

REDUCING megacity impacts ON THE COASTAL ENVIRONMENT

Alternative livelihoods and waste management
in Jakarta and the Seribu Islands

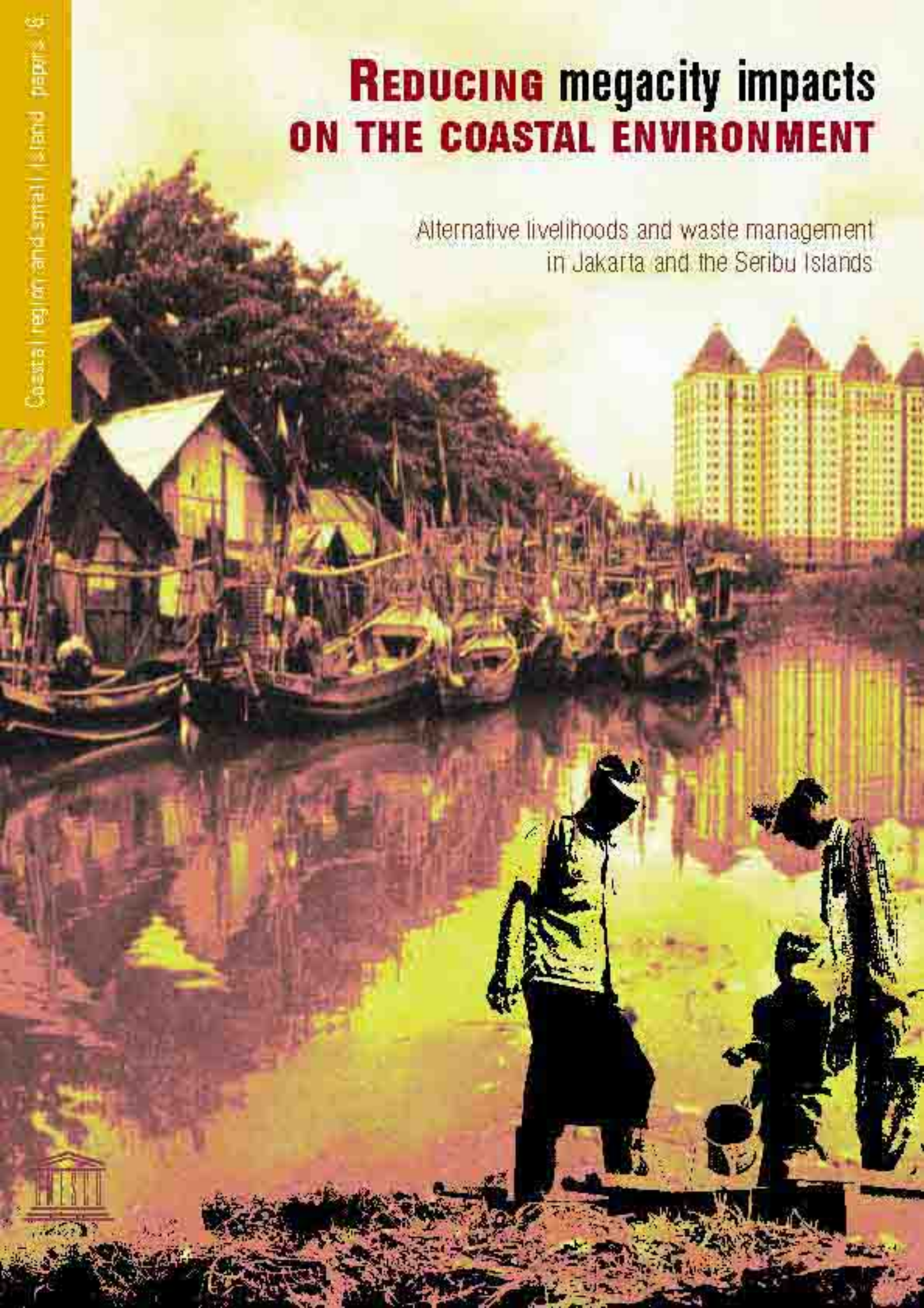
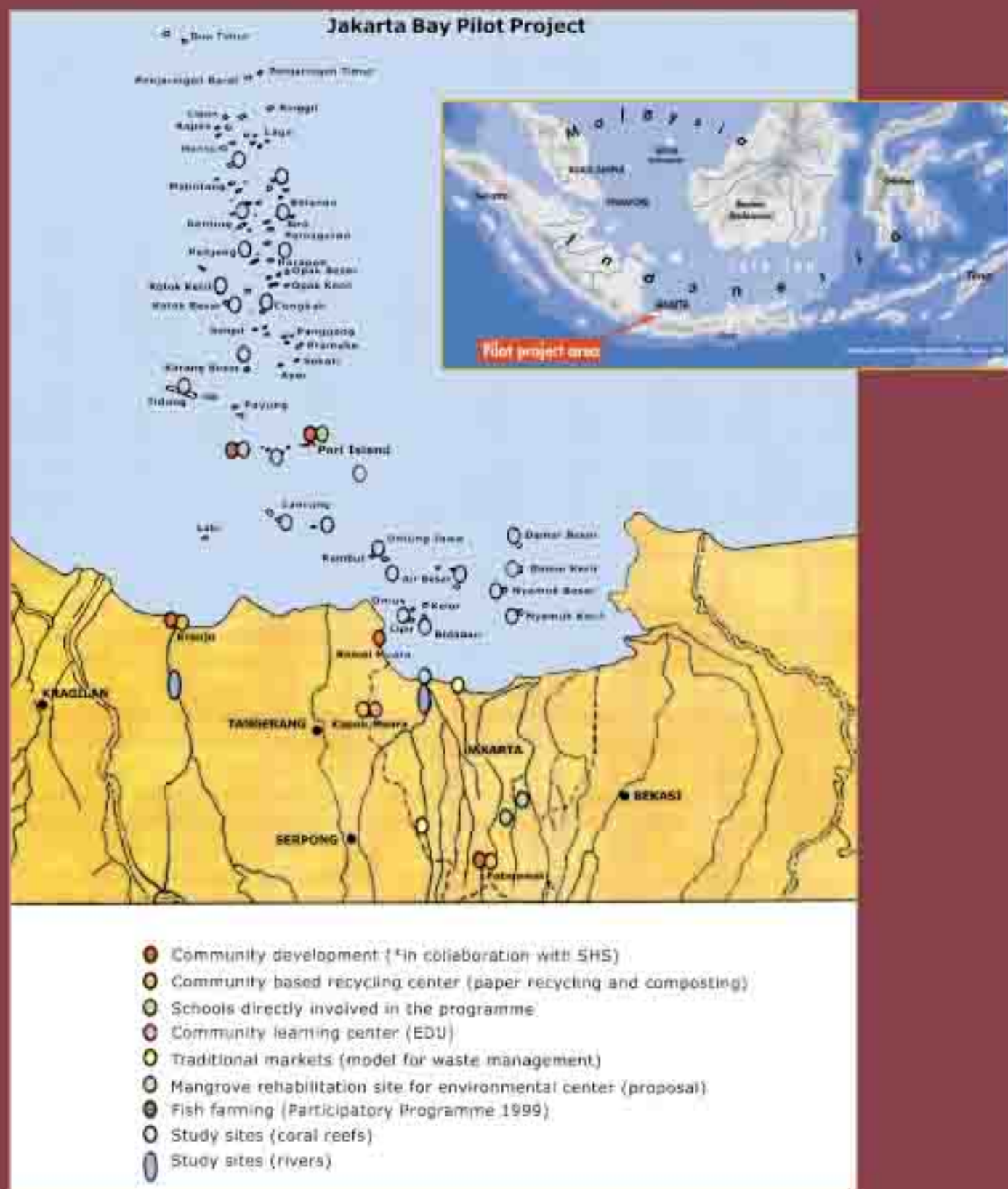


Figure 1.

Map of Jakarta and Kepulauan Seribu Archipelago.



Reducing megacity impacts on the coastal environment

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in Jakarta and the Seribu Islands

Pilot project report



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FOREWORD

As we enter the third millennium, one of the most critical problem areas, and indeed defiant challenges, continues to be the impacts on the coastal environment within or near megacities. Many of these sprawling urban areas have mushroomed, with little or no planning which would take into account the negative effects such growth has, directly and indirectly, on the coastal inhabitants and systems in their vicinities.

Concern about such problems has been on the rise for a number of years, and rightly so. One specific site where the Organization has joined hands with local stakeholder groups in this respect is Jakarta (Indonesia), and its bay area. The UNESCO Jakarta Office has developed and carried out a number of programmes and scientific projects, the objectives of which have been to co-operate with Indonesia and other countries of the region in tackling environmental problems. Since 1985, local partners have been supported to carry out specific research and monitoring in Jakarta Bay and the Seribu Islands – particularly related to coral reefs. Beginning in 1996, the activities were enhanced and broadened into a pilot project carried out on the intersectoral platform for Environment and Development in Coastal Regions and in Small Islands (CSI). This project seeks to address some of the human and ecological aspects of sprawling megacity growth through working with local communities on alternative approaches to solid waste management and assisting islanders develop new income-generating livelihoods.

The present document, Coastal Region and Small Island Papers 6, reports on the project's various phases and results thus far. Appreciation is expressed for those individuals, institutions and agencies that have supported or participated in the various stages of the project, and for those who will continue to carry on the tasks involved. A non-exhaustive list is included under 'Acknowledgements' on the following page. For their substantial contributions to the preparation of this report, we mention specifically Yoslan Nur, Stefano Fazi, Nuning Wirjoatmodjo and Thomas Hansen. Considerable credit also goes to Claire Blackburn and Gillian Cambers for their editing.

Dirk G. Troost
Chief, UNESCO-CSI

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In the implementation of the UNESCO co-sponsored project on Jakarta Bay and Seribu Islands, recognition is due to the efforts and support of a number of partners, for without their co-operation the project would not have progressed. In terms of institutions, to be pointed out are the: Center for Oceanological Research and Development - Indonesian Institute of Sciences; Indonesian News Agency ANTARA; Indonesia Institute of Technology; Demography Institute - University of Indonesia; and the non-governmental organizations Kirai Indonesia Foundation, Self-Empowerment Foundation (Yayasan Bina Swadaya), Estuary Foundation (Yayasan Muara) and the Indonesian Child Care Group (Kelompok Pecinta Anak Indonesia).

The project has benefited from the strong commitment of the following: the communities of Banjarsari, Kapuk Muara, Kamal Muara and Kronjo; the managers of Pluit and Bintaro traditional markets; and Public Senior High School No. 34 - South Jakarta. These partners can be regarded as the primary agents of the project. Substantial support was given by the Provincial Government, the Municipalities of the Jakarta area, the Indonesian Ministry of Marine Affairs and Fisheries as well as the Indonesian Navy.

The execution of the project has benefited from the contributions of a number of counterparts, in particular: Drs Ugo Bernieri, Hendro Sankoyo, Arnold Sinurat, and Suharsono, as well as Messrs Salam, Yulius Wibowo and Muhamad Yusri. Credit is due, for ensuring the project's execution and support, to the staff of the UNESCO Jakarta Office, particularly the Director Stephen Hill, Nuning Wirjoatmodjo, Stefano Fazi and Han Qunli. Former staff member Robin Harger was instrumental in laying the basis for the project during the early stages.

