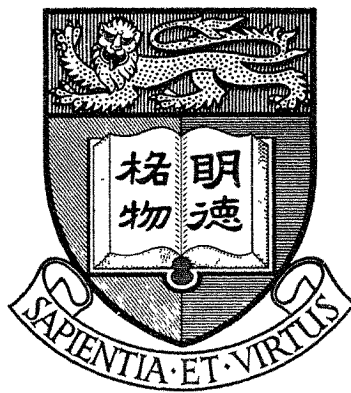


UNIVERSITY OF HONG KONG
LIBRARIES



ASIAN

Journal of Environmental Management

Special Issue: Hong Kong's Environment in Transition



Volume 5

Number 1

May 1997

Asian Journal of Environmental Management

Centre of Urban Planning and Environmental Management, The University of Hong Kong, Pokfulam Rd., Hong Kong.
Tel. 2859-2721, Fax 2559-0468

Editor
Dr Bill Barron

Copy Editor
Ms Jeanne Ng

Managing Editor
Professor Peter Hills

Subscriptions Manager
Ms Carrie Lee

International Editorial Board

Dr Binayak Bhadra
Member
National Planning Commission
His Majesty's Government of Nepal
Kathmandu, Nepal

Professor Lee Sang-Gon
Director
International Affairs Office
Inha University
Korea

Dr Lex Brown
Head
Australian School of Environmental Studies
Griffith University
Brisbane, Australia

Professor Low Kwai Sim
Department of Geography
Universiti Malaya
Kuala Lumpur, Malaysia

Mr Henry Chiu
Director
Materials and Process Branch
Hong Kong Productivity Council
Hong Kong

Mr Kazunobu Onogawa
Director
Research and Information Office
Global Environment Department
Environment Agency
Government of Japan
Tokyo, Japan

Mr David R. Cope
Director
United Kingdom Centre for Economic and
Environmental Development
Cambridge, United Kingdom

Mr K.V. Ramani
Executive Secretary
Asian and Pacific Energy Environment
Planning Network
Coordinator, Energy Programme
Asian and Pacific Development Centre
Kuala Lumpur, Malaysia

Dr Dhira Phantumvanit
President
Thailand Environment Institute
Bangkok, Thailand

Mr Katsunori Suzuki
Division of Environment
and Sustainable Development
Asia Technical Department
The World Bank
Washington D.C., U.S.A.

Professor Huang Junxiong
Executive Director
Research Centre for
Eco-Environmental Sciences
Academia Sinica
Beijing, China

Dr Thomas Wilbanks
Corporate Fellow
Oak Ridge National Laboratory
Oak Ridge, Tennessee, U.S.A.

Management Board

Dr John Hodgkiss
Chairman
Department of Ecology and Biodiversity
The University of Hong Kong
Hong Kong

Dr David Dudgeon
Department of Ecology and Biodiversity
The University of Hong Kong
Hong Kong

Dr Gordon T.L. Ng
Vice-Chairperson
The Conservancy Association
Hong Kong

Dr Kerrie MacPherson
Department of History
The University of Hong Kong
Hong Kong

ASIAN

Journal of Environmental Management

Vol 5 No 1 May 1997

Hong Kong's Environment in Transition

Editors for this special issue:

Megan Reilly

Bill Barron

Jeanne Ng



Hong Kong University Press

香港大學出版社

Hong Kong University Press
The University of Hong Kong
Pokfulam Road, Hong Kong

© Hong Kong University Press 1997

ISSN 1021-6634

All rights reserved. No portion of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information storage or retrieval system, without permission in writing from the publisher.

Publication of this journal has been supported in part by a grant from the Caltex Green Fund, Hong Kong.

Printed on 40% recycled paper by Caritas Printing Training Centre.

Contents

Call for Papers	v
Subscription Information	vi
Introduction to this Special Issue on Hong Kong: A Context of Unprecedented Change <i>Bill Barron and Megan Reilly</i>	vii
Reference Maps of Hong Kong	xiv
• Development Planning For A Growing Hong Kong	
The Environmental Dimension of the Territorial Development Strategy Review <i>E.G. Pryor and Teresa L.Y. Chu</i>	1
A Vision for Hong Kong's Future With Regard to Land Use: Sustainable Urban Living in the 21st Century <i>Christine Kung-wai Loh</i>	15
• Protecting Hong Kong's Natural Environment	
Conserving Hong Kong's Biodiversity <i>Cho Nam Ng</i>	25
• The Wages of Affluence	
Solid Waste Management in Hong Kong: Towards an Integrated Partnership <i>Gordon T.L. Ng</i>	31
• Assessment Tools	
Developing Practical Indicators of Environmental Sustainability for Hong Kong <i>J.H. Liu, Nicola Atkinson and Carlene Van Toen</i>	37
EIA in Hong Kong: Effective But Limited <i>K.C. Lam and A.L. Brown</i>	51
• Environmental Report Cards	
Hong Kong's Environmental Accomplishments and Continuing Challenges: A Commentary From the Hong Kong Government's Environmental Protection Department <i>Robert J.S. Law</i>	67
A Little Green Dragon? <i>Mei Ng and Lisa Hopkinson</i>	75

• **Hong Kong on the International Scene**

Thinking Globally: Hong Kong's Participation in International Environmental Forums <i>W.K. Chan</i>	85
--	----

Institutional Profiles

The Hong Kong General Chamber of Commerce's Environment Committee	91
American Chamber of Commerce in Hong Kong Environment Committee	93
Private Sector Committee on the Environment	95

Environmental Organizations

The Conservancy Association	97
Friends of the Earth (Hong Kong)	99
World Wide Fund For Nature Hong Kong	100

Call for Papers

The *Asian Journal of Environmental Management (AJEM)* invites articles on practical aspects of environmental management in Asia. Priority is given to papers involving (1) descriptions of efforts (or specific proposals) to *manage* problems associated with pollution or nature conservation, and (2) matters of concern to organizations involved in environmental management or public awareness (for example, environmental data, management tools, institutional developments).

The manuscript should be clear and concise. Where some of the material presented is highly specialized in nature, the text should include explanatory statements which convey its importance to a readership from different professional backgrounds. Submissions will be refereed by an international panel of experts in the field, and the referees will determine if the submitted papers are to be published as received, published following specific requests for revision, or not published. In keeping with *AJEM's* goal of facilitating information exchanges, comments on published articles are invited and these will be published. Comments and rejoinders should be between 50 and 800 words.

Submission of a manuscript will be taken to imply that the material is original and no similar paper has been published or currently submitted for publication elsewhere.

The manuscript should be between 3000 and 8000 words and the cover page must include the

title (less than 15 words), the author's correspondence address, fax and telephone numbers, an abstract of 100 to 200 words, and a list of up to 10 key words. The typescript must be submitted along with a photocopy of original illustrations (for example, photographs, drawings). Indications of appropriate style for references, and other points of style, may be taken from the articles in this issue. Manuscripts must be submitted double spaced with wide margins on all sides along with a copy on a computer disk. (If requested, *AJEM* will return computer disks or printed material to the author.)

Copyright of papers will be held by the publishers. Twenty-five reprints of each published paper will be provided free to authors with additional copies or alternative arrangements for reproduction to be worked out in consultation with the Editor.

Manuscripts submitted for consideration for publication in *AJEM* as well as comments on published papers should be sent to

The Editor
Asian Journal of Environmental Management
CUPEM
The University of Hong Kong
Pokfulam Road
Hong Kong

Prospective authors are recommended to use existing issues of *AJEM* for guidance on format, or they may write to the Editor for further information.

Subscription Information

The *Asian Journal of Environmental Management (AJEM)* is published twice yearly. Annual subscription **rates within Asia** — exclusive of Japan, Australia and New Zealand — are US\$50 for institutions and US\$30 for individuals. Rates for other subscribers are US\$70 for institutions and US\$40 for individuals. All rates cited above are inclusive of international airmail charges.

Subscriptions should be paid through INTERNATIONAL MONEY ORDERS drawn in United States dollars. Money Orders should be made payable to: THE UNIVERSITY OF HONG KONG. (Personal or regular bank cheques cannot be accepted.)

Organizations wishing to become **corporate sponsors** may do so annually by contributing US\$600. Such sponsorship will be acknowledged in each issue of *AJEM*, but will not be taken to indicate endorsement by *AJEM* of the sponsor's activities.

All subscription-related correspondence should be addressed to:

Subscriptions
Asian Journal of Environmental Management
CUPEM
The University of Hong Kong,
Pokfulam Road,
Hong Kong.

ORDER FORM

Please Indicate: INSTITUTION _____ PERSONAL _____

Amount Enclosed: US\$ _____

Subscriber's Name:

Subscriber's Address:

Please enclose payment and send to:

Subscriptions, *AJEM* c/o CUPEM, The University of Hong Kong, Pokfulam Road, Hong Kong.
(Subscribers should allow up to four weeks for delivery.)

Asian Journal of Environmental Management

Introduction to This Special Issue on Hong Kong: A Context of Unprecedented Change

Bill Barron and Megan Reilly

As of 1 July 1997 British rule of Hong Kong comes to an end with the creation of the Hong Kong Special Administrative Region (HKSAR) of the People's Republic of China. With the transition, this largely autonomous metropolitan area of 1,000 square kilometres and 6.5 million people will undergo a sort of change unprecedented in world history. Henceforth, the broad context in which Hong Kong operates will ultimately be set by the government of China in Beijing, rather than by Britain's Parliament in London. Yet, except for foreign affairs and defence, as is set out in the 'Basic Law', the HKSAR's mini-constitution, Hong Kong will enjoy a high level of autonomy, and will maintain its economic and social systems, its currency, and separate identity in international forums within the formula of 'One Country, Two Systems'.

Environmental management, like other aspects of local social, economic and political decision making, is to remain a matter of choices to be made by the people and government of Hong Kong itself. In that sense, the HKSAR is to retain much of the essential features of a separate identity and autonomy which have contributed to its success and prominence on the world stage. Yet, the *fundamental* nature of the transition and the absence of precedents inevitably leads to uncertainties and a perhaps unavoidable tendency to view the longer term with anxiety. Hence, while the articles in this Special Issue describe the legacy of environmental successes and failings to be passed on to the SAR, and outline prospects for the future, it is evident that such prospects will be fostered or altered by the way the transition plays out in the coming months and years.

In certain respects Hong Kong historically has operated much like a classical 'city-state' with a single administration, rather than overlapping municipal, provincial and national ones. It has always had a clear sense of the closeness of its borders. Unlike most modern metropolitan centres in which

political boundaries often mean less than the relationships which extend well beyond them, the 'borders' around Hong Kong, never more than about 30 kilometres from any point, have historically reflected abrupt social and economic discontinuities. It is perhaps this geo-political fact as much as any other which has fostered a strong sense of local identity and distinctiveness, particularly among the generations born in Hong Kong. The population is about 98% ethnic Chinese, but many are citizens of other countries and virtually all Hong Kong people have spent much of their lives within political and economic systems strikingly different from those prevailing in mainland China. While it is widely recognized that over time this sense of separateness will diminish, the prospect of Hong Kong people undergoing a rapid assimilation into Mainland lifestyles carries with it considerable anxiety.

With its per capita income now significantly higher than Britain's and manyfold that of the wealthiest parts of mainland China, and its status as the world's eighth largest trading entity, Hong Kong is an extraordinary success story. This success is built on a dynamic and flexible economy, driven by a largely Chinese entrepreneurial group, operating within a British colonial context based on the rule of law, relatively effective checks on corruption, and considerable freedom from governmental interference in economic and other spheres of activity. Indeed, Hong Kong is regularly assessed as the freest economy in the world.

Although widespread participation in the political process was very late in coming to Hong Kong, the enthusiasm with which recent opportunities were embraced suggests that Hong Kong people share many of the values and expectations of economic peers in Europe and North America. The call for even wider participation in decision making has been evident in the field of environmental management as much as in any other.

Yet, it should be stressed that while Hong Kong has long been separate politically from mainland China, it has never really been isolated from it economically or socially. The earliest and most recent economic successes have been grounded in Hong Kong's role as the major port for the China trade. With the Communist revolution came the closing of the border and the severing of most commercial ties. This also led to massive migration to Hong Kong, not only from adjacent Guangdong Province but from Shanghai and other areas in northern China. With uncommon success these migrants were absorbed and the economy shifted to manufacturing until mainland China opened its doors decades later. Since the early 1980s, Hong Kong has served as the transshipment point for much of China's international trade, and a large share of China's exports have been produced in factories established with Hong Kong investment and management.

The social connections between Hong Kong and the Mainland are even more fundamental. Most Hong Kong people are first, second or third generation mainland immigrants, and, with the traditionally strong Chinese family ties, continuing links with families across the border are common. As in Chinese communities everywhere, those in Hong Kong take pride in the antiquity of Chinese history and the enduring values of the culture. Most Hong Kong families may have sought refuge in this part of China colonized by foreigners, but the very existence of such a colony is something about which there tends to be, at the least, ambivalence. Indeed, there is considerable pride simply in the fact that the colonial era in this part of China is coming to a close.

Concerns about Hong Kong's future do not spring regret about the sunset of the colonial era. Rather, they stem from apprehensiveness about the ways in which the SAR government will develop its own approaches to such matters as the rule of law, the form and extent of participation in governmental decision making, and the breadth of freedom of expression.

In sum, Hong Kong has always been closely linked with mainland China and is basically a largely 'Chinese' place. Yet, in certain important respects, it more closely resembles its economic peers elsewhere in the world. The significance and promise of the transition and the tensions and uncertainties which arise from it stem from the very identity of Hong Kong and its evolving relationship with the rest of China, as well as with Hong Kong's own economic counterparts in the post-industrialized world.

On the eve of the transition, with so many changes looming ahead, the environment clearly is not the paramount concern for most Hong Kong people. Nonetheless, over the past decade environmental concerns have risen markedly as the economic well-being of the population has grown ever further out of line with the level of environmental quality on which a good standard of living and basic human health depends. In contrast to what many people from abroad may envision, only about 15% of the land area of Hong Kong is built-up, and about 40% of the land is in protected country parks. The rugged terrain is the primary explanation for this pattern of development, giving rise to areas with some of the highest population densities in the world very close to extensive and relatively wild green areas. The combined effects of the extensive park system and the spreading of development along the shorelines of this harbour city mean that in contrast to those in other megacities, Hong Kong people can relatively quickly escape the concrete jungle. In short, there is much environmental amenity to protect.

Environmental pressures, already great, are likely to get much worse in the future as Hong Kong seeks to accommodate the projected additional one to two million people within the coming decade or so. Hong Kong people will need to make a number of difficult choices in the years ahead about the way the HKSAR will develop. While average income is among the highest in the world, industrial re-locations from Hong Kong to the Shenzhen Special Economic Zone just across the boundary have meant a declining job market for less skilled workers within Hong Kong itself. In comparison with the rest of China and most of its regional neighbours, Hong Kong is well endowed with the financial resources to make its environment safe and healthy, so the choices here are quite real. The quality of life for Hong Kong people in the coming years will depend on the achievements and omissions in respect to sound environmental management, just as it will on events in the economic and political arenas.

It is against this backdrop that the Editors invited academics, representatives of environmental advocacy organizations, members of the business community, Hong Kong government officials and other commentators to contribute their views on the state of the Hong Kong environment on the eve of the transition — and their thoughts on its prospects for the future. The invited contributors were asked for an assessment of where Hong Kong stands with

regard to the management of the environment, in general and in particular. What is evident in the submissions is that the contributors generally view Hong Kong as a place which truly 'works', with an impressive built environment, a world class infrastructure and a natural setting that is not only visually spectacular but also ecologically impressive. Yet, Hong Kong is also a place where the quality of the environment is declining dramatically.

It is a place where incomes continue to rise sharply, while chronic air pollution not only clouds the horizon but also increasingly becomes a serious health concern. It is a place where some of the largest and most modern port and airport infrastructure in the world is under construction and planned, and yet water pollution from untreated sewage, the continued discharge of industrial effluent, and massive reclamation are damaging the marine environment to an alarming degree. Even remote beaches are often unsafe for bathing, and eating local seafood can pose risks. Outings to the countryside are a local passion; the existing country parks are well appreciated. Yet, much of the land within the country park system is so designated because the steeply sloped landscape renders them otherwise unusable. Prospects for expanding the country park system to include a wider range of terrain and ecologically richer habitats remain unclear. Meanwhile, large tracts of former farmland and undeveloped land are being blighted by haphazard and poorly designed development, which wipes out ecologically sensitive areas and often increases the risk of floods. With a projected population increase of about 25% over the next two decades, the widespread loss of unprotected natural areas represents a potentially great cost to the next generation of Hong Kong people, who will find it much more difficult to escape for the density and hectic pace of the city.

While environmental protection in Hong Kong began in the 1980s as a largely government-initiated activity, it has gradually evolved, along with the political process in Hong Kong generally, to become more participatory. Today, citizen groups, the press, members of the Legislative Council, local government officials, chambers of commerce, and others regularly comment on the actions (or inactions) of the executive agencies such as the Environmental Protection Department, the Planning Department or the Transport Branch.

IN THIS ISSUE

Visions for the Physical Transformation of Hong Kong

Hong Kong is presently engaged in massive reclamation of its harbour to provide more land in the core urban area for infrastructure and building. In addition, much larger reclamations are envisioned as part of a planned four-fold increase in the capacity of what is already the world's busiest container port. .

The first two papers deal with the basic issue of what constitutes adequate and appropriate planning to accommodate the pressures for continued demographic and economic expansion, in light of the already damaged environment and the potential for it to become far worse. In their paper 'The Environmental Dimension of the Territorial Development Strategy Review', E.G. Pryor and Teresa Chu of the Planning Department see Hong Kong as the future service centre for southern China, and explain the associated infrastructure developments underway, including the new airport, and the planned port facilities, as well as proposed further reclamation in the inner harbour area.

Perhaps the most striking point they make is that in choosing between two options for development until the year 2011 — one which would have been biased towards development of the less-populated areas in the New Territories and the other which would rely on filling in a significant portion of Hong Kong's inner Victoria Harbour — the decision was made on the basis that the latter option could be realized in ten years, whereas the former would take fifteen. The fact that Hong Kong is basing its most wide-ranging development decisions on a matter of five years indicates the extreme nature of the current pressure to provide housing and infrastructure for the rapidly increasing population.

With regard to the importance of environmental considerations in the planning process and with respect to participatory decision-making, Pryor and Chu note that,

whilst the TDSR (Territorial Development Strategy Review) has taken account of a broad spectrum of objectives, a significant area of concern that has surfaced from the public consultation process is the extent to which environmental considerations have prevailed in the strategy formulation and, of course, the impacts which any finally adopted strategy will have on the kind of place Hong Kong may become.

Yet, they also note that,

there is no turning away from the economic, social, and environmental pressures that Hong Kong will have to face in future, given that many such pressures arise from external circumstances.

While arguing that the current planning process has been as sensitive to environmental concerns as it could be, they note that it is clearly not adequate to cope with the types of massive changes which Hong Kong is undergoing. In the near future Hong Kong must develop a more robust strategic development framework that provides a long-term view of the planning process, but also gets things done effectively within a shorter time. If the planning process does not rapidly evolve to meet this challenge, air pollution — already bad — is expected to deteriorate, noise levels will widely exceed guidelines, the sewerage infrastructure will be overloaded, solid waste disposal will be a major on-going problem, and the local ecology will face the threat of pervasive damage.

In her paper 'A Vision for Hong Kong's Future With Regard to Land Use: Sustainable Urban Living in the 21st Century', the Hon. Christine Loh, Legislative Councillor, outlines a vision for Hong Kong's future focusing on land use. While highlighting many of the same development pressures cited by Pryor and Chu, particularly the need to accommodate increases in population, Loh strongly opposes the plans laid out in the Territorial Development Strategy Review that involve large-scale reclamation. She believes reclamation to be only a short-term and partial solution, and one which would be unnecessary if greater attention were given to intensifying land use in the currently low density and poorly planned areas of the northwestern New Territories.

She faults the planning process, arguing that it tends to favour solutions favouring bureaucratic convenience and enhancement of government revenue, at the expense of adequately addressing Hong Kong's serious population and development pressures. She notes,

in view of the Hong Kong Government's own reasons for the relative advantages/disadvantages of the two development options, it is hard to see that the New Territories-biased option was ever seriously considered.

She faults unilinear decision making and the lack of an independent statutory planning body, and

notes the 'unusually loud, public and united opposition' with which the government's plans for massive reclamation of Victoria Harbour were received. More broadly, Loh outlines a deeper vision for Hong Kong, one that forecasts a future of 'more than roof and rice'. Hong Kong has the resources 'to be a proud home of human civilisation, offering opportunities for economic, social, political, educational, cultural as well as environmental excellence', she explains. While its population in the past consisted largely of refugees striving for basic subsistence, and planners at the time did a good job a meeting that challenge, Hong Kong in the 1990s expects something more from its planners. She concludes that,

it is irresponsible for the Hong Kong Government to push ahead [with its reclamation-based plans] as it has neither determined the health effects its plans would have on Hong Kong people nor the loss of biodiversity and what effects that might have.

She calls for a new sort of planning process, to further the prospect of a sustainable and prosperous Hong Kong.

Hong Kong Has a Natural Environment?

As noted above, many readers from outside Hong Kong, even those who have made short visits to the territory, may be surprised to learn that 'jungles' in Hong Kong are not always concrete. Cho Nam Ng of City University details sub-tropical Hong Kong's impressive biodiversity. He lists endemic species of reptiles and plants, and the number of rare and endangered species of birds that live or winter in Hong Kong, particularly in the Mai Po Marshes and Inner Deep Bay area, which is internationally recognized as a 'Wetland of International Importance Especially as Waterfowl Habitat' under the 1995 Ramsar Convention.

Ng's paper highlights the significant wild side of Hong Kong, and delves into the existing administrative mechanism for its protection, arguing that the country park system, while wide-reaching, is insufficient to the task of protecting enough of Hong Kong's natural environment. His description of one ecologically impressive area which falls outside government protection, the high mountain valley of Sha Lo Tung, serves as an indication of the challenges posed to Hong Kong planners and developers, in maintaining the green face of Hong Kong, and enabling it to co-exist with the rapidly increasing human

population. While the valley has impressive biodiversity and is attractive to hikers and other nature enthusiasts, and is under threat of full-scale development, the government has so far been unwilling to incorporate this area and others like it into the country park system. It is in areas such as Sha Lo Tung that much of Hong Kong's remaining wildlife live, and it is these very areas that are now a prime target for private developers.

The Wages of Affluence

As the population of Hong Kong has prospered and multiplied, so has its solid waste. Gordon Ng of ERM Consultants Ltd., describes the significant constraints on Hong Kong's ability to dispose of its waste, including landfill space that is projected to run out in ten to fifteen years. These constraints have been heightened by the decision of Hong Kong's most popular waste destination, China, to cease waste imports. 'For example, from January to July 1996, about 98% of the 132,000 tonnes of recovered plastic wastes and 86% of the 260,000 tonnes of waste paper exported from Hong Kong were destined for China.' After the new PRC law takes effect, Hong Kong will face even greater challenges in cleaning up the residues of its own affluence. Ng concludes by detailing the new, non-traditional approaches to Municipal Solid Waste Management, which promotes the government's partnership with community and environmental groups, the media and local schools, in order to engage the community in the important task of reducing, recycling, and properly disposing of its solid waste.

Some Assessment Tools

In the effort to move Hong Kong towards sustainable development, several internationally recognized environmental tools have been introduced. One of these, Strategic Environmental Assessment, otherwise known as *Environmental Impact Assessment* (EIA) which, as K.C. Lam of the Chinese university of Hong Kong and A.L. Brown of Griffith University Australia explain, has been employed in Hong Kong with some success. Another tool is sustainability indicators. A team from the University of Hong Kong describes their approach to developing these indicators for the media of air, water, and waste.

K.C. Lam and A.L. Brown begin their piece

with a description of Hong Kong's staggering current developments — including a new airport with accompanying suspension bridge, railway and expressway; a number of truly massive reclamation projects; six new container ports; three marine borrow areas; six public road systems; one major waste incinerator; seven landfill projects; five refuse transfer stations; a major sewage collection and treatment scheme; five public housing developments and numerous private development and redevelopment projects, and a partridge in a pear tree. All of these developments should be subject to an EIA.

Lam and Brown detail the evolution of EIA in Hong Kong, in a process shaped to meet the specific circumstances of Hong Kong's city-state method of government, and its rapid pace of development. They emphasize that the continued success of EIA in Hong Kong will be based significantly on the professionalism of the civil servants charged with the duty of employing an EIA and acting on its findings. They expect that if public participation in government continues to increase, the EIA system will have to evolve to reflect a greater variety of stakeholders in the development decision-making process. Hong Kong's use of EIA is particularly effective and efficient, they argue, due to its concentration on design and mitigation — on getting the project right, rather than simply compiling a satisfactory document and failing to act on its findings. They conclude that the movement away from using EIA as a regulatory device and towards its employment as a planning tool at the most fundamental level of the process is a good one, and one which offers constructive lessons for Hong Kong's neighbours in the Asia Pacific region.

Jinhua Liu, Nicola Atkinson and Carlene Van Toen describe progress on their work 'to extend and refine the concept of sustainability from one of broad aspirations to one of specific measures of success or failure'. Basically, the approach is one of identifying such things as the quality of the air people breathe day in and day out. If the air is unhealthy and is likely to remain so, then Hong Kong is clearly not on a sustainable development path and specific solutions must be considered. More generally, the authors of this paper and other project team members are identifying a variety of measurable signs of environmental chronic problems that significantly affect the health and well-being of Hong Kong people, and the larger environment on which we all depend. Once selected data will be collected for the

chosen indicators of air, water, land and cross-border issues. Projections will be made to determine whether or not Hong Kong is on a sustainable development path in regard to each particular area.

Environmental Report Cards

This issue includes an assessment of the current state of Hong Kong's environment with two 'report cards', the first from the Director of the Environmental Protection Department, Robert Law, and the second from Mei Ng and Lisa Hopkinson of Friends of the Earth Hong Kong. Robert Law outlines the history of environmental protection in Hong Kong, from its institutional beginnings in the Environmental Protection Agency in the early 1980s, through the past decade of progress under the Environmental Protection Department. In just a decade Hong Kong has established Air Quality and Marine Quality Objectives, introduced environmental impact assessments, and succeeded in imposing restrictions on noise.

He lists the evolution of resources applied to environmental protection in Hong Kong, noting that the present EPD staff numbers 1600, and is charged with an array of duties. He highlights past achievements in restricting fuel, intervening in the planning process, protecting schools from noise, and providing environmental infrastructure. He also details the current challenges, noting that:

. . . arguably, Hong Kong's most pressing environmental problem is once again air pollution. This is frustrating for us, as a number of years ago we felt we had a good grip on this . . . Unfortunately, we did not reckon with the incredible growth in motor vehicle numbers, [or the] contribution of dust emissions from the numerous construction sites in Hong Kong and also from vehicle and industrial emissions from neighbouring China.

He explains how an initiative to combat vehicle emissions by phasing out the use of diesel fuel was defeated by local opposition. Law adds that Hong Kong faces 'ever growing mountains of waste', and concludes that Hong Kong must concentrate its efforts today on moving towards sustainable development, within the context of the Pearl River Delta region, 'if we are to avoid major problems in the future'.

As Ng and Hopkinson note, the EPD 'has introduced a staggering number of environmental laws,

policies and programmes'. Yet they argue that the environmental consequences of Hong Kong's rapid economic development nonetheless have been dire, leaving Hong Kong with 'a first-world economy with a third-world environment'. And with the current development plans outlined above by Pryor and Chu and by Loh, environmental quality is projected to decrease substantially in the future.

Ng and Hopkinson offer a comprehensive and systematic assessment of the current state of Hong Kong's environment. They agree with Law that 'if there is one area in which Hong Kong is really failing it is with the control of air pollution', and offer their own assessment of the failure of the diesel-to-petrol fuel switch proposal. They further emphasize Hong Kong's problems with regard to road traffic, and argue that the traffic consequences of Hong Kong's further development as a hub port for south China have not been taken into account in development decisions.

