures. The greatest loss was in East Kalimantan, as the 1990 figures included the impact of the 1982-1983 fires. Yet attributing all deforestation to the fires was as much an oversimplification as blaming it on population increase. CIFOR researchers later argued that observers should look beyond the local scene, to the broader political and economic trends influencing behaviour at the forest margin (Sunderlin and Resosudarmo 1996:16).

Table 3. Kalimantan, Total forested area by province, 1982 and 1990 ('000 ha)

Province	Land Area	Area Forested 1982	Area Forested %	Forested 1990	% Decline Forested* %	From 1982 level
West Kalimantan	14,751	8,701	59.0	7,996	53.9	8.6
Central Kalimantan	15,300	11,188	73.1	10,619	69.4	5.1
South Kalimantan	3,698	1,796	48.6	1,620	43.8	9.8
East Kalimantan	21,144	17,900	84.6	14,538	68.8	18.8
Total	54,893	39,585	72.1	34,733	63.3	12.3

* 'Forest' includes areas in nature reserves, tidal forest, and protected forest

Source: RePPProT (as for Table 2), FAO/GOI (1990 v 2: 113). Figures do not always add up to 100 due to rounding.

The powerful conglomerates that dominated the timber industry, with close links to the Soeharto family, had been encouraged by low stumpage fees for raw logs and the enhanced economic rent or excess profits which they could cream off (Brown 1999:1-5; Fraser et al. 1999:174-6, 181; Ross 2001:190-

[19] The difference in the rates depended on whether all of the burned land in East Kalimantan in 1982-1983 was considered 'deforested' or only one-third of it. Kalimantan's share in the rate for 1990 was thus either 377,700 ha/year or 233,300 ha/year.

203). Exports of plywood continued at a high level into the 1990s, but they did not all come from concessions. Excess factory capacity in the plywood and sawn timber industries had been noted in 1989. In addition to concession-linked factories, there were large numbers of other wood-processing plants, especially sawmills, both legal and illegal. A new type of licence to cut timber for clearing both production and conversion forest, the Timber Utilization Permit (IPK), was established in 1993. It was specifically issued for clear-felling unproductive or logged natural forest, for transmigration, forest plantations, or estate crops.[20] By the end of 1994, 25% of Indonesia's legal log supply came from clear-cutting.[21] If all legally harvested timber was used to feed the concession-linked mills, then David Brown concluded that the independent mills must be solely dependent on illegal supplies (Brown 1999:32). In 1996, Forestry Minister Djamaludin began revoking concessions which were not complying with the TPTI regulations. The parastatal companies Inhutani I-III, which operated their own concessions and plantations (though with no time limit on their leases), were supposed to reforest these revoked areas, using the Reforestation Fund for this purpose.

Meanwhile a landmark decision had been taken in 1992, with the passage of the Spatial Use Management Law authorizing each province to prepare its own land-use plan based on the RePPProT maps. All plans included a conservation area and a human-use area, the latter being divided into production forest, wetland and dryland agriculture (including estate crops), and settlements. The Ministry of Forestry rejected such plans, insisting that estate crops could only be grown in areas they classified as 'conversion forest', while tree plantations were allowed in 'production forest'. Degraded logged-over forests, deemed no longer productive, could be reclassified for agriculture with the Minister's approval. In 1997 a special team attempted to 'harmonize' (*paduserasi*) the provincial land-use plans with those from the Ministry of Forestry. All four Kalimantan provinces were among those remaining in dispute, although the 'harmonization' process has continued.

Oil palm

Competition for land was meanwhile increasing, and forestry activities were further challenged during the 1990s with the rapid expansion of oil palm from its base in northern Sumatra. Oil palm was especially prominent in West Kalimantan, with more than 200,000 ha planted to the crop by 1996.

20 In 2000 the IPK were also issued to smallholder cooperatives by local district heads in 100-hectare lots (Barr et al. 2001:13-7).

21 It is now estimated that 40% of timber harvested is clear-cut with IPK licences (Obidzinski and Barr 2002:199).

The other Kalimantan provinces were slower to plant, but had initiated the release of production forest. Most companies sought forested land, as they hoped thereby to reduce the number of local claims, and could offset their planting costs by selling timber through IPK licences. Bogus companies simply felled the timber, with no intention of planting (Potter and Lee 1998:24; Casson 2000:12-3).

Forest dwellers thus had another force to contend with. First came the loggers, who were not too disruptive, providing roads and spasmodic employment while removing the big trees. They were followed by the timber plantations, more worrying as they represented permanent forest conversion, though rather slow to materialize. Finally, there was oil palm: the companies promised considerable wealth in exchange for land,[22] but smallholders were tied to repaying large debts and dependent on estate factories for processing their fruit. Villagers struggled to cope with these sequent arrivals and the changed condition of the forests (Mayer 1996a; Goenner 1998:1-5; Colfer et al. 2000).