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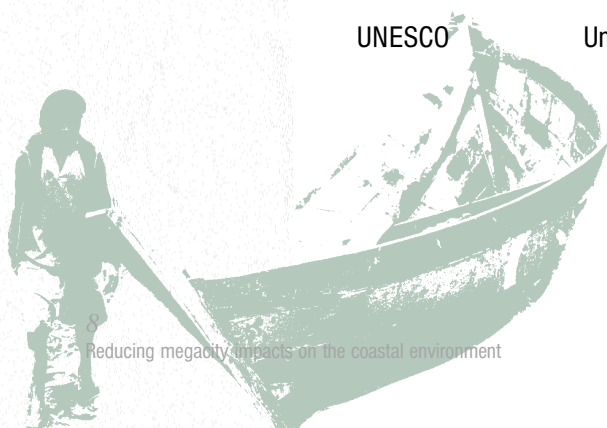
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ACRONYMS

ASEAN	Association of Southeast Asian Nations
CSI	Environment and Development in Coastal Regions and in Small Islands (UNESCO intersectoral platform)
DKI	<i>Daerah Khusus Ibukota</i> (Jakarta city government)
ENSO	El Niño Southern Oscillation phenomenon
FKWKKM	<i>Forum Komunikasi Warga Kelurahan Kamal Muara</i> (Communication forum of the Kamal Muara community)
IDT	<i>Inpres Desa Tertinggal</i> (Donation programme for poor neighbourhoods)
ITI	<i>Institut Teknologi Indonesia</i> (Indonesian Institute of Technology)
JABOTABEK	Jakarta, Bogor, Tangerang and Bekasi (urban community)
JMA	Jakarta Metropolitan Area
JPS	<i>Jaringan Pengamanan Sosial</i> (Social safety net)
LIPI	<i>Lembaga Ilmu Pengetahuan Indonesia</i> (Indonesian Institute of Sciences)
P30–LIPI	Center for Oceanological Research and Development – Indonesian Institute of Sciences
MOST	Management of Social Transformation (programme of UNESCO's Social and Human Sciences Sector)
NGO	Non-Governmental Organization
PBB	<i>Pajak Bumi dan Bangunan</i> (regular household tax)
PCB	polychlorobiphenyl
PLN	<i>Perusahaan Listrik Negara</i> (public enterprise for electricity)
PROKASIH	<i>Program Kali Bersih</i> (clean river programme)
PROPASIH	<i>Program Pasar Bersih</i> (clean market programme)
RT/RW	<i>Rukun Tetangga/Rukun Warga</i> (RT is the smallest unit of local administration, RW is a larger unit)
RUTRK	<i>Rencana Umum Tata Ruang Kota</i> (Directive urban plan)
SHG	Self-Help Group
SMERU	Social Monitoring and Early Responsive Unit
STM	<i>Sekolah Teknik Menengah</i> (Technical High School)
TPS	<i>Tempat Penumpukan Sementara</i> (provisory garbage depot)
UNCED	United Nations Conference on Environment and Development, Rio de Janeiro, June 1992
UNESCO	United Nations Educational, Scientific and Cultural Organization



Summary



Jakarta Bay lies to the north of Jakarta and receives freshwater runoff from the nineteen rivers that run through the Jakarta Metropolitan Area, a conurbation that is home to some 20 million people. The bay is shallow, average depth is 15 m, and contains an archipelago of small, low-lying islands – Kepulauan Seribu, referred to in this report as the Seribu Islands. With the expansion of the Jakarta Metropolitan Area during the second half of the 20th century, the environment of Jakarta Bay and the Seribu Islands has been significantly affected by a range of human activities as well as natural forces. The impacts of pollution, natural ecosystem transformation and non-sustainable coastal resources exploitation are being increasingly felt.

Youth
environmental
education



In 1996 the region became the focus of a pilot project on UNESCO's intersectoral platform for Environment and Development in Coastal Regions and in Small Islands (CSI). This pilot project 'Reducing the impact of a coastal megacity on island ecosystems, Jakarta Bay and the Seribu Islands' attempts to alleviate the pressures being placed on

Jakarta Bay and the islands through community-based solid waste management and the development of alternative livelihoods for people living in the area. This document describes and assesses the project activities carried out in the period 1996–1999.

Coral reef surveys over the period 1969–1995 have shown a dramatic decline in coral reef health, a result of natural causes such as higher sea water temperatures, and anthropogenic factors such as pollution, unsustainable fishing practices and dredging. Indeed several islands have disappeared within recent decades.



Coral
bleaching
in 1998
in Seribu
Islands

Photo: P30 LIPI documentation

Prior to the full development of project activities, a socio-economic survey was conducted of three selected communities in the Jakarta area, two urban and one rural, and of one community in Pari Island in the Seribu Islands. The surveys covered social organization, housing, water supply and management, drainage, sanitation and public health.

Following several workshops, community-based waste management was selected as an area for action. An initial study of solid waste composition showed that 74% of the solid waste generated in Jakarta consists of organic matter, which can be made into compost. Working with communities in Banjarsari and Kapuk Muara, recycling centres were established where young people, women's groups and unemployed people have been trained and carry out waste sorting, recycling and composting, including marketing of the products e.g. medicinal herbs. This activity aims to generate an 'Urban ecology model' to reduce the impact of urban areas on the rivers and coastal areas through appropriate waste management. In Kapuk Muara, the UNESCO Education programme also established a community learning centre. Other composting projects have been started at the Bintaro and Pluit traditional markets, and in the former case a 40% reduction in total waste was achieved after two months. The projects have been successful to date although further work is needed to find markets for the recycled products so that the activity becomes a viable income-generating alternative livelihood. This activity aims to produce a 'Model for waste management in traditional markets', which may eventually be replicated in other areas.

With an average of 1,400 m³ of rubbish being thrown into Jakarta's rivers daily, education is an important part of waste management. The project has several educational components, including formal school programmes, and informal projects such as field courses and action orientated activities.

Fishing has long been the major income-generating activity in the Seribu Islands. However, due to the impacts of the city and unsustainable fishing practices, catches have declined and 35% of the population in the Seribu Islands are living below the poverty line. This project has focused on developing alternative income opportunities, specifically duck farming on Pari Island.

In order to fully maximise the benefits of alternative-income generating activities, the project, through the UNESCO Social and Human Science programme, has focused on social empowerment in one community selected as a case study, Kamal Muara, through the development of self-help groups. These self-help groups have strengthened the community by improving their organizational skills, providing a system for savings and loans, and in the future it is anticipated that they will assist in small business development.

To ensure the sustainability of the ongoing pilot project, a project document for the integrated environmental development of the Jakarta Metropolitan Area has been prepared. While the overall approach for future action will focus particularly at the community level through social empowerment and poverty alleviation activities, co-operation with government organizations and the development of public-private partnerships will be complementary foci.



One of Jakarta's slum areas



Training on waste-composting for youth

1

Introduction





Jakarta, the capital city of Indonesia, is a large tropical megacity with a population of more than 20 million people. Jakarta Bay, which lies north of Jakarta and within which there is a chain of small islands, the Kepulauan Seribu, is heavily impacted by human activities taking place in and around the city as well as those taking place in the bay itself. The impacts from the city include solid and liquid waste from domestic, industrial and agricultural activities resulting in pollution and eutrophication of the bay waters. Activities within the bay itself include sand and coral mining, oil exploration, fishing and tourism. As a result of these activities, several islands within the Kepulauan Seribu (referred to as the Seribu Islands in this report) have disappeared within recent decades and others are seriously threatened.

Since an international workshop on 'Human-induced damage to coral reefs' in 1985, UNESCO has been collaborating with the Indonesian Institute of Sciences (*Lembaga Ilmu Pengetahuan Indonesia* – LIPI) and other scientific institutions to collect information on the status of coral reefs in the Seribu Islands. A baseline coral reef survey was conducted during this workshop in 1985. During an international workshop in 1995 on 'Coral reef evaluation, Pulau Seribu' a second reef survey was conducted. The results showed a dramatic decline in reef health over the ten year period.

In 1996, the intersectoral platform for Environment and Development in Coastal Regions and in Small Islands (CSI) was launched by UNESCO. This initiative, which seeks to develop wise coastal practices for sustainable living, has three modalities: pilot projects, university chairs/twinning, and a web-based discussion forum on 'Wise Coastal Practices for Sustainable Human Development'. Jakarta Bay was selected the same year as a pilot project site, and the activities and results of the project between 1996 and 1999 are described in this report.

One of the first activities, in 1996, was to hold a workshop on coral reef management together with LIPI and The Indonesian National News Agency – *Antara*. Key sections of the presentations and discussions from this workshop are included in Section 2 of this report, which describes the impacts of human activities on the biophysical status of Jakarta Bay and the Seribu Islands. One of the recommendations of the workshop was to develop community-based solid waste management through recycling and composting, and this has become one of the major activities of the pilot project.

Prior to commencing activities, a socio-economic survey was conducted of three selected communities (two urban and one rural) in the Jakarta Bay coastal zone, and of the community in Pari Island in the Seribu Islands. The results of these surveys are described in Section 3 of this report.

Following on the recommendations of the 1996 workshop, and in co-operation with the UNESCO Jakarta Office and several NGOs, the project has undertaken several activities relating to community-based solid waste management. These are described in Section 4 of this report, and include firstly an assessment of waste production in Jakarta; secondly, household and traditional market waste composting, and paper recycling; and thirdly environmental education – both school programmes and informal initiatives.

During a workshop in 1997 to establish a framework for sustainable development in the Seribu Islands, one of the priority areas recommended for action was to develop alternative livelihoods for the islanders. This has become another major focus of the project and Section

Crowded conditions
in Jakarta's water-
front areas



5 of this report describes these activities which include duck and seaweed farming in Pari Island. A further development of the 'alternative livelihood concept' has been to develop self-help groups in communities in Jakarta, this is also discussed in Section 5.

In 1999, a panel discussion was held, organised together with LIPI, to develop a concept for coastal city management, specific to Jakarta, which would seek to establish an equilibrium between resource exploitation and ecosystem preservation. Major recommendations from this meeting were to encourage co-ordination between sectors and stakeholders, to prepare an environmental management plan, and to increase awareness amongst community, government and private sectors, concerning environmental quality.

The main conclusions and recommendations from the project are described in Section 6. Future activities will maintain the existing themes of community-based development, social empowerment and alleviation of poverty.

Biophysical assessment of Jakarta Bay and Seribu Islands





2.1 GEOGRAPHICAL AND HISTORICAL BACKGROUND

Jakarta Bay is located north of the Indonesian capital city, Jakarta. It is a shallow bay, with an average depth of about 15 m, an area of 514 km², and a shoreline about 72 km long. On its eastern and western sides, the bay is bound by two capes, Tanjung Karawang and Tanjung Pasir, respectively. The bay receives highly polluted water from the nineteen rivers that run through the Jakarta Metropolitan Area.

Kepulauan Seribu is an archipelago within Jakarta Bay. This chain of offshore islands stretches some 80 km in a northwest to southeast line and 30 km from east to west (see Figure 1, inside front cover). Although the name Kepulauan Seribu means 'thousand islands', there are currently 105 in all, so the island group is referred to in this report as the Seribu Islands. On average, the islands are smaller than 10 ha and less than 3 m above sea level. Administratively, the Seribu Islands are under the authority of the Jakarta City government (*Daerah Khusus Ibukota Jakarta – DKI*). The archipelago is used for many purposes: tourism, sand mining, offshore oil exploration, sailing and fishing.

Human activity in and around the bay started thousands of years ago. Initially, the bay was used only for fishing, although it is probable that some shipping took place along the coast. At the beginning of the colonial period, Jakarta Bay was one of the first landing points for foreign powers. The current harbours of Tanjung Priok and Sunda Kelapa were first used more than 300 years ago. In former times, some of the islands in the bay were used for quarantine. Within recent decades many of the people living in and around the bay have been involved in fish and shrimp farming. The sea floor and reefs close to Jakarta have been dredged for landfill, and thousands of hectares around the bay have been transformed into fishponds, luxury residences, industrial zones and fishers' kampungs (residential neighbourhoods). Some of the islands are national park wildlife refuges, others have been developed as tourist resorts or residential communities for Jakarta. Further offshore, to the northwest of the reef tract, a major oil field exists and oil is being extracted.