As regards the marine waters which nearly surround Hong Kong, they note 'it is to Hong Kong's shame that we have no comprehensive sewage treatment', and note that the increasingly threatened status of the Chinese White Dolphin, the mascot for the 1997 transition, highlights Hong Kong's widespread disregard for marine conservation. Ng and Hopkinson also detail Hong Kong's problems with regard to waste and energy and the threats posed to its ecology by rapid and wide scale development.

Yet, they conclude that with all these challenges, 'there are positive signs' for the future, as Hong Kong's environmental thinking has come a long way in the seven years since the government's first policy statement on the environment was published. The previous

emphasis on the more elementary infrastructure and pollution clean-up has been replaced with a more enlightened approach, including discussion of sustainability indicators, green accounting, and proposals for a study on sustainable development.

Nonetheless, they say, 'the engine of growth continues,' and Hong Kong people will have to make it clear that environmental protection should be high on the government's agenda. As they conclude:

Decision makers in government and the private sector should grasp the opportunity to become a little green dragon, and a true example of good environmental management in Asia.

Hong Kong on the International Scene

We wrap up the articles section of this Special Issue with a brief piece from W. K. Chan, Secretary General of the Hong Kong Coalition of Service Industries, on Hong Kong's future status in the international environmental community. Chan highlights the potentials and limits of the 'One Country, Two Systems' approach under which Hong Kong will make the transition to Chinese sovereignty. He stresses that while Hong Kong has had a minimal 'official' presence in global environmental forums in the past, its participation in the future will be based in no small part on the international community's recognition of its unique position as a non-sovereign territory. While Hong Kong will retain its current membership in many international organizations, its ability to serve as a proactive member will depend on the evolution of the recognition of the role of autonomy versus sovereignty in such organizations, and on the awareness of the international community of the unique circumstances of modern-day Hong Kong.

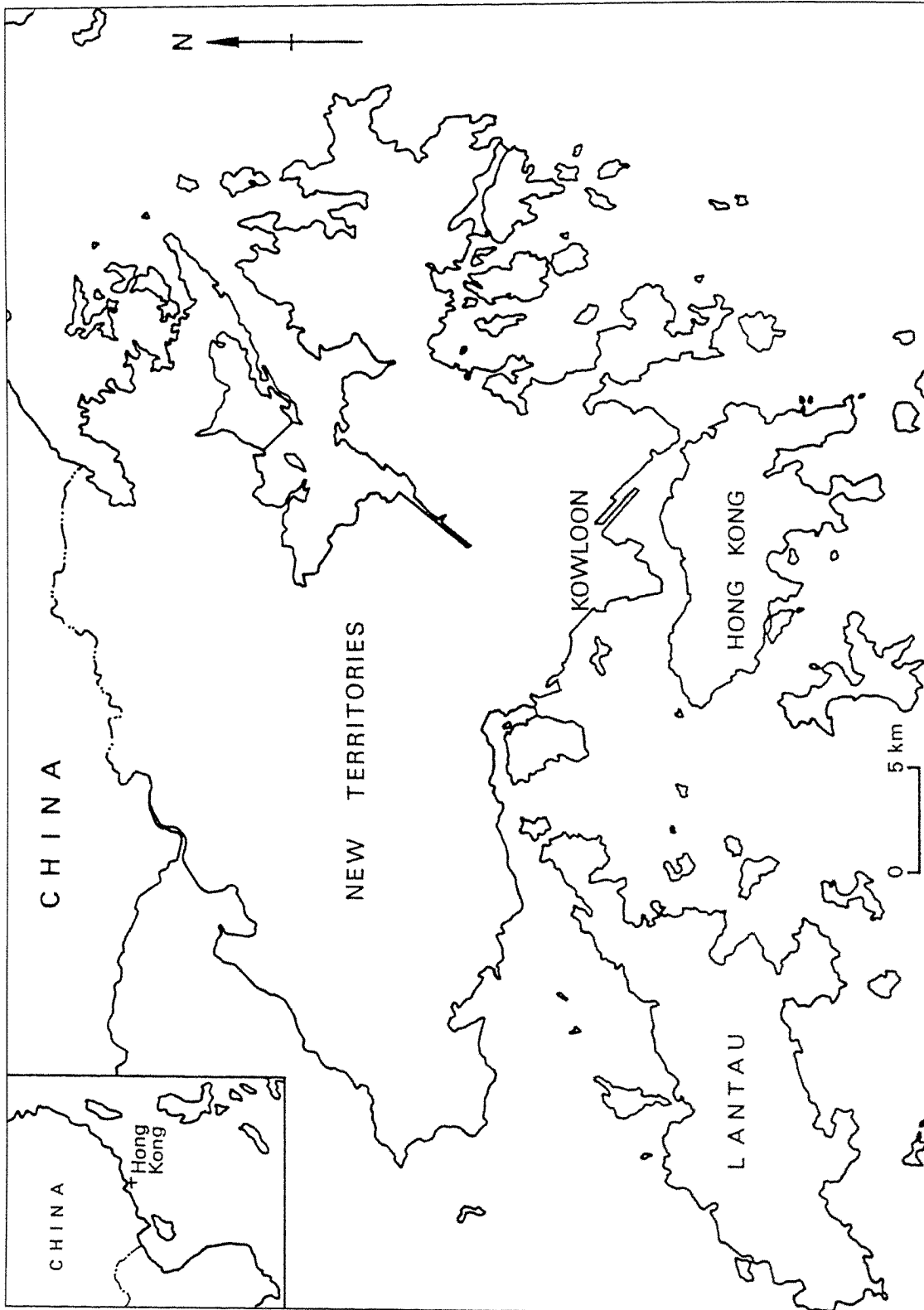
INSTITUTIONAL PROFILES: THE BUSINESS SECTOR AND PRIVATE VOLUNTARY ORGANIZATIONS

One of the truly special features of Hong Kong is its sense of identity. Perhaps as much as anywhere in the world, significant segments of the business community in Hong Kong take an active role in sponsoring environmental initiatives, in critiquing

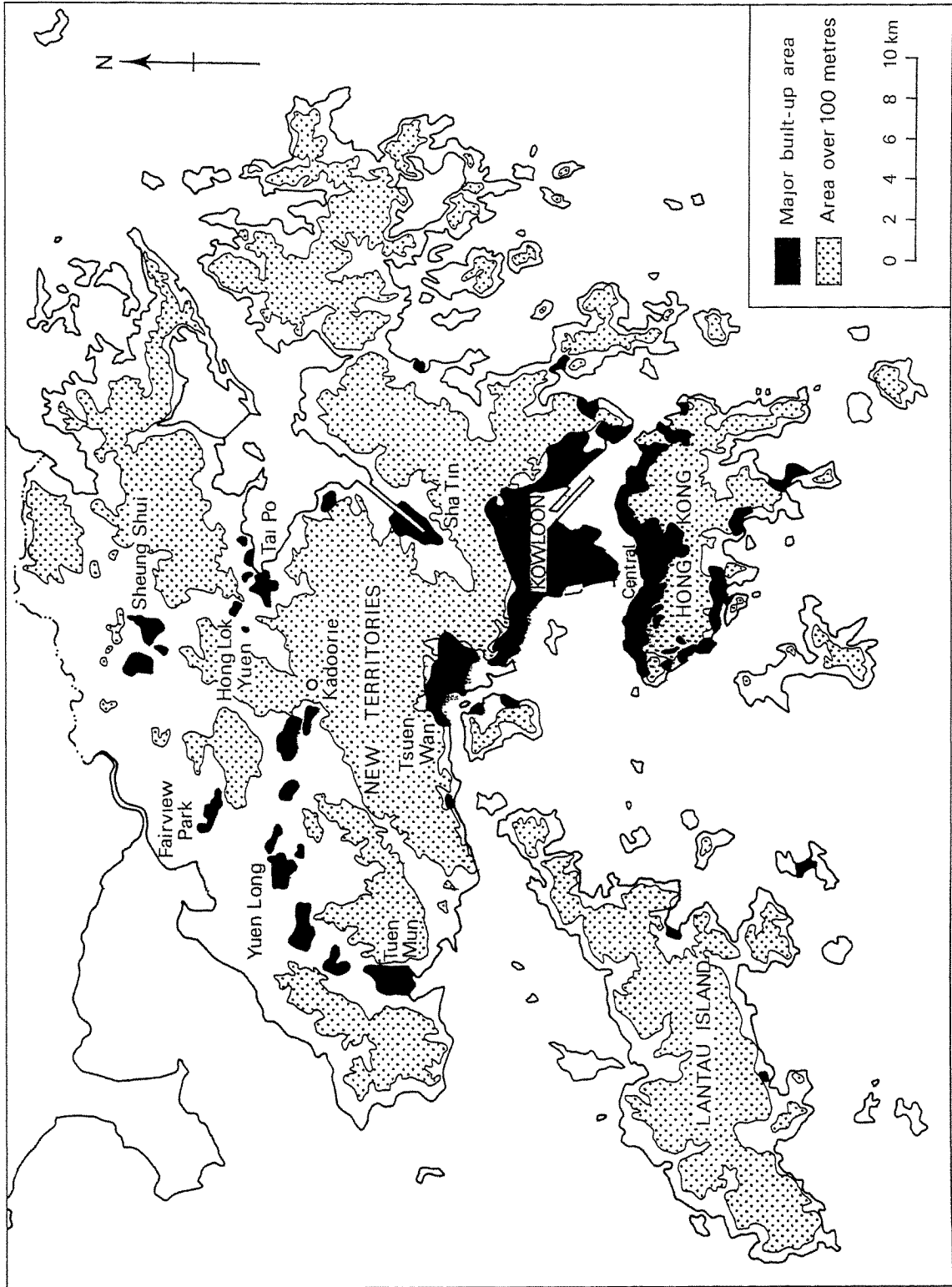
the government's environmental policies (or lack of them), and in making specific proposals for improving the environment. In this issue three separate business sector groups are profiled: the Hong Kong General Chamber of Commerce's Environment Committee, the American Chamber of Commerce's Environment Subcommittee, and the Private Sector Committee on the Environment. The interests and activities laid out in these institutional profiles provide a telling picture of how these parts of the business community view the proper role of business in promoting environmental quality. Expressing the common sense characteristic of Hong Kong people, one commentator from the business community recently noted, 'we all breathe the air'.

Hong Kong also has a number of active community-based voluntary organizations. The three profiled here suggest the variety and depth of their approach and topical concerns. The Conservancy Association is a grass-roots organization with the broad aim of helping Hong Kong learn how to live in healthier and in more environmentally friendly ways. Friends of the Earth Hong Kong is perhaps the most active community organization commentator on government policies and in assessing alternatives to them. Finally, the World-Wide Fund for Nature Hong Kong focuses on protection of the natural environment both in Hong Kong and in neighbouring parts of China.

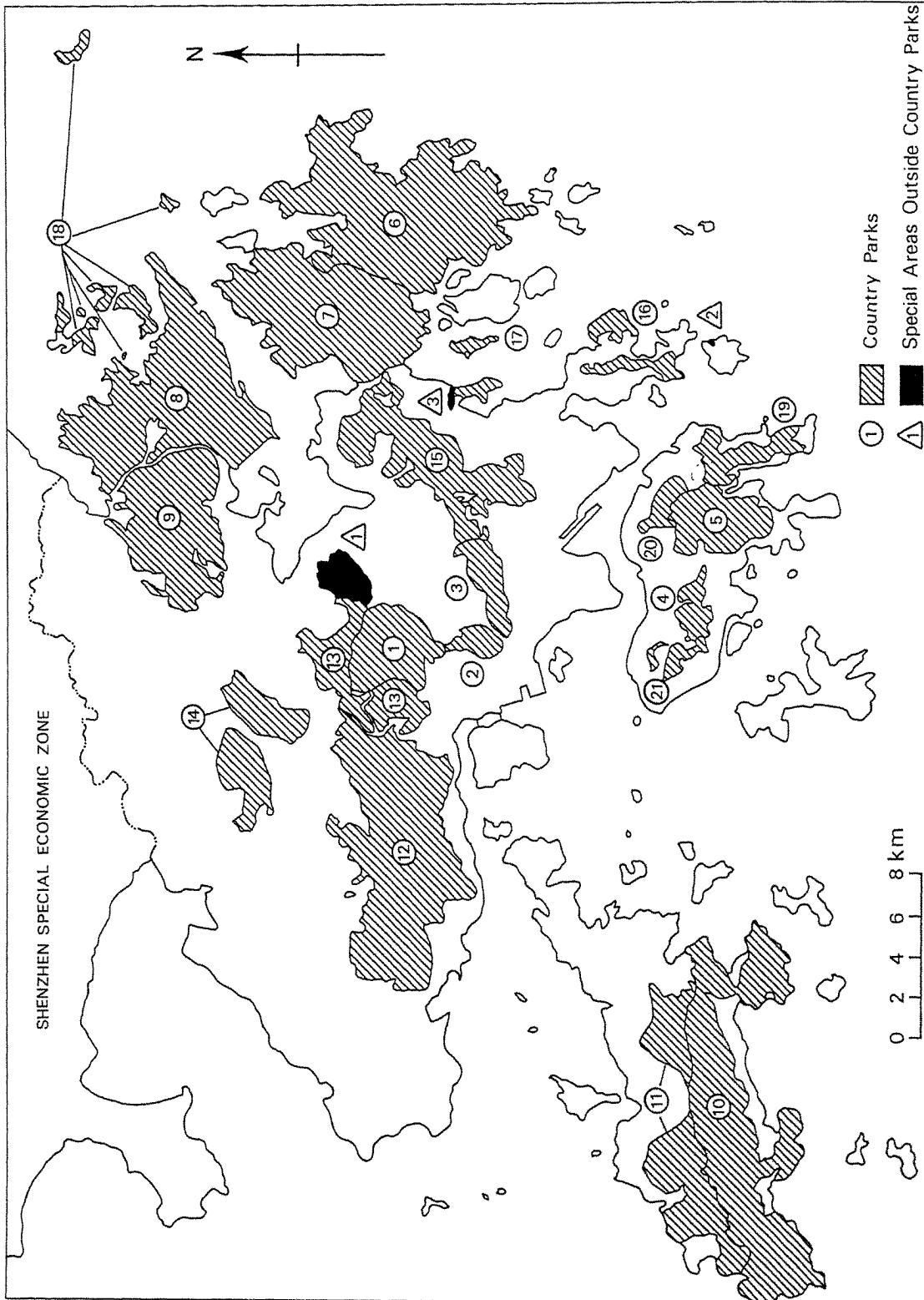
We hope our readers will find this Special Issue of the *Asian Journal of Environmental Management* interesting and informative, with regard to the environment in Hong Kong and Hong Kong itself, a place which nearly all the contributors to this issue call home.



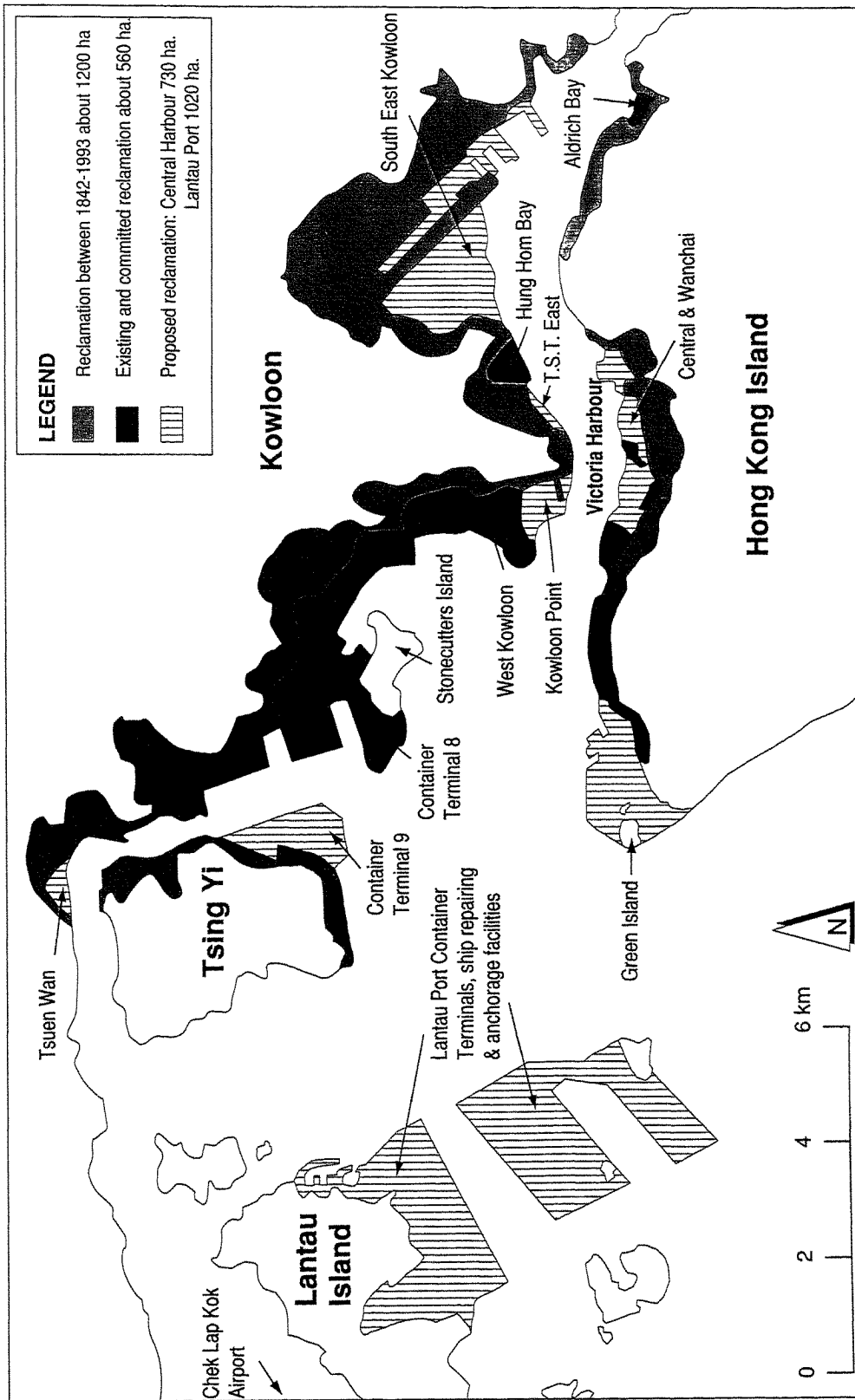
Map 1 Source: Department of Geography and Geology, The University of Hong Kong.



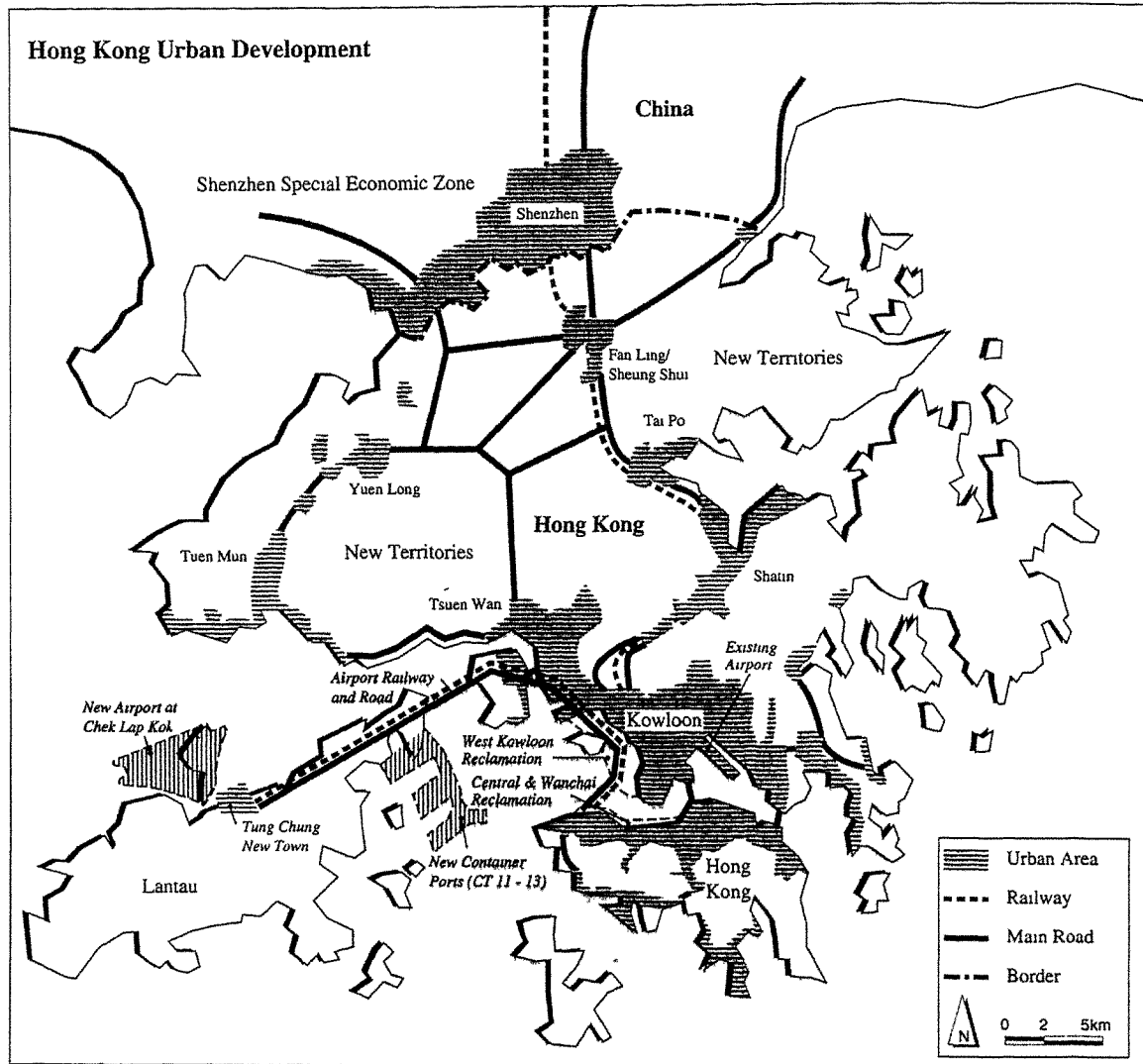
Map 2 Source: Department of Geography and Geology, The University of Hong Kong.



Map 3 Source: Department of Geography and Geology, The University of Hong Kong.



Map 4 Source: Ng, M.K. and Cook, A. Reclamation: An Urban Development Strategy Under Fire. *Land Use Policy*, Vol. 14, No. 1, pp. 5-23, 1997.



Map 5 Source: Ng, M.K. and Cook, A. Reclamation: An Urban Development Strategy Under Fire. *Land Use Policy*, Vol. 14, No. 1, pp. 5-23, 1997.

The Environmental Dimension of the Territorial Development Strategy Review

E.G. Pryor and Teresa L.Y. Chu

ABSTRACT

Hong Kong is continuing to experience high growth pressures, arising principally from its role as a hub port serving a wide regional hinterland, and from an associated population increase that has been on the order of an additional million people per decade since the 1940s. A review of the Territorial Development Strategy (TDS) is now in its final stages, after five years of effort involving a wide range of sectoral studies and an iterative process of option formulation and evaluation. That process has involved examining the interrelationship between a substantial number of objectives, especially in respect of land use, transport, environmental, financial, economic and institutional fields of concern. Many trade-offs have been made along the way. The outcome of the review process indicates that in the process of reaching the projected population of 8.1 million by the year 2011, and for Hong Kong's continued development of hub functions, there will be a number of major environmental concerns that will necessitate deeper thought on whether Hong Kong's current growth trends, on the basis of current policies and corporate decision-making systems, will be sustainable.

Keywords: Hong Kong, planning, objectives, strategic development options, environmental assessment, sustainable development

INTRODUCTION

In July 1993, the Hong Kong government released for public consultation a series of documents that collectively comprised the Territorial Development Strategy Review (TDSR) (Planning Department, 1995-96). The broad goal of the TDSR process is to produce a land use-transport-environmental framework within which to formulate more detailed plans and programmes on the basis of current policies, subject to resource availability.

The TDSR is now in the final stage of completion, which entails the incorporation of feedback from a public consultation programme that involved 70

briefings of 47 community, business, statutory, professional and academic bodies. Consultative digests were produced in English and Chinese for wide-spread distribution, with further technical reports made available through the Government Publications Centre and the Planning Department. About 80 written submissions were returned. Mini exhibitions were also taken to 10 principal locations and discussions held by means of seminars and dialogue at briefings. Additionally, high-level discussions were held with authorities in the Pearl River Delta (PRD) area and Macau to identify and review key issues of mutual concern.

The final product, in the form of an Executive

E.G. Pryor, MBE, Principal Government Town Planner/Territorial and Teresa Chu, Senior Town Planner/Strategic Planning, Planning Department, Hong Kong Government, 16-18/F Murray Building, Garden Road, Central, Hong Kong. Tel: (852) 2848-2103. Fax: (852) 2878-0389. Views expressed do not necessarily reflect the position of the Hong Kong government.

Report, is expected to produce a package of proposals for both the medium term and the long term, as well as some thoughts on the issues that may need to be addressed beyond 2011. As the document appears relatively condensed, many of the proposals may seem to be self-evident and even over-simplified. Yet, behind such ideas lies a strategy formulation process that has called for a high degree of interactive corporate efforts which, at times, have gone to deep levels of research and debate.

Whilst the TDSR has to take account of a broad spectrum of objectives, the public consultation process has highlighted significant concern for the environmental dimension of the planning process, particularly the extent to which environmental considerations have prevailed in the strategy formulation and, of course, the impacts which any finally adopted strategy will have on the kind of place Hong Kong may become. This paper addresses such issues.

A STARTING POINT FOR STRATEGY FORMULATION

A starting point for this ambitious undertaking was to identify 'Base Growth' and 'Baseline' transport networks comprising existing and committed development, as shown by Figure 1. On that foundation, assumed time horizons for strategy formulation were set at 2006 for the medium term and 2011 for the long term. Additionally, the TDSR assumed two broad economic catchments and long term population scenarios. Scenario A assumes that the Pearl River Delta (PRD) will be the primary economic catchment of Hong Kong with a territorial population in 2011 of about 7.5 million, compared to a 1996 total of about 6.2 million. Scenario B assumes that Guangdong Province and other parts of southern China will be the primary economic catchment, along with a 2011 territorial population of 8.1 million.

The TDSR took six principal objectives as a basis for strategy formulation and evaluation, as follows:

Objective 1: To enhance the role of Hong Kong as an international city and a regional centre for business, finance, information, tourism, *entrepot* activities and manufacturing;

Objective 2: To ensure that adequate provision is made to satisfy the land use and infrastructure needs

arising from sectoral policies on industry, housing, and commercial, rural, recreational and other major socio-economic activities;

Objective 3: To conserve and enhance significant landscape and ecological attributes, and important heritage features;

Objective 4: To enhance and protect the quality of the environment with regard to air quality, water quality, noise, solid waste disposal and potentially hazardous installations by minimizing net environmental impacts on the community and maximizing opportunities to improve existing environmental problems;

Objective 5: To provide a framework within which to develop a multi-choice, high capacity transport system that is financially and economically viable, environmentally acceptable, energy efficient and makes provision for the safe and convenient movement of people and goods; and

Objective 6: To formulate a strategy that can be carried out both by the public and private sectors under variable circumstances, particularly with respect to the availability of resources and significant changes of demand.

RECOMMENDED LONG-TERM STRATEGIES

The recommended long-term strategies for Scenarios A and B, as proposed in the TDSR released for public consultation in mid-1996, provided for the development needs of the territory to be met by a combination of redevelopment in the Metro Area, by the use of spare capacities in currently planned areas, by the development of additional harbour reclamations and by the opening up of new strategic growth areas mostly in the North Western New Territories. Table 1 and Figure 2 illustrate a possible future pattern of growth for Scenario B and associated strategic transport systems.