Fire

The severe El Niño drought of 1997-1998, accompanied by many burning episodes, intensified these impacts. In 1997, the burning was most serious in the southern part of West Kalimantan and extending eastwards into Central Kalimantan. Burning was being undertaken for land clearing, primarily for oil palm, though some forest plantations were also involved. The infamous 'million hectare rice scheme' on peat lands of Central Kalimantan (one of Soeharto's major disasters) was also burning, generating huge amounts of smoke. Satellite imagery made it clear that plantation companies were largely responsible, disproving claims that the fires were 'an act of nature' or set by shifting cultivators. The drought continued in East Kalimantan into the early months of 1998, as it had done in 1982-1983. Although conditions improved elsewhere, East Kalimantan suffered greater devastation in 1998, with 5.2 million ha being burned, including timber concessions, plantations, and local farms. While the 1982-1983 burned area was again affected, fires spread beyond that boundary into recently logged forests (Siegert et al. 2001:440). Some fires were deliberately lit to settle grievances between different groups.

Meanwhile, the Asian economic crisis was taking hold, with precipitous declines in the value of the rupiah and the collapse of many banks and other financial institutions. A flight of foreign investment and confidence fol-

22 A common system involving local smallholders required them to give up 7.5 ha in exchange for 2 ha of land planted to oil palm, and to work for a few years on the estate before receiving their holding.

lowed. As conditions worsened, especially in Jakarta, pressure mounted for Soeharto's dismissal. Eventually he stepped down in May 1998, ending the New Order period.

The post-Soeharto years

The fall of the regime was welcomed by most Indonesians. Some tycoons became bankrupt and one was jailed. This raised the question of who should own and control the surviving forests. In the forests themselves, *reformasi* was perceived to mean that previous controls no longer applied. This was especially true of the TGHK boundaries, and there were many invasions of protected areas and national parks. In some cases local people sought to reclaim land they considered rightfully theirs; in others they were incited by merchants, sawmillers, and others to take valuable commodities such as ramin from the parks. Such activities have been blatant in their scale and level of organization, which has extended to neighbouring countries. The perpetrators, now almost as powerful as Soeharto's tycoons, are as difficult to prosecute. The illegal logging of ramin from the Tanjung Puting National Park in Central Kalimantan is one example (EIA/Telapak 1999). Illegal logging on a similar scale exists in West Kalimantan near the Sarawak border, with timber smuggled into Sarawak from parks such as Danau Sentarum (Wadley 2001:1-2).

The market demand for wood is equally buoyant in districts where pulp and paper industries are being developed. The government identified 13 priority plantations for pulp and paper projects. Four are located in East Kalimantan and one each in South and West Kalimantan (Barr 2001:65). While the proportion of their land planted to fast-growing exotics, according to the most recent figures, varies from 91% to 11%, most are trying to establish their holdings.[23] The trees take at least seven years to grow, so companies need alternative sources of fibre, largely drawn from natural forests, as 'mixed tropical hardwoods' (MTH). Since the economic crisis, pulp firms have enormous debts, so are even more likely to seek the cheapest sources of fibre, with tacit encouragement to illegal suppliers (Barr 2000:80, 90). The low prices for rubber and other local products made selling wood the best economic alternative for villagers, even though they received a mere fraction of the product's value. The result has been an 'epidemic' of illegal logging, as remaining forests are targeted, whatever their official status.

23 Spek 2000:25. The low level of planting by West Kalimantan's Finnantara Intiga is largely a result of its orientation toward the social needs of surrounding communities. This has made it uncompetitive with other interests (Source: fieldwork, Sanggau 2001).

Table 4. Results of forest conversion, 1985-1997, Sumatra, Kalimantan, and Sulawesi

Locations and forest loss		Large investors oil palm, timber plantation		Smallholders rubber, coffee, cocoa, coconut		Total land planted		Balance of forest cleared cleared	
Island totals and selected provinces	Total forest loss (m/ha)	Area planted (m/ha)	% of forest loss	Area planted (m/ha)	% of forest loss	Area planted (m/ha)	% of forest loss	Area planted (m/ha)	% of forest loss
Kalimantan	8.47	1.67	19.7	0.47	5.5	2.14	25.2	6.34	74.8
E. Kalimantan	3.97	0.61	15.3	0.10	2.5	0.71	17.9	3.26	82.1
C. Kalimantan	1.71	0.26	15.2	0.10	6.1	0.36	21.3	1.35	78.7
W. Kalimantan	1.99	0.47	23.6	0.21	10.8	0.68	34.5	1.30	65.5
Sumatra	6.69	2.92	43.7	1.59	23.8	4.51	67.5	2.17	32.5
Sulawesi	2.27	0.28	12.6	0.63	28.0	0.91	40.6	1.35	59.5
Three islands	17.43	4.88	28.0	2.70	15.5	7.58	43.5	9.86	56.6

Source: Reworked from Holmes's table in World Bank 2001:16. Totals do not add up to 100 for the four provinces of Kalimantan, because South Kalimantan was excluded.