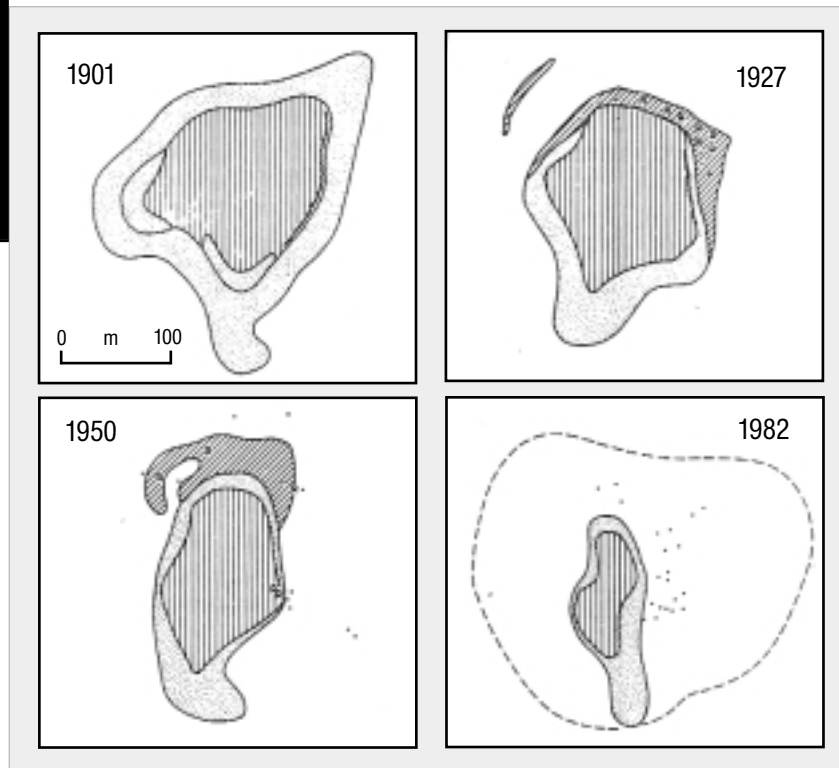
Jakarta Bay is important for a number of human activities which contribute significantly to the economic development of the region. However, the high population growth rate, together with the expansion of Jakarta City during the second half of the 20th century, have led to serious pollution and over-exploitation of coastal and marine resources, thus threatening the sustainability of the marine environment. Within Indonesian coastal waters, Jakarta Bay has undergone some of the most drastic changes over the last few decades.

2.2 EXTENT OF ECOSYSTEM DEGRADATION

2.2.1. Disappearance of islands

Several of the Seribu Islands disappeared in the 20th century mainly as a result of human activities. Coral reefs were removed at Air Kecil and Ubi Kecil Islands, and as a result of subsequent erosion, both islands have now disappeared. Ubi Besar Island is eroding rapidly as the reef around it is dredged, see Figure 2. Willoughby *et al.* (1998) reported that three islands disappeared below sea level between 1985 and 1995.

Figure 2.
Change in
morphology,
Ubi Besar Island
(Source:
Stoddart, 1986)



2.2.2. Status of coral communities of Seribu Islands

Much of the information described in this and the following section (2.2.3) has been derived from the proceedings of a 1995 'Coral reef evaluation workshop, Pulau Seribu' (UNESCO, 1998).

The corals and reefs of the Seribu Islands were first described in detail by Umbgrove (1928, 1929, 1939) and Verwey (1931), who found them in generally good condition in the 1920's, although some human influence was already apparent on nearshore reefs. With the rapid expansion of Jakarta, increasing use of the resources of the reefs and islands of the Java Sea occurred (Harger, 1986, Tomascik *et al.*, 1994).

A long-term coral reef monitoring programme in Jakarta Bay and the Seribu Islands has been initiated by the LIPI Research and Development Centre for Oceanology in collaboration with UNESCO. Through the collection of time series baseline data, the programme aims to study the dynamic changes of coral assemblages.

The first baseline data were collected in 1985 during an international workshop on 'Human-induced damage to coral reefs'. Twenty eight islands were surveyed and over 550 man-hours were spent collecting data on the islands' geomorphology and the biological status of the surrounding coral reefs. Coral growth, using the line intercept transect method (English *et al.*, 1994) was measured along a pollution gradient from Jakarta Bay to the

outermost part of the Seribu Islands, some 80 km from the coast. The results of the exercise showed that many of the reefs were in poor condition.

A second survey was conducted ten years later in 1995, during an international 'Coral reef evaluation workshop, Pulau Seribu'. This covered the same sampling sites and used the same methodology as the 1985 survey. A national 'Coral reef management workshop for Pulau Seribu', conducted in Jakarta and Pulau Ayer in 1996, provided a forum for different stakeholders – fishermen, scientists, teachers, journalists, NGOs, government officers and resort owners – to confront the problems. The workshop participants reviewed the research conducted in the 1995 survey of the Seribu Islands. The dramatically worsening status of the reefs caused much concern among participants and demonstrated the need for a more comprehensive response.

A dramatic decline in reef health in the Seribu Islands was recorded between 1985 and 1995 (De Vantier *et al.*, 1998). The decline in coral cover and species richness may be attributed to outbreaks of crown-of-thorns starfish; temperature stress associated with the El Niño Southern Oscillation Phenomenon (ENSO) in periods in the 1980s (Suharsono, 1990) and possibly also in the 1990s (Harger, 1995); the spread of the sodium cyanide fishing technique in the 1990s; pollution from the Jakarta coastal area (Harger, 1986, Hungspreugs, 1988); and the muro-ami coral breakage in the 1980s and 1990s.

Table 1 compares coral reef cover between 1969 and 1995 for two of the Seribu Islands. Percentage cover was used as an indicator of coral reef condition, rather than species diversity, as this depends on other factors such as the density of reef colonies in the area. As can be seen there was a dramatic decrease over the period, especially between 1970 and 1985.

Location	1969–70	1985	1995
Pari Island	80%	22%	15%
Air Island	70%	25%	30%

Table 1.
Percentage coral reef cover for two Seribu Islands

During the 1985–1995 assessments, the reef tract was divided into three groups based on oceanography, reef geomorphology and distance from the mainland. These groups were: reefs within Jakarta Bay, reefs of the mid-region (15–50 km offshore from Jakarta), and reefs of the outer region (> 50 km from Jakarta).

Reefs in Jakarta Bay remained in very poor condition in 1995, with little apparent change in coral cover since 1985. Living hard corals covered less than 5% of the substrate, and sand, rubble and algae were the dominant types of cover on most reefs. Water quality was very poor, with flotsam and high concentrations of plankton in the nutrient-enriched bay waters. Three of the nearshore islands had disappeared below sea level since 1985 and several others were eroding, probably through a combination of dredging for landfill and natural loss of sediments. High rates of bio-erosion were apparent on the inner region reefs, and there was little to no coral growth occurring to counter these effects. Thus, further erosion of the reefs and islands is likely, particularly if dredging continues. At present, most of these reefs can be considered functionally dead, mainly as a result of human impacts.

Reefs of the mid-region exhibited substantial variability in 1995, ranging in coral cover from less than 10% (Pulau Tidung) to more than 50% (Pulau Dapur). Since 1985, several reefs had increased in coral cover, others showed little change and one showed a major decline in cover (Pulau Tidung). Overall, coral cover remained at approximately 20% and

had shown a slight increase. Although included in this mid-region, the reefs of Pulau Damar Kecil and Pulau Untung Jawa appear to represent the transition zone between the major influence of Jakarta and the adjacent mainland. Cover of living hard corals on these reefs was approximately 10% in 1985 and 1995. By contrast, coral cover had increased substantially on Pulau Damar Besar (by approximately 15 to 30%) and Pulau Dapur (by approximately 25 to 55%) over the same period. These two reefs are both less than 25 km from Jakarta, indicating that water quality at this distance is not inimical to coral growth and recovery. Indeed, Pulau Dapur showed the greatest improvement in coral cover of all reefs surveyed in 1995, and was the only reef that could be considered to be in good/excellent condition (in terms of coral cover) by international standards.

Most reefs of the outer region exhibited declines in coral cover since 1985, particularly in corals of the genus *Acropora* on the reef slopes (3 m depth). In 1985, the outer region had the highest cover of hard corals (approximately 30%), and there was an overall improvement in reef condition with increasing distance offshore from Jakarta (Brown, 1986; Harger, 1986; Moll and Suharsono, 1986). By 1995, there had been a significant decline in coral cover, to approximately 20%. Blast fishing was occurring at the time of the 1985 surveys (Harger, 1986), however, there was no evidence of blast fishing in 1995, although poison fishing with cyanide was reportedly occurring in the region (Djohani, 1994). Overall, there was a marked absence of large reef fishes and other fauna of commercial value (e.g. *holothurian* 'sea cucumbers') at most sites, and an increase in the abundance of sea urchins, particularly *Diadema* sp., and of crown-of-thorns starfish *Acanthaster planci*. These starfish appear to have been increasing in abundance in the Seribu Islands reef tract since 1985.

2.2.3. Other indicators of coral reef stress

In order to evaluate the potential of several new reef assessment techniques, the 1995 UNESCO-P30 LIPI survey of the Seribu Islands reefs was expanded in scope to include surveys of both stomatopod crustaceans and echinoderms. Stomatopod crustaceans are particularly well suited for inclusion in large-scale, rapid coral reef assessments for they are ubiquitous, abundant, and diverse in the Indo-Pacific region, and their populations are easily sampled objectively without the use of SCUBA equipment. As stomatopods are an important component of the abundant mobile cryptofauna of coral reefs, study of their populations can offer insight into reef processes which might otherwise be missed. Stomatopod abundance, diversity and recruitment are very negatively correlated with sediment concentrations of petroleum hydrocarbons and certain heavy metals, and with surrogate measures of sewage and agrochemical runoff contamination (Steger and Caldwell, 1993).

Despite some exceptions, the general trend of increasing stomatopod abundance with distance from Jakarta is pronounced. Detailed analyses proved that stomatopod abundance was highly correlated to a number of water quality parameters, many indicative of marine pollution.

In relation to stomatopod diversity the results show that the reefs in Jakarta Bay are exclusively dominated by two species (*G. viridis* and *G. hendersoni*). In the central region of the archipelago, species diversity rises from two to seven species, while in the northern part of the Seribu Islands species diversity drops to four.

This interesting pattern of highest species richness in the central zone of the archipelago has also been demonstrated for the hard coral (Moll and Suharsono, 1986; Brown *et al.*, 1983). The process responsible for this pattern of species richness has not yet been fully explained. Moll and Suharsono (1986) consider that increasing human impact with proximity to the mainland may be of primary importance; this may account for the observed structuring of stomatopod communities as well. However, this theory fails to account for the

slightly decreased species richness in the northern Seribu Islands reefs, which ostensibly suffer the least from human impacts. Brown *et al.*, (1983) conclude that the lower coral species diversity on the northern reefs may be a result of increased exposure to high wave energy on those reefs. A synthesis of the observed pattern of species richness could result in a variant of the 'intermediate disturbance hypothesis', which holds that species diversity is often highest in areas where intermediate levels of disturbance act to 'maintain local diversity by preventing the elimination of inferior competitors' (Connell, 1978; Karlson and Hurd, 1993). Jakarta Bay reefs seem strongly affected by human disturbances such as marine pollution, dredging and sedimentation, so that only pollution and sediment-tolerant species are able to exist in these zones. Likewise, the northern Seribu Islands reefs may be strongly affected by wave exposure, which also limits species richness by excluding exposure-intolerant species. The central zone of the reef is affected by both human impacts and physical exposures, but only at 'moderate' levels. This situation may allow a larger number of species to coexist on the central Seribu Islands reefs.

2.3. CAUSES OF ECOSYSTEM DEGRADATION

There are many factors involved in ecosystem degradation in Jakarta Bay, some of them natural such as the high sea surface temperatures during the El Niño episodes, many others are man-induced. This section will discuss several of these causes, namely: the bleaching event in 1998; sand and coral extraction and mangrove clearance; destructive fishing practices; and pollution.

2.3.1. Bleaching event in 1998

Extensive coral bleaching was observed in Indonesian waters in 1998, from Riau Islands (East Sumatera) to the Seribu Islands (off Jakarta), Karimunjawa Islands (Central Java), Bali and Lombok Islands. In the islands of Bali and Lombok, the first signs of bleaching were reported in early March 1998, while in the Seribu Islands they were only observed in early May 1998. By the end of June 1998 extensive mortality was noted. About 90-95% of the corals extending from reefs flat down to a depth of 25 m were affected. *Acropora* spp. were the most impacted species. Regular monitoring of sea surface temperature at Pari Island (Seribu Islands) revealed that a warming occurrence began on 10 January with a maximum around 19 March 1998. The average daily sea surface temperature at Pari Island was 2–3 °C above normal values. The satellite data showed that warming water originated in the Gulf of China in August 1997 and travelled to the South China Sea, Malaysia and Singapore, as well as to Riau Islands and the Java Sea. The warming water also originated off western Australia flowing through the Timor Sea and the Indian Ocean.

2.3.2. Sand and coral extraction and mangrove clearance

Large scale sand extraction started with harbour dredging in the Jakarta Bay area, generally the dredged material was dumped elsewhere in the bay. In the 1970s, sand extraction for building started on a small scale and was carried out manually. Since the 1980s, extraction has intensified and is now of great economic importance to various small communities along the coast.