As regards the possible future pattern of economic activities, the Port and Airport Development Strategy (PADS), adopted in October 1989, made provision for new port and airport facilities; the TDSR generally continues in the framework conceived in the PADS, while taking into account the feedback from subsequent reviews of the resultant Port Development Strategy. It is important to note that the port plays a vital role in sustaining our

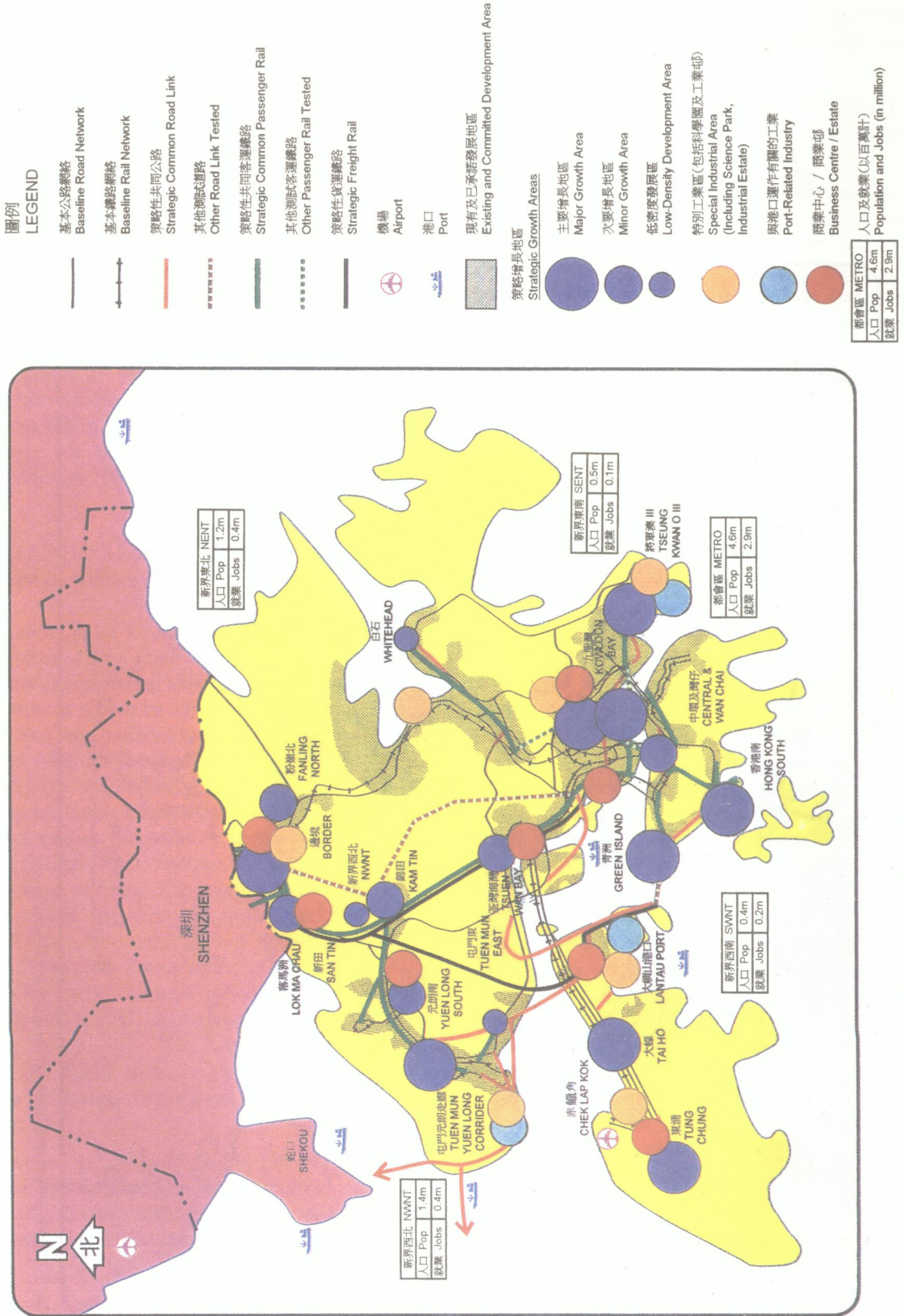


Fig. 2 An assumed development pattern for scenario B by 2011.

Table 1
Assumed Population and Job Distribution Scenario B, Long Term Development Strategy (as at July 1996) (in million)

Sub Region	Base Growth		Strategic Growth		Total by 2011	
	Population	Jobs	Population	Jobs	Population	Jobs
Metro	3.72	2.41	0.84	0.46	4.56	2.87
NWNT	1.19	0.29	0.21	0.15	1.40	0.44
NENT	1.10	0.30	0.13	0.10	1.23	0.40
SWNT	0.12	0.08	0.28	0.08	0.40	0.16
ENT	0.38	0.09	0.13	0.02	0.51	0.11
Total	6.51	3.17	1.59	0.81	8.10	3.98

Source: Planning Department

economy, as demonstrated by the fact that a wide diversity of port functions directly provide employment for about 600,000 workers and contribute about 25% to our Gross Domestic Product (GDP) (Hong Kong Government, 1996). At the same time, however, the rapid growth of Hong Kong as a hub port has generated substantial needs for off-port back-up areas for the storage of empty containers, with the consequence that there now are many sites in lowland rural areas in the North West New Territories (NWNT) that are used for that purpose. On top of that, the growth of the city has generated additional needs for other 'back-yard' uses, such as storage for wrecked cars and building construction materials and equipment. The resultant rash of random development has had significant adverse environmental impacts.

Key employment centres are expected to remain concentrated in the Metro Area, although it is foreseen that there could be prospects for new nodes of development in the New Territories at major transport interchanges, at sites close to the new airport at Chek Lap Kok and in a north-south 'technology corridor,' generally along the line of the Kowloon-Canton Railway (see Table 1 and Figure 3).

Linking up various kinds of 'activity nodes,' additional provision would need to be made for high-capacity highways and especially passenger railways. The role of Hong Kong as a service centre for South China would also require new cross-border road, rail and sea-based transport links. That, in turn, can be expected to increase environmental pressures on the territory.

Whilst endeavouring to meet the future growth needs of Hong Kong, the recommended long-term strategies also provide for the protection and exten-

sion of country parks and marine parks, as well as the safeguarding of areas of special and scientific interest, particularly the Mai Po Marshes. But, as the scale of Hong Kong's urban growth needs escalates, there will be growing threats to the integrity of ecologically sensitive areas.

The general conclusion reached was that, in spatial terms, there should be adequate capacity to meet long term needs and to provide the required infrastructure. However, it was recognized that there would be a price to pay in that additional shallow harbour areas and lowland rural areas would need to be committed to urban growth of some considerable scale. That, in turn, would create additional stress on environmental capacities, especially in respect of air quality and water quality, as well as with regard to the disposal of solid waste (see below). The overall position is that development pressures, derived largely from external forces of change, appear to have no finite limits whereas the geographic scope for satisfying the resultant land use demands is dwindling at an accelerating pace.

RECOMMENDED MEDIUM-TERM STRATEGY

Our currently committed plans and programmes now have sufficient capacity to meet housing needs only until about the turn of the century. Over the medium term (2001–2006), it is concluded that new homes would need to be provided for about one million people. That would require the production of approximately 76,000 flats a year. In exploring the means by which such substantial needs could be

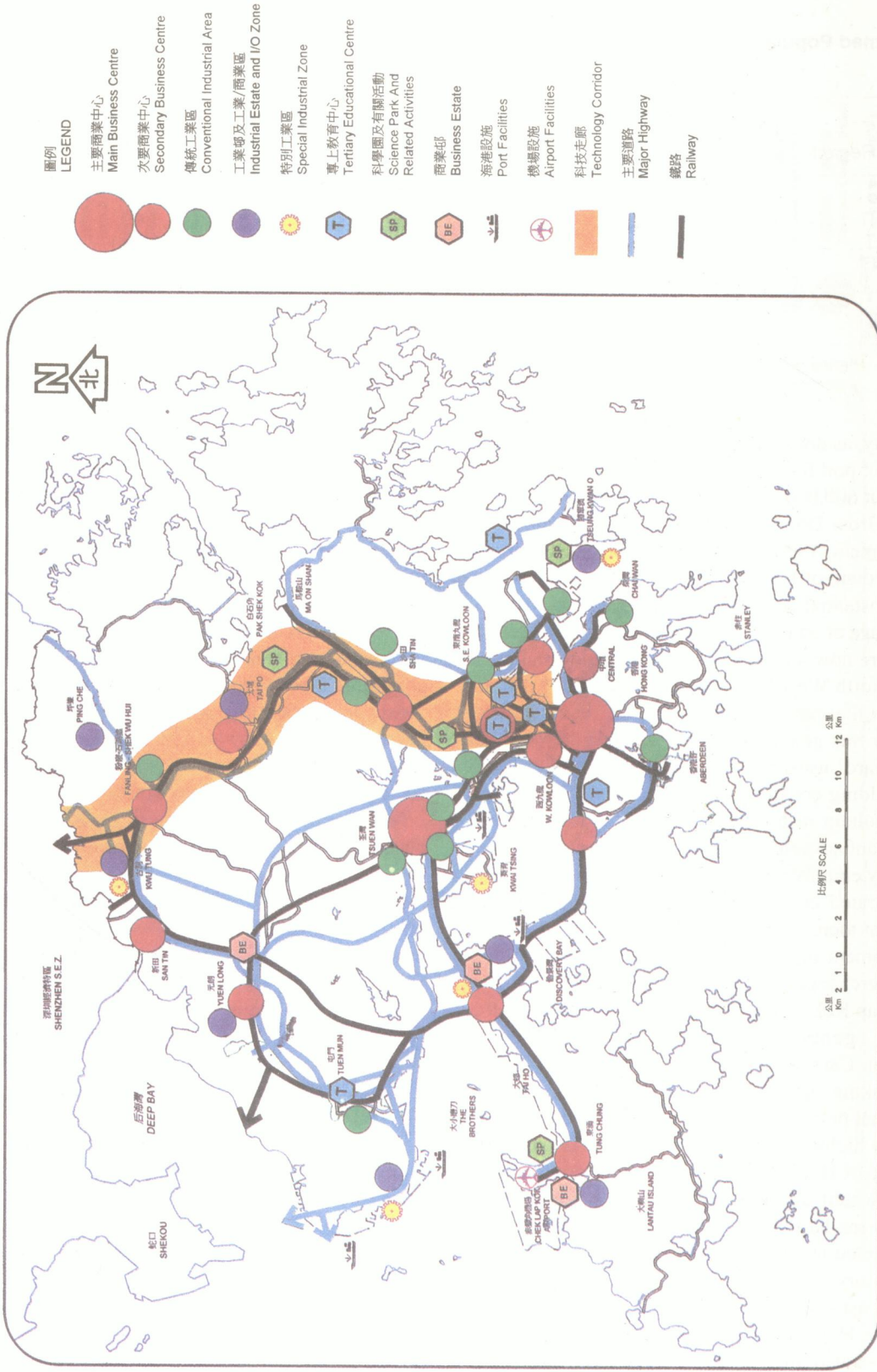


Fig. 3 Key employment centres – 2011.

met, two broad medium term strategies were postulated. One choice was a 'New Territories Biased Option' that should endeavour to accelerate urban growth in lowland rural areas and limit the extent of additional harbour reclamations. The second choice was a 'Harbour Biased Option' that gave priority to development on extensive reclamations in Victoria harbour, as first proposed in the Metroplan of 1991 (Planning Department, 1991).

These two strategies were tested to see how they would perform against a set of land use, transport, environmental, financial and institutional objectives. The overall conclusion was that neither option performed well and that a medium-term strategy that achieved a more balanced distribution of development would be required.

For the Metro Area, new solution spaces are required to:

- facilitate the restructuring of congested, obsolete urban areas and the upgrading of environmental conditions;
- enable the provision of new housing for households displaced by redevelopment schemes, especially those undertaken by the Housing Authority, the Housing Society and the Land Development Corporation;
- make a significant contribution toward meeting the general housing needs of the territory;
- provide opportunities for the development of new employment centres beyond the current concentration in the Central-Wanchai area, especially in locations around major public transport interchanges;
- facilitate the provision of new road and passenger rail transport links to alleviate congestion along existing transport corridors and also to provide additional capacity in new corridors of growth; and
- enable the realisation of the Metroplan aim to bring the harbour to the city and the city to the harbour' through the provision of an integrated system of waterfront promenades and associated civic squares.

For the New Territories, new solution spaces are required to:

- provide a wider range of choice of housing to respond to changing trends and aspirations, especially among households who wish and can afford to purchase private housing;
- provide opportunities to make the best possible

use of private-sector land holdings in helping to fulfil the development needs of the territory;

- encourage, through appropriate institutional policies and mechanisms, a greater measure of decentralization of jobs, especially at key nodal points in the principal north-south flow corridors between the Metro Area and the PRD;
- help optimise the return on the investment in and enhance the viability of currently planned trunk highways, passenger rail links and other infrastructure, especially to the NWNT; and
- rationalise development patterns in such a way that could help clear up existing areas of environmental degradation and also divert development pressures away from areas of high landscape, agricultural and ecological value.

In pursuing the implementation of both a medium-term and long-term strategy, one very important aspect to consider is the element of time. There is currently a very apparent shortage of housing, especially in the private sector, and the supply of land for public housing also is diminishing rapidly. In broad terms, about 100 hectares of land per annum need to be produced for both public and private housing. The best sources of supply over the medium term would come from the acceleration of development at Tseung Kwan O and Tung Chung-Tai Ho on North Lantau, from the redevelopment of the airport site at Kai Tak (following relocation of the existing airport to Chek Lap Kok) and from the initial phases of various harbour reclamations for which plans already exist. A lead time of about 10 years may be expected. While such action is being pursued, there is a need to move ahead with the planning of new strategic growth areas in other suitable location, especially in the NWNT, although this will require determined efforts to be made to overcome a number of substantial constraints. For such areas, a lead time of up to 15 years may be expected.

THE BROAD APPROACH TO STRATEGY FORMULATION

The strategy formulation and evaluation process involves articulating a number of initial options for each scenario, which are then subject to various evaluations that lead to new sets of improved options that become progressively more detailed (see Figure 4). Once a preferred option is produced for

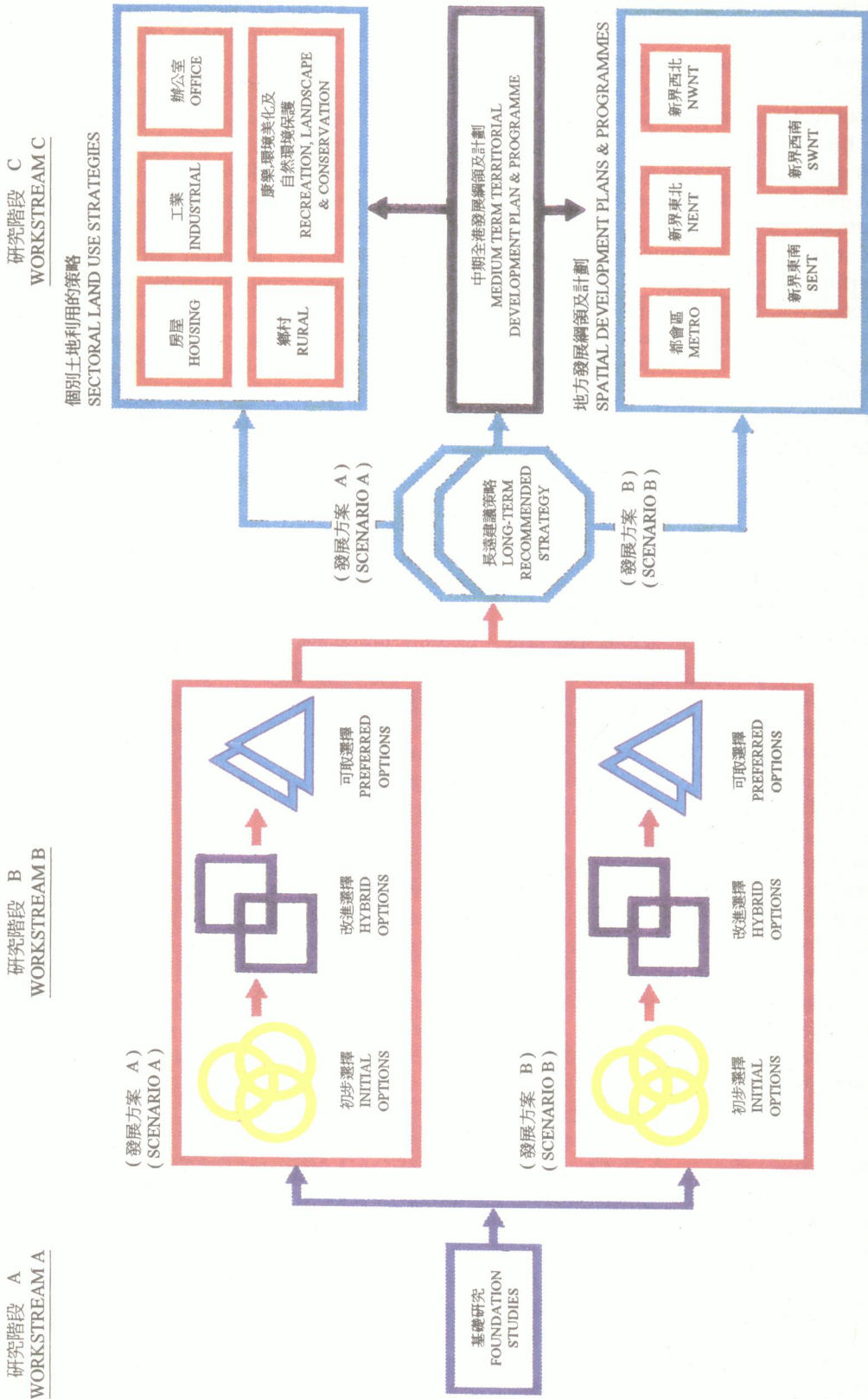


Fig. 4 Simplified TDS review process.

each scenario, a final process of in-depth evaluation is undertaken, as illustrated by Figure 5.

At each stage of the process, there are five streams of evaluation, namely economic, planning, environment, transport and financial. In more specific terms, the approach for the evaluation of TDS options is as follows:

- options are evaluated against predetermined objectives and sub-objectives;
- the results of evaluations form the basis for option refinement in subsequent stages on the principle that option formulation and evaluation is an iterative and mutually dependent process;
- the emphasis of evaluation is on those criteria with significant performance differences rather than on the common and non-differentiating features so as to focus on specific rather than general aspects of options; and
- the purpose is not to select the single best option but to identify the positive attributes of each option to be carried forward for further refinement until a preferred option is derived as a basis to formulate a Recommended Strategy for 2011 for each broad scenario and a Medium-term Strategy for 2006.

As indicated by Figure 5, the separate streams of evaluation are inter-related to form an evaluation process based on common sets of zonal/land use/employment data. For instance, the transport testing considered the performance of specific transport routes and the overall transport system for a given land use pattern. The efficiency of the transport network is also affected by the employment and land use distribution. The environmental assessments focused on the impacts of specific transport networks and specific land use distributions, particularly on the quality of air and water respectively. The financial and economic viability of each option was directly correlated with the proposed land uses, transport infrastructure and environmental mitigation measures. The results of transport, environmental, financial and economic evaluations also provided inputs for the refinement of land use components at subsequent stages.

ENVIRONMENTAL BASELINE STUDY (EBS)

As the TDS Review needed to incorporate environmental considerations at an early stage, an

environmental baseline study was undertaken in 1992 (Planning Department, July 1993) to help establish, in broad terms, the assets to be protected and the problems to be resolved. The approach used is schematically illustrated by Figure 6. The study thus formulated territory-wide environmental profiles that will help determine the 'sustainable' level of development of each sub-region. It also highlighted that the key environmental issues in the next two decades will be liquid and solid waste management as well as marine and surface water quality. With regard to marine water quality, further development must take account of the capacity of existing and planned effluent treatment and disposal facilities. The study was published in 1993 together with the consultative document for public information.

ENVIRONMENTAL OBJECTIVES AND STRATEGY FORMULATION PRINCIPLES

The integrated evaluation process referred to above aimed to derive an environmentally friendly and transport-efficient land use pattern through a reconciliation process to achieve the following objectives:

- the integration of land use-transport-environmental planning from the outset of the strategy formulation process in seeking to meet forecast growth demands;
- minimization of the need for road travel and the selection of new transport corridors through the least environmentally sensitive areas;
- as a corollary to the foregoing point, the preservation and conservation of areas of high landscape and amenity value, wherever possible;
- the achievement of air quality standards to avoid damage to health, including reduction in obnoxious gaseous emissions;
- an increase in the amount of personal and freight transport by more environmentally friendly modes of transport;
- an allowance to be made for market-driven trends towards emission-free industries and assuming tighter controls over vehicle fuel emissions; and
- the provision of new environmental infrastructure to reduce the intrusive and extrusive impacts of development on environmentally sensitive areas.

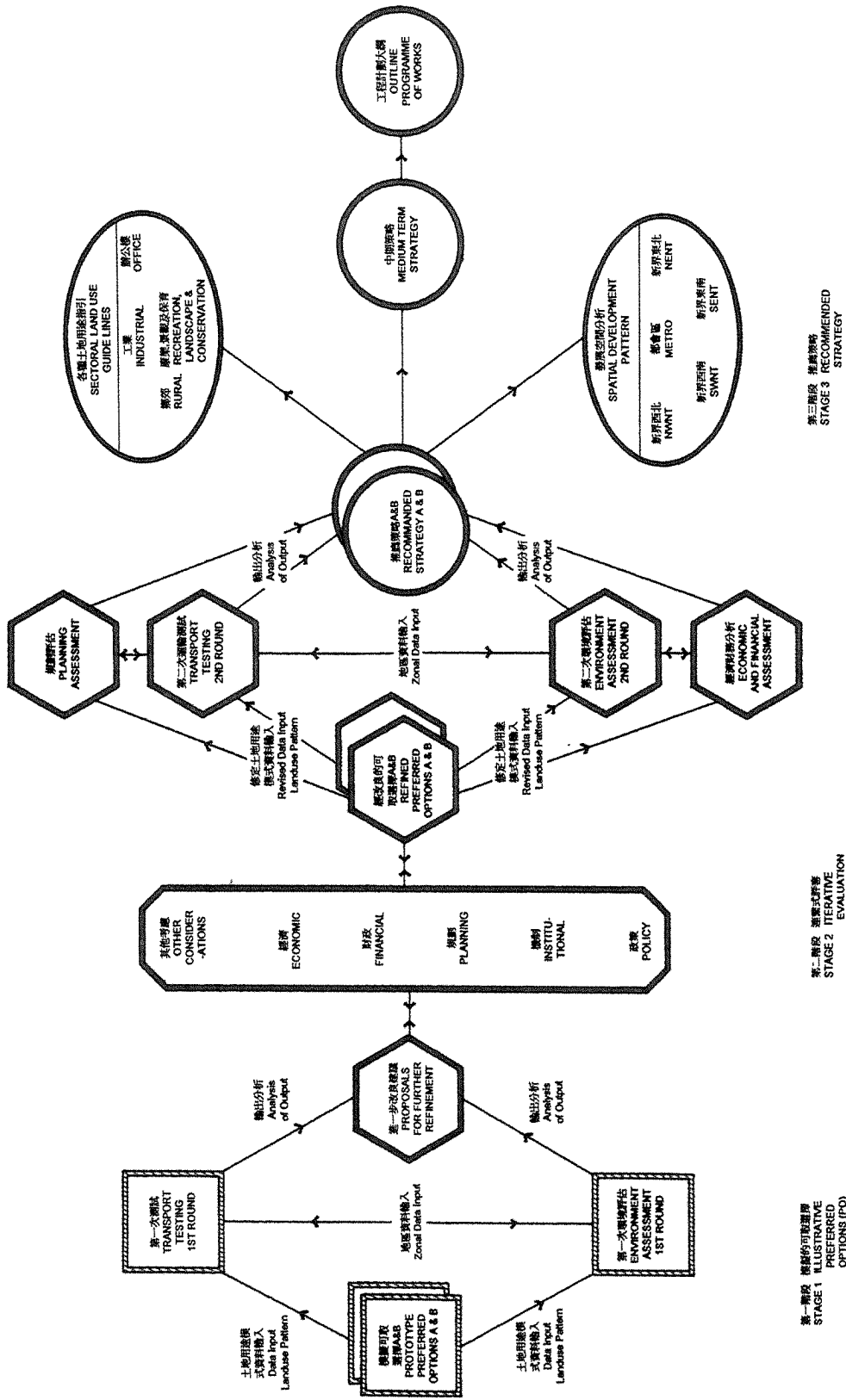


Fig. 5 Evaluation process for TDS preferred options.

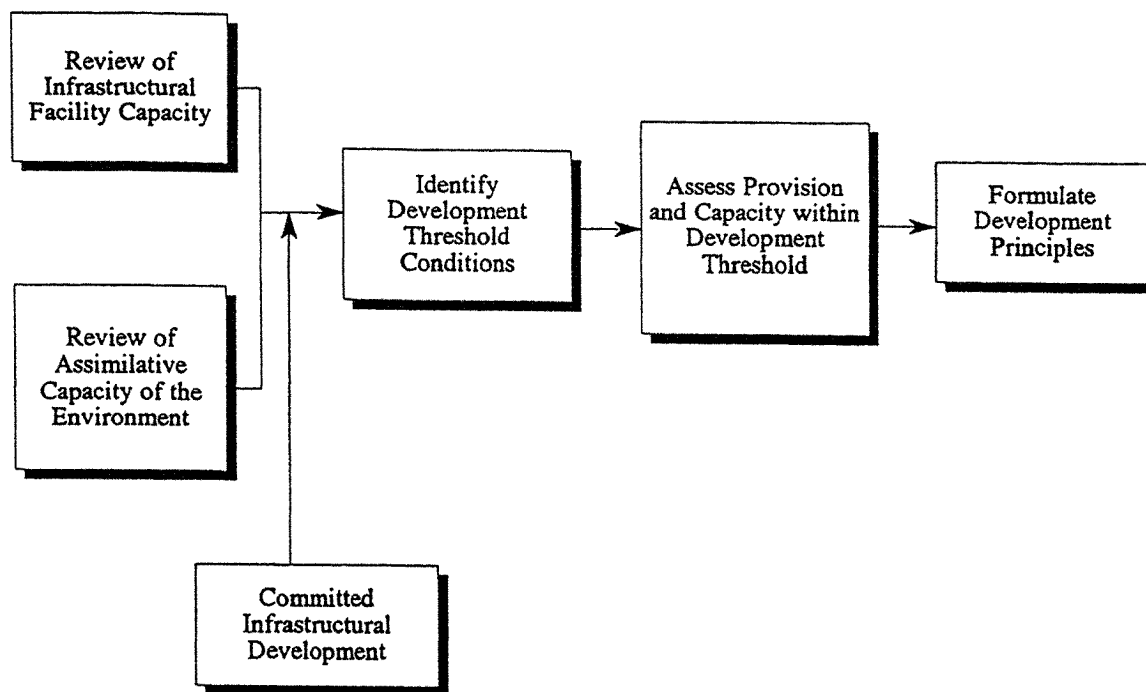


Fig. 6 The study approach to establish environmental baseline conditions.

Adoption of such objectives led to the establishment of a number of guiding principles for option formulation, as follows:

- identification of a wide choice of suitable locations that offered opportunities for creating environmentally acceptable combinations of land uses;
- assessment of the scale and type of development to be commensurate with various environmental and infrastructure thresholds;
- optimization of the use of the capacity of planned/committed infrastructure;
- establishment of preference in the greater Metro Area for relatively high-density development so as to achieve greater efficiency in the provision and utilization of infrastructure services;
- encouragement of rail-based developments to facilitate the movement of people and goods;
- the creation of new employment centres to achieve a better balance in the distribution of population and jobs, thereby helping to reduce interzonal traffic movements; and
- the upgrading and better use of areas of urban transition in the New Territories, especially in the NWNT.