In 2000 a further study of deforestation rates compared the RePPProT figures with the results of a revised forest inventory, undertaken with World Bank funding by the Ministry of Forestry. Rates of forest loss were calculated for the period 1985-1997 at 1.7 million ha per year, a total loss of 20 million ha (Holmes 2000:3). These were the highest rates of forest loss for Indonesia, and they continue to climb.[24] In Kalimantan, forest declined from around 40 million ha to 31 million ha, with East Kalimantan registering the greatest loss. Map 4 indicates both the areas deforested before 1985 (RePPProT) and the conversion from 1985-1997. To understand what had happened to the deforested lands, D. Holmes examined impacts of both large investors (in forest plantations and oil palm) and smallholder cash-crop farmers. Shifting cultivators, once reviled as the major forest destroyers, disappeared from the calculations, though it is unlikely that they in fact vanished. In the forest-rich provinces of Kalimantan, neither large investors nor smallholders have been prominent, so there remains a considerable balance of cleared but apparently unused forest land. This was especially true in East Kalimantan, where the impact of the fires was undoubtedly a factor, and in Central Kalimantan, perhaps a result of the failed Million Hectare Rice Scheme.

A Revised Forestry Law, No. 41 of 1999, has finally replaced the Basic Forestry Law of 1967. Some of its changes were to limit concessions to a maximum of 100,000 ha in any one province, and to extend the length of a lease up to 55 years. Local cooperatives of settlers living in or near concessions were allowed the right to manage them, though this did not include tenure over the lands. The law has been criticized for not going far enough in its reforms. It still concentrates on wood production rather than the total forest ecosystem, and has not altered the TGHK.[25] While the Ministry of Forestry's reform agenda[26] included the resolution of tenurial issues on forested lands, action has been slow. In March 2001 traditional communities in East and West Kalimantan met to discuss ways of securing autonomy over their land (Lynch and Harwell 2002:84-91), and agrarian reform has been debated in the parliament. To advance this process commentators have been pushing for a redefinition of the Forest Zone:

> 1. To determine priority areas of natural forests and watersheds that need focused attention in their management and protection; and
> 2. To address conflict by recognizing and securing the rights of smallholders whose lands have been misclassified as State Forest (Fay et al. 2000:1).

[24] A further study (Barber et al. 2002) has estimated current loss rates at 2 million ha per year.

[25] While the Forestry Law recognizes 'customary forest' (*hutan adat*), its use must not conflict with national interest and the land remains state land.

[26] Part of a 12-point commitment to the aid donor CGI group made in December 2000 (Barber et al. 2002).

Chip Fay, Martua Sirait and Ahmad Kosworo argue that the process of forming the 'forest estate' (TGHK) was in fact illegal, as villages were supposed to be consulted and informed, but this seldom happened. However, efforts to date to persuade the Ministry of Forestry to consider a radical revision of the boundaries have been unsuccessful.

Conclusion

The years from 1950 to 2002 have seen a massive transformation of land use in Kalimantan. A fifteen-year transition period from colonial times was followed by the heyday of state-sponsored logging of the dipterocarp forests between 1965 and 1989, especially in East Kalimantan, and a growing domination by corporate interests. The years from 1990 to 1997 witnessed the emergence of planted monocultures to partially replace the forests, with clear felling gradually being substituted for selective logging. In 1997-1998, drought conditions encouraged large-scale clearing: the resulting multiple fires, burning on a wide front, had a huge impact on forests, especially in East and Central Kalimantan. After the fall of the Soeharto government in 1998 there has been both rapid change (*reformasi*; decentralization) and continuing crisis. Since the first 'timber boom' of the 1970s, the aim of loggers has been exploitation and rent-seeking in the forests, rather than sustainable management, despite paper regulations and suggested improvements by outside observers. Although the Ministry of Forestry has claimed control over extensive areas, many have challenged its authority, including other government agencies, powerful commercial interests, NGOs, and latterly, forest dwellers. This last group, held silent and alternately ignored and vilified during Soeharto's New Order period, have actively asserted their rights since 1998. Since the regime's demise, some attention has been given to democratizing the forests, but despite promises of reform, the 'way forward'[27] remains unclear.

After fifty years of exploitation, Kalimantan's forests are now facing their most critical test. While there has been talk of agrarian reform and participatory redrawing of forest boundaries, many in the Ministry of Forestry oppose such ideas. However, the Ministry has lost much of its power, with responsibility being devolved to the decentralized districts. It is at the district and village levels that the most important decisions must now be taken. It could be argued that people with tenure are more likely to use both land and forest sustainably, but there are no guarantees. There is cynicism from some researchers about the value and practicality of Community Based Natural Resource Management (CBNRM) (Eghenter 2000; Li 2002), while others are

27 A recent book on the forests is Colfer and Resosudarmo 2002.

supportive (Lynch and Harwell 2002). Two schools of thought have emerged in the international literature, one which would give local people more power and responsibility, while the other would return to heavy policing of forests deemed endangered (Wilshusen et al. 2002). What is certain is that revolutionary new rules are needed, accepted by both government and forest dwellers. Their acceptance is fundamental in the continuing battle against vested interests, which threaten the forests' very existence.

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