Hardenberg (1939) reported that coral harvesting in the Seribu Islands reefs started in the early part of the twentieth century. He estimated that 12,000–25,000 m³ of coral reef cover were exploited annually. Verwey (1931) estimated the annual removal of coral reef in

the 1930s at 8,500–20,000 m³ in the Seribu Islands. Nowadays, it is estimated that the scale of exploitation has escalated significantly, based on a doubling of quantities between 1979 and 1982.

Extensive dredging activities have been allowed to proceed, despite local government regulations banning the exploitation of sand, gravel and boulders, in order to provide construction materials.

In addition, mangrove destruction for land reclamation for residential and fishpond development has resulted in increased sedimentation, loss of species habitat and ecosystem degradation.

2.3.3. *Destructive fishing practices*

Over-fishing, as well as the use of destructive fishing practices, such as blast and cyanide fishing, have resulted in a decline in fish catches.

At present hundreds of fishing boats, either motorised or sail-powered, operate in the waters of the Seribu Islands everyday. Boats powered by 5–75 horsepower outboard motors are most commonly used, but some fishers still use sailboats. The boats are not always their own property. The fishing industry 'hierarchy' consists of 'bosses' (boat owners), boat captains and crew.

Fishers in the Seribu Islands can be classified into two groups: those catching fish for human consumption (larger fish such as snapper, oil sardine, yellow tail and mackerel) and those catching ornamental fish. The principal fishing equipment is fishing rods and plaited rattan fish traps.

Traditional fishers, like those in the Seribu Islands, are very dependent on the weather

Traditional
fishers



and usually only fish six to ten months of the year. There is a period, usually between November and March, when the sea is often rough. During these non-fishing months people have to live off their savings and they are far from financially secure. In order to alleviate this problem, they sometimes risk fishing in the calmer periods of the bad months.

Fishers in the Seribu Islands only fish in local waters. However, since the region was designated as a marine national park, fishing grounds have been limited. Consequently their

income has decreased. Some fishers now fish outside their home area, in the waters of Lampung Province, Bangka and around the Sunda Straits. Many fishers think that if they do not take the resources, others will. Consequently they use the technology which enables them to make the biggest catch possible, e.g. blast fishing and cyanide fishing.

Blast fishing, using explosives to stun or kill fish, kills indiscriminately both targeted and non-targeted fish, as well as invertebrates of all but the largest classes. It also damages or destroys the reef framework. Repeated blasting can result in reefs that are little more than fields of rubble punctuated by an occasional massive coral head. Although blast fishing is illegal in Indonesia, it is still quite common throughout the archipelago, particularly on remote reefs where the threat of law enforcement is low. Erdmann (1998) reported that blast fishing was one of the most widespread and devastating of fishing practices in 1985, but it was neither observed nor heard of during the 1995 survey. Blast fishing works best on dense

schools of fish, now an uncommon sight in the Seribu Islands. The disappearance of blast fishing may be related to an absence of target fishes.

The use of sodium cyanide to stun fish for live collection is a widespread activity in the Seribu Islands. As with blast fishing, it is often indiscriminate and large side-kills of larval and juvenile fish, as well as invertebrates, are common. Prior to 1990, the principal targets of cyanide fishing were ornamental fish and invertebrates in the aquarium trade. In the years following 1990, a new lucrative cyanide fishing trade infiltrated Indonesia: the live reef fish food trade. Several groups of fish are targeted for live collection and eventual export to wholesalers for consumption primarily abroad.

Making destructive fishing practices illegal has not been sufficient to halt the activities, economically they are too rewarding.

2.3.4. Pollution

The hinterland is the primary source of pollution in Jakarta Bay. All the wastewater from the Jakarta Metropolitan Area ends up in Jakarta Bay. Several major coastal rivers transporting sediments, sewage, agricultural and industrial effluents, and solid waste flow into Jakarta Bay. This has resulted in high nutrient levels and eutrophication of coastal waters extending over a considerable distance – as far as the Java Sea.

A review of historical data indicates that Jakarta Bay is becoming progressively more eutrophic. Nutrient concentrations have increased in Jakarta Bay and the Seribu Islands since 1969. High nutrient concentrations have been identified as the main cause of increased primary productivity in the surface waters. Chlorophyll *a* concentrations measured in Jakarta Bay by Nontji (1978) ranged from 5.41 to 12.3 mg/m³; suspended particulate matter concentrations were between 10 and 79.6 mg/l in 1975 and 1976. Praseno and Adnan (1978) documented massive diatom blooms.

Phytoplankton biomass distributions in Jakarta Bay, measured from 1986 to 1990, have undergone significant shifts; phytoplankton blooms are now spreading further offshore. In 1986 massive algal blooms were detected as far as 2 km from Jakarta's port, Tanjung Priok. However, in 1988 the blooms spread 5 km offshore and in 1990 massive algal concentrations were recorded 12 km from the port.

There are three major sources of pollution: industrial, domestic and agricultural activities. Two types of industrial pollutants have been identified in Jakarta Bay: heavy metals and polychlorobiphenyls (PCBs). Jakarta's Office of Urban Environmental Study reported in 1997 that the heavy metal content (copper, lead and mercury) in Jakarta Bay waters had been increasing since 1983. Hutagalung (1987) and Mahbub and Kuslan (1997) showed that this pollution is a result of industrial waste. PCBs are used in dielectric fluid for capacitors, transformers, the production of carbon-free copy paper and the manufacture of ink; they are non-biodegradable, lipophilic and carcinogenic. Razak (1994) reported that PCBs can be found in marine plankton, fish, mammals, birds and the human body. Marine activities, including ship waste, oil spillage and offshore mining are other sources of industrial pollution.



Poverty and environmental degradation in one of the rivers that drain Jakarta

The rivers flowing through the Jakarta Metropolitan Area pick up large amounts of domestic effluents and solid waste. Since there is no sewage treatment, these rivers are heavily polluted with organic nutrients and bacteria. In addition, the water drainage system in the Jakarta Metropolitan Area is degraded. A third of northern Jakarta is flooded on average twice a year. This situation, which seriously affects 5% of the city, is exacerbated in some areas by subsidence.

Flooding
in Kapuk
Muara



Razak and Khozanah (1994) reported on the pesticide content in Jakarta Bay waters and sediment, based on observations made in September and November 1993. The persistent pesticides and derivatives detected were dieldrin, aldrin, heptachlor and endosulfan. Erosion caused by agricultural activity constitutes another source of pollution – suspended sediments in rivers and Jakarta Bay waters. Land reclamation is another cause of increased suspended sediment.

Solid waste, which may originate from domestic, industrial or agricultural sources has increased since 1985. During the 1985 workshop on 'Human-induced damage to coral reefs', strand-line pollution was measured on 24 islands in the Seribu Islands. The survey was repeated in 1995 on 18 islands. Total shoreline litter in-

A serious problem:
uncontrolled dumping
adds to river
pollution



creased about two-fold between the two surveys. This is reinforced by data on the maximum amount of litter found on a single transect. In 1985, more than 1,000 items of litter were found on a 50 m transect; in 1995 nearly 2,500 items per 50 m were found on Kelor and more than 1,000 per 50 m were found on eight occasions in six other islands: Damar Kecil, Onrust, Bidadari, Untung Jawa, Rambut and Bokor. Evidence points to Jakarta as the source of much of this litter.

Socio-economic conditions in communities in the Jakarta Bay area and the Seribu Islands





In order to develop a holistic approach to the problems facing Jakarta Bay and the Seribu Islands, a socio-economic survey was conducted in 1997–1999 with UNESCO support, by several local partners: the Indonesian Institute of Technology (ITI), the University of Indonesia, and the Bina Swadaya and Muara Foundations. These surveys included three communities in the Jakarta Bay coastal zone: Kapuk Muara, Kamal Muara and Kronjo; as well as Pari Island in the Seribu Islands.

3.1. SOCIO-ECONOMIC SURVEY OF COMMUNITIES IN THE JAKARTA BAY AREA

3.1.1. Community social organization

KAPUK MUARA is an urban waterfront community on the Muara Angke River estuary, about a kilometre from the coast. Administratively, Kapuk Muara is located in Kecamatan Penjaringan, North Jakarta Municipality. The study area covers about 19 ha, (2.9% of the Kapuk Muara area) where 1,364 families live. The purpose of the study was to describe the socio-economic conditions, attitudes and perceptions of the communities with respect to their environment. The study was conducted by ITI in 1997.

The Angke Riverbank has been inhabited for over 50 years. The inhabitants consist of two principal groups: 'indigenous people', Betawine communities who have lived on the Angke Riverbank for more than five decades; and new migrants from other parts of Jakarta or from other areas such as: Central Java (Tegal, Wonogiri, Solo, Brebes, Semarang and Purwokerto), West Java (Tangerang, Bekasi, Karawang, Cirebon and Kuningan) and Madura. These migrants settled on the Angke Riverbank in the 1990s. Most are seasonal migrants who stay in the Jakarta area during the agricultural slack season. Most of the inhabitants of Kapuk Muara work in informal sectors as vendors or labourers, generally working between 9–10 hours a day. They live, however, below the poverty line due to their limited capital and skills.

Many people living along the riverbank scavenge used objects and collect garbage from the river by boat, which they then sell to a collector or lapak. Usually scavengers work on the river renting boats, fishing or in construction work and scavenge only in their spare time.

KAMAL MUARA is an urban community located on the northern coast of Jakarta on the border between Jakarta and West Java. There are three significant ethnic groups in Kamal Muara: the Buginese (60%) who are economically dominant; the Javanese (20%) who are newcomers, and the Betawine (20%) who are considered to be indigenous people. Although they live in segregated areas, they coexist peacefully. While the newcomers live close to the beach, the Betawine people live in the kampung (inland area). Most people are fishers (65%), others work in factories (20%) or as traders (15%). A long time ago, about 80% of the people in this area were fishers. Young people now prefer to work in the factories of north Jakarta.

KRONJO is a rural community. The village is situated north of Tangerang, with a total area of 700 hectares. In 1998 it had a population of approximately 5,963. Administratively, the village is part of the District of Tangerang. About half of the active population are fishers, others depend on agriculture. Like Kamal Muara and Kapuk Muara, most of the inhabitants, especially the fishers, live below the poverty line.

3.1.2. Housing conditions

Housing conditions in the three areas reflect the poverty of the inhabitants. Housing in Kamal Muara falls into two categories, formal and informal. Formal housing lies on private land and was built with construction permits; informal housing has no legal basis. On

Housing conditions on the Muara Angke Riverbank



the Angke Riverbank almost 80% of the houses are semi-permanent, cement or soil floored, with brick and wood walls. The crowded clusters of buildings are separated by narrow streets (0.5–1 m wide). Angke River housing can be divided into two categories: houses on the riverbank and houses on stilts in the river (*rumah panggung*). Over the last thirty years the residential area has increased. The tidal swamp which functioned as a storage reservoir or flood plain for the Angke River has been filled in and houses now stand on the reclaimed land. None of the houses have a construction permit and they stand on illegally occupied state land. In the Jakarta Metropolitan Area Urban Plan (RUTRK 1985–2005) this area is destined to be a green corridor along the river. By applying the 'Clean River Programme' (*Program Kali Bersih – PROKASIH*), the Jakarta Municipality has tried to move people from the area. Some people have received compensation for their land and

buildings but they still live on the Angke Riverbank. They know that they are there provisionally, but they do not know for how long. Their lack of capital makes it unlikely that they will be able to afford a house or land elsewhere.

The settlement has been legitimised by the local government (North Jakarta Municipality) in that it is included in some governmental programmes: the Donation Programme for Poor Neighbourhoods (*Inpres Desa Tertinggal – IDT*), Social Safety Net (*Jaringan Pengamanan Sosial – JPS*), Kampung Improvement Programme (Muhamad Husni Thamrin Programme). The inhabitants pay regular household tax (*Pajak Bumi dan Bangunan – PBB*) which normally only applies to permanent constructions; and the Angke Riverbank is serviced by electricity from the Public Enterprise for Electricity (*Perusahaan Listrik Negara – PLN*).

The housing in Kamal Muara can be grouped into three categories: permanent (20%), semi-permanent (23%) and non-permanent (47%). The two latter categories consist of small houses with leaking roofs, soil floors and bamboo, or in a few cases old rubble walls. Most houses are on state land; only a few long-term residents own their own land. Since the area experiences seasonal floods it is clear that the physical environment is a hazardous one, causing skin-related problems, particularly in children.