STRATEGIC ENVIRONMENTAL ASSESSMENT OF OPTIONS

Armed with the above objectives and principles, the various strategic development options were evaluated by a panel using both quantifiable measures and, where necessary, the best professional judgement. Each Strategic Environmental Assessment (SEA) sought to identify environmental thresholds for individual areas and districts, to determine whether the carrying capacities could be compromised as a result of the developments proposed and to propose the nature and extent of any necessary remedial measures within the limits of available resources. At a strategic level, the evaluations permitted comparative assessments of the various development options. A critical component of the overall evaluation process was the assessment of the proposed developments at different time horizons and the implications of the proposed phasing. It may be that individual development strategies or components thereof could be made more environmentally acceptable if discrete components were to be brought on stream at different time horizons.

The SEAs examined the areas of noise, air and

water quality, waste disposal, ecology, and risks from potentially hazardous installations (PHIs), having regard to the degree of compliance with environmental planning guidelines. The process included the application of a ranking system in order to integrate variables. The noise evaluation focused on the proximity of residential areas and other sensitive receivers to proposed freight rail links and proposed trunk highways. The air quality evaluation assessed the potential capacities of airsheds and the extent to which residential areas and other environmentally sensitive uses could be adversely affected by vehicle and industrial emissions. As for water quality, the main concern was the pollution loading on receiving waters relative to assumed water quality objectives, particularly in respect of ecologically sensitive water bodies, such as Deep Bay and Tolo Harbour. Evaluations relating to solid waste disposal assessed the amount of waste production and accessibility to waste disposal facilities. Ecological evaluations examined interface impacts on significant sites, the extent of wetland depletion and coastal landform modification. As for PHIs, the evaluation was based on the number of people falling within defined consultation zones.

The final SEA for the recommended TDSR indicated that, for the long-term strategies, despite all the improvements suggested during the evaluation, there would still remain a number of environmental concerns.

Air Quality

On the basis of currently predicted trends, air quality is expected to deteriorate. Air pollution, especially from goods vehicles, is likely to exceed of the statutory Air Quality Objectives (AQOs) in some parts of the territory, even with all currently proposed pollution control measures in place. An enhanced commitment to promoting environmentally friendly modes of transport (such as rail-based and mass-transit commuting), reducing vehicle-related emissions (by such means as the implementation of a diesel-to-petrol programme, emission control regulations and stricter car maintenance schemes) and further reviews of transport/ environment policy, will be essential to finding solutions in the long term.

Traffic Noise

Traffic noise is expected to exceed the parameters

set out in the Hong Kong Planning Standards and Guidelines in many areas in the long term. Development in the NWNT is of particular concern because of increased port-related activities and the anticipated growth of associated traffic, especially in respect of cross-border movements. Measures to ameliorate traffic noise, both at-source and off-road, should be considered for major development projects at the planning stage.

Sewerage and Water Quality

Sewerage and water quality issues are of considerable concern. Planned sewerage infrastructure is expected to be overloaded, particularly in the NWNT, NENT and the Metro Area, emphasising the need to accelerate the implementation and upgrading of sewerage reticulation and treatment plans. While in theory it may be possible to expand the existing and planned sewage infrastructure to keep pace with proposed development, the feasibility of achieving such improvements needs to be further studied as a matter of priority.

Solid Waste

A substantial concern arises in connection with the disposal of solid waste, as waste generation rates are forecast to exceed previous estimates by a substantial margin. For a worst case scenario, the life spans of existing and planned landfills are predicted to diminish substantially. Measures to reduce demand need and to find suitable, alternative means of disposal (such as a waste-to-energy plant) need to be pursued as a matter of urgency. The current strategic waste disposal strategy would also need to be reviewed, having regard to possible wider regional solutions.

Ecology

The potential loss of habitat and the destruction of fragile ecosystems is of considerable concern. Areas of ecological value that are most vulnerable include the Special Areas, Country Parks, Marine Reserves, Marine Parks, Mirs Bay, Tolo Harbour, Mai Po Marshes and Deep Bay. In order to protect such areas, a concerted effort will be required by the authorities in Hong Kong and their counterparts in neighbouring cross-border areas to establish an ecological baseline and conservation strategy to

enable balanced decisions to be made on the effects of development in ecologically important areas.

SUSTAINABLE DEVELOPMENT

A substantive and growing point of concern is the long term sustainability, in economic, social and environmental terms, of Hong Kong's development path. Much of our growth is generated by 'external' factors, especially immigration and the growth of Hong Kong as a hub port.

One view as to which path to follow comes from the proponents of growth who measure success by the rate and scale of economic development, even if that might mean accepting some lower standards in other fields. Others, more oriented towards demand management, measure success by the degree to which the quality of life in social and environmental terms can be enhanced, even if that might mean sacrificing some measure of economic gain. Clearly, it would not be practical to assume either extreme view. There is a need to strike a balance in response to continually changing conditions with respect to the principal components that collectively contribute to the welfare of society, namely: *the promotion of acceptable forms of economic development, the fulfilment of social needs and the achievement, protection and maintenance of satisfactory environmental conditions.* To that end, a need is seen to investigate how the processes of government might be improved to create a better system of corporate decision making to achieve objectives in all three fields so as to guide development along a more sustainable path.

Accordingly, a unique study has been launched under the title of SUSDEV21, or Sustainable Development for the 21st Century. In broad terms, this study will:

- define what 'sustainability' should mean for Hong Kong;
- develop guiding values, sustainability indicators and criteria covering the economic, social and environmental objectives of our society;
- conduct economic, social and environmental baseline studies for the territory;
- develop proposals for a user-friendly, 'sustainable development system' that could be applied on a corporate basis to provide a means by which policies, resource allocation, planning, programming and the implementation of works could be

developed, applied and monitored on a coordinated basis;

- test and refine the sustainability indicators, criteria and sustainability system using the latest TDSR as a reference;
- seek guidance from the government at certain key stages of the study to identify policy and/or institutional areas that may need to be improved so as to facilitate more informed and balanced decision-making on issues related to sustainable development; and
- achieve the widest possible public participation throughout the study process, and call the community's attention to the importance of sustainable development.

SUSDEV21 will, without question, be a challenging study, the final outcome of which cannot be predicted at this stage. It will have to take account of conditions both in Hong Kong and in adjoining areas of South China, especially in the PRD. It will require new initiatives to involve a broad range of stakeholders in both the public and private sectors, as well as the community at large. The study has been structured to produce outputs by stages over a period of about 30 months, during which period it will be necessary to continue to move forward with plans and programmes to satisfy the growing needs of society. At the same time, however, it will be essential that our country parks, marine parks and other areas of high landscape and ecological value continue to be given the fullest possible protection both for their own intrinsic worth and as an essential recreational amenity for the enjoyment of city dwellers.

CONCLUSION

There can be no turning away from the economic, social and environmental pressures that Hong Kong will have to face in the future, given that many such pressures arise from external circumstances. There is therefore a need for a robust strategic development framework that provides a long-range view of new directions of endeavour but also gives a sharp focus on getting things done effectively within a shorter time horizon. To that end, the TDSR sets out some new insights and guidelines that now need to be carried forward through the formulation and implementation of more detailed plans and programmes. How successfully this can be achieved will depend,

among other things, on the way in which corporate decisions are taken to coordinate the deployment of resources in a way that helps achieve a sustainable pattern of development. In the process, we will need to maintain a balanced stance with regards to the

interests of the main stakeholders. That, in turn, will make it necessary to monitor new trends to provide an ongoing basis for periodic adjustments to strategic development plans, always taking account of wider regional perspectives.

REFERENCES

- Hong Kong Government. 1996. *Hong Kong 1996*. Hong Kong: Hong Kong Government.
- Planning Department. 1995–1996. *The Final Technical Report on Territorial Development Strategy Review*. Parts 1 & 2, 1995. Part 3, 1996. Hong Kong: Hong Kong Government.
- Planning Department. 1993. *Territorial Development Strategy Review: Environmental Baseline Conditions*. Hong Kong: Hong Kong Government. July, 1993.
- Planning Department. 1991. *Metroplan*. Hong Kong: Hong Kong Government. Nov. 1991.

A Vision for Hong Kong's Future With Regard to Land Use: Sustainable Urban Living in the 21st Century

Christine Kung-wai Loh

ABSTRACT

Hong Kong provides a good example of the extraordinary speed of urban growth that is taking place in many cities around the world. Like other cities, Hong Kong must find its own balance between economic growth, infrastructure development and the quality of life of its people. With its small geographical size, physical compactness, level of sophistication and wealth, Hong Kong has the capacity to become a leader in exploring sustainable urban living for the 21st century if it aspires to take on that role.

Keywords: urban growth, Hong Kong, sustainable urban living, twenty-first century

INTRODUCTION

Hong Kong's population exploded from about 1.6 million in 1946, just after World War II, to 2.36 million by the end of the 1950s as refugees from China poured into Hong Kong to escape famine and revolution. By the end of the 1960s, the population had reached just over 4 million. Although China's economic reforms in the late 1970s have improved the standard of living on the mainland, particularly in the major cities and coastal areas, Hong Kong remains a powerful draw for migrants. The territory's population grew to over 5 million by 1980, and today, Hong Kong's population stands at approximately 6.2 million (Table 1).

Hong Kong is one of the world's great trading cities, famous for its enthusiastic, 'can do' entrepreneurial spirit. It has the freest economy in the world, and its open economic system has enabled it to become the crossroads for the Chinese speaking world,

as well as a business meeting point between East and West. Millions of people come to this tiny but incredibly busy city to do business, invest, bank, renew family and social ties, to shop and play. Thus, not only is the city an economic magnet, but it has also become a social interchange among the Chinese speaking communities from around the world, as well as a cultural centre with distinctive Cantonese pride.

The high rate of population growth has put severe demands on Hong Kong to provide adequate housing, facilities and services for its people. The Hong Kong Government acknowledges that: 'The pressure on Hong Kong's environment is intense. Pressure on the environment comes from people and what they do at home, at work and at play' (EPD, 1996). Furthermore, the small size of Hong Kong has resulted in the city expanding vertically, with a residential density of 1,000 people per hectare, the highest in the world (EPD, 1996).

Christine Kung-wai Loh, Legislative Councillor, Central Government Offices, West Wing, 11 Ice House Street, Central, Hong Kong. Tel: (852) 2537-2485, Fax: (852) 2537-6937. Email: cloh@hknet.com

Table 1
Population and Vital Statistics 1975–1995

Year	Estimated Population	Growth Rate (%)
1975	4,429,200	1.8
1976	4,476,300	1.1
1977	4,559,100	1.5
1978	4,702,900	1.9
1979	4,989,500	6.1
1980	5,119,800	3.3
1981	5,238,500	2.4
1982	5,319,500	1.6
1983	5,345,100	1.5
1984	5,397,000	1.0
1985	5,456,200	1.1
1986	5,524,600	1.3
1987	5,580,500	1.0
1988	5,627,600	0.8
1989	5,686,200	1.0
1990	5,704,500	0.3
1991	5,754,800	0.9
1992	5,811,500	1.0
1993	5,919,000	1.8
1994	6,061,400	1.2
1995	6,189,800	2.1

Sources: Hong Kong Annual Digest of Statistics 1986, 1992, 1993, 1994, 1995, 1996.

This pressure is not expected to ease. The Hong Kong Government estimates that by 2006, the population is expected to increase to 7.3 million and by 2011, the population could reach 8.1 million. These numbers are based on the likelihood that mainland migration will continue at the present rate of 150 legal migrants per day, and also that a certain number of Hong Kong people who have emigrated abroad would return to live and work in the territory.

TERRITORIAL DEVELOPMENT STRATEGY REVIEW 1996

In order to cope with demands for land and facilities, the Hong Kong Government plans to reclaim a substantial part of Victoria Harbour and other areas, as it explains in the *Territorial Development Strategy Review 1996* (TDSR'96). If the Hong Kong government's extensive reclamation plans are fully implemented, the territory's famous harbour will be reduced to approximately one half of its original size in the 1800s and turn Victoria Harbour into a sea channel, with the narrowest point only 860 metres wide at Kowloon Point (Figure 1 and Table 2).

Table 2
Proposed Reclamation Areas in TDSR'96

Central/Wan Chai	Area : 78 hectares
Kowloon Bay	Area : 300 hectares
Kowloon Point	Area : 48 hectares
Green Island	Area : 186 hectares
Tsim Sha Tsui East (TST East)	Area : 6 hectares
Tsuen Wan	Area : 30 hectares
Total :	648 hectares

Sources: HKIA Study, SPH Response and Petition to Governor-in-Council.

The official plan is seen by many as too heavily, and unnecessarily, based on harbour reclamation. An alternative plan to develop the New Territories was seen as requiring longer lead-time prior to development 'due to (the) need for comprehensive feasibility studies' and the fact that 'assembly of land of fragmented ownership' is 'difficult, time consuming and costly' (TDSR'96 Consultative Digest). However, no official explanation is given as to why plans were not considered earlier to explore developing the New Territories. The harbour-biased option is promoted as a more speedy option because 'harbour reclamation areas are either covered by detailed feasibility studies or are currently subject to such investigations' (TDSR'96 Consultative Digest). In view of the Hong Kong Government's own reasons for the relative advantages and disadvantages of the two development options, it is hard to see that the New Territories-biased option was ever seriously considered.

One explanation of why harbour reclamation is favoured is that the Port and Airport Development Strategy (PADS) involving the construction of a new airport at Chek Lap Kok to replace Kai Tak Airport in Kowloon has already created the transport infrastructure on the western side of the New Territories and West Kowloon, thereby making it attractive to consider reclaiming Kowloon Point, and Kowloon Bay once Kai Tak closes. The Green Island Reclamation would allow a bridge to be built to link it to Lantau Island once a series of container terminals are completed.

The Hong Kong Government's latest reclamation plans met with unprecedented opposition, articulated in an unusually loud, public and united voice from professional groups including architects,

planners, landscape specialists, engineers and pilot-age professionals, as well as academics, environmentalists, politicians and even real estate developers. The Hong Kong Institute of Architects (HKIA) produced its own *Alternative Harbour Reclamation Study* in June 1996. The Society for Protection of the Harbour (SPH) built on that study and published *A Response to 'Territorial Development Strategy Review 1996': Option for a Minimum Harbour Reclamation and a Balanced NT Development Pattern* in December 1996. SPH also collected 150,000 signatures from members of the public which it presented on 30 December 1996 to the Governor-in-Council — Hong Kong's highest executive decision-making body — as a petition to stop further harbour reclamation.

Both HKIA and SPH use the Hong Kong Government's population assumptions as their base. Both organizations recommend that:

- Central-Wanchai Reclamation Projects be substantially reduced and replanned to retain a curvilinear waterfront;
- Kowloon Bay Reclamation Project be substantially reduced in order to preserve a sizable body of water in the harbour;
- Kowloon Point Reclamation Project be dropped altogether because it is unnecessary and aesthetically damaging; and
- Green Island Reclamation be substituted for other land based option and design solutions rather than to destroy the channel which serves as a western gateway to the harbour.

In order to understand the Hong Kong Government's enthusiasm for reclamation, it should also be seen in context of how it can eventually contribute to government revenue. The Hong Kong Government derives a major proportion of its revenue from land, including property rates and taxes, stamp duties, lease modifications, and premium on new land, such as that created by reclamation. As such, it has a vested interest in creating new prime site properties (Ng and Cook, 1996). Despite the sustained public discomfort with further harbour reclamation, the Hong Kong Government's new pitch is to argue for a 'balanced' New Territories and harbour reclamation strategy, but in effect, the amount of reclamation is likely to be only slightly reduced to placate opponents.

AN OUTDATED PLANNING PROCESS

Reclamation of the harbour is governed by the Fore-shore and Sea-bed (Reclamations) Ordinance. The procedure to reclaim only requires the Director of Lands to make a proposal for reclamation and for the Governor-in-Council to authorize it. No public consultation is required by law, and only persons claiming to have an interest and entitled to compensation may lodge an objection. The Hong Kong Government's reclamation plans do not require approval from the Town Planning Board which is only concerned with the use of land after it has been reclaimed.

As the decision for reclamation requires no approval from any public body, any information which the Hong Kong Government provides is at its discretion. The original *Territorial Development Strategy 1984* laid out a framework for urban growth. The *1993 Territorial Development Strategy Review — Development Options* presented potential development paths over the long term (up to 2011) and the medium term (up to 2006). The outcome of the 1993 review was presented in the TDSR'96, and a *Territorial Development Strategy Review Executive Report* is expected in 1997 'to set out a selected framework' (PELB Consultative Digest). This series of documents would be impressive if it were not for the fact that the Hong Kong Government has effectively already selected its preferred framework. These documents are used more as propaganda and ways to justify decisions rather than to lay out development options for genuine public discussion.

For example, misleading information was given in the TDSR'96 Consultative Digest. Plan 1 (Figure 1), which was prepared by the Planning Department, was not produced in the Digest. Instead, an outdated 1984 plan showing fewer reclamation projects was published (Figure 2). Further, the public was asked questions which were impossible for any meaningful answers to be given. For example, on page 83 of the Digest, in a section headed 'Your Views Are Welcome', these questions were put:

On Land Use Issues

- Do the strategic development principles we have assumed seem reasonable?
- What policy and institutional measures might be worth considering to encourage a higher level of decentralisation of jobs from the Metro Area?
- Has a reasonably balanced view been taken of the relative merits for the options for a Medium-Term Strategy?

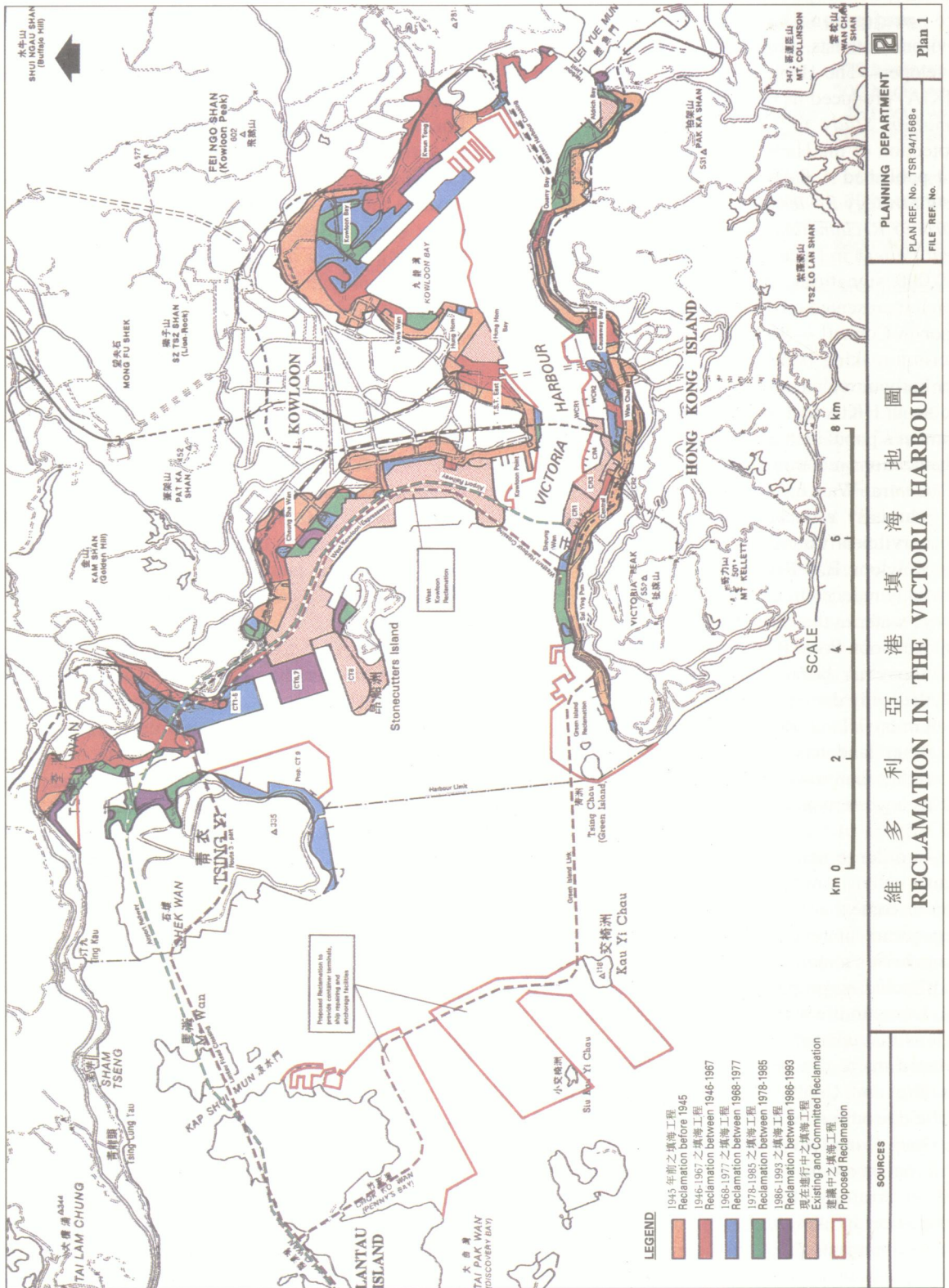


Fig. 1 Plan 1.

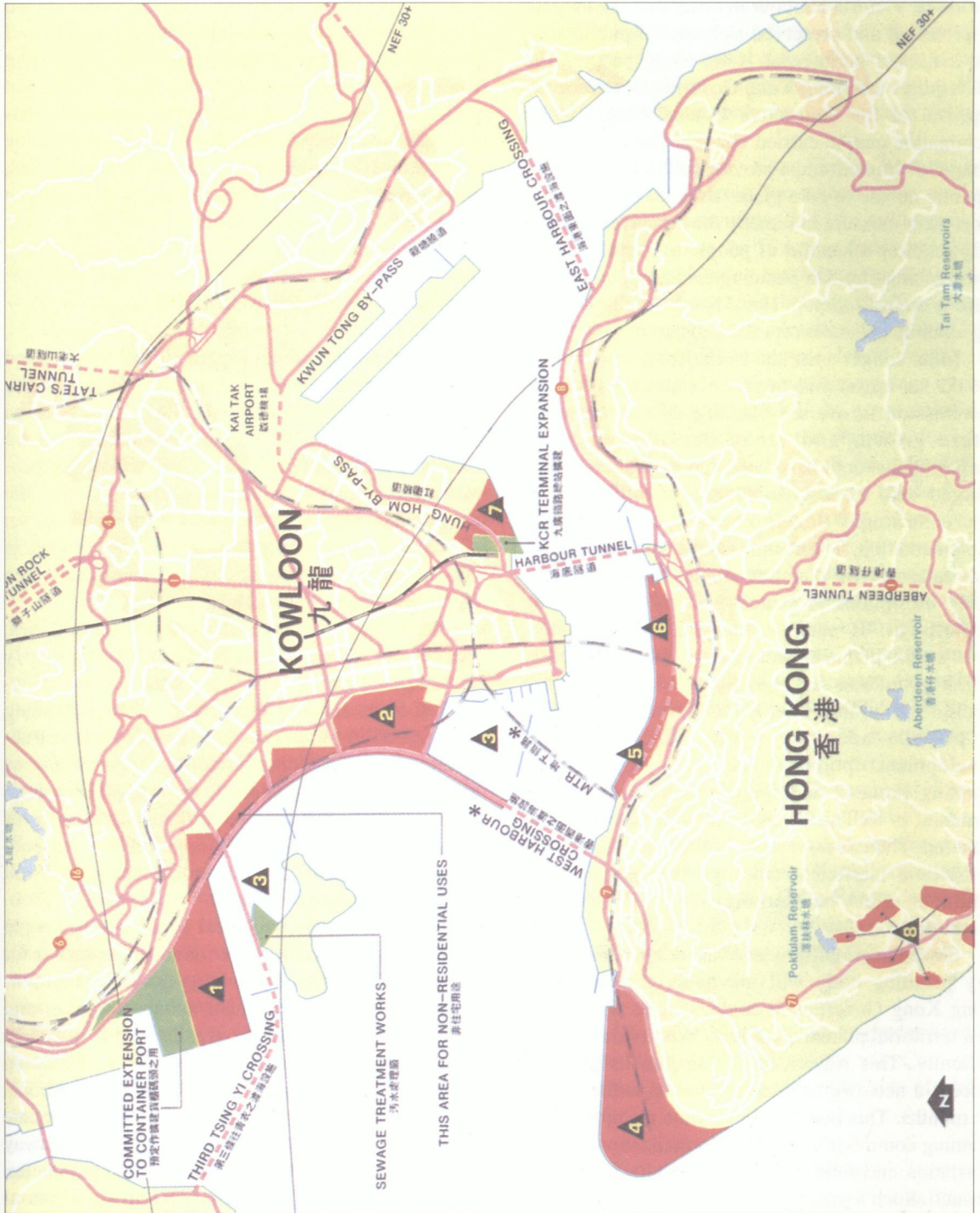


Fig. 2 1984 plan.

In December 1996, I raised *The Protection of the Harbour Bill* in the Legislative Council. The bill provides for a statutory presumption against reclamation in Victoria Harbour in order that the harbour be protected and preserved as a special public asset and a natural heritage of Hong Kong people. The bill requires the Hong Kong Government to seek the approval of the Legislative Council before major reclamation can be carried out. This way, the Hong Kong Government must provide full information for a public debate to take place. I regard this Bill as a short-term measure to remedy the current law which only requires a handful of people to decide on harbour reclamation. On planning decisions, at present, there is no institution in Hong Kong capable of forcing a public debate except the legislature.

In the longer term, the Hong Kong Government should set-up an independent, statutory Planning Commission to oversee planning of the territory's future growth and urban development. The commission should have wide representation and be charged with the duty to examine the direction of future strategic development and monitor its implementation. The commission should be able to undertake its own planning studies rather than rely solely on options presented to it by the Planning Department. If such a planning body existed, government planners would have to work closely with it in order to secure approval of its plans. That would result in the Hong Kong Government having to provide adequate public information on development options at the early stages of the planning process, and for professional experts to comment as well as for public input to be effectively gathered. There is no reason for the planning process to become inefficient since government planners would in effect be working in tandem with the community.

Since the establishment of an independent, statutory planning body will inevitably take time, the Hong Kong Government could, if it so wished, set up a territorial planning advisory body without much difficulty. This way, it can bring into its planning process a network of interests and expertise within six months. This body could become the provisional planning commission, pending formalization through legislation and funding approval by the Legislative Council. Such a process was successfully used when the Hong Kong Government set up a provisional Arts Development Council before the formal establishment of the full council two years later.

The degree of sustained opposition to harbour reclamation probably surprised the Hong Kong Government, which is not used to its development plans being challenged by such a broad-based constituency. Perhaps the very vocal and professionally argued objection indicates that Hong Kong people are becoming more interested in and politically aware of public decision-making. This experience is likely to have a profound effect on the Hong Kong Government's outdated, colonial-styled, paternalistic planning process involving only a handful of government officials.

MORE THAN ROOF AND RICE

The wide public attention paid to reclamation and the TDSR'96 is a good occasion for Hong Kong to gain a deeper understanding of the urban challenge facing the community, and the opportunities that are available for finding the best solutions to offer people security and comfort without destroying the environment. In order to do so, there must be an active civic partnership and governance aimed at enriching the potentials of city life; an aspect which the TDSR'96 does not address.

Hong Kong is one of the world's richest cities. Per capita Gross Domestic Product is nearly US\$24,000 (higher than that of the United Kingdom, Canada and Australia), with reserves standing at over US\$50 billion. The city has good infrastructure facilities, including educational institutions, as well as a strong regulatory framework. There is no reason for Hong Kong not to be a proud home of human civilization, offering opportunities for economic, social, political, educational, cultural as well as environmental excellence.

In the Hong Kong context of the 1990s, people expect city planning to cater for adequate shelter for its people in terms of providing not only the minimum living space, but also adequate space, and privacy, proper structural stability with adequate lighting and ventilation, infrastructure for sanitation and waste management, within secure neighbourhoods at affordable prices. People want adequate recreational facilities and open spaces to get away from city stress. A key problem with fast population increases in an already very dense living environment is that quality of life could be severely compromised for everyone. Imaginative and bold solutions are called for.