Housing conditions in Kronjo are more organised than in Kamal Muara and Kapuk Muara. Most fishers live on the riverbank in bamboo houses, some live in the kampung close to the river, and farmers live in inland areas.

3.1.3. Water supply

Prior to 1997, clean water came from public water containers and hydrants financed by the Public Enterprise for Water Supply, but since the economic crisis this service has stopped.

Now there is no clean mains water supply in the Angke Riverbank residential area; people buy clean water from vendors who deliver it by lorry to their homes. The inhabitants pay 30 rupiahs per litre for clean water (about 20 times more than people pay in luxury residential areas). Clean purchased water is only used for drinking and cooking, while groundwater and Angke River water are used for bathing and washing. Children swim and play in the river.

Chemical and microbiological analysis results show that the water in Kapuk Muara is highly contaminated with *Escherichia coli*, *Salmonella*, *Shigella*, lead, mercury, copper and iron. The bacteria indicate that the water is polluted by faecal matter. The heavy metal present in highest concentration in the groundwater is iron at 58 mg/l (maximum tolerable level is 2.0 mg/l). Other metal pollutants are within the safety limits.

The river water is used for some commercial food processing, such as 'tempe' (fermented soybeans) and 'cincau' (food derived from the *cincau* plant). Processing requires a lot of water. If mains water or water from street vendors is used, production costs are higher. According to producers, their product is safe and clean, as they filter the water before using it.

Although various programmes have been implemented to help the Kamal Muara community, their standard of living has hardly changed. According to the residents the provision of clean water is a priority. The scarcity of clean water is due to the natural conditions of the area and the poverty of its people. At present, there are three sources: piped water from hydrants, pumped groundwater and water from shallow wells.

For drinking and cooking, people buy water from street vendors who collect clean water from the state-owned water company (PAM) hydrant. The hydrant lies outside the three neighbourhoods under discussion in Tegal Alur Kelurahan. The price of hydrant water is about 600 rupiahs per tin or 24 rupiahs/l (one tin contains 25 l).



Washing with Angke River water

There are six jet pumps, half are managed by the neighbourhood committee together with the Mosque, half are managed privately. Pumped groundwater is used for bathing and washing; it is not used for drinking because it tastes bad. The better-off pay to have water from the pumps delivered to their homes; others collect water themselves. People who live near jet pumps use rubber pipes to transport the water, so they have cheaper access to water than people who live at a distance.

Since the residential area was formerly swamp land, people have made shallow wells close to their homes simply by digging 1.5 to 2 m down. The water quality of these wells is not good and the water is used only for washing and bathing. During seasonal flooding the wells are unusable as they are polluted by all kinds of wastes. Once the floods subside, people can use the wells again and so reduce household water expenses.

Those who have lived on the Angke River for more than 15 years, no longer use river water to fulfil their daily needs; having seen the river water quality deteriorate they prefer to collect well water. Meanwhile those inhabitants who arrived more recently have a different perspective for they are not aware of the long term deterioration of the river water quality, and the inadequate freshwater infrastructure forces them to use river water for their daily needs.

3.1.4. *Drainage system*

In Kapuk Muara and Kamal Muara, the drainage system is in a very bad condition. The river water is black and has an unpleasant odour because of the tidal flow and the use of the river as a garbage disposal system for local household waste. The river is also used to flush out industrial waste, some of which contains heavy metals. Most of the residential area in Kamal Muara and Kapuk Muara is two metres below sea level and floods at high tide.

3.1.5. *Sanitation*

Only 34 of the 422 houses in Kamal Muara have lavatories; no houses in the other two communities have indoor plumbing. On the Angke Riverbank, people have a habit of defecating and urinating in the river; public toilets (hanging toilets) along the river are common. An interesting dimension of hanging toilets is the social interactions it creates between people in the area. Kronjo inhabitants defecate in fishponds and on paddy-land near their houses.

Public sanitary units (*Mandi-Cuci-Kakus* – MCK) built by the community with private or government assistance, are sometimes supplied with bad quality groundwater (yellowish, smelly, brackish and polluted). In the study area there are seven public sanitary units to serve about 2,000 households (29,000 people). Each sanitation unit has two lavatories and four baths. They are managed by the private sector. In Kamal Muara, there are 3 public sanitary facilities. One is close to Kamal Raya road, the other two are in the housing area.

3.1.6. *Public health*

The economic crisis, which started in 1997, has changed the consumption patterns of Indonesians in general, including people living in the coastal zone of the Jakarta Metropolitan Area. The price of food has increased three or four fold since the crisis. Food consumption is therefore less, especially protein, which has increased in value more than other food products. In areas like Kamal Muara and Kronjo, people continue to consume enough protein, due to fishing activities. On the Angke Riverbank, however, most mothers cannot afford food supplements and depend on their own milk to feed their babies (0–1.5 years). As mothers do not eat enough protein, their milk production is lowered, and their babies show signs of malnutrition.

The most common infectious diseases affecting children are diarrhoea, influenza, coughs, skin diseases and cholera. People who habitually use river water for bathing are subject to all kinds of skin diseases, from minor fungal diseases, e.g. *pitiriasis versikolor*, to skin infections that suppurate. Respiratory tract infections are common among children and old people, caused by humid conditions and cramped living quarters with insufficient sunlight and ventilation.

On the Angke Riverbank and in Kamal Muara gastrointestinal diseases like dysentery and cholera are common. They are spread by infected water and poor sanitation. River water and groundwater both contain high levels of *Escherichia coli* and *Salmonella* bacteria.

Although environmental factors are responsible for much of the disease and ill health suffered by the peoples of north Jakarta, this is not fully understood by the inhabitants, who believe these diseases are common to all people.

3.2. SOCIO-ECONOMIC SURVEY OF THE SERIBU ISLANDS

Located close to the capital city, the Seribu Islands are exploited in several ways, from tourism to mining, and from sailing to fishing. While the region is income generating, some of the current economic activities constitute a potential threat to the environment.

In 1994 this region, which has a total land mass of 11.8 km², had a population of 15,114 (7,774 men and 7,340 women), grouped under 3,165 heads of families. Between 1989 and 1994 population growth averaged 1.2% annually. The Regional City Site Planning Unit (RBWK) predicts that by the year 2005 the population of the Seribu Islands will reach 27,425, or nearly twice its current population. As a little over half of this total (about 13,000 people) will be of working age, the issue of job opportunities will become a serious problem in the region.

Although the archipelago now consists of 105 islands, the population is concentrated on certain islands. The islands with the largest populations are Kelapa (3,746), Panggang (2,912), Tidung (2,869), Untung Jawa (1,363) and Harapan (1,236). The tendency of the population to concentrate on certain islands is influenced by two factors: the availability of important natural resources, particularly potable water; and the restricted access to some islands because of conservation and tourism. Only fourteen islands are inhabited; their population is thus relatively dense, averaging 1,281 people/km². Panggang Island, the sub-district's administrative seat, has the highest population density.

The average educational level of the islanders is rather low. About 50% drop out of elementary school and very few manage to obtain secondary school education. The majority of workers are employed in the 'informal' sector, most (75%) as fishers. Other islanders work as civil servants, construction workers and merchants, or have jobs in the service sector.

Although there are several other major economic activities in the archipelago, e.g. mining and tourism, few local workers are involved. In the last few years light industry has developed. These alternative activities notwithstanding, there is no real indication that the people of the Seribu Islands are moving towards a non-fishery based economy. Their background makes it difficult for them to expand into other sectors.

Research undertaken in 1990 on the region's fishing society by 'Gugus Analisis' (a community group), indicated that 35% of the population were living below the poverty line. Only 40% of the islanders have permanent homes, while 34% live in semi-permanent dwellings and 26% in temporary ones. The villages in the area are still classified as 'backward'

by the government.

Men still play the dominant role in the household. Women are limited to domestic work or to helping their husbands. Their only income-generating role is in small-scale trading, such as running tiny stalls to provide daily necessities.

3.2.1. Socio-economic status of Pari Islanders

Pari Island lies approximately 24 km north of Jakarta. It is home to 118 families (about 350 people). Traditionally, most families relied on fishing for food and income, but now many people work on seaweed farms. Seaweed cultivation was initiated with LIPI/UNESCO support and has proved successful due to the demand for seaweed both nationally and interna-

tionally.

Approximately 60 people were interviewed in order to study their social and economic conditions. The educational level of the respondents was very low; some had no formal education (20.2%), most only went to primary school, a few went to intermediate school (7.3%).

Almost everybody stated that their major source of income (90%) came from seaweed cultivation. A

few had additional minor sources of income such as fishing, trading, boat hire or carpentry. Table 2 shows the average family income and expenditure. Family income is dependent on the price of seaweed, which in December 1998 was 5,000 rupiahs/kg for dried-unsalted seaweed and 3,500 rupiahs/kg for the dried-salty seaweed. Most of the family income was spent on food.

Table 2.
Average income
statistics for the
Pari Islanders

Income/expenditure	Amount Rupiahs/family/month
Average income from seaweed farming	435,000
Average expenditure on food	355,000
Average expenditure on education	48,000
Average expenditure on electricity	25,400
Average total expenditure	428,400

(1 US dollar = 7,500 IDR)

Community-based waste management in Jakarta





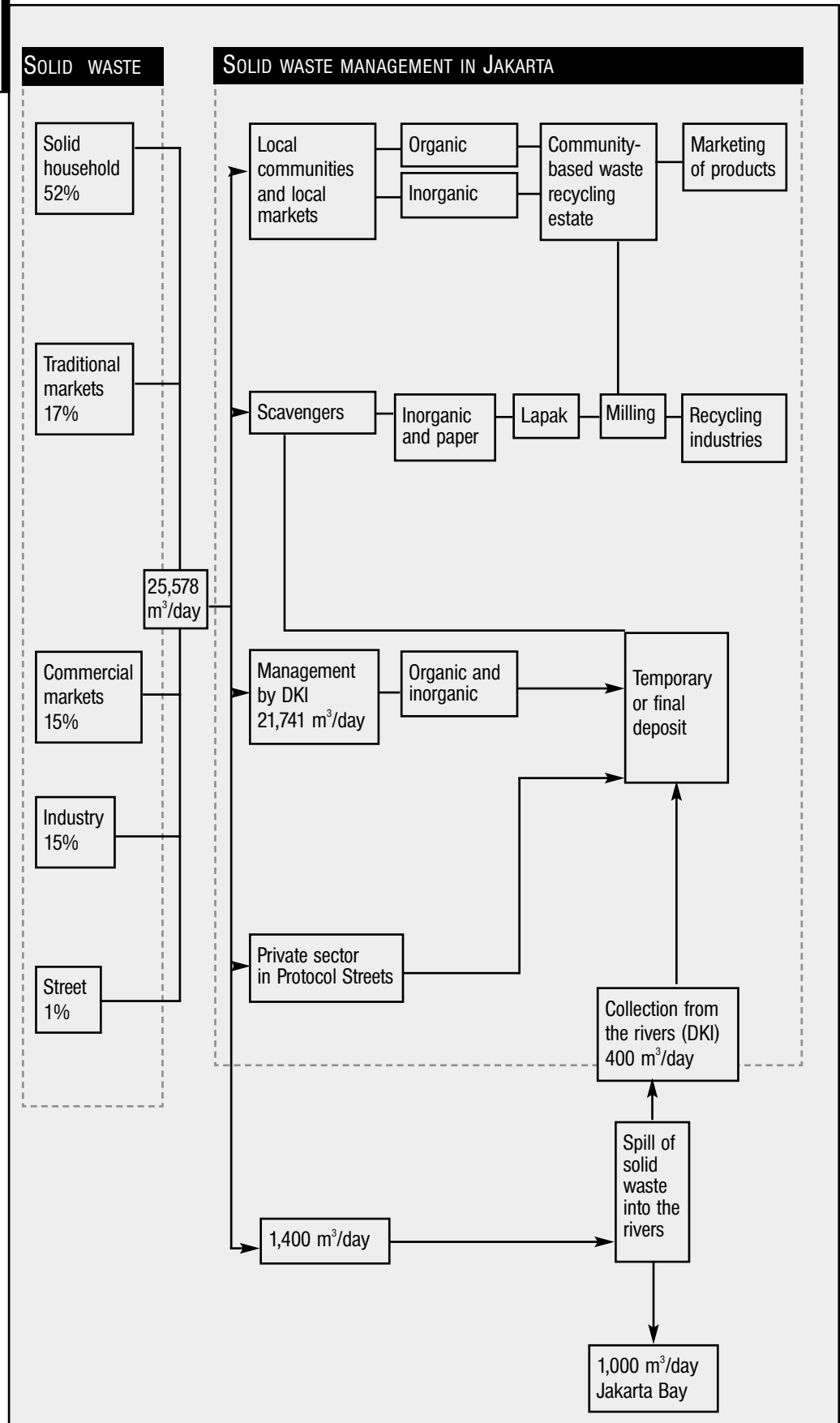
A growing population and an increase in urban commerce and industry have given Jakarta a serious waste problem. Solid waste management has been identified as an important issue and while attention has traditionally focused on the provision of infrastructure, facilities and equipment, alternative approaches merit consideration. These include the promotion of waste reduction, reuse and recycling.