A CHANGE IN ATTITUDE — NOW

When working under such pressure, it is tempting for the Hong Kong Government to opt for reactive solutions to problems rather than to plan for the future while abiding by a set of clear guiding values. It is encouraging that the Hong Kong Government is embarking on a *Study on Sustainable Development for the 21st Century* (SUSDEV21) in order 'to identify a set of values that reflect the beliefs and concepts important to society and its people ... such values should represent the essence of a sustainable society and should be at the core of decision-making to integrate economic, social and environmental policies, plans and programmes' (Planning Dept., 1996). However, SUSDEV21 is expected to take 30 months to complete (mid-1999) and its results may be too general to have immediate impact on policy. In the meantime, if the Hong Kong government is to push ahead with the full implementation of the TDSR'96, the city could end up with little left to develop in the future, irreversible damage to the environment, reduced biological diversity, and perhaps not a very pleasant place for human habitation.

The Hong Kong Government's development vision is based on vast reclamation, and the development of container terminals and related facilities. This vision brings with it worsening pollution as opting for more container terminals will increase the number of diesel driven container trucks on the road. According to the Hong Kong Government's own estimates, the number of such trucks could increase a staggering 564% by the year 2011 (Transport Branch, 1993). The TDSR'96 Consolidated Technical Report acknowledges that its overall territorial development plans will result in the statutory Air Quality Objectives being exceeded. Furthermore, 'traffic noise in both the urban areas and the New Territories is expected to exceed the Hong Kong Planning Standards and Guidelines requirements,' thereby increasing noise in a city which is already 'dubbed as the noisiest city in the world' (EPD, 1996). The bad news continues: 'planned sewerage infrastructure would be overloaded in many areas ... and water quality objectives will probably be unachievable,' and 'the proposed scale of development ... have the potential to adversely impact ecologically valuable habitats' (TDSR'96 Consolidated Technical Report).

It is irresponsible for the Hong Kong Govern-

ment to push ahead with these plans as it has neither determined the possible health effects for Hong Kong's people nor the potential loss of biodiversity. Indeed, government planners should also present alternative development options rather than propose growth projections based essentially on container terminal development, implying therefore that Hong Kong's growth can only be tied to such developments.

Although the Hong Kong Government has been voluntarily carrying out for several years environmental impact assessments (EIA) for public projects, its attitude is to use the EIA process as mitigation, rather than as a planning tool. Now that the groundbreaking Environmental Impact Assessment Ordinance has been passed by the Legislative Council, the Hong Kong Government should integrate the EIA process into the earliest planning stage in order for it to be truly meaningful. If the government does not use the EIA process for the purposes for which it is intended, it will inhibit itself from finding the best solutions and continue its bias on physical infrastructure development as a key source of growth.

The Hong Kong Government should carry out SUSDEV21 with due speed, but it should also be ready to allow a degree of flexibility in its policy-making and planning *now* so as to make room for more creative thinking about city planning, and for there to be an opportunity to correct the reclamation/container terminal bias in the TDSR'96. In any event, the TDSR'96 is deficient in another way in that it offers no indication for development after 2011. Since the Hong Kong Government does not have a long-term view as yet, it should take the opportunity to pause and reconsider its direction for development. To view Hong Kong's development as part of the Pearl River Delta Region as a whole presents many exciting possibilities.

I suggest that the Hong Kong Government consider:

- How the city of Hong Kong might 'expand' by exploring special arrangements with Chinese authorities to use land on the other side of China's border.

Such an idea may have been unthinkable before, but as Hong Kong becomes a part of China and the main centre for the Pearl River Delta region, it would be sensible to plan properly for the whole of this southern Chinese metropolis-in-the-making. Such an

expansion into Hong Kong's natural hinterland could relieve the pressure to reclaim Victoria Harbour and also avoid other social and environmental problems related to over-population. Proper planning for the whole area will also allow for better natural resource management as well as conservation. While acknowledging the importance of regional development, the TDSR'96 is non-explicit about the possibilities of joint planning between Hong Kong and the Pearl River Delta region.

Perhaps it is politically incorrect for the Hong Kong Government to even hint at such an idea while the territory is still under British rule, but the logic and necessity of collaborative planning in the future is inescapable. Thus to insist, as the TDSR'96 does, that Hong Kong's population pressure is best relieved by harbour reclamation is myopic; and the wisdom that Hong Kong must develop more container terminals even though it has already ran out of land is suspect. There is land for development on the mainland.

- To complement SUSDEV21 by requiring relevant government departments to submit proposals on how to develop and implement:
 1. Energy/water conservation and efficient usage
 2. Constructing buildings in more resource efficient ways
 3. Coastal management to conserve marine resources
 4. Expanding country parks and preserving areas of special ecological value

The time between commissioning of SUSDEV21 and the adoption of a sustainable development policy could be several years. The intervening time should not be wasted. It is obvious that a number of government departments will be key in developing new policies. They should be asked to carry out studies now in areas where they know will require attention. For example, Hong Kong must have a comprehensive conservation policy which covers the use of natural resources, including energy and water, as well as preserving biodiversity. Furthermore, the Agricultural and Fisheries Department can already be working on establishing a detailed database

on ecosystem representation, developing a long-term, comprehensive coastal management plan and public education programme, as well as better protection of terrestrial habitats.

It is hoped that SUSDEV21 will lead the Hong Kong Government to adopt a new organizational approach to decision making. At present, decision making and implementation in housing, public health, the environment, public parks, transport, electricity, water, waste disposal, sewage and education are all compartmentalized within departments and public bodies with limited links with one another. The vertically integrated structure is a barrier to cross-departmental and cross-disciplinary fertilization of knowledge and ideas. Government departments must collaborate much more in order to find solutions to the challenge of high density sustainable urban living.

CONCLUSION: SUSTAINABLE URBAN LIVING IN THE 21ST CENTURY

Making living in Hong Kong an enjoyable experience is one of the great tasks ahead. Territorial and town planning must give full consideration to how people can feel more secure in their neighbourhoods, live in a clean, healthy and comfortable environment, how institutions such as schools, housing, policing and public spaces can work in tandem, and also how to take into account the other forms of life that inhabit our natural surroundings. Rather than wholesale development, such as extensive harbour reclamation, Hong Kong needs to keep and renew its built-in natural inheritance.

Hong Kong may have been a refugee city once, but now it has its own distinctive identity and its sense of place must be reinforced rather than depleted with insensitive development. Since territorial and town planning affects the entire community, the decision-making processes involved must provide meaningful channels and opportunities for public participation, as is the right of citizens in a modern society. With a sense of identity comes pride, and with pride comes a sense of ownership which needs to be acknowledged in policy making.

REFERENCES

- Census and Statistics Department. *Hong Kong Annual Digest of Statistics 1996*. Hong Kong: Government Printer.
- EPD (Environmental Protection Department). *Environment Hong Kong 1996*. Hong Kong: Government Printer.
- Environmental Impact Assessment Ordinance, Cap. 499.
- Planning Department. *Plan I: Reclamation in the Victoria Harbour*. Plan Ref.No. TSR 94/1568.
- Planning Department. *Territorial Development Strategy 1984, Territorial Development Strategy Review — Development Options 1993; Territorial Development Strategy Review 1996*; Hong Kong: Government Printer.
- Planning, Environment and Lands Branch. *A Consultative Digest: Territorial Development Strategy Review'96*. Hong Kong: Government Printer.
- Planning, Environment and Lands Branch. *Consolidated Technical Report on the Territorial Development Strategy'96*. Hong Kong: Government Printer.
- Planning Department. *Brief for Study on Sustainable Development for the 21st Century*. September 1996.
- Society for Protection of the Harbour (SPH). *A Response to 'Territorial Development Strategy Review'96': Option for a Minimum Harbour Reclamation and a Balanced NT Development Pattern*. December 1996.
- The Hong Kong Institute of Architects (HKIA). *Alternative Harbour Reclamation Study*. June 1996.
- Transport Branch. *Railway Development Study*. May 1993.
- Ng, Mee Kam and Cook, Alison. *Are there feasible alternatives to the reclamation-led urban development strategy in Hong Kong?* Centre of Urban Planning and Environmental Management, The University of Hong Kong. Occasional Paper No. 132 June 1996.

Conserving Hong Kong's Biodiversity

Cho Nam Ng

ABSTRACT

With its urban population confined to only about 15% of the land area, Hong Kong provides a wide variety of natural habitats which sustain a highly diverse flora and fauna. However, increasing population levels, redevelopment of previously agricultural areas, the extensive recreational use of the country parks, and other factors continue to put considerable stress on the natural environment. Government policies to protect flora and fauna, while quite valuable, are deficient in many ways, particularly in coping with the rapid changes Hong Kong has been undergoing and is likely to experience in the future. A far more integrated and comprehensive management approach is needed if Hong Kong's natural environment is to survive in anything like its present form.

Keywords: Hong Kong, nature conservation, biodiversity, wildlife

INTRODUCTION

Given Hong Kong's reputation as a high-density city, many people often ask if Hong Kong has a natural environment. In fact, Hong Kong sustains a wide variety of fauna and flora (Table 1), despite years of intense economic development which has increasingly confined the territory's biodiversity within geographic limits. Today, Hong Kong has more wild plant and animal species than the whole of Britain (Dudgeon and Corlett, 1994), and new species are continually being discovered. For example, an ongoing biodiversity survey being conducted by a team of researchers from the University of Hong Kong added 52 species of plants new to Hong Kong in the first nine months of the study (Holland, 1996).

A remarkable number of the animal species recorded are endemic to the territory, e.g. the Hong Kong Cascade Frog *Amolops hongkongensis*, Romer's Tree Frog *Philautus romeri*, mangrove crab *Chiromanthes maipoensis*, and the lizard *Didamus*

Table 1
Approximate numbers of wild species in selected plant and animal groups in Hong Kong (Ashworth et al 1993; WWFHK 1994).

Groups	Approximate number of species	Approximate % of global total (recorded species)
mammals	57	1%
(bats)	21	2%
birds	422	5%
reptiles	78	1%
amphibians	23	0.5%
freshwater fish	96	
flowering plants	1900 (including 120 orchids)	0.8%
moths	2000	
butterflies	200	
dragonflies	100	

Cho Nam Ng, Associate Professor, Department of Physics & Materials Science, City University of Hong Kong, Tat Chee Avenue, Kowloon, Hong Kong. Tel: (852) 2788-7821 Fax: (852) 2788-7830. Email: apcnng@cityu.edu.hk

Bogadeki. A number of plant species considered rare or endangered in China (and globally) are found in Hong Kong, e.g. the Hong Kong Breadfruit *Artocarpus hypargyrea*, Hairy Chestnut *Castanopsis concinna*, Keteleeria *Keteleeria fortunei*, and several species of Camellia and orchids (WWFHK, 1994). Hong Kong also supports a number of globally rare and endangered bird species, notably the Black-faced Spoonbill, of whose global population 16% winters in the Mai Po Marshes and Inner Deep Bay area (Aspinwall, 1996). Much of Hong Kong's diversity is due to the variety of habitats created by its geographical position, complex terrain and seasonal variation (Dudgeon and Corlett, 1994). The existence of large tracts of protected land and associated conservation measures also help many terrestrial species to survive in such an urban and congested place.

One of Hong Kong's most important wildlife conservation sites is the Mai Po Marshes and the surrounding Inner Deep Bay area. The mudflats, *gei wai* (shrimp ponds) and dwarf mangroves in the area provide a rich habitat, particularly for migratory and resident birds. Some 300 species of birds have been observed here; 13 of them are globally threatened species and five have important populations in Deep Bay. Over the 1990–94 period, the area supported an average of 50,000 waterfowls in mid-winter; in January 1996 that figure reached 68,000. As a result, and after years of active lobbying by green groups and conservationists, some 1500 hectares of the Mai Po wetlands were listed as a 'Wetland of International Importance Especially as Waterfowl Habitat' under the Ramsar Convention in September 1995 (Aspinwall, 1996).

THE THREATS

As hunting and trapping of wildlife seem to have declined during the last decade, habitat loss resulted from urbanization and infrastructure development has become the main threat to the biodiversity of Hong Kong. For example, the massive development of Chek Lap Kok and Lantau Island associated with the new port and airport construction has destroyed one of the principal habitats for the endemic Romer's Tree Frogs (Greiner, 1991), and affected the streams at Tai Ho and Tung Chung which support unusually high fish diversity — 47 and 23 species, respectively, including some threatened fishes (Dudgeon and Corlett, 1994).

An increase in the standard of living and in the population's mobility, due to improved road and transport systems and wider car ownership, have also encouraged people to live in areas considered too remote a decade or two ago. This recent movement of population and the associated amenities to previously rural areas has exerted considerable development pressure on our diminishing wildlife habitats.

GOVERNMENT POLICY AND LEGAL FRAMEWORK

The government's policy on conservation, broadly, is 'to conserve and enhance our natural environment by protecting existing conservation areas and heritage features, by identifying new areas for such conservation, and by compensating for areas which merit conservation but which are inevitably lost to essential development projects.' (PELB, 1993)

The mechanism for protection of Hong Kong's diverse fauna and flora relies principally on the existing Country Parks system. The Country Parks Ordinance enacted in 1976 provides the legal framework for the designation, protection and management of Country Parks and Special Areas. Today, Hong Kong has established 21 Country Parks and 14 Special Areas, and together they cover 41,474 hectares (Hong Kong Government, 1996), or about 40% of the total land area — this is one of the highest in the world in terms of percentage coverage (World Resources Institute, 1992). However, it is important to point out that the Country Parks are managed for multiple functions, namely recreation, education and conservation (Thrower, 1984); therefore they should be classified in the more general category of Protected Landscape (category V) in the IUCN classification system for Protected Areas (IUCN 1990). The 14 Special Areas and the two Restricted Areas at Mai Po Marshes and Yim Tso Ha Egrettry are, however, qualified as Managed Nature Reserve/Wildlife Sanctuary (category IV) for their preponderant conservation function. Together they occupy only about 2% of the total land area of Hong Kong; this figure is lower than the average for developed countries (World Resources Institute, 1992).

Following the enactment of the Marine Parks Ordinance (Chapter 476) in mid-1995, the first sites at Hoi Ha Wan Marine Park, Yan Chau Tong Marine Park and the Cape D'Aguilar Marine Reserve

were designated a year later. This marks a very important step in the conservation of Hong Kong's marine environment.

Apart from the Country Parks and Marine Parks Ordinances, several ordinances related to the conservation of flora and fauna are in force in Hong Kong. The Wild Animals Protection Ordinance (Chapter 170) prohibits hunting, possession or sale of listed wild animals. It also restricts access to designated wildlife reserves including the Mai Po Marshes and the Yim Tso Ha Egretty. The Forest and Countryside Ordinance (Chapter 96) protects forests, plantations, and natural vegetation on government land from fire and physical damage, and prohibits cutting, felling, damaging or possession of listed protected plants, which amount to 27 species. The import, export and possession of endangered species of animals and plants listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is subjected to strict licensing control under the Animal and Plant Protection of Endangered Species Ordinance (Chapter 187).

In terms of planning control, the Town Planning Ordinance (Chapter 131) enables the preparation of statutory plans delineating areas as conservation zones such as Site of Special Scientific Interests (SSSIs), greenbelts, coastal protection areas and conservation areas. In such conservation zones, developments are restricted and controlled in accordance with the outline zoning plans. The recently enacted Environmental Impacts Assessment (EIA) Ordinance requires major development projects to carry out an EIA process in order to predict, assess and mitigate the project's possible environmental consequences.

DEFICIENCY OF THE PRESENT COUNTRY PARKS SYSTEM

As far as conservation is concerned, the existing Country Parks system does not provide protection for all Hong Kong's wildlife and their habitats. The existing Country Parks and Special Areas consist largely of steep hillside and ridges, usually excluding the areas around villages. As a result, some ecologically important sites such as lowland rivers, fresh water marshes and *fung shui* woods are not protected. Government has to rely on other rather indirect means, such as planning controls or the EIA

process, to limit undesirable development at those sites.

Sha Lo Tung, a small upland valley near Tai Po and surrounded by Pat Sin Leng Country Park, is an example. A total of 68 species of dragonfly have been recorded so far in the valley, including one species new to science and nine rare species. This makes the site an internationally important site for the conservation of dragonflies (AXIS, 1995). However Sha Lo Tung has been threatened by a proposed private development for golf course and luxury houses since the early 1980s. As there was no statutory planning control on the land use in the valley, the EIA process became effectively the only device to limit and mitigate environmental impacts caused by the proposed development.

In view of the exceptional importance of Sha Lo Tung, the Advisory Council on the Environment concluded that the impact of the development was not acceptable and thus the council did not endorse the EIA report in December 1996. The development has been postponed for the time being, but the valley is still not secure for wildlife as local inhabitants are in strong support of the development and there is presently no long-term strategy for the protection of the valley. This latter point also highlights the limitations of the EIA process as a proactive means for wildlife conservation.

A relatively minor extension of the Country Parks' boundaries to include the most ecologically significant sites could solve the problem in Sha Lo Tung, but the government seems reluctant to take any action, particularly that which might involve resumption of private land. There appear to be two main reasons: firstly, resumption action would mean the government taking away the property rights of the landowners which would require legally defensible justifications; and secondly, there is no precedent in Hong Kong for resuming private land for the purposes of conservation.

The lack of sufficient funding and resources from the Government is also a major problem in the management of existing Country Parks and Special Areas. In the 1996-97 fiscal year, the government has allocated only \$218 million to the Country Parks which amounts to about 53 cents per square metre per year. The figure is criticized by conservationists as being far too low for carrying out any effective conservation measures (Walker, 1997). For the same reason of limited resources, the progress of designation of new country parks has been extremely slow,

even though the government has already identified 14 potential sites in the territory (Hong Kong Government, 1996).

THE CHALLENGE

The trend of intense and rapid development in Hong Kong is unlikely to abate in the next decade or so, as is clear in the Planning Department's Territorial Development Strategy Review (Planning Department, 1995). More land will be required to satisfy the needs of the growing population, predicted to range from 7.5 to 8.1 million by the year 2011, and the associated infrastructure and other facilities. With extreme pressure for public housing and a lack of easily accessible land it may be inevitable that ecologically sensitive areas be encroached upon to satisfy land for housing needs. The TDSR points out that 'potential loss of habitat and destruction of fragile ecosystems would be of considerable concern. Areas of ecological value that are most vulnerable include the Special Areas, Country Parks, Marine Reserves, Mirs Bay, Tolo Harbour and Deep Bay.'

To meet this challenge, conservationists (see for example WWFHK, 1994) urge the government to formulate a comprehensive and proactive conservation strategy, and an associated action plan. With inputs from green groups, academics and conservationists, the Government should identify priority

areas for immediate and long-term action, and formulate a more proactive conservation policy which could include, for example, allowing the resumption of ecologically important sites for the purposes of conservation. A coordinated territorial Biodiversity Information Service with active monitoring programmes of sites and species should be developed to provide a sound and scientific base for planning and decision making. The government should also launch a territory-wide public awareness campaign and increase education programmes on the conservation of biodiversity. Finally, and most importantly, the government should strengthen its resources in areas related to biodiversity conservation.

Since both China and Britain are signatories of the Convention on Biological Diversity, though the United Kingdom has not explicitly applied it to Hong Kong, the Hong Kong government may be obliged to comply with the convention before and after 1 July 1997. The Hong Kong government has in fact stated that it is determined to adopt the standards set out at the 1992 Earth Summit, including the Convention on Biological Diversity (PELB 1993). Under the Convention, each country is required to develop strategies for conservation and sustainable use of biodiversity. It is high time for the Government, green groups, conservationists and academics to work together to develop such a strategy for Hong Kong's biodiversity to survive well into the twenty-first century.

REFERENCES

- Aspinwall Clouston and Wetland International/Asia Pacific. 1996. *Development of a Comprehensive Conservation Strategy and a Management Plan in Relation to the Listing of Mai Po and Inner Deep Bay as a Wetland of International Importance under the Ramsar Convention*, December 1996, p. 103.
- Ashworth, J.M., Corlett, R. Dudgeon, D., Melville, D. and Tang, Winnie. 1993. *Hong Kong Flora and Fauna: Computing Conservation*, World Wide Fund for Nature Hong Kong, p. 24.
- AXIS. 1995. Sha Lo Tung Revised Development Plan: Supplementary Environmental Impact Assessment Volume I — Technical Assessment, 3.6.45, pp. 3–18.
- Dudgeon, D. and Corlett, R. 1994. *Hills and Streams: an ecology of Hong Kong*. Hong Kong: Hong Kong University Press, p. 234.
- Greiner-Maunsell. 1991. *New Airport Master Plan: Environmental Impact Assessment*.
- Holland F. 1996. 'Botanist's rare plant feat.' *South China Morning Post* 6 December 1996.
- Hong Kong Government. 1996. *The 1996 Policy Address*.
- International Union for Conservation of Nature. 1990. *United Nations List of National Parks and Protected Areas*. Gland, Switzerland, p. 284.
- Jim, C.Y. and Wong, F.Y. 1996. 'The protected-area system in Hong Kong: its management and prospects,' in Jim, C.Y. and Li, B., ed., *Protected Areas and Nature Conservation in East Asia*. Hong Kong: Joint Publishing(H.K.), p. 515.
- Planning Department. 1995. *Territorial Development Strategy Review: Strategic Environmental Assessment of the Preferred Options*. Hong Kong: Hong Kong Government.
- Planning, Environment and Lands Branch. 1993. *The Hong Kong Environment: A Green Challenge for the Community*. Hong Kong: Government Secretariat, p. 174.

- Thrower, S.L. 1984. *Hong Kong Country Parks*. Hong Kong: Hong Kong Government, p. 216.
- Walker, E. 1997. *Agenda 2047(Phase I)*, Friends of the Earth, p. 82.
- World Resources Institute. 1992. *World Resources 1992-93*. Oxford: Oxford University Press, p. 385.
- WWFHK. 1994. *Conservation of Hong Kong's Biodiversity — A Time to Act*, unpublished report. Hong Kong: World Wide Fund for Nature Hong Kong.

Solid Waste Management in Hong Kong: Towards an Integrated Partnership

Gordon T.L. Ng

ABSTRACT

Solid waste management has become one of the major environmental issues for Hong Kong, posing a threat to limited disposal facilities and consuming much of the financial and environmental resources available in Hong Kong. Traditional approaches toward managing solid wastes rely on the provision of environmental infrastructure and enforcement of regulations against littering, and countering illegal collection and disposal. Recent initiatives show that the government, environmental groups and the private sector are working towards a partnership in pooling resources and expertise to implement various waste reduction measures and projects. This paper describes the present waste management issues and examines recent initiatives, and concludes with a discussion of the partnership approach within the framework of an integrated solid waste management.

Keywords: *Integrated solid waste management, Hong Kong, partnership*

INTRODUCTION

Municipal solid waste management (MSWM) is one of the key environmental concerns in Hong Kong. The quantity of waste generated from households, commercial and industrial activities, and construction projects has increased from approximately nine million tonnes in 1986 to 17 million tonnes in 1995; about half of the respective totals were disposed of in landfills or at the Kwai Chung incinerator.¹ New strategic landfills which handle over 95% of all wastes were commissioned in the first half of the 1990s and were expected to serve Hong Kong for at least 20 years, but recent estimates put their projected lifespan at 10 to 15 years.²

The purpose of this paper is to review the waste

management policy in Hong Kong. The first section discusses major issues on municipal solid waste management, followed by an outline of the various collaborative efforts by the government and the community. The latter section discusses how the government, the general public and the business community can collaborate and progress towards achieving integrated solid waste management in Hong Kong. Such efforts could provide a basis for developing a partnership approach whereby all sectors within the community could contribute to tackling environmental challenges. In this paper, municipal solid waste refers to domestic, commercial and industrial waste; construction waste refers to those arising from the construction and demolition activities.

Gordon T. L. Ng, Senior Consultant, Environmental Resources Management - Hong Kong, Ltd., 6/F., 9 Chatham Road, Hechy Tower, Tsim Sha Tsui, Hong Kong. Tel: (852) 2722-9715, Fax: (852) 2723-5660. Email: gtl@ermhk.com

MANAGING SOLID WASTES

In 1995, the quantity of solid waste disposed of at Hong Kong's landfills and incinerator was about 8.4 million tonnes (averaged at 23,000 tpd).³ The main sources of solid wastes disposed of are construction (65%), domestic (26%), commercial and industrial (9%).

The quantity of municipal solid waste is found to have an almost linear relationship with the community's economic growth as measured by the Gross Domestic Product (GDP), and this relationship has been used by the government to forecast waste arisings.⁴ The Waste Reduction Study commissioned by the Environmental Protection Department in 1994 predicted that if the growth of waste arising continues, the quantity of waste requiring disposal will increase by 40% by the year 2005, with total waste management costs reaching \$3.5 billion in that year.⁵

Along with the increased affluence of the community, construction activities related to projects such as housing, offices, roadworks, and infrastructural facilities have increased significantly. Whilst over half of the construction waste is diverted for reclaiming land, a significant proportion is still disposed of at the landfills. More efforts are therefore needed to promote segregation and sorting at source for useful materials, and diversion of wastes for reclamation in order to conserve resources and use landfill space more efficiently.

As the amount of solid waste requiring final disposal grows in volume, Hong Kong is fighting an uphill battle to manage the problem within constraints of limited available land, a dense built environment (in some urban areas such as Kwun Tong the population density is as high as 53,000 people per square kilometre⁶) and intense commercial activities. These constraints make it difficult to site new landfills.

In light of the growing problem and current constraints, the Hong Kong community needs to be brought to focus on making the limited environmental resources more sustainable. The current estimate of the remaining life span of the existing landfills is 10 to 15 years, if nothing is done to check the escalating growth of waste. Recent growth in urban areas and new towns means that land and environmental resources need to be utilized more efficiently so that people in Hong Kong may live in an acceptable environment with proper control of pollution and protection of public health. The throwaway habit of

the community, like that of many affluent counterparts in other countries, needs to be changed to encompass more conscious use of resources and increased awareness of sustainable waste management. Whilst efforts in this direction have been initiated by the government, non-governmental organizations and businesses, it would be beneficial to focus attention on integrating resource conservation and waste management in the form of a close partnership between the community at large, businesses, non-governmental organizations and the government in the waste management system.

GOVERNMENT POLICY AND MANAGEMENT FRAMEWORK

Prior to the early 1990s, the primary waste management objectives as stated by the government were to provide facilities for the 'cost effective and environmentally satisfactory disposal of all wastes' and 'proper enforcement of legislation' against adverse environmental effects associated with the storage, collection, treatment and disposal of wastes.⁽⁷⁾ The Waste Disposal Ordinance enacted in 1980 provides the overall framework for managing the collection and disposal of all waste in Hong Kong. As far as municipal wastes and construction wastes are concerned, the ordinance stipulates the preparation of the Waste Disposal Plan which was published and approved in 1989, setting out the strategy of constructing three large state-of-the-art landfills and a network of refuse transfer stations for handling the solid wastes in Hong Kong. These facilities comprise the government's effort to provide an 'end-of-pipe engineering fix' in the least costly (at least financially) but effective, and to a certain extent, environmentally acceptable way of managing solid waste in Hong Kong.

In the past, despite its intentions to promote recycling and other waste minimisation measures as options for managing waste, the government considered the prospect of its direct participation in waste recovery and recycling activities inappropriate.⁽⁸⁾ In the last few years, however, the government has initiated several waste avoidance and material recovery projects,⁹ indicating a shift of government policy from relying on a solely market-driven recycling system to more proactively assuming some responsibility in promoting waste reduction as a waste management option.

Such a change reflects the global trend of adopting integrated solid waste management, and local pressure to promote resource conservation and waste reduction, brought by community and environmental groups. However, it is certain that waste reduction has been seen as an essential method for reducing the pressure on existing disposal facilities, with the potential of extending the life of existing landfills by 6 to 23 years.¹⁰ A long-term Waste Reduction Plan is currently being developed by the government to identify practical means to facilitate waste avoidance, reuse, material recovery and recycling, and to promote the use of bulk waste reduction technologies such as incinerators based on advanced waste-to-energy technology. The plan is scheduled for public consultation in late 1997.¹¹

WASTE CHARACTERISTICS AND RECOVERED MATERIALS

The characteristics of disposed waste often shed much light on the affluence, vibrancy, and lifestyle of a community. The main components of municipal solid waste, in terms of weight, include putrescible (35%), paper (21%), plastics (14%), bulky and junk waste such as old furniture and electrical appliances (10%).¹² The high proportion of putrescible and moisture content (about 45%) found in Hong Kong's domestic waste may reflect the community's Chinese style of cooking and diet. Over the past 10 years, the composition of domestic waste remained relatively stable. However, for commercial and industrial waste, the proportion of paper has increased from about 20% in 1984¹³ to over 30% in 1994, which in part reflects the growing intensity of commercial activities and the increased practice of using paper documents and packaging.

Current recovery and recycling activities in Hong Kong mainly focus on marketable materials (e.g. paper, non-ferrous metals such as copper and aluminium cans, ferrous metals) which can be readily recovered from the waste stream. There are various constraints which limit the extent of waste recovery and recycling activities, including space, which affects the viability of waste separation and sorting activities; high land premiums and labour costs, which govern the economic viability of local recycling facilities; and the market economics for the recovered materials and recycled products.

Despite the various constraints, Hong Kong's

overall material recovery rate is significant. The overall recycling rate for MSW is estimated at about 44% of the waste generated, amounting to 2.2 million tonnes in 1995. In 1994, the main recovered materials, in terms of weight, were paper (37%), plastics (17%), ferrous metals (37%) and non-ferrous metals (7%). About 75% of these materials were exported for reprocessing, amounting to an export value of HK\$3 billion in 1995. These recycling activities rely heavily on the overseas market demand. China, in particular, is the major market for waste exported from Hong Kong. Recent legislation in China which prohibits the import of contaminated wastes has had a significant impact on waste recycling in Hong Kong, as the changing market for recyclables has impacted particularly on individual waste collectors and small companies.¹⁴

As mentioned earlier, construction waste materials, if properly separated at source, could be diverted for reclaiming land. The government is currently promoting the reuse of construction waste at public dumps, and reviewing the overall public dumping strategy, which could complement various construction waste management measures including intermediate sorting facilities at landfills, landfill charging schemes and improvements in waste management practices in the construction industries.

COLLABORATIVE EFFORTS AND CHALLENGES AHEAD

The discussion above identifies various major concerns which relate to managing municipal solid waste in Hong Kong, and outlines the government policy to deal with them. This section will discuss some examples of collaborative efforts and waste management challenges for the whole community. This is particularly timely as the government is presently in the process of drafting a waste reduction plan. The following discussion will examine ways in which the government, the business sector and the community at large may work towards a sustainable way of managing our municipal wastes.

It should be noted that such collaboration is not new. In 1994, the Environmental Protection Department (EPD), in collaboration with the Retail Management Association, launched the Use Less Plastic Bags Campaign (sic) involving more than 1,500 local supermarkets and stores. In the first year, the campaign achieved an overall reduction target

of 10%, saving the issuing of 35 million plastic bags.¹⁵ The campaign was also extended to 28 public markets through a joint effort by the Consumer Council, EPD, Housing Department, Housing Society, Urban Services and Regional Services Departments.

Other waste reduction projects include numerous material recovery projects, such as the Waste Paper Collection Day jointly organized by the Environmental Campaign Committee, the Housing Authority and RTHK Radio 2 on 30 December 1995. Through the Environment and Conservation Fund (ECF) set up by the government in August 1994, a number of recycling and waste reduction programmes were organized by community groups. One of the six explicit behavioural and lifestyle changes which the ECF intends to promote is the 'minimization of waste generation and promotion of the 3R (reduce, reuse and recycle) concept'.¹⁶ A cursory examination of the 118 educational and community action projects funded by ECF between August 1994 and September 1996 highlights that some were related to waste reduction, ranging from avoidance programmes (e.g. No Foam Box Campaign) to material recovery (e.g. Paper Recycling Project). Other organizations are also collaborating their efforts in waste reduction. For example, Hong Kong Telecom has collaborated with the Conservancy Association on a Waste Paper Recovery Project in over 200 schools.

It is difficult to evaluate the success of these projects. With a few exceptions, most of these initiatives were implemented on a project by project basis and lack continuity. This increases the difficulty of assessing the effectiveness and economic efficiency of any particular form of waste reduction project, as the short-term benefits and costs are not representative of what may happen in the longer term. The projects are often poorly documented and there are insufficient efforts to systematically reflect on the experience gained and the lessons learnt. The experience of the author indicates that a typical complaint made by organizers of waste recovery projects is the difficulty in getting waste dealers to remove the materials they have collected. On the other hand, waste dealers often consider the available quantity to be insufficient for an economical truckload, or the materials to be too contaminated, which reduces the value of the materials or adding to the cost of further sorting and cleaning the materials.

The situation is further complicated by China's

recent prohibition of importing domestic and contaminated plastic wastes, following the PRC's Comprehensive Solid Waste Pollution Control and Prevention Law made effective on 1 April 1996. In 1995, about 1.6 million tonnes of recovered materials from the waste stream were exported for recycling; China has been a main export destination for these materials. For example, from January to July 1996, about 98% of the 132,000 tonnes of recovered plastic wastes and 86% of the 260,000 tonnes of waste paper exported from Hong Kong were destined for China.¹⁷ If these wastes were recycled locally, an additional capacity of 600,000 to 700,000 tonnes per annum of waste re-processing facilities for paper and plastics would have been needed. In 1995, it was estimated that some 600,000 tonnes of recyclables were reprocessed locally. Recyclers may find markets for recyclable materials more stringent in terms of material quality and specifications and waste generators may find it more difficult to get recyclers to collect their recovered materials.

Recently, the Environmental Protection Department commissioned two projects on waste reduction and material recovery to non-governmental organizations. The first one was awarded to the Conservancy Association, to develop two information packages on waste paper reduction in the office environment and waste reduction in the community. The project was completed in April 1996. The other was a follow-up project to implement the proposal contained in the information package on waste reduction in community in four housing estates. The project was awarded to Friends of the Earth in September 1996 and was scheduled for completion in early 1997. These projects mark a new form of collaboration between the government and non-governmental organizations. In the process, the experience of the government and that of non-governmental organizations, especially in documenting experience and motivating community involvement respectively, can be shared and integrated.

The provision of environmental education, in particular education to promote the awareness of resource conservation and waste management, is an important area for consideration if the partnership approach is to succeed. Efforts on related education programmes and activities are often fragmentary and ephemeral. With continuous support from the government and the private sector, the environmental and local resident groups are the most appropriate base for mobilizing community resources to cam-

paign for resource conservation and waste reduction.

The initiatives from the private sector are another important element in the success of partnership. The experience from the Use Less Plastic Bags Campaign (sic) and other material recovery programmes indicate that the relevant parties need to be motivated and involved in the right part of the chain. For example, supermarkets and retail outlets are important stakeholders in distributing plastic bags and their involvement is essential to the success of reduction of plastic bag wastes. Similarly, recyclers, re-processors and retailers for recycling products are all important stakeholders of the recycling chain.

The participatory approach requires the leadership and strong commitment of the government to encourage the adoption of waste management. It also needs concerted action from the business sectors and the community at large in order to make any participatory programmes a success. The above examples illustrate how various stakeholders may play a part in an integrated waste management system. Much more concerted effort is still needed to tackle various challenges ahead in conserving the precious environmental resources and in achieving more sustainable waste management.

NOTES

- 1 Environmental Protection Department. 1996. *Environment Hong Kong 1996: A Review of 1995*. Hong Kong: Environmental Protection Department.
- 2 Environmental Protection Department. 1996. *Hong Kong — The Environmental Challenge: Environmental Protection Department 1986–1996*. Hong Kong: Environmental Protection Department.
- 3 Wong, Koon-kwai. 1996. 'The Environment: Heading Towards Sustainability?' in *The Other Hong Kong Report 1996*, edited by Nyaw Mee-kau and Li Si-ming. Hong Kong: Chinese University Press, pp. 367–387.
- 4 Environmental Protection Department. 1995. *Monitoring of Municipal Solid Waste 1991–1992*. Hong Kong: Environmental Protection Department.
- 5 Planning, Environment and Lands Branch. 1996. *Heading Towards Sustainability: The Third Review of Progress on the 1989 White Paper*. Hong Kong: Planning, Environment and Lands Branch.
- 6 Census and Statistics Department. 1996. *1996 Population By-census: Summary Results*. Hong Kong: Government Printer.
- 7 Hong Kong Government. 1989. *White Paper: Pollution in Hong Kong — A Time to Act*. Hong Kong: Government Printing Department.
- 8 Planning, Environment and Lands Branch. 1989. *Waste Disposal Plan for Hong Kong*. Hong Kong: Planning, Environment and Lands Branch.
- 9 In 1990, for example, the Environmental Protection Department conducted two pilot projects, one to collect waste paper in a public housing estate in Tuen Mun, the other to collect waste plastic bags in a public housing estate in Shatin.
- 10 Hong Kong Government. 1996. *Policy Commitments: The 1996 Policy Address*. Hong Kong: Government Printer.
- 11 Hong Kong Government. 1996. *Progress Report: The 1996 Policy Address*. Hong Kong: Government Printer.
- 12 Environmental Protection Department. 1995. *Monitoring of Municipal Solid Waste: 1993 and 1994*. Hong Kong: Environmental Protection Department.
- 13 Environmental Protection Department. 1989. *Monitoring of Municipal Solid Waste 1989*. Hong Kong: Environmental Protection Department.

CONCLUSION

This paper has looked briefly at the development of the physical facilities and policy measures of an integrated waste management system in Hong Kong. The previous section examined some recent examples of collaboration among various parties in waste reduction and resource conservation. It has been proposed that a sustainable waste management system requires participation from all concerned parties: the community at large, NGOs, businesses and the government. Participatory efforts cannot be confined within the traditional command-and-control approach, which demands much resource in the implementation process and may not be efficient. A partnership approach whereby stakeholders exercise their duty of care towards the environment is needed to achieve progress towards sustainability.

ACKNOWLEDGEMENTS

I would like to express my sincere thanks to Dr Sam Tsang who provided some thoughts on the framework of this paper.

- 14 Ng, Cho-nam and Ng, Ting-leung. 1997. 'Environmental Protection' in *The Other Hong Kong Report 1997*, edited by Cheng Y S et al. Hong Kong: Chinese University Press (forthcoming).
- 15 Environmental Protection Department. 1996. *Hong Kong — The Environmental Challenge: Environmental Protection Department 1986–1996*. Hong Kong: Environmental Protection Department.
- 16 Planning, Environment and Lands Branch. 1996. Advisory Council on Environment Paper 48/96, Hong Kong.
- 17 Census and Statistics Department. 1996. *Hong Kong Trade Statistics: Domestic Exports and Re-exports*. Hong Kong: Government Printer.

Developing Practical Indicators of Environmental Sustainability for Hong Kong

J.H. Liu, Nicola Atkinson and Carlene Van Toen

ABSTRACT

Environmental sustainability at the geographic level of a major urban area and its immediate surroundings presents rather different issues and opportunities from those studies at the national, regional or global level. Basically sustainability at the local level must involve extensive trades with other areas and this needs to be reflected appropriately. Data availability is also quite different. The present study is designed to develop and illustrate a methodology for better defining and measuring environmental sustainability at the metropolitan level.

This paper presents the preliminary findings of a study of environmental sustainability for Hong Kong, in particular the results of the first round selection of environmental sustainability indicators for Hong Kong. The selection focuses on indicators relating to air quality, marine water quality and solid waste. A total of 19 possible indicators were considered and evaluated on the basis of the selection criteria. Of these, six were selected as initial indicators. Subsequent rounds will address the issue of terrestrial nature conservation, fresh water systems and the urban natural environment. Consideration will also be given to cross-media and cross-boundary environmental issues and the possibility of developing indicators to address them.

Keywords: *environmental sustainability indicators, Hong Kong, air quality, marine water quality, solid waste*

INTRODUCTION

'Sustainable development' became the focus of much attention after the 1992 United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro. Since the term was first coined in the early 1970s, great effort has been expended on defining its parameters (Liverman *et al.*, 1988; Basiago, 1995). Yet even if the concept of sustainability is conceptually appealing, it presents a daunting challenge.

Present economic systems throughout the world are clearly unsustainable in many fundamental ways, and defining measures to enhance sustainability

which are seen as practical by the public requires considerable care and thought. Hence, the process of moving from broad aspirations to specific measures of success or failure has been slow. This has perhaps followed from efforts to discuss the term at a global rather than a local level and from the absence of specific measures or indicators which could be used to assess progress in selected areas. As a result, the focus of work in the last few years has begun to shift to the development of such indicators (Hammond *et al.*, 1995; UK Government, 1996).

Much of the work on sustainability and its measurement has been at the national level. Yet increasingly attention is focused at the local level

J. H. Liu, Nicola Atkinson and Carlene Van Toen, Centre of Urban Planning and Environmental Management, The University of Hong Kong, Pokfulam Road, Hong Kong. Tel: (852) 2857-8598. Fax: (852) 2559-0468.

(LGMB, 1995). In May 1996 a study designed to develop initial indicators of environmental sustainability for Hong Kong was launched with the financial support of a joint private sector/Hong Kong government environment fund. The fundamental aim of this study is to extend and refine the concept of 'environmental sustainability' from one of broad aspirations to one of specific measures of success or failure at the local level (Barron and Reilly, 1996). As far as possible such measures should be readily understood and appreciated as valid by policy makers and the public. In other words, the indicators of environmental sustainability should be designed so as to make it clear to non-specialists and specialists alike whether it is desirable or even possible to continue specific forms of business as usual over normal longer-term planning horizons.

In this effort to move from the general to the specific in conceptual terms, a related aim is to move from a global view of sustainability to a practical one which is delineated by the specific geographical area of Hong Kong. A tight geographic focus potentially brings the concept of sustainability down to the manageable level of personal and community action. The study aims to present a manageable set of measures of environmental sustainability for Hong Kong which enhances participation in the sustainability debate, and in the process identify specific policy measures the government might undertake towards enhancing sustainable development in Hong Kong.

The approach taken in this process is fourfold:

1. to develop a specific set of initial indicators of environmental sustainability for Hong Kong;
2. to measure these;
3. to make preliminary projections of future conditions for each indicator; and, where these suggest Hong Kong is on an unsustainable path (e.g. air quality is projected to be seriously unhealthy for a prolonged period);
4. to examine policy options and develop recommendations for moving Hong Kong towards a more sustainable future.

In this study, most of the indicators selected are expected to be *state* indicators within the *pressure-state-response* paradigm. *State*, as well as *pressure* indicators serve to highlight the need for policy measures, while *response* indicators are considered here to be part of policy evaluation. State indicators are preferred here because they are typically more di-

rectly experienced or understood by the non-specialist.

Environmental sustainability at the geographic level of a major urban area and its immediate surroundings presents rather different issues and opportunities from those studies at the national, regional or global level. Basically sustainability at the local level must involve extensive trades with other areas and this needs to be reflected appropriately. Data availability is also quite different. This study is designed to develop and illustrate a methodology for better defining and measuring environmental sustainability at the metropolitan level.

THE INDICATOR SELECTION PROCESS

In order to define sustainability needs/concerns as a specific sub-set of environmental needs/concerns, the study undertook to develop a practical and useful methodology for assessing candidate indicators of environmental sustainability. Atkinson (1996) outlines the basic features of the approach to indicator selection and using that as a starting point and general guide, seven basic standards to assess candidate indicators were eventually employed:

1. Does it address an important sustainability concern; (i.e., can one argue convincingly that failure to address this problem eventually will require major involuntary changes in the way development proceeds)?
2. Is it amenable to policy initiatives (i.e., can underlying conditions be changed so as to avoid the up-coming problem or develop an effective adaptation strategy)?
3. Are the data available to measure it as defined?
4. Is it likely to be readily understood by the non-specialist, including the public at large?
5. Does it represent a problem which is chronic and widespread rather than acute or highly localized?
6. Is it founded on valid scientific understanding and data (i.e., can we be reasonably certain of avoiding issues which are more apparent than real)?
7. Can the candidate indicator be assigned meaningful reference or threshold values so that the consequences for development of impending problems may be directly assessed?

The first two criteria serve as a 'screen', since

only candidate indicators which reflect serious sustainability concerns and which may be significantly influenced by policy steps are relevant to assessments of environmental sustainability, regardless of their other merits.

While it is important to keep in mind that the concept of sustainability by its very nature is a holistic one, in practical terms most of the existing data and policy initiatives address a specific environmental medium (i.e. air, water, land). A media-based approach to identifying indicators of sustainability is thus quite useful, so long as cross-media effects are monitored and addressed in the development of policy responses. For example, solid waste disposal may be considered as a separate matter from air pollution, as long as the effects on air quality of such things as incinerator exhaust or fugitive gases emissions from landfills are considered when assessing alternative waste disposal strategies.

AIR QUALITY

The Issues and Policy

For a metropolitan region to be considered on the path to environmental sustainability it must demonstrate that ambient air does not hinder the health and well-being of its population. Unfortunately in Hong Kong poor air quality is a daily threat to public health.

The generation of Hong Kong's air pollutants is mainly attributed to human activities surrounding electricity production, road transport, manufacturing and construction (Environmental Protection Department (EPD), 1995). A considerable amount of Hong Kong's land is steep terrain, with buildable land space limited to less than 200 square kilometres (km²). The resulting densely built environment contributes to air pollution problems by trapping pollutants and restricting natural circulation. High levels of air pollutants are frequently detected in the metropolitan regions of Hong Kong. However, even moderate to high levels of background pollutants are also observed in rural air, indicating that regardless of where people are living in Hong Kong they are effected by air pollution. The EPD has established Air Quality Objectives (AQOs) designed to monitor major pollutants that pose the greatest risk to human health. While legislation, such as the Road Traffic Ordinance, and the Air Pollution Control Vehicle Design

Standard exist to regulate air pollution, standards are frequently breached (EPD, 1996). Further evidence of the severity of the problem is the recent linking of over 5,700 fatalities in 1996 to respiratory complications resulting from the inhalation of air pollutants, representing a 20% rise over 1994 figures (Smith, 1996).

Selected Initial Indicators for Air Quality

Selected Indicator: Average annual levels of Respirable Suspended Particulates (RSP) for areas of high population density as a ratio to the air quality objectives (AQO)

Respirable Suspended Particulates (RSP) are minute, easily inhaled airborne substances. The combustion of diesel fuel in the engines of motor vehicles is Hong Kong's greatest contributing source of harmful RSP (Cheung & Sze, 1995). Particulates, resulting from the burning of fossil fuel, carry with them other materials, including toxic heavy metals, sulfur and nitrogen.

When inhaled, particulates of 10–2.5 micrometres (µm) in size may clog respiratory passages causing shortness of breath, coughing, and irritation. Fine particulate matter of 2.5 µm or less in size pose the greatest threat to health, as they can become lodged in lung tissue (HKU, 1992). Once embedded in the lungs these foreign substances increase the risk of respiratory diseases such as asthma, bronchitis, and lung cancer.

Hong Kong's annual average AQO for RSP is 55 micrograms per cubic metre (µg/m³). There are frequent violations of this standard, particularly in areas of high traffic concentration (EPD, 1995). Hong Kong's normally high levels of RSP arguably represent the most serious health threat to the majority of its population. In keeping with this project's focus on chronic rather than acute and environmental and health risks, average annual levels of RSP is the preferred measure, since this reflects the 'background' levels of pollution intake. Due to Hong Kong's terrain, there is the possibility of considerable variation in RSP exposure levels even with small areas. Hence, an 'average' for all monitoring stations might mask serious problems in particular stations. Therefore, the selected indicator will be composed of a series of data from separate monitoring stations, or from a single station that represents an area of high population density.

Selected Indicator: Average annual Hong Kong NO₂ levels as a ratio to the AQO

Nitrogen dioxide (NO₂) is a serious respiratory irritant. When inhaled it induces symptoms such as chest tightness, burning of the eyes, headaches, bronchitis and asthma. Irreversible lung damage has also been attributed to long-term exposure to high levels of NO₂.

Hong Kong's highest concentrations of airborne NO₂ are found in areas of high traffic congestion. When nitrogen oxide (NO) is emitted as exhaust from motor vehicles it has the potential to oxidize, forming nitrogen dioxide. Nitrogen dioxide may be further oxidized to form nitric acid, a main component in acid rain. It is estimated that emissions of nitrogen oxides from motor vehicles will increase by 60% by the year 2001 (PELB, 1993). Hence, NO₂ levels in Hong Kong are likely to be a long-term environmental problem and health threat. Therefore, NO₂ will be used as one measure to assess environmental sustainability in Hong Kong. Again, in keeping with the focus on longer-term concerns, average annual levels of NO₂ as a ratio of the AQO was chosen as the measure of this indicator.

Selected Indicator: Average annual emissions of Carbon Dioxide (CO₂) within Hong Kong as a ratio to 1990 levels for Hong Kong

Emissions of greenhouse gases from anthropogenic sources has become a significant global concern. Excess burning of fossil fuels have resulted in the release of large quantities of gases such as CO₂, CH₄ (methane), O₃, NO₂, and CFCs, which have the effect of increasing the heat retention of the earth's atmosphere (Pearman, 1992). Carbon dioxide is believed to account for about half of the greenhouse forcing effect (Wijetilleke and Karunaratne, 1995). Possible negative impacts of the greenhouse effect include temperature change, the rising of sea levels, as well as impacts on rainfall patterns. Although this phenomenon is surrounded by uncertainty regarding specific nature of the connection between an increase in CO₂ concentrations and the resulting timing and strength of climate changes, the seriousness of the build-up of greenhouse gases and the eventual need for action is becoming increasingly accepted (Pearman, 1992).

Hong Kong's CO₂ emissions result mainly from the burning of fossil fuels for power generation, use of motor vehicles, and industrial processes. The Hong

Kong government is a party to the United Kingdom's commitment at the 1992 United Nations Conference on Environment and Development (UNCED) to reduce CO₂ emissions by the year 2000 to their 1990 levels (EPD, 1993). However, no specific domestic legislation has been adopted to facilitate reaching this goal.

To reflect the possibility that an international agreement will eventually be reached to limit greenhouse gases, and that Hong Kong's energy policy will be affected, annual carbon dioxide emissions as a percentage of 1990 levels has been chosen as an initial indicator of environmental sustainability. If CO₂ levels continue to rise past 1990 levels, then this will indicate that environmental management in Hong Kong is not on a sustainable path in this particular aspect.

Other Candidate Indicators

This study also considered a number of other candidate indicators to be used to measure sustainability with regard to emissions of air pollutants. All but the three aforementioned initial indicators were eliminated by the project selection process. A brief synopsis of this process is shown in the Appendix.

MARINE WATER QUALITY

The Issues and Policy

In order to be considered environmentally sustainable marine water should be ecologically productive and diverse and waters should be safe for human use (including recreation). Hong Kong's marine waters are suffering from increasing damage to its natural flora and fauna and are often unsafe for human use (e.g. swimming)

Relative to its small land area of only 1,150 km², Hong Kong has a very long coastline of about 800 kilometres (km). The large diversity of marine habitats and life forms, especially endemic species, makes Hong Kong a place of scientific importance (Morton & Morton, 1983). The marine ecosystem is, however, under serious stress from pollution and reclamation. The 'carrying capacity' of Hong Kong's waters with regard to being able to absorb the effects of environmental threats in the form of pollution and seabed change is affected by the local population and the expansion of infrastructure, and by the

regional environmental degradation accompanying rapid economic development in Southern China (Liu, 1996). In Hong Kong, the main pollution load comes from the untreated sewage and the effluents discharged by industry. An estimated 1.5 million cubic metres (m³) of domestic sewage and industrial wastewater, mostly untreated, are discharged into Victoria Harbour every day (Hong Kong Government, 1995).

The primary threats to the sustainability of Hong Kong's marine environment may be classified within the following categories:

- Industrial: nutrients and heavy metals
- Agriculture and aquaculture: nutrients and pesticides
- Coastal reclamation: destroys natural shores and affects shallow water species; release of toxic sediments; damage from dredging and filling
- Marine shipping and other activities: oil spills
- Marine fishing: possible stress on species regeneration

The main existing legislative protections for Hong Kong's marine environment come from the Water Pollution Control Ordinance of 1980, which established ten water control zones to enable the measurement and control of existing water quality levels. Unfortunately, the most polluted and heavily populated zone, Victoria Harbour, was the last to be introduced (1996) and the least successful in meeting the water quality criteria. Additional legislation resulted in the banning of livestock farming in urban areas, and the establishment of a Sewage Master Plan for which works are now in construction. While both of these steps have a positive impact on the state of Hong Kong's waters, given the primacy of the marine environment to the territory of Hong Kong, and the degree to which it is threatened the sustainability of Hong Kong's use of its marine waters as the sink of last resort is almost certainly not sustainable.

The key sustainable development objectives for Hong Kong's marine environment are: (1) to prevent or greatly reduce the discharge of untreated effluent (particularly those effluents which are toxic, persistent and have the potential to bioaccumulate) into the sea; and (2) to protect marine habitats and maintain biodiversity through the protection of flora and fauna and, where appropriate, to increase the population of endangered plants and animals. Indicators relevant to the above objectives include

measures of standard water quality, sediment quality, eutrophication, contaminant concentrations in shellfish and oil spills. Additional threats to Hong Kong's sustainability are posed by reclamation and associated marine dredging and dumping.

Selected Initial Indicators for Marine Waters

Selected Indicator: Annual mean levels (mg/l) of total inorganic nitrogen, total nitrogen, and total phosphorus in water as a concentration at selected sites and for total inorganic nitrogen the level as the ratio of water quality objectives for all monitoring stations

Perhaps the most basic unsustainable feature of Hong Kong's development path (and that of its neighbours) is the large amount of effluent discharged into the sea with little or no treatment. Concentrations of nutrients, such as inorganic and organic nitrogen and phosphorus, demonstrate the degree to which the marine environment has been affected by effluent pollution.

Nitrogen and phosphorus are important nutrients in the marine environment. The inorganic forms of nitrogen, i.e. ammonia, nitrite and nitrate, together with phosphorus, are also the major nutrients that lead to eutrophication. The effect of eutrophication (i.e. elevated nutrient levels) in the sea, is evident through changes in phytoplankton population dynamics, such as the occurrence of algal blooming, the extremely heavy growth of phytoplankton which leads to a deterioration in water quality. Thus, a measurement of levels of nutrients, primarily inorganic and organic nitrogen and phosphorus, will indicate the effect of effluent pollution on Hong Kong's waters. Alternatives for establishing reference values for this measure are still under evaluation. One option is to use threshold levels where they exist (e.g. for total inorganic nitrogen) and then to set some percentage of stations which must meet this standard.

This indicator deals with matters directly related to the consequences of the present development path. A further advantage is that its underlying causes are reasonably well understood and amenable to policy initiatives. Also, the data are available to measure it. It also does well in terms of its scientific validity. While a reference value has been established for total inorganic nitrogen, equivalent values are not available for the other two nutrients. Also,

decisions about how to judge 'compliance' with environmental sustainability goals are admittedly somewhat arbitrary. With these limitations noted, this indicator nonetheless does quite well overall with respect to each of the selection criteria and hence has been selected in this first round.

Selected Indicator: The quality of bathing beaches based on swimming season water quality standards for *E. coli* (no./100 ml)

Temperature and other conditions (e.g. sharks) permitting, marine waters are an attractive source of recreation. When development undermines water quality to the point where even occasional immersion in previously clean waters now presents a health risk, such a situation would (hopefully) not be considered as indefinitely sustainable, even by those who might argue that economic measures of value should be the primary guide for development.

The primary determinant of water quality around Hong Kong's bathing beaches is the discharge of raw sewage from inland rivers, nullahs and the storm water drainage system. These discharges affect the coastal waters by depressing the levels of dissolved oxygen and expose bathers to possible infections, primarily intestinal, from pathogenic bacteria. One widely used indicator of bathing water contamination that poses a threat to human health is the concentration of faecal coliforms (typically *E. coli*) in water samples.