The 'Clean up Jakarta Bay' initiative was launched in 1996 with UNESCO support. This campaign united local community groups, NGOs, governmental organizations and the media through three main activities: solid waste monitoring; waste composting and recycling; and environmental education for all.

4.1. SOLID WASTE MONITORING IN JAKARTA

In 1997, *Yayasan Kirai Indonesia* (NGO) in co-operation with UNESCO, analysed and summarised waste production in Jakarta, based on data provided by the city government. Figure 3 shows a comprehensive flow diagram of waste management in Jakarta.

Figure 3.
Garbage
production and
management
in Jakarta



4.1.1. Solid waste composition

Every day the urban population of Jabotabek (Jakarta, Bogor, Tangerang and Bekasi) generates over 35,000 m³ of garbage (enough to cover a soccer pitch to a depth of over 5 m), of which 26,000 m³ is from the city of Jakarta.

An initial study concluded that paper and plastics make up the bulk of waste and that waste production has increased in line with population growth. Between 1990 and 1995 the fraction of paper in the garbage rose from 8.28% to 10.18%; plastics rose from 5.54% to 7.86%. The rise in plastic content is thought to be related to increases in consumer goods, which are plastic wrapped.

Solid waste is generated by households (52%), traditional and temporary markets (17%), commercial areas (15%), industrial areas (15%) and the streets (1%). The garbage composition in Jakarta in 1995 was 74% compostable, organic matter and 26% non-compostable matter (paper, wood, rubber, leather, plastic, metal, glass, etc.), see Table 3.

	1994/95 %
Non-compostable matter	26.11
Paper	10.18
Wood	0.98
Fabric	1.57
Rubber/Leather	0.56
Plastic	7.86
Metal	2.04
Glass	1.77
Battery	0.29
Other	0.86
Compostable, organic matter	73.92

Table 3.
Garbage
composition
in Jakarta

Source: Jakarta City government

4.1.2. Waste collection methods

83% of the garbage produced in Jakarta is collected by the local community, scavengers, the local government and the private sector. The remaining 17% is thrown into the rivers. Outside the city of Jakarta, only about 50% of the waste generated is collected, and 20% of that does not find its way to a disposal site – which in any case may only be a smouldering open dump.

Waste collection methods necessarily involve some or all of the following steps: collection from households or other premises; consolidation in temporary storage sites (*Tempat Penumpukan Sementara* – TPS); transport to a transfer station; and transport to a final disposal site.

Household collection

Household waste reaches temporary storage sites (large bins, enclosed sites, market areas, or designated roadside areas) in a variety of ways:

- in kampung areas householders place rubbish in containers at the front of their property, where it is collected by handcart. Householders pay for their rubbish to be collected 2 to 4 times a week depending on local circumstances;
- solid waste is taken by the householder or trader to the disposal site as often as desired;
- a rubbish truck regularly passes through a community giving a musical signal, the household waste is brought out by individual householders and dumped into the truck;
- in higher income residential areas, a waste disposal truck comes directly to each household and removes the waste stored in bins; such a system is only available in areas that are easily accessible by truck.

Traditional market areas

There are two types of traditional market: permanent and temporary. Solid waste is removed from permanent market areas by the Market Authority using open trucks and is taken to temporary or final disposal sites. Waste from temporary markets is usually collected by local government workers using handcarts and taken to the nearest temporary storage site. Some temporary markets are serviced by Cleaning Department workers using open trucks.

Traditional
market
waste
collection



Prior to collection, solid waste is dumped near the market area on the roadside, on open land or in open concrete bins. The high content of biodegradable matter of market waste makes this unsightly, creates unpleasant odours and is unsanitary. Waste often spreads from these sites into drains causing blockages leading to local flooding.

Since most permanent markets are adjacent to roads and accessible by trucks they are ideal sites for the use of covered steel bins serviced by 'roll-arm' trucks. Smaller, less accessible

traditional markets may still need to be serviced by handcart collection, but should be provided with covered bins for temporary storage.

Commercial and industrial areas

Solid waste from small commercial and industrial areas is usually collected by handcart and taken directly to a temporary storage site. Larger commercial and industrial areas are serviced by trucks that transfer the waste directly to temporary or final disposal sites. As with households and market areas, the greatest threat to health and sanitation is the use of open concrete bins for temporary disposal of waste. These need to be progressively replaced with covered bins of appropriate size for the next transfer stage.

Streets

In residential areas, each householder is responsible for the removal of any solid waste from the front of their house. Streets in non-residential areas, such as commercial areas and main roads, are swept by local government employees. The cost of street sweeping is high, Jakarta spends about 40% of its solid waste budget on this. Ways to reduce this cost without lowering the standards of cleanliness need to be investigated.

4.1.3. Waste disposal

There are two principal means of solid waste disposal in the Jabotabek region: open dumping and sanitary landfill. Low swampy areas are commonly chosen for open dumping. The height of the dumped waste is usually two to four metres. Covering soil is seldom used at the time of disposal, but a final covering is usually applied later. Open dumping is an apparently low cost waste disposal option, but only in the short term. In the medium and long-term it is costly due to inefficient land use and the remedial effort needed to make the land available for other uses. The sanitary landfill method is specifically aimed at minimising the adverse impacts of open dumping. Table 4 compares open dumping and sanitary landfills.

OPEN DUMPING	SANITARY LANDFILL
Formal sites are indistinguishable from illegal sites and therefore encourage indiscriminate dumping.	Control and check the amount and type of waste and prevent disposal of hazardous materials.
Waste is poorly compacted and occupies an unnecessarily large area.	Ensures the maximum compaction of disposed waste.
Provides a breeding site for vermin.	Prevents breeding of insects and vermin.
Sites give off foul odours. Prone to subsidence limiting future development options.	Prevents foul odours. Maintain site stability and reduce the rate of leachate generation by regular coverage with soil.
On sloping sites, dumps can become unstable and damage down-slope facilities.	Proper planning reduces impact on adjacent sites and provides for site restoration and other uses after the landfill is closed.
Lack of drainage and leachate recovery leads to contamination of groundwater.	Protect groundwater by the recovery and re-circulation/treatment of leachate.
Smouldering fires are common producing smoke and noxious fumes.	Prevent air pollution caused by rubbish fires.
Landfill gases are difficult to recover for use as fuel, cause foul odours and are potentially explosive.	Facilitate the management, possible recovery and use of landfill gases.

Table 4.

Comparison of open dumping and sanitary landfill methods

The presence of garbage poses serious health problems. Organic material may be a breeding ground for disease. Chemical pollutants once absorbed into the soil cannot be removed without considerable cost and their entry into the human food chain is inevitable and unhealthy.

The disposal of some of Jakarta's solid garbage into the sea has resulted in a covering of plastic on the sea floor in the Seribu Islands. This affects benthic communities such as coral reefs, seagrasses and the species that use these habitats as breeding grounds. This in turn has economic consequences for the fishers and other inhabitants of the archipelago.

4.1.4. Assessment

To deal adequately with the garbage produced daily in Jakarta, the city needs a well organised, well funded waste management programme and infrastructure. In view of current economic conditions, this goal is not likely to be achieved in the short term. The mobility of many of the inhabitants of Jakarta is one of the reasons why it is hard to ensure adequate management. Since some communities view flooding as an annual occurrence, they see the waterways as conduits washing away the accumulated rubbish. For the majority of Jakarta's residents, waste is viewed as a commercial and industrial problem, rather than a household and community problem. Aesthetically, the problem of garbage may be understood, but rarely does this transfer to an appreciation of the environmental repercussions of improper waste disposal.

4.2. COMMUNITY-BASED WASTE MANAGEMENT ACTIVITIES IN JAKARTA

4.2.1. Household waste composting and paper recycling

The waste generated in urban areas has been increasing in quantity, and the problem cannot be solved merely by supplying more equipment, personnel and budget for solid waste management. Waste reduction, recycling and re-use needs to be introduced and promoted.

Of the municipal waste in the Jakarta Metropolitan Area, 74% consists of organic matter, which can easily be processed into compost using simple technology, with little investment, thereby saving money and simultaneously protecting the environment.

When waste containing organic refuse is subjected to a process of decomposition under aerobic conditions at a temperature of 40–60 °C, it becomes compost. The resulting compost can be used for agricultural land, parks and even shrimp farming as an

organic fertiliser or soil conditioner. At least 30–60 days are required for the decomposition process. Although the maintenance and control of the process appears simple, the production of good quality compost depends on the selection of suitable organic waste, minimising foreign matter and the maintenance of ideal fermentation conditions over a long period of time.

Based on the idea that a community is the most important unit for effective waste management, the project is carrying out a number of waste management and recycling activities.

Assistance was provided to NGOs to set up community-based recycling and composting. Training was given in new waste management practices, which would provide economic benefits to the participants. Recycling organic matter was the basis of these community waste management initiatives. Through training in composting, with and without worms, organic recycling has become available to both households and markets.

In co-operation with the Kirai Indonesia Foundation, the project has, since 1996, concentrated activity in Banjarsari, Kelurahan Cilandak, south Jakarta. At present Banjarsari is probably one of the few neighbourhoods in the Jakarta Metropolitan Area where the inhabitants are highly aware of environmental quality.

After providing training in paper recycling, composting and environmental education, the people of Banjarsari were encouraged to set up a small scale Environmental Committee or *Komite Lingkungan*, which represents the neighbourhood. Then a small-

scale recycling centre, located on 'idle' land, was established. Here young people recycle paper and carry out composting. The community has the task of providing household organic waste and paper for the centre. The young people also plant medicinal herbs in the compost, and further planting will be encouraged in the kampungs. A community-greening programme will be a further phase of the project in Banjarsari, Kapuk Muara

Young people
being taught
vermicomposting
in the Banjarsari
recycling centre



Kapuk
Muara
recycling
centre



and Kronjo. This is urgently needed since people in the kampung areas live in cramped houses lacking ventilation, and need green open spaces.

Women make cotton bags and other handmade products out of flour sacks at the centre. There is also a show room for the products (recycled paper products, compost, cotton bags etc.), which are sold to the public. So far, the project has been successful, the environment is greener, adolescents and women have become more productive, and young people have gone on short training courses using the profits generated. Recently a marketing co-operative has been established.

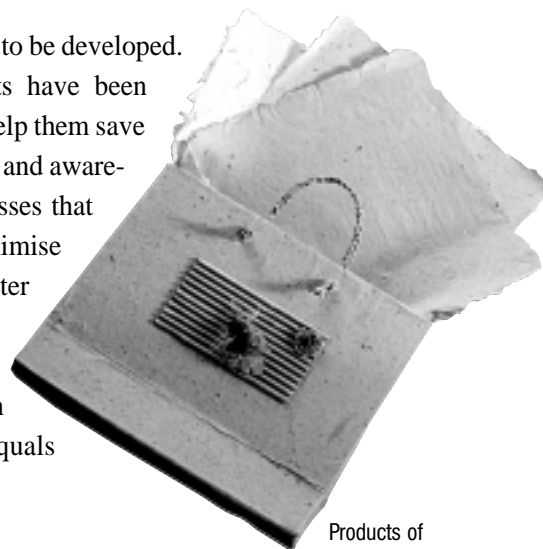


Gardening
in Kapuk
Muara and
Banjarsari

Following the success of solid waste management in Banjarsari, a second community-based recycling centre in Kapuk Muara in north Jakarta was initiated in 1999. This centre is a place for learning and a venue where the community can discuss environmental problems. Adolescents have already produced recycled paper products and compost.