While being able to safely go to a bathing beach is, admittedly, not a necessary condition for a human life, for such a problem to persist indefinitely in the face of already high and still rising incomes certainly raises major questions of priorities. Further, a beach which is unsafe for swimming due to high *E. coli* levels also reflects a wider set of environmental health problems (e.g. the continued use of sea water for toilet flushing, an important and growing means of water conservation).

This indicator is one for which the data are good, the causes are generally known and are amenable to policy controls. One particularly attractive feature of this indicator is that, more so than most, it is readily understood by the population at large, and reflects widespread and persistent problems, while also being based on clear and scientifically defensible measures.

Other Candidate Indicators

A number of other candidate indicators were considered and either rejected or postponed for possible later consideration pending further data collection. The results of the process are summarized in the Appendix.

SOLID WASTE

The Issue and Policy

The generation and disposal of waste as a sustainability issue has been explicitly recognized by the international community in Agenda 21 (Chapter 21). Not only does the land needed for waste disposal represent an opportunity cost in terms of alternative uses such as housing, but waste also amounts to an inefficient use of an increasingly scarce resource and represents a potential danger to people and to the environment. While the export of solid waste for final disposal might arguably be considered as economically efficient in certain cases, it is increasingly being viewed as inappropriate and unacceptable. Arguably, the idea of 'sustainable' solid waste generation seems to be viewed increasingly as a matter of the ability to dispose of it locally.

For Hong Kong, a 'sustainable' solid waste management policy should be one based on the following principles:

1. the disposal of Hong Kong's solid waste should occur largely within territorial boundaries;
2. decisions relating to the disposal strategy must be made at least a decade in advance; and
3. based on present and foreseeable technology and land resources, Hong Kong's capacity for disposing of solid waste should be viewed as capacity constrained over the long term.

The first point is meant to emphasize that it would be unwise to presume that Hong Kong could or should ship excess wastes to other places (e.g. Guangdong Province, the open sea). Such options might be possible but even then, it would likely be expensive and subject to considerable uncertainty. The second point simply reflects the long lead times required to plan and build new solid waste disposal facilities and to implement significant waste reduction measures. The third point serves as an explicit reminder that finding the sites for new landfills within

Hong Kong is already highly problematic and likely to become much more so.

Solid waste arisings in Hong Kong have increased by 70% over the past ten years (ERM, 1996) and now amount to some 3 million tonnes a year from domestic, commercial and industrial sources (EPD, 1994). Traditionally, 'solid wastes' includes both 'municipal waste' and 'chemical' and 'difficult' wastes. Non-hazardous waste in Hong Kong, however, is the larger component of waste arisings and is produced by ordinary people in their every day activities. For this reason, it is considered to be the more important 'sustainability' issue. However, if hazardous waste were to continue to increase, it also would present obvious sustainability concerns.

Already one of the most densely populated places on earth, Hong Kong has relatively little land area within which to dispose of its waste. In 1989, Hong Kong conducted a comprehensive appraisal of its disposal capacity (PELB, 1989). As a result of this appraisal three strategic 'mega-landfills' were then designated and subsequently commissioned to replace 13 landfills which are being closed down. Little reliance is currently placed on incineration. Remaining waste disposal capacity, estimated at 40 to 50 years in the early 1990s, stands as of 1996 at only about 16 years (Stokoe and Arthur, 1996).

Measures of mitigation appear unlikely to have much impact upon the problem in the near to mid term. Waste minimization, according to a recently commissioned government study, would only extend current waste disposal capacity by about six years (ERM, 1996). Massive waste exports to Guangdong are likely to be politically unacceptable to the relevant authorities and expensive. Within Hong Kong itself, the number of possible landfill or incinerator sites of sufficient distance from population centres and of adequate scale is seriously constrained and in any event require planning lead times of at least a decade (Stokoe and Arthur, 1996).

An Initial Indicator for Solid Waste

Selected Indicator: annual quantity of non-hazardous municipal solid waste for disposal within Hong Kong (in tonnes) as a fraction of total remaining existing disposal capacity (in tonnes)

Given Hong Kong's circumstances, the principal purpose of a 'sustainability' indicator for waste management should be to identify requirements for

additional facilities beyond the existing or currently planned landfills and incinerators. In effect, this measure describes the percentage of disposal capacity which is 'consumed' in a given year. Hence, existing disposal capacity refers to the total initial capacity at commissioning minus what was used up in those landfills and incinerators which are currently operational, commissioned or fully planned. Waste which has been recycled or exported for disposal is not included in the assessment of waste quantities. Projections based on estimates for future waste arisings for disposal will reveal when existing and planned local disposal capacity will be exhausted and other, potentially more costly or more damaging options must be employed. Given the lead times needed for the planning and construction of new facilities, an indicator showing less than ten years of disposal capacity would point to an unsustainable path.

The above indicator generally does well with respect to each of the evaluation criteria. It reflects an important sustainability concern and does so in terms which are directly amenable to policy decisions. It provides a single numerical value whose implications — once adequately explained — should be readily understood by the non-specialist. It obviously reflects a long-term and pervasive problem. The measure as set out here is scientifically defensible and has meaningful threshold values (e.g. the time for new disposal facilities to come on line). It is also something for which the data are already available.

Measurement of the indicator is based on historical information (1981–1996) relating to landfill capacity, planned incineration capacity and past waste arisings. Projections up to the year 2020 are based on information relating to matters such as consumption patterns of Hong Kong's population, population changes, technology developments and changes in particular waste-generating activities such as construction.

Possible difficulties with this indicator include: uncertainties with respect to the measurement of 'capacity' and even more so, projections of future waste arisings; incomplete information about private sector recycling; and dealing with existing definitional problems and uncertainties relating to future land allocation and alternative disposal options (especially 'exports' to other places).

In effect, this indicator allows users to anticipate how long Hong Kong will be able to absorb future waste arisings, subject to technological or behavioural developments which may then be reflected

in the projections. As resources permit, a second indicator for hazardous solid wastes, and perhaps others for further specific components of the solid waste stream, will be developed.

Other candidate indicators of sustainability with regard to solid wastes considered in this first round of indicator selection are defined and described in the Appendix along with a brief summary of the outcome of the review process.

CONCLUDING POINTS

The initial round of the selection of indicators of environmental sustainability for Hong Kong focused on candidate indicators relating to air quality, marine water quality and solid waste. The selected and other candidate indicators are summarized in the Appendix. Work is underway to collect and assess data on the trends for each of the initial indicators and to begin the process of projecting future levels. Subsequent work will address the issues of terrestrial nature conservation, fresh water systems, and the urban natural environment. In addition to the areas mentioned above, consideration will be given to cross-media and cross-boundary environmental is-

ues and the possibility of developing indicators to address them.

The indicators selected and eventually assessed in this first round and subsequent rounds deal with measures for which data collection and reporting systems are already largely in place. While this is expedient, it would be inappropriate to constrain the concept of sustainability to things which can be conveniently measured at present. In later phases of project work potential new indicators, as well as the data collection and analysis systems needed to support them, will be identified. For example, among the areas of importance but for which existing data limitations present significant constraints are materials recycling, noise, the loss of biodiversity, and the long-term security of adequate and safe fresh water supplies.

ACKNOWLEDGEMENTS

This work forms part of a project funded by the Environment and Conservation Fund of the Hong Kong Government. The project started in May 1996 and the final report of the project will be published in April 1998.

REFERENCES

- AFD. 1994. Agriculture and Fisheries Annual Departmental Report 1993-1994. Hong Kong Government.
- Atkinson, N. 1996. Initial indicators of sustainability — a selection methodology for Hong Kong. *Sustainability Indicators Project Working Paper. No. 2*. The University of Hong Kong: Centre of Urban Planning and Environmental Management.
- Barron, W. and Reilly, M. (Eds.) 1996. Developing Practical Indicators of Environmental Sustainability for Hong Kong. *A Project Progress Report*. The University of Hong Kong: The Centre of Urban Planning and Environmental Management.
- Basiago, A.D. 1995. Methods of defining 'sustainability'. *Sustainable Development*, 3, 109-119.
- Cheung, S.Y.L., Sze, S.M.H. 1995. *The Other Hong Kong Report*. The Chinese University of Hong Kong, The Chinese University Press.
- EPD. 1989. *Monitoring of Municipal Solid Wastes*. Environmental Protection Department, Hong Kong Government.
- EPD. 1993. *Environment Hong Kong 1993*. Environmental Protection Department, Hong Kong Government.
- EPD. 1994. *Environment Hong Kong 1994*. Environmental Protection Department, Hong Kong Government.
- EPD. 1995. *Environment Hong Kong 1995*. Environmental Protection Department, Hong Kong Government.
- EPD. 1996. *Environment Hong Kong 1996*. Environmental Protection Department, Hong Kong Government.
- ERM. 1996. *Waste Reduction Study*. ERM Hong Kong.
- Hong Kong Government. 1980. *Water Pollution Control Ordinance (Chapter 358)*.
- Hong Kong Government. 1989. *Waste Disposal Plan*.
- Hong Kong Government. 1995. *The Shape of Things to Come — An Overview of the Role of Harbour Reclamation in the Future Development of Hong Kong*. Planning, Environment and Lands Branch, Hong Kong Government. pp. 136.
- Hammond, A., Adriaanse, A., Rodenburg, E., Bryant, D. and Woodward, R. 1995. *Environmental indicators: A Systematic Approach to Measuring and Reporting on Environmental Policy Performance in the Context of Sustainable Development*. World Resources Institute.
- HKU. 1992. *Air Pollution and Respiratory Health in Primary School Children in Hong Kong*. Hong Kong University: Department of Community Medicine.

- Liu, J.H. 1996. Cross-border trade in pollution. *Sustainability Indicators Project Working Paper. No. 3*. The University of Hong Kong: Centre of Urban Planning and Environmental Management.
- Liverman, D.M., Hanson, M.E., Brown, B.J. and Merideth, R.W. 1988. Global sustainability: toward measurement. *Environmental Management*, 12, 133-143.
- LGMB. 1995. Indicators for Local Agenda 21 — A Summary. *Sustainability Indicators Research Project*. United Kingdom: The Local Government Management Board.
- Morton, B. & Morton, J. 1983. *The Sea Shore Ecology of Hong Kong*. Hong Kong: Hong Kong University Press. pp. 350.
- Ng, T.L. 1994. *An assessment of strategies for the management of plastic bag wastes in Hong Kong*. Ph.D. Thesis. The University of Hong Kong.
- Pearman, G.I. 1992. *Limiting Greenhouse Effects controlling Carbon Dioxide Emissions*. Report of the Dahlem Workshop on Limiting the Greenhouse Effect: Options for Controlling Atmospheric Carbon Dioxide Accumulation. Berlin.
- PELB. 1989. *Territorial Development Strategy*. Planning, Environment and Lands Branch, Hong Kong Government.
- PELB. 1993. *The Hong Kong Government: A Green Challenge for the Community*. Second Review of the 1989 White Paper: Pollution in Hong Kong — A time to act. Planning, Environment and Lands Branch, Hong Kong Government.
- Rhyner C.R., Schwartz, L.J., Wenger, R.B., and Kohrell, M.G. 1995. *Waste Management and Resource Recovery*, CRC Press.
- Richards, J. 1985. *Fisheries production in Hong Kong Waters*. Manuscript Report. Agriculture and Fisheries Department, Hong Kong Government.
- Smith, A. 1996. Respiratory disease soars with pollution. *South China Morning Post* (December 27, 1996).
- Stokoe, M.J. and Arthur, D.A. 1996. An integrated waste reduction plan for Hong Kong. *Green Productivity (June 1996)*. pp 14-18.
- UK Government. 1996. *Indicators of Sustainable Development for the United Kingdom*. London:HMSO.
- Yeung, Y.M. 1992. China and Hong Kong. In *Sustainable Cities: Urbanization and the Environment in International Perspective* (eds. Stren, R, White, R and Whitney, J) Westview Press. pp 259-280.
- Wijetilleke, L. and Karunaratne, S.A.R. 1995. *Air Quality Management Considerations for Developing Countries*. The World Bank, Washington D.C.

APPENDIX

Candidate Indicators

	Candidate Indicators	Advantage	Disadvantage	Status
<i>AIR QUALITY</i>				
Respirable Suspended Particulate(RSP)	Annual average RSP levels as a percentage of AQO	represents a serious long-term health problem; source is easily identifiable (man-made) thus is amenable to policy development	considerable variations in RSP exposure levels	selected as round 1 indicator
Carbon dioxide (CO ₂)	Annual emissions of CO ₂ within Hong Kong as a percentage of 1990 emissions	reflects sustainability issue; long term pervasive problem; reliable data available; understandable measure to the non-specialist	scientific uncertainty regarding the relationship between increasing CO ₂ concentrations and the resulting timing and strength of climate changes	selected as round 1 indicator
Nitrogen dioxide (NO ₂)	Annual nitrogen dioxide levels as a percentage of AQO	similar to RSP as it represents a serious long term health problem pollutant and effects are well understood; amenable to policy development	less visible than other indicators, importance of this measure may not be apparent to the non-specialist	selected as round 1 indicator
Sulfur dioxide (SO ₂)	Average annual sulphur dioxide level as a percentage of AQO	1990 restriction of sulfur content in fuel	at present, not a serious long-term health threat thus it is not a sustainability issue	rejected
Tropospheric ozone (O ₃)	Average annual concentrations of ground level ozone as a percentage of AQO	similar to RSP it represents a serious long term health problem; understandable to the non-specialist due to its visual effect	no AQO measuring long term exposure	rejected
Stratospheric ozone (O ₃)	Annual consumption of ozone depleting substances within Hong Kong	measure classified as a sustainability issue; long term health threat	adequate legislation controlling this measure	rejected

Noise complaints	Annual average number of noise complaints within Hong Kong	measure is classified as a sustainability issue; long term health effect; understandable by the non-specialist	no comprehensive monitoring system, meaningful data not available	rejected
Radon	The percentage of surveyed premises experiencing radon concentrations above AQO	long term pervasive problem; reflects sustainability issue, AQO	site specific no comprehensive monitoring system preset	rejected
Carbon monoxide (CO)	Average annual CO levels as a percentage of AQO	reflects sustainability issue; reliable data available	adequate legislation controlling this measure, level are far below AQO	rejected
Lead (Pb)	Annual emissions of lead from motor vehicles in Hong Kong	reliable data available	existing legislation adequately enforces the use of un-leaded fuel	rejected
Total Suspended Particulate (TSP)	Annual average TSP level as a percentage of AQO	understandable to the non-specialist due to its visual effect; reliable data available	not associated with health problems, not classified as a sustainability issue	rejected

MARINE WATER QUALITY

Nutrients in water	Annual mean levels (mg/l) of total inorganic nitrogen, total nitrogen, and total phosphorus in water as a concentration at selected sites	deals with an important sustainability issue; represents long term problem; data available; understandable to the non-specialist		selected
Concentrations of <i>E.coli</i>	The quality of bathing beaches based on swimming season water quality standards for <i>E.coli</i> (no./100 ml)	important sustainability issue; long term problem; data available; understandable		selected

	Candidate Indicators	Advantage	Disadvantage	Status
Heavy metals in sediment	Annual mean bottom sediment levels of chromium, copper, lead, mercury and zinc (mg/kg dry solid)	deals with an important sustainability concern; represents a chronic problem; data available; understandable to the non-specialist	lack of meaningful reference values	postponed
Heavy metals in shellfish	Concentrations of chromium, copper, lead, mercury and zinc in shellfish	deals with an important sustainability concern; represents a chronic problem; understandable to the non-specialist;	limited by the lack of good time series data	postponed
Reclamation	The size the remaining areas of shallow depth	deals with an important sustainability concern; represents a chronic problem; understandable to the non-specialist	lack of adequate readily available data; also suffers from the lack of a clear 'benchmark'	rejected
Oil spills	Annual frequency and intensity of oil spills	deals with an important sustainability issue; reflects a long term problem; understandable to the non-specialist	limited by the lack of proper measure	rejected
Fish catches	Annual fish catches of major species (tonnes)	deals with an sustainability issue; reflects a long term problem; understandable to the non-specialist	lack of available data	rejected
MUNICIPAL SOLID WASTE				
Disposal capacity	Annual quantity of non-hazardous municipal solid waste for disposal within Hong Kong (in tonnes) as a fraction of total remaining existing disposal capacity (in tonnes)	reflects sustainability issue; amenable to policy decision; single numerical value; long term and pervasive problem; scientifically defensible; meaningful threshold value; data available	complex to compile so more difficult to understand	selected as round 1 indicator

Waste generation	Amount of waste generated per capita per year	reflects sustainability issue; easy to understand; long term and pervasive problem; scientifically defensible	not readily amenable to policy decisions; no meaningful threshold values; data not as accessible	rejected
Consumption	Proportion of changes in waste generated to changes in consumer expenditure	easy to understand and intuitive	not readily amenable to policy decisions; no meaningful threshold values; data not as accessible	rejected

EIA in Hong Kong: Effective But Limited

K.C. Lam and A.L. Brown

ABSTRACT

This paper reviews the development of the Environmental Impact Assessment (EIA) system in Hong Kong, examines its effectiveness and identifies the ingredients that are responsible for its success and its limitations. It is argued that in Hong Kong's high pressure development situation with its unique political setting, the current system, despite its limited scope and function, can be considered effective and efficient. The key to this success has been the early integration of environmental assessment with project design, and the extension of the EIA activity within the environmental management programme. Lessons which may be relevant to other rapidly developing countries have been extracted from this analysis.

Keywords: EIA, Hong Kong, project appraisal, environmental management, environmental planning

INTRODUCTION

There are few places in the world with the rapid pace and immense scale of infrastructure building now taking place in Hong Kong. This has been the case for several decades but, before the turn of this century, a remarkable number of projects will be completed, the largest of which is the airport core programme estimated to cost US\$20 billion. The programme comprises a large airport with a capacity of 45 million passengers per annum by the year 2010, a suspension bridge which will be the longest in the world, a 34 km airport railway and about 30 to 40 km of expressway. Other projects include a number of reclamation programmes which will provide more than half of the land Hong Kong has reclaimed from the sea in the last hundred years, six new container ports, three marine borrow areas, six public road systems, one major waste incinerator, seven landfill projects, five refuse transfer stations,

a massive sewage disposal package comprised of eight sewerage schemes, one underground treatment facility and possibly a 35-km long ocean outfall, five public housing developments for over 300,000 people, seven projects in relation to electrical utilities, eight oil, gas, chemical and industrial works and fourteen miscellaneous private development and redevelopment projects. All but the last three groups are public sector projects, and all in an area of about 1000 km².

The upsurge in the number of projects has been hastened by the imminent reversion of Hong Kong to Chinese sovereignty. Infrastructure building is considered a sign of confidence and a contribution to maintaining stability and prosperity. Contrary to the earlier belief that the political change-over would slow down public spending, the cloud of political uncertainty has only accelerated the pace of development and fast-tracked many projects. Hong Kong is still a vibrant city that sees no end to its growth.

Lam Kin Che, Department of Geography, The Chinese University of Hong Kong, Shatin, N.T. Hong Kong. Tel: (852) 2609-6458. Fax: (852) 2603-5006. Email: kinchelam@cuhk.edu.hk
A.L. Brown, School of Environmental Planning, Griffith University, Brisbane, Australia 4111. Tel: 61-7-38757645. Fax: 61-7-38756684. Email: lexbrown@ens.gu.edu.au

The government is determined to invest in infrastructure building to keep Hong Kong at the economic forefront of the region.

The problems brought about by this upsurge in construction are immense. Projects have to be completed within very tight time, financial, space and environmental constraints. Many projects are inter-related; one cannot function properly without the completion of others. Because of the difficult terrain, urban land is scarce and infrastructure projects inevitably affect existing developments. The pressure on natural, particularly marine, resources are extreme. To undertake and orchestrate these projects while minimizing their environmental impact is a formidable task and a challenge for the planning and environmental professionals (Reed, 1992).

Environmental Impact Assessment is (EIA) an environmental management tool that has been used extensively by the Hong Kong government in an attempt to include environmental concerns in this pressure-cooker development situation. In this article we briefly review the evolution of the EIA procedures in Hong Kong, place them in the context of current problems and issues in Environmental Assessment (EA) worldwide, and examine the strength and weaknesses of the Hong Kong system and its relevance as a model for rapidly developing countries in the Asia-Pacific region. Our preference would be to use the simpler abbreviation 'EA' to describe the generic environmental assessment process, but persist with the use of 'EIA' in this paper because of its entrenched use in the Hong Kong context.

EIA IN HONG KONG

The Evolution of EIA in Hong Kong

Environmental protection was afforded no priority by the Hong Kong government before the mid-1970s. This changed some two decades ago when a consultant to the government advised that the absence of proper planning was a major cause of the environmental pollution problems observed at that time, and suggested the development of environmental legislation, including legislated EIA requirements, and an environmental planning system (Environmental Resources Limited, 1977). Most of these recommendations had long been implemented, with the exception of the EIA legislation which has only recently been enacted.

The lack of legislative backing for EIA has not inhibited its use (Ashcroft, 1984). On the contrary, the growth in the employment of EIA in Hong Kong has been rapid: from 1979 to 1985 some 23 assessments were completed, from 1986 to 1991, 80, and from 1992 to 1994 the figure has jumped to over 200 (Au and Baldwin, 1994). Most of these assessments have been at the project level, and applied to infrastructure and land reclamation projects as well as to some new town and industrial developments.

According to Au and Baldwin (1994) there have been several phases in EIA development in Hong Kong. The first phase (1979–86) was based on *ad hoc* requirements imposed on a small number of projects with a focus on project design and mitigation (Reed, 1982; Lam, 1990). EIA requirements were laid down in an administrative circular for public sector projects or stipulated as conditions of the land grant in the case of some private developments.

This arrangement was soon found to be inadequate and a set of systematic administrative procedures were instituted during the second phase (1986–91). Recognizing that many public sector projects have the potential to cause environmental problems because of their scale or because of their proximity to sensitive receivers, internal administrative guidelines were strengthened, culminating in the promulgation of a set of guidelines for EIA procedures for public sector projects (PELB, 1992), with separate guidelines for major private sector projects (EPD Advice Note 2/92) and potentially hazardous installations. These administrative guidelines stipulate very broadly the types of projects to be covered, the procedures for conducting the EIA, and their administration. Though lacking a legislative base, the provisions have had the intent of binding government agencies and have been able to impose on the private sector through conditions in the land lease or development approval.

Au and Baldwin (1994) refer to a recent third phase (1991–93) of EIA in Hong Kong. However, this 'phase' cannot really be considered a change in the basic approach or administrative structure, but more a strengthening of one component of the EIA process — that of monitoring the project during its implementation. This has resulted in specifications, within the EIA document itself, for the environmental monitoring and audit programme as well as detailed contractual arrangements between the proponent and contractor for on-site practices, and for actions to be taken where the monitoring reveals

that environmental limits have been exceeded. This will be discussed further below.

The latest development is the introduction of EIA legislation which is intended to fully establish the authority for the EIA system, and further to specify the powers of the environmental agency, the screening requirements, criteria for assessment, sanctions for non-compliance and provisions for review and judicial involvement. Why is a bill necessary given that the EIA system has been operating in Hong Kong for over a decade without legislation? We presume it is because the existing system may still lack teeth in ensuring that both government and private developments will comply, and in ensuring enforcement of EIA imposed conditions. These are important matters to EIA administrators and in ensuring results, but in terms of this analysis of the Hong Kong system, we do not see that the promulgation of EIA law would result in major structural changes in current practices.

The administrative process for EIA in Hong Kong (see Figure 1) includes two key players. The Environmental Protection Department (EPD) is instrumental in steering EIA studies through the Study Management Group (SMG) and the Advisory Council on the Environment (ACE) provides an independent review of the EIA studies and a channel for public consultation.

One, perhaps unique, aspect of EIA in Hong Kong is that, for large infrastructure projects, there has been segmentation of the whole project into a series of discrete, though related sub-projects, each of which is subject to an EIA (in conjunction with other studies on the planning, transport, and engineering issues required for that sub-project). An example is the airport core program for which, in addition to the EIA done for the airport, separate studies have been undertaken for sub-projects such as the ancillary bridges, rail, roads, reclamation, and aviation fuel supply.

EIA in the Wider Context of Environmental Management in Hong Kong

It is not the task of this paper to review the system of environmental management in Hong Kong, but in examining EIA it is essential to place the EIA component of the system in context. The overview provided in Figure 2 shows that the system in Hong Kong includes, in addition to project-based EIA, inputs to urban and regional planning, inputs to policy

development and to environmental education, and conventional pollution control. Most components of this system would be initiated, if not solely provided, by the Environmental Protection Department.

Managing the environment in a high pressure development situation calls for an effective institutional set-up as well as a high degree of professionalism. Established in 1986 from an amalgamation of the previous Environmental Protection Agency and various environment-related components of government departments, EPD's staff increased from 225 in 1986 to over 1500 in 1996. About 25% of its existing staff are professionals. In 1995 alone, the 50 professionals within the Environmental Assessment Division had to steer about 50 EIA studies and provide environmental input to over one thousand development applications, building plans and government policies.

The Political Context

Examination of the EIA system that has evolved in Hong Kong requires an understanding of its political context. Unlike many Western democratic countries, the government in Hong Kong is administration-led rather than legislature-dominated. The primary role of the legislature is to improve rather than to reject the administration's policies. Furthermore, Hong Kong is effectively a 'city-state'. Decision making is highly centralized and the power of the local governments is very limited. As such, the central Hong Kong government provides strong control and direction in public affairs. It plans, finances and oversees the building of most major infrastructure projects. The local government administration plays only a minor role in development planning and environmental matters. The government obtains public views on its environmental policies and programmes through ACE, the Legislative Council and local District Boards. Other than that, there is little provision for community participation, public hearing and redress through the court system. There is, however, an Ombudsman for recourse in situations of poor administration.

PROBLEMS AND ISSUES IN EIA

Currently EIA is subject to scrutiny worldwide with respect to its scope, effectiveness and efficiency (Sadler, 1996). It is criticized for being applied aloof

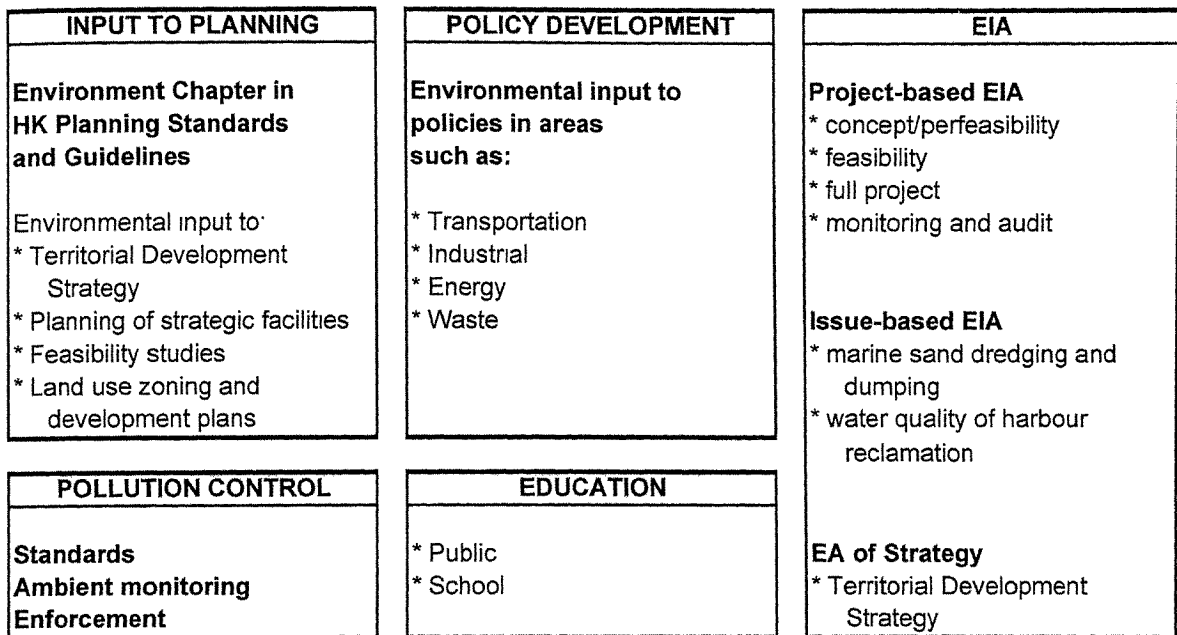


Fig. 2 The Hong Kong environmental management system.

from both the design process and the planning process (Brown and Hill, 1996). Its failure to accommodate cumulative environmental impacts is widely acknowledged, but equally widely it is suggested to have application, unproven as yet, to plans and to policies extending it beyond its conventional application to project assessment (Goodland, 1994). The role and extent of public participation in the EIA process is also a matter for debate.

The EIA system in Hong Kong has its origins in EIA systems in other countries, but it is not a simple transplant. Rather, the past two decades have witnessed the evolution of an EIA system in Hong Kong that has been modified and firmed over time, and shaped to meet the specific set of conditions in Hong Kong. Because Hong Kong's unique set of developmental pressures and administrative governance has shaped its environmental management systems, it is useful to examine how the practice of EIA in Hong Kong performs with respect to a range of these international concerns.

The Effectiveness of EIA in Hong Kong

Very little has been done, either in Hong Kong or elsewhere, to evaluate overall EIA effectiveness. The end result of an effective EIA process is that all projects which are processed under that system prove

to be environmentally benign in theory and in realization — either because the original design was right, or because mitigation strategies proposed in EIA were implemented to achieve this end. In the case that a project proves not to be environmentally benign, an effective EIA process would require that it be implemented only after decision makers had been adequately appraised of its consequences. Despite the general lack of overall evaluations, it is possible to make some observations about the effectiveness and efficiency of some aspects of EIA in Hong Kong.

How effective is the screening process?

The current provisions for EIA studies are outlined in the administrative circulars (PELB, 1992; EPD, 1992) for both public and private sector projects. Because these are not statutory requirements, the administration has to rely on administrative procedures in requiring private developers, and to a small extent, even public agencies, to undertake the EIA. This arrangement has a potential for arbitrariness and its effectiveness is dependent on the professionalism of the officers in charge. However, most public and private developments of a major scale or of a controversial nature have been subject to EIA studies.

What is the scope of impacts examined?

EIAs undertaken in the late 1970s and 1980s focused largely on pollution issues (specifying the media of air, noise and water) but the scope of more recent studies has broadened to include visual and ecological impacts. There is as yet very little discussion on the social and economic impacts. The recent emphasis on ecological issues reflects not only the interest of conservation groups who are represented in ACE, but also the risk of the irreversible loss of valuable habitats and species in a high pressure development situation.

Is the process effective and efficient in terms of the required level of assessment?

Given the large number of EIAs to be undertaken and reviewed, there is a pressing need to focus only on critical impacts. The current arrangement, as portrayed in Figures 1 and 2, allows different levels of assessment for different levels of projects. It enables assessments to be applied at various stages and levels of development planning: strategic, conceptual, pre-feasibility, site selection, feasibility, project assessment and detailed design.

The Study Management Group has adopted a similar approach, which requires proponents to identify issues and to focus only on the key ones. Thus, issues of different complexities and consequences are given appropriate levels of treatment. For several EIAs undertaken in the last few years, the comprehensive EIA study was followed by focused assessment, dealing with specific issues of great complexity, or problems that may contribute significantly to cumulative impacts.

Are alternatives and no-build options effectively pursued within the EIA process?

The current approach can be faulted on a number of grounds. Perhaps the greatest criticism is that the existing system is very mitigation-based. Critics argue that technological fix is only effective if all potential impacts are identified and are known with a high level of certainty, but this is not always the case. Furthermore, this technocratic approach tends to over-emphasize on the design and physical impacts and is likely to be overly definitive and technical. The rationale for the site or route selection are often not given (ACE-EIA Subcommittee, 1995) and the report rarely provides adequate infor-

mation for meaningful public discussion of these matters.

In short, most EIAs have been undertaken with a rather narrow scope, the 'no-build' option is rarely considered, the fundamental need for the project is seldom mentioned, the selection of the site is rarely justified and the evaluation of various options is hardly explained. The focus of EIA use in Hong Kong is to identify a project's impacts and to mitigate them to acceptable levels through design changes and the use of other structural measures. Of the several hundred EIAs that have been undertaken in the past two decades in Hong Kong, no more than ten projects have been abandoned on the findings of the EIA. This is not to say that the choice of a site or a route is never considered, but rather that choice is usually performed in a separate planning exercise or in a feasibility study — and these are quite divorced from the EIA study and its documentation.

The current focus of EIA in Hong Kong can be envisaged as at a particular stage in an evolutionary process (Figure 3). EIA, as portrayed in the diagram, can have different foci and assume different functions, depending on the environmental awareness of the public and the degree of democratization. Given the political culture and the pressure-cooker development situation, the existing practice in Hong Kong is probably a, if not the only, pragmatic, effective and efficient way of handling a large amount of environmental assessment work within a short period of time. Since the EIA in Hong Kong has absolved of many of the 'normal' responsibilities, the conclusions are only right at the 'appropriate' site and for the 'appropriate' option.

How effective is the implementation/enforcement of the findings of EIA?

There is ample evidence in Hong Kong of projects being modified as a result of the EIA process, and this has to be one way to measure of effectiveness of the system. However there has been no testing of implementation and enforcement in the courts, precious little vigilance by NGOs, and the effectiveness of the EIA process is highly dependent on the professionalism (and political will) of the environmental department and on the scrutiny by the independent Advisory Council on the Environment (ACE). The system can be criticized for its informality, and for its apparent lack of teeth. While projects can be, and a large number have been, modified as a result of

Issues		Sustainability	Societal Need/ Alternatives	Sites/ Routes	Technical
Target		Development Strategy	Policies/ Programmes	Plans	Projects
Functions	Core Functions	Development Scenario Evaluation	Economic Evaluation	Alternatives Evaluation	Designs/Plan Modification Mitigation Project Appraisal Information Gathering
	Peripheral Functions	Public Enquiry	Mediation	Public Consultation	"Yes - No" Decision
Goal		Conflict Resolution	Planning	Mitigation	Justification

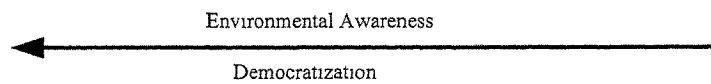


Fig. 3 Evolving paradigm of EIA.

EIA recommendations, it appears that much implementation and compliance monitoring may not be legally enforceable — or at least there is an unwillingness to have this enforceability put to the test. With no clear provision for sanction in case of non-compliance, problems that may arise can hardly be resolved without recourse to cumbersome administrative measures. Despite this, the system seems to have worked well in Hong Kong because public projects are subject to the scrutiny of ACE whose endorsement is essential for securing government funding. On the other hand, private developers who are beginning to play an increasingly important role in infrastructure building because of trends towards privatization. This is why the EIA legislation has to be brought in to ensure compliance.

Is the EIA Connected to the Design Process?

The need to integrate EIA with project design has been underscored by a number of workers (Wright and Greene, 1987; Brown and Hill, 1996). There is, however, as of yet only very scanty research into systems that are known to work; nor is there much

discussion on how environmental assessment can be integrated with project planning and design. Identification of the appropriate institutional set-up and procedural system which would enhance integration at various decision points of the project cycle is thus a logical step in the refinement of the EIA process. In this respect, the Hong Kong EIA system reflects good practice in integrating EIA and project planning as described in Brown (1992) and Brown and Hill (1996).

A key element of the procedural system (see Figure 1), which may not appear unusual at the first glance, is that built into it are a number of ingredients — sensitization, integration and collaboration — which make environmental assessment work in Hong Kong. Sensitization makes the project proponent become aware of potential problems and undertake the responsibility to rectify them. This is achieved by requiring the proponent to prepare a 'project profile' together with a list of potential impacts using a check-list format prepared by the EPD. The Planning Guidelines (Environmental Protection Department, 1991) alert proponents of potential problems, introduce the possible mitigation measures, and set out the design rules in non-technical terms.

Integration, a second feature of the procedural system in Hong Kong, is the incorporation of environmental considerations into project design through a number of iterative steps. Various channels are provided at different stages of the project cycle to facilitate dialogue between EPD and other interested government departments, the proponent, designers and environmental consultants. Integration begins with an evaluation of the project profile by EPD at which point the appropriate level of environmental assessment for the project is decided. From then onward, a study management group (SMG), overseen by EPD, is formed to advise and comment on the selection of environmental consultants, contents of the study brief, methodology, focus, findings and implications of the study.

SMG is the main forum for the project planners and designers, the environmental consultants, EPD and other interested government departments to interact and resolve problems. The project proponent is required to submit programmes, reports and working papers as warranted by the preliminary findings. As the group has to be convened many times to discuss issues, environmental assessment is not a

one-off exercise. The system can effectively integrate environmental considerations with project planning thus providing the appropriate level of environmental input at the appropriate decision point.

This integrative approach provides ample opportunities for the designers to take into account and respond to views from the EPD at an early stage. The consequence is an iterative environmental assessment exercise, with each step progressing towards the solution (Figure 4). This is a significant departure from the traditional approach in which project designers often work in isolation and without environmental input until a very late stage of the design process. The traditional linear approach would usually lead to a 'yes-no' decision at the end. EIA, and thus is in effect no more than a post-design appraisal instrument. The current progressive and interactive approach, made possible by the SMG, helps reduce time and cost for the EA exercise and may answer the call for greater efficiency in the EA process.

The procedural system also fosters collaboration and creative problem solving because it provides the platform to involve all concerned parties, early

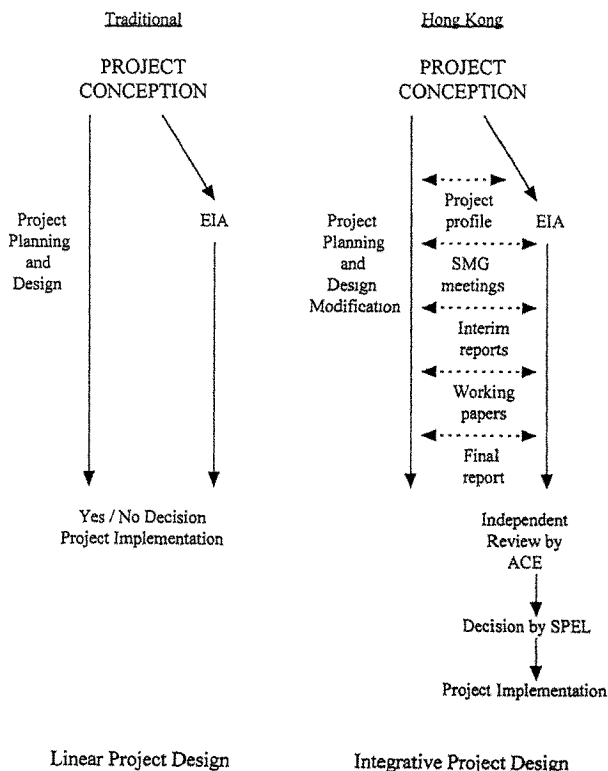


Fig. 4 Comparison of linear and integrative project design.

in the EIA process, to interact closely and work creatively without the clumsiness of a linear parallel decision-making process. This system will undoubtedly place significant burdens on EPD staff, but it helps to shorten project approval time and may even avoid rejection of the project.

Do the EIAs Handle Cumulative Impacts?

Another criticism that can be leveled at the EIA system in Hong Kong but which is also true of systems in other countries is its inability to handle cumulative impacts. It is well known that assessments prepared on a project-by-project basis can fail to account for the cumulative effects — mostly incremental creep in pollution levels, or loss of biodiversity, but also cumulative social impacts — of a series of projects.

The government is not unaware of the limitations of EIA in dealing with cumulative impacts and has developed some innovative approaches to handling some of these, specifically those dealing with pollution from construction activities. Environmental monitoring project offices have been set up in some of the pressure-cooker development situations where a range of different projects are being constructed simultaneously. Their function is to audit the cumulative impacts arising from projects that are closely clustered together (Nash, 1993) so that remedial actions can be taken if warranted by the monitoring results. This is achieved through clauses in the construction contracts which require the monitoring of cumulative impacts and the necessary remediation. It is an interactive and curative process, which may lead to reactive mitigation strategies not necessarily foreseen in the single-project EIA. In addition, independent environmental project offices are set up to scrutinize large projects to press for the timely implementation of mitigation measures, ascertain cumulative effects, audit monitoring results and liaise with the site engineers to work out remedial measures before small problems develop into big ones (Nash, 1993; Sanvicens and Baldwin, 1995).

Effectively, this procedure is a way of responding to the uncertainties associated with environmental impact assessment. This uncertainty may arise from our inability to model and predict complex environmental systems, or simply from baselines shifting due to inadequate initial knowledge or because of cumulative effects from multiple projects. The ap-

proach in Hong Kong encourages flexibility in the environmental conditions placed on the proponents' activities by specifying clearly the environmental goal or criteria which must be attained, but not requiring mitigation activities, which instead are implemented only when necessary. It makes the EIA system more robust and efficient, with less need for precision with respect to predictions while still achieving the required environmental goals. The functioning of a system such as this is strongly dependent on a high level of environmental professionalism and the absence of corruptive practices in the government machinery.

The approach described above is an important advance in handling cumulative environmental effects, albeit in a highly specific setting and for a highly specific set of impacts. This innovation apart, most EIA practitioners acknowledge that cumulative impacts can generally be handled only at the regional planning and resource policy levels (Saddler, 1996). How does the EIA system in Hong Kong shape up in this respect?

Public Participation in the EIA Process in Hong Kong

The current system allows for some public involvement largely in the form of consultation with ACE and local District Boards (Lam, 1996) and representation of the local District Officer in some SMG meetings. However, the concerns of ACE and the local community, as represented by the District Officer, are not always the same. The former is focused largely on broad issues and the latter on local problems. Whilst the public may have access to the final EIA reports, they are not involved in most of the EIA process. By the time the report is submitted for public consultation, projects tend to have gained so much momentum, the design so finely tuned, and the remaining issues so technical, that there is very little room for substantial project modification, let alone for project rejection.

Without early public input, the focus of the EIA may not reflect new realities and changing aspirations of the community, with the result that issues of concern such as biodiversity and sustainability have not, until very recently, been given adequate attention. The formation of an EIA Subcommittee under ACE in 1994 has fostered re-examination of these issues and listing of these issues on the agenda for discussion.

Overall, the system bears the imprints of the administrative-led political system, which has little provision for direct community participation, public hearing and redress through the court system — all of which ingredients are considered by some to be essential and critical elements of an effective EIA system. This apparent lack of public input has been seen in the context of the changing political culture and the evolving paradigm of EIA activities (Figure 3).

There are many factors which may broaden the scope of EIA, the key ones being the change in environmental concern and the demand for democratization. As such, the scope is more a reflection of the political culture rather than of the nature and magnitude of the problems. Opening up the decision-making process broadens the scope because public involvement often brings in new perspectives and fresh concerns. As the public have a greater influence on the political agenda in such a situation, the discussion is confined not only to the acceptability of a project, but rather the necessity of the project, and various alternatives of meeting the need. The recent worldwide trend is that EIA has moved gradually upstream into the policy arena, extending from the assessment of projects to the assessment of policies and programs. It is no wonder that in democratic societies such as Australia, the activities of environmental assessment have grown from the early starting point of focusing exclusively on the biophysical environments to encompassing issues of biodiversity and sustainability (Morris, 1987; Carbon, 1994)

The level of democratization in a society also determines the mode of decision making. At one end is the top-down approach where decision-making is of the 'decide-announce-defend' type (Wondolleck, 1985). As such, environmental assessment is merely a project justification tool and an instrument to rationalize government actions. Little consideration is given to societal needs, alternative sites and other options. With increasing public involvement, different degrees of consultation and mediation may be introduced. The focus may change, from the traditional 'yes-no' decision to the weighing of gains and losses, and to creative problem solving.

The degree of public involvement also shapes the role of different actors. At one extreme, the government may assume many roles — guardian of the environment, assessor, and proponent. At the other

extreme, the government may just become a facilitator in the bargaining process and a referee in the EIA exercise. With increasing public involvement, project proponents can no longer hide behind the bureaucracy but have to face squarely the issues, wants and needs of the society.

Whilst this broadening process often takes many years to complete, it can be hastened in a number of ways. Within a country, it may be accelerated by public pressure and changing social values and aspirations. From without, it can be imposed by a foreign aid agency or an international organization. In the latter case, the focus is no longer whether the environmental impacts are acceptable, but rather whether the development is sustainable. This accelerated transition is not always painless. More often than not, environmental assessments are not undertaken out of conviction, but only in response to pressures from donor agencies which impose the agenda on the recipient country. Very often, the expertise and skills required for a reasoned discussion of these issues are lacking. Furthermore, broadening of the scope is not always accompanied by a commensurate expansion of the environmental agency's jurisdiction to cover areas such as conservation and economic development. This can create tension between different line agencies and promote dispute. In Hong Kong, the catalysts of change have originated from within — inspired by the vision of the advisory bodies and senior administration and fostered by the repeated campaign of the NGOs.

Of course, one advantage of limited public participation is the very short project lead time made possible by the interactive and incremental mode of decision making. Because the EIA process in Hong Kong is overseen by EPD and there is no provision for any public enquiry, the likelihood of the EIA requirements resulting in delays to the project, not to mention the possibility of rejection on environmental grounds, is indeed very small. Time is considered very important by the government and the private sector in Hong Kong. Whilst this system has distinct merits, particularly in meeting the needs of a very tight programming schedule, its success can only be guaranteed by a high level of professionalism in the public service and a delicate check and balance system in the EIA review process (Lam, 1996). The ingredients are currently there, but how they would stand up to the test of time is yet to be seen.

Are the EIAs Applied to Policies and Plans?

EIA in Hong Kong is still predominantly project-based. The danger of this project-by-project approach has been succinctly illustrated by Goodland (1994):

When an EA (Environmental Assessment) team is asked to do an EA of a proposed highway project, the team will not last long if they say that a rail is more needed than the proposed highway. Or an EA team assessing a power generation project concluding that the demand side management is more needed than the proposed power project.

This limits investigators' vision, predisposes them towards the original proposition, and precludes them from coming up with innovative options. To address concerns regarding the limitation of the EIA process, there have been suggestions in Hong Kong to widen the application of the EIA process to policy proposals, conceptual plans and development strategies (Au, 1994) what is widely referred to as Strategic Environmental Assessment (SEA).

However, to date, Hong Kong has had only limited experience with SEA. There has been no direct application of a formal EIA process to policies, but there has been one major on-going attempt to apply EIA to plans, namely the review of the Territorial Development Strategy — a major regional planning exercise (Planning Department, 1996). This is a very important start with far-reaching environmental implications. The outcome of this experiment will be watched with interest.

Are EIAs Connected to Planning and Policy?

Hong Kong has a history of both strategic territorial planning and local planning, and although planning does not fall within the jurisdiction of the Environmental Protection Department, planners in Hong Kong interact with the environmental professionals to solicit the latter's input in drafting development strategies, urban development feasibility studies, regional land use plans and more detailed outline zoning plans (Au, 1991). This interaction occurs through requests for input to strategy development, to comments on draft plans, and more formally through the Planning Standards and Guidelines which set out government policy on land use development. A chapter in these guidelines specifies environmental criteria for the planning of urban development, industry, and infrastructure (Environmental Protection Department, 1991).

This environmental input into planning and policy, probably more so than in most countries, has been facilitated, to a large extent, by collecting environmental baseline information scientifically and systematically over the relatively small area of the territory. This base has been used, for example, in a territory-wide study undertaken in the mid-1980s to ascertain the development and environmental constraints of various regions in Hong Kong. Another example was environmental input to a strategic planning exercise done for the whole Victoria Harbour area (PELB, 1995).

In the same manner as for planning, environmental input to policy development can occur through requests for environmental department input to policy formulation and, since 1992, there has been formal requirement that new and altered policies presented to the Executive Council for approval need to contain specific sections on the environmental implications of that policy (Au, 1995).

It is not the purpose of this paper to comment on the extent to which the environmental management components of planning or policy are complete and effective in Hong Kong. Our interest is in the potential of these to provide essential complementarity to project-based EIA. In Hong Kong, EIAs conducted on specific projects generally have both regional and local plans and policies, to provide both context and criteria for the detailed environmental assessment of individual projects. A bonus is that there is often some notion of cumulative effects within these plans and policies. This goes some way towards minimizing some of the conventional failings of project-based EIA.

Have EIAs fostered Better Environmental Management?

Traditionally, EIA has assumed the fundamental role of providing advice, in a rather passive way, to decision makers on projects' environmental acceptability. This process is more a matter of analysis and criticism than being a creative and proactive endeavour. There is now a call to move EIA beyond its reactive and curative role to become a proactive and forward looking environmental management program (McDonald and Brown, 1995).

Hong Kong is among those jurisdictions which have seen some progress in this area. In the past few years, an increasing number of EIAs have involved more than project appraisal in providing the basic

framework for developing its recommendations into an environmental management system. These are proactive suggestions and concrete advice, in terms easily understood by contractors and site engineers, on the best environmental practices. This move has been made possible by the incorporation of Environmental Monitoring and Auditing (EM&A) programme in most EIAs.

Figure 5 illustrates how the EM&A programme can add this significant environmental management dimension to the EIA activity. Without it, the EIA will simply recommend a project design, set down conditions to comply and environmental objectives to attain, with hardly any suggestion of how these goals can be met. This EM&A programme provides not only a check on the attainment of the environmental objectives, but also the feedback to which the project proponent must respond. At the same time, the EM&A programme is often accompanied by a set of clauses to be included in the works contract, and suggestions on good environmental practices that are deemed necessary.

With these feedback and supportive mechanisms, the project managers are obliged to implement both structural measures to comply with the project de-

sign as well as management practices to achieve the goals. Such practices can prevent problems that may occur and respond more readily to unanticipated problems and unforeseen situations. The periodic reporting system also fosters interaction between the project manager, environmental consultant and control authority and instills in the project proponent the responsibility to examine its practices and conform to sound environmental management.

CONCLUSION

EIA in Hong Kong has gradually moved from a post-project-design and evaluation tool towards an effective, or at least potentially effective, one of planning and design. It has brought different actors in infrastructure building together, facilitating interaction, redistributing influence and fostering good environmental practices.

The EIA process in Hong Kong, which has been made a statutory requirement only very recently, can be criticized for its informality, over-reliance on technological fix, narrow focus on technical issues, almost exclusive concern with the biophysical envi-

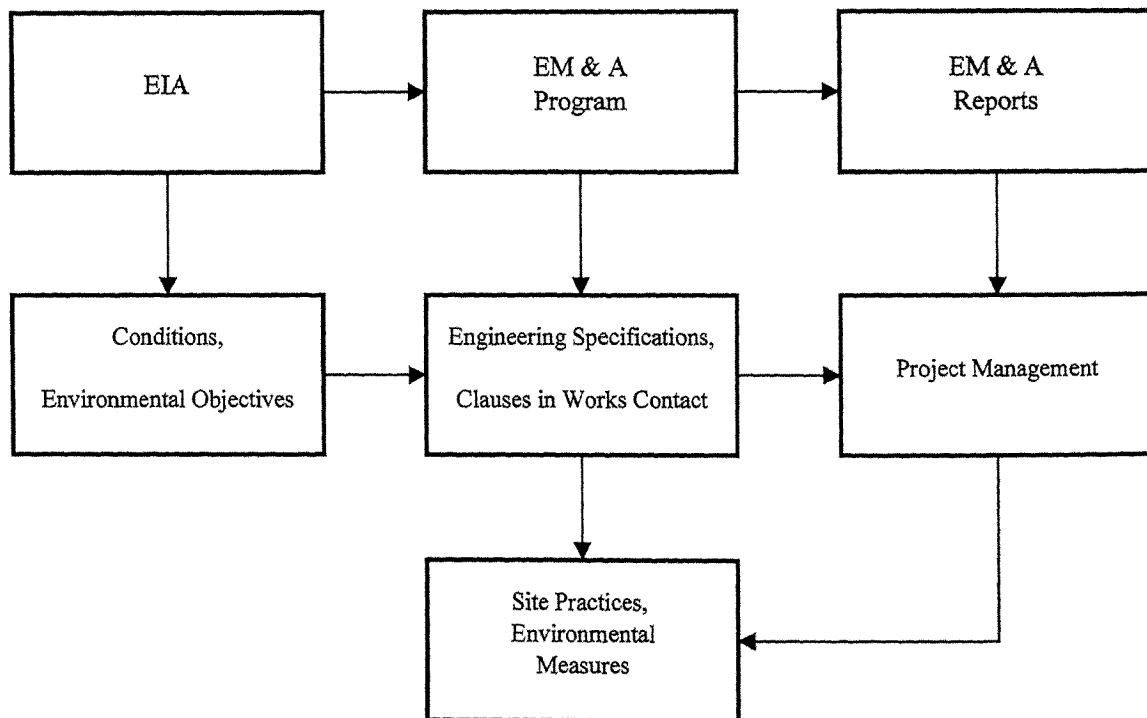


Fig. 5 Environmental management response cycle of EIA activities in Hong Kong.

ronment and lack of large-scale public involvement. However it is arguably quite an effective and efficient system for integrating environmental considerations into design, resolving problems, and containing impacts — all with the minimal time delay that is seen as essential in development activities in Hong Kong.

It has achieved this effectiveness and efficiency by concentrating most efforts on design and mitigation. Its emphasis is on getting, through the interaction of the various actors in the SMG, the *project right* the first time, and in the shortest possible time, and on controlling environmental damage to acceptable limits (Brown, 1992). The existing system has moved in the right direction and can be contrasted with EIA systems in many parts of the world where the maximum effort in the assessment procedure is in getting the *EIA document itself right*, generally with little energy or mandate left, after the document is deemed satisfactory, to implement its findings.

The orientation of the Hong Kong system is also different from that of many developing countries in which EIA is used as a regulatory rather than as a planning tool. The over-emphasis on the regulatory role of EIA can create incentives to delay environmental studies until late in the project development cycle when EIAs are no longer of much use for shaping project decisions. Where this is the case, project proponents view EIA mainly as a perfunctory step in obtaining development permits and the result can be a protracted formal review process of the impact statements which often delays projects. While there is no doubt that project proponents in Hong Kong would initially have seen EIA in this way, and these attitudes take a long while to change, the Hong Kong approach to EIA as a planning tool has had some success. The key to this success can be attributed to the early integration of environmental assessment and project design, translation of EIA recommendations to environmental management programmes and the extension of EIA to other planning activities. As a result, there is evidence that an increasing number of the key players in development activities in Hong Kong, both from the public and private sectors, are cooperating in EIA.

Hong Kong has also provided an exemplary example of how the EIA, traditionally a 'one-off' exercise, can be extended to become part of an ongoing environmental management programme. This has been achieved by incorporating environmental clauses in the works contract and making environ-

mental monitoring and audit an integral part of EIA. The move of EIA into strategic planning studies is in the right direction. This is not only trendy but also absolutely necessary given the high intensity of development within so short a time and so small a place. These strategic EIA studies are required to address problems arising from cumulative impacts and explore implications of various development scenarios. Such studies cannot be kept aloof from consideration of community aspirations, societal needs and trade-offs. It has been argued that the scope of EIA has to be broadened in Hong Kong to allow meaningful discourse on these inherently controversial issues.

There are of course some deficiencies in the current system. Problems arising from the absence of explicit screening and evaluation criteria and the lack of teeth in implementation will be addressed in the recently enacted EIA Ordinance. However, there is no doubt that EIA is still seen by environmental professionals in Hong Kong as properly restricted to certain 'core functions,' and is primarily based on mitigation. With few exceptions, it does not include functions mandated to EIA in other, particularly Western democratic, jurisdictions, such as assessing the need for the project, determining whether or not a project should proceed, and choosing from available alternatives, while employing EIA as a vehicle for public participation in the planning process. Although the significance of these functions in Hong Kong has been recognized (ACE-EIA Subcommittee, 1995), they are not yet widely perceived