As a result of the establishment of these two centres, 19 different groups, including students, unemployed people and women's groups, were trained in paper recycling and composting in 1999. Demand is increasing for training in such alternative income-generating activities.

To complement these efforts, a waste reduction programme needs to be developed. Some industries, distributors, department stores and supermarkets have been consulted and are interested in supporting the programme, as it will help them save money. The next step will be to prepare the formal policy, regulations and awareness campaigns. Industrialists need to develop more efficient processes that produce less waste. Meanwhile, traders and services need to minimise packaging and wrapping, and consumers need to develop greater environmental awareness and the will to refuse to buy commodities that produce too much packaging. Political support will be an important part of such a programme, since waste collection is run by the private sector, thus from a business viewpoint, more waste equals more profit.



Products of
paper
recycling

4.2.2. Traditional market waste management

In Jakarta there are two types of markets: formal markets are government-built, planned markets designed by the City's Market Spatial Planning Committee; informal markets are those that spontaneously expand from street stalls and over time begin to resemble the managed markets. The daily waste produced by traditional markets in the Jakarta Metropolitan Area is considerable, about 4,000 m³ a day.

In September 1997, in association with the NGO Kirai, the project started a waste management and composting activity in Bintaro traditional market, which would eventually provide a model for sustainable waste management in traditional markets.

Training courses for organic matter recycling were organised in the market. Two different-coloured baskets were provided for organic and inorganic waste collection. The market's organic waste was recycled using the 'heap' method. Compost was produced, pro-

viding income for local vendors. In Bintaro Market two people were responsible for collecting organic waste and its subsequent composting. By the end of the two-month project a 40% reduction in total waste was achieved.

The problem with implementing a waste management project, such as the one at Bintaro, is finding the space within the market for organic recycling. Bintaro was chosen because it had space. Informal markets are more likely to have sufficient space; formal markets have not been planned for recycling. In order for organic recycling to be incorporated into all the markets of Jakarta, it must become a part of the Jakarta municipality (DKI) market plans so that the extra space is created whenever markets are built or renovated. The model of waste management adopted at Bintaro market has not yet been included in DKI's Market Spatial Planning. Future success therefore depends on the political will of decision-makers and other stakeholders at a regional level to change the waste management of markets.

Bintaro
traditional
market waste
management:
organic matter
composting by
heap method



A seminar on traditional market waste management and recycling was held for decision-makers and the public through a programme called PROPASIH (*Program Pasar Bersih* – clean market programme).

Difficulties in marshalling political support also hamper the re-assessment of Jakarta's waste collection system. Under the current system there are no incentives for improved efficiency in waste management since the production of less waste does not lead to a reduction in costs. In Bintaro market four trucks must still be paid for, even though only three are

filled. This is largely due to waste collection being a business run by the private sector.

Market research needs to be conducted to determine potential sales outlets for the organic compost produced by Bintaro; gardening companies which service wealthy areas of Jakarta or greenhouses which have a retail facility may be suitable buyers. In order for the public market composting activities to advance beyond their present externally funded status, a means of turning the organic compost into a viable source of income must be found.

In November 1999, a second composting pilot project was started in Pluit traditional market, north Jakarta. An environmental campaign was carried out in the market by 40 high school students. They talked to vendors and customers and helped to separate the market waste, explaining the difference between biodegradable and non-biodegradable waste. The idea of this activity is to popularise recycling ideas, to educate young people to see the real problems in their community and, at the same time, take an active part in the project. In January 2000 the Pluit Market manager was awarded a prize by the Jakarta City government for the waste management scheme adopted at the market.

Products of
waste
composting



4.3. ENVIRONMENTAL EDUCATION

With an average of 1,400 m³ of rubbish being thrown into Jakarta's rivers everyday, it is clear that the problem of waste management is not simply a matter of garbage collection, but also of public education. Education in alternative practices for those living around rivers will help reduce dumping of waste into rivers.

The Jakarta Bay project has programmes in the three forms of environmental education highlighted by Agenda 21 (Chapter 36) of the United Nations Conference on Environment and Development (UNCED): re-orienting education towards sustainable development; increasing public awareness; and promoting training.

4.3.1. School programmes

Environmental education is not uncommon within the Indonesian school system, but like many new areas of study it does not receive the necessary funding and training required. Environmental education essentially involves many areas of study, from natural sciences to history and philosophy. It is most successful if integrated into existing subjects rather than as an independent or optional course.

The Ministry of Education and Culture has an integrated programme to develop greater environmental awareness at the school level. The programme consists of two components:

- PKLH (*Program Kependudukan dan Lingkungan Hidup*). This is a broad-based environmental curriculum, where the environment is incorporated into existing subjects and the subject content is uniform nationally.
- PLKJ (*Program Lingkungan Kehidupan Jakarta*). This is a local environment programme (in this case Jakarta), which includes specific environmental subjects based on the local area. Its content varies from one region to another, and it is planned to implement it throughout Indonesia.

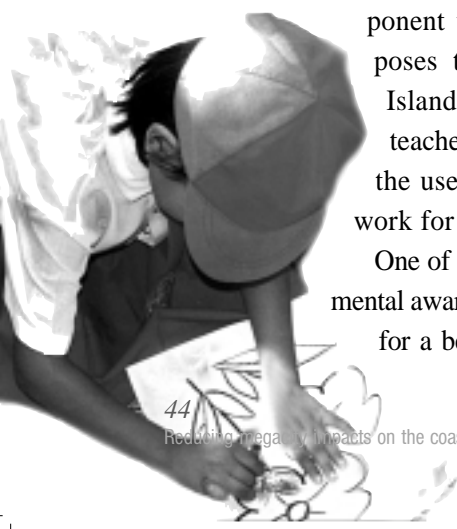
The programmes have been carried out with very limited resources and budgets, and have consequently had little impact. About 26,000 teachers and 27 provincial management units have been trained, compared to a total teacher population in Indonesia of nearly 2.4 million.

Environmental education must include formal and informal modes. UNESCO can offer assistance with both avenues – firstly, by contributing environmental education modules to a task force examining the national curriculum, which is due to change in 2004. Secondly, assistance can be given through informal education activities, which will add a new dimension.

In order for environmental education to be successful in schools, the teachers themselves must first be taught. Following a workshop on Pari Island, a significant need was

identified for teaching material that would allow for an environmental component to be included in the subjects already taught. UNESCO proposes to offer an in-service workshop for teachers in the Seribu Islands and Kronjo. This would include an extra two days at the teachers' annual general meeting to provide the tools, and training on the use of the teaching resources, as well as to create a support network for environmental education among the islands.

One of the primary aims of the Jakarta Bay Project is to improve environmental awareness among young people living in Jakarta and the Seribu Islands, for a better understanding of the environment will lead to its protection.





Education and training objectives for youth fit within a broader policy of 'education for all'. To date this project's focus has been on communities affected by waste problems in Jakarta and those communities which place stress on the coastal marine environment, both on the islands and along the rivers which feed into Jakarta Bay.

Besides incorporating environmental topics into the teaching of other subjects, at the high school level there is a need to develop focused studies to combat coastal environmental destruction. Such a programme should provide general background information on the interrelationship between urban activities and coastal environmental quality, and specifically the following:

- the natural and urban environment in the coastal area, and the consequences of environmental, social, and economic changes;
- people and the coastal zone, including those living in urban and rural areas of large land-masses, and people living in small islands (Seribu Islands);
- Jakarta Metropolitan Area growth patterns and impacts on coastal environmental quality;
- water quality in the Jakarta Metropolitan Area;
- system hydrology;
- urban solid wastes;
- urban ecology in the Jakarta Metropolitan Area.

4.3.2. Informal education programmes

Informal field and action-orientated activities are an important education mode, which can complement formal school programmes.

Some field courses have been organised for young people, the objectives of which are to:

- apply knowledge of coastal regions, small islands and associated systems, through the analysis of existing problems;
- promote interaction between high schools;
- encourage the collection, recording and dissemination of information relating to the environment year by year;
- encourage the implementation of standardised monitoring and protocols to enable the consistent collection and use of data.

Two field courses were organised in 1999 on coastal environmental education. Participants included students, teachers and young journalists.

- The first field course was held in July 1999 to show the environmental degradation in Jakarta Bay and the Seribu Islands to the participants, and to discuss ways to solve the problems of Jakarta City and Jakarta Bay. Fifty-four participants (students and teachers) joined the field study to Bidadari Island.

- The second field course, organised in co-operation with the Muara Indonesia Foundation and the Sea World aquarium in Ancol, in November 1999, involved 105 participants (46 students and 21 teachers from 17 schools, 5 participants from Kapuk Muara's community-based self-help group, 6 journalists, 3 private TV station crews, 2 participants from Riau Province and one from Kalimantan).

In co-operation with Antara (an Indonesian News Agency), a monthly bulletin in Indonesian entitled *Lautku* (My ocean) has been published since August 1999. Target readers are students and young fishers. The aim is to encourage young people to know more about coastal and marine environments, enhance their interest in marine science, increase their knowledge about the sea and cultivate a healthy attitude towards the sea.

The project has also supported action-orientated education. After a number of environmental education sessions and training in composting and paper recycling, the students of Senior Public High School No. 34 in Jakarta began to recycle their paper. Through the students' science club they now regularly produce very artistic paper. They also carry out some composting, although not in large quantities since they prefer to recycle and sell paper. They reported that there are many other schools interested in following their example, and they are willing to teach other groups. In bazaars and fairs, they have attracted visitors by demonstrating how to recycle paper, and marketing is no problem. Recycling programmes for schools is a good way to educate students to be wise in facing environmental problems.



Student in paper recycling process

Developing alternative livelihoods





In order to reduce unsustainable fishing practices (see Section 2.3.3), alternative incomes in new areas had to be found for fishers and others in the island communities. These communities are among the poorest in the region, and need to develop livelihoods that help alleviate poverty whilst also providing for environmental protection and management.

A workshop was held in May 1997 involving fishers, NGOs and LIPI, in order to establish a framework for sustainable development in the Seribu Islands. Pari Island had been identified previously as a suitable 'pilot' island for such an exercise. A major result of the workshop was the identification of four priority areas where change is needed:

- controlling access to fishing grounds to protect and strengthen traditional management systems;
- improving alternative employment opportunities;
- introducing sustainable pisciculture (fish-farming) and seaweed farming; and
- strict control and development of the aquarium fish trade through breeding programmes and the introduction of non-destructive capturing methods.

This project has focused on one of these priorities: developing alternative employment opportunities in the Seribu Islands. To complement these activities, emphasis has also been placed on social empowerment in Kamal Muara through strengthening self-help groups. This chapter describes these two related activities.

5.1. DUCK FARMING AND SEAWEED FARMING IN PARI ISLAND

Duck farming has been developed as an alternative income-generating occupation at Pari Island, and may act as a model for other small islands.

In March 1997 a feasibility study was conducted and project implementation started in 1998. At the start of the project, meetings were held with local authorities and families to assess the population of the island and explore issues relevant to the project, e.g. land ownership, freshwater availability, marketing of eggs and duck meat, the number of families to be involved in the project, and the existence of any constraints to the introduction of ducks. A training course on duck farming was held on the island in June 1998

and a manual 'Training course on duck farming techniques' (Sinurat and Bernieri, 1998) was distributed. In this way families were introduced to basic duck farming methods: duck housing, rearing ducklings, feeding, hatching, disease prevention, and egg and meat production.

Duck farming:
project
implementation



Materials for building duck houses are limited and expensive in Pari Island. Bamboo, wooden blocks, and roofs were imported to make duck houses.

In July 1998, 290 five month old ducks, that had been quarantined for a week, were distributed among 55 families. Each family was expected to breed enough ducks so that they could hand on the number of ducks they originally received for distribution to another island. A similar project in Java had been made self-generating by requiring that for every duck given to a family, they must

return one within a year. Egg production is approximately 280 eggs per duck per year, so even after breeding replacement ducks, each family would be expected to have more than 1,000 eggs per year to dispose of as they wished.

A technician from Balai Penelitian Temak Bogor stayed on Pari Island to monitor the duck farming and give advice where necessary. Once a month, other experts visited to collect data and make recommendations.

Some ducks started to lay eggs within a few days of their arrival on Pari Island. Egg production increased from July to December 1998, but fell in the first two months of 1999 due to a lack of food.

Duck mortality was 5.5% in the first month of the project, and three ducks were lost. Mortality was also high in ducklings, 85% died. It was thought that insufficient care was taken of them and that the high quality feed they require in the first few weeks was lacking. Economically, it is more practical to bring in ducks rather than raise them. The carrying capacity on Pari Island is limited to about 400 ducks.

Seaweed
desalinisation



At the end of the project 35 participants (64%) provided ducks to be redistributed to their neighbours. The others promised ducks as soon as they had them. Everyone who took part in the project benefited in that they had an additional protein source and a cash crop: eggs. The project showed that while duck farming and egg production are feasible on the island, raising ducklings has little potential due to limited food resources. Production costs could be minimised and income maximised if duck farmers formed a co-operative to purchase ducklings and food and sell eggs.

Nearly all Pari Islanders are involved in seaweed farming. Women do the land-based work, such as attaching seaweed to ropes before 'planting' and later detaching the mature seaweed. Evaluation of the seaweed cultivation activities brought to light two main problems: post-harvest processing and

marketing. Seaweed may or may not be desalted before drying. Desalting requires freshwater to soak the seaweed, usually for two days. As freshwater is in short supply on the island, the water is reused sometimes for as long as two weeks. Technical assistance is needed to improve post-harvest seaweed processing. The creation of a seaweed farmers co-operative would allow farmers to negotiate better prices for their products.



Drying
seaweed after
desalinisation

5.2. DEVELOPMENT OF COMMUNITY SELF-HELP GROUPS

In December 1998, Bina Swadaya, a local NGO, began a social empowerment project in Kamal Muara with UNESCO support. The main objective is to improve the quality of life for the people of Kamal Muara. The project has had two phases: initiation of community self-help groups (SHG); and strengthening of SHGs and development of small enterprises. Through these activities the concept of equal partnerships between men and women is promoted.

A participatory approach has been adopted involving the community directly in assessing local needs, identifying the most appropriate solutions and starting implementation.

5.2.1. Initiation of community self-help groups

At a preliminary meeting, attended by 16 people from Rukun Warga I (a unit of local administration) of Kamal Muara, in December 1998, the objectives and procedures of the social empowerment project and the benefits to be derived from self-help groups were discussed. There were already some self-help groups in the neighbourhood, e.g. green mussel farming group (*Mapada Elo*), salt fish craftsmen group, and others. Most groups were formed by financial subsidy or government development programmes and are not very active.

At a community meeting in January 1999, it was decided that existing self-help groups could not participate in the project. Groups based on the smallest unit of local administration, the *Rukun Tetangga* (RT), were formed in Nurhasanah (RT.004), Kamal Bahari (RT.009), Bina Usaha (RT.010) and Mandiri (RT.011). Membership is restricted to people living in these neighbourhoods. Members chose a management board (leader, secretary, treasurer) and a chairman from within their ranks and collected money to act as a reserve for group projects and loans to individuals.

In December 1998 a specialist in community development was available in Kamal Muara to give advice to the SHGs and other local community groups on group administration and the development of constructive activities.

Two courses on SHG management were held in Kamal Muara city hall (January and March 1999); there were 89 participants. Bina Swadaya co-ordinated the meetings and other NGOs were invited to participate. A course on household economics was held in March 1999. Its purpose was to clarify and emphasise the contribution that women make to running a household and the type of problems they face in budgeting time, money and energy.

A straw poll showed that the educational backgrounds of the SHG members is quite varied: 39% only attended elementary school, while 22% attended junior high, and 39%

senior high school. In the first six months membership of the SHGs increased by 20% in Kamal Bahari and 31% in Mandiri. The other groups maintained their original size.

In April 1999, a grant of 1,500,000 rupiahs (US\$200) was given to each SHG. Each month members are required to contribute 3,000 to 10,000 rupiahs. Members can borrow money from their SHG to help set up small businesses or in times of urgent family need. The Mandiri group requires 2% interest and 2% administration costs on loans. The other SHGs ask borrowers to pay interest on a voluntary basis. Table 5 shows the types of capital held by the SHGs.

Table 5.
Capital held by Kamal
Muara's self-help
groups, May 1999

SELF HELP GROUP	MEMBERS SAVINGS RUPIAHS				SEED MONEY RUPIAHS	TOTAL RUPIAHS
	Initial contributions	Monthly savings	Voluntary savings	Interest from loans		
Nurhasanah	267 000	340 000	70 000	46 000	1 500 000	2 223 000
Kamal Bahari	675 000	990 000	528 000	97 000	1 500 000	3 790 000
Mandiri	296 500	520 000	968 000	30 000	1 500 000	3 314 500
Bina Usaha	299 000	219 000	694 750	36 500	1 500 000	2 749 250
Total					6 000 000	12 076 750

Every three months the SHGs are evaluated in terms of organization and administrative capabilities and project implementation. The groups are appreciated by their members and other local people not only for their savings and loan functions but for their involvement in community action such as environmental clean-ups and literacy campaigns. The success of the groups has stimulated the formation of others.

5.2.2. Strengthening community self-help groups

Up until May 1999 the SHGs were not self-reliant, they still depended on external technical assistance. Their most valued activity was as a system for savings and loans. There was a need to focus on strengthening group organization and broadening their activities to include the development and assistance of small business enterprises.

Future activities will concentrate on four main areas: planning, administration, network development and small business enterprises. SHG administrators need help to plan board and member meetings, business development and capitalisation. Group members need education on the democratic process. The NGO Bina Swadaya continues to guide the group boards in

simple administration such as record keeping and financial organization.

On Independence Day in 1999 the SHGs organised a gala to introduce their work to the Kamal Muara community. Members of all four SHGs have made contact with the Community Self Reliance Partnership Agency from east Jakarta to discuss the development of a co-operative marketing system for salted fish, Kamal Muara's principal product.

Women's
involvement
in economic
activities –
fish drying
in Kamal
Muara



When members of the 'Delegation 8' from Bangladesh, Egypt, Iran, Malaysia, Nigeria, Pakistan, Turkey and Indonesia visited Kamal Muara in August 1999, members of the SHGs were pleased to discuss their progress and share experiences in developing SHGs.

Many members of the SHGs have small, individual businesses producing or selling food, utensils, cigarettes and fish, and some members have obtained loans making expansion possible. However, as units, the SHGs have made little progress in business development. Some of the women in the Mandiri group produce crispy beans (*rempeyek*) and the Bina Usaha group is trying to produce Aceh's crispy and steamed sponge cake. Some effort has been made to find new marketing opportunities for SHG products.

A Social Safety Net (*Jaring Pengaman Sosial*) is being implemented in Kelurahan Kamal Muara, which will provide assistance to people in need who have no other resources to fall back on. The SHGs are participating in helping to organise the Communication Forum for this activity, this will help members better understand and improve their economic situation.

Members of the SHGs also participated in August 1999 in a workshop to map poverty in Kamal Muara. The map shows where the Social Safety Net is most needed.

Conclusions and recommendations





6.1. CONCLUSIONS

Research conducted in Jakarta Bay and in the City of Jakarta identified waste management as a pressing need. The intersectoral UNESCO-CSI project acts as a means of unifying the agencies involved in combating this problem: local community groups, NGOs, government organizations and the media. A 'Clean up Jakarta Bay' campaign was organised in parts of Jakarta, mainland coastal areas, the urban core and the Seribu Islands. This was followed by grass-roots programmes on waste management, recycling and composting. There was widespread support within the communities for these activities, which provided some income for the principal participants.

A more general issue was the need to create awareness of Jakarta's waste problem among the wider community. This is being achieved by developing public-oriented programmes on waste management, reporting on new techniques and successes within the projects underway, and complementary environmental awareness campaigns. However, even among those directly involved in waste management, e.g. in the Bintaro Market composting project, it has been difficult to change attitudes, and this has hampered some activities. Waste should be regarded as a resource that can be of significant benefit to the community at large.

Improving the transfer of information to the public about new practices can only occur through interaction between the various groups involved, government agencies, NGOs and the media. The media is really the most important potential partner in achieving the goal of information transfer. Good examples of Jakarta communities involved in recycling activities should form the basis for a larger campaign encouraging other waste management initiatives. Such campaigns need to target specific groups such as health system workers, municipal cleaning services, neighbourhood groups, polluters. Raising social awareness is necessary to maintain the continuity of community-based waste management initiatives.

Fish-drying
process
in Kamal
Muara



The most important step in policy reform is to acknowledge and encourage the role of the community in solid waste management. Communities involved in waste processing, for the most part, live in poor conditions and would benefit greatly from additional legal protection from polluters and from statutory sanitary measures. Other objectives include land provision for community waste processing units; mandatory waste-separating at the domestic level; and compulsory composting for municipal markets. Waste management should begin with economic and environmental assessments of the communities' contributions to waste reduction. Subsequently, a system of financial support may be needed to implement waste management guidelines at the regional level. Macro-level policy reform in the area of the environment would bring quicker and more widespread results,

e.g. initiatives to encourage the use of organic fertilisers by agro-producers.

The project activities emphasised the importance of environmental education and recycling networks among schools in Jakarta. This could be achieved by organising inter-school workshops, and perhaps joint marketing and selling of the paper products produced by schools. Expansion beyond Jakarta to other high schools within Indonesia and the creation of a national network may allow the activities to go beyond this project, so that they become an independent self-financing initiative. It is recommended that waste recycling topics are included in the curriculum within the wider framework of environmental education. The non-formal education activities, e.g. field courses and training, carried out within the project are important tools to enhance environmental awareness among youth.

Involvement with the international youth recycling organization may also encourage the expansion of the recycling projects in Jakarta. The publication *YARN* (Youth and Recycling Newsletter), a product of UNESCO's division of Youth and Sports Activities, was developed to encourage recycling among young people throughout the world, and to provide a forum for sharing experiences and the lessons learnt. The possibility of establishing informal ties with schools involved in recycling in other countries may benefit high schools in Jakarta.

Paper
recycling
programme
for youth



The need for improved marketing of paper products and compost was clearly identified, since currently a marketing framework does not exist. For local communities, there is the possibility of marketing their products through co-operatives; and to further this objective the project recently organised training courses on the 'Establishment and management of co-operatives'. An association of recycled paper producers will be established soon to help marketing. It is essential that economic incentives accompany the first stage of future projects, to ensure motivation and enthusiasm among the participants. Overall, the paper and organic recycling has been very successful, combining the need for waste management with education on the environment and on the general threat to Jakarta Bay and the Seribu Islands.

6.2. RECOMMENDATIONS FOR PROPOSED NEW ACTIVITIES

Poverty is one reason for a decline in environmental quality, and the negative feedback effect means that a decline in the environment's carrying capacity may increase poverty. Environmental management and poverty alleviation are therefore important co-dependent targets for sustainable development of the Jakarta Metropolitan Area.

Based on the studies and project activities, it is clear that the future initiatives in community-based development should include the four sectors of the Jakarta Metropolitan Area: small islands (Seribu Islands), mainland coastal areas, the urban core and upstream zones.

Community-based development activities in the Seribu Islands should focus on improving and preserving the environmental quality of small islands with a high population density, such as Pari, Kelapa, Panggang, Tidung, Untung Jawa and Harapan Islands; and policy analysis and information sharing, which support the devolution of authority to the local level.

Conditions in the mainland coastal areas could be improved by balancing the farming or culture of marine resources (e.g. fish, seaweed and pearls) with conservation goals through demonstrations in kampungs of community-based coastal resource management; and the devolution of authority to a local level, as recommended for the Seribu Islands.

In urban areas, such as Jakarta, Bogor, Tangerang, Bekasi and Depok, the target group are the inhabitants of kampungs, who should be assisted with job creation for the poor through solid waste management activities; retraining workers and their families in small-scale commercial enterprises, marketing and entrepreneurship; and expanding job opportunities for women and high school drop-outs. Environmental education needs to be included in formal and informal educational programmes.

The majority of the population living upstream from Jakarta work as farmers. Activities in this area should focus on soil conservation and pest management in rice growing and market gardening, through training small-scale rice farmers and market gardeners in environmentally sound agricultural practices; documenting the economic benefits of an integrated farming system; and working with NGOs in environmental management and advocacy.

To ensure the sustainability of the ongoing pilot project, a project document for the integrated environmental development of the Jakarta Metropolitan Area has been prepared. While the overall approach for future action will focus particularly at the community level through social empowerment and poverty alleviation activities, co-operation with government organizations and the development of public-private partnerships are complementary foci.



Agricultural activities in an upstream area – tea picking, Puncak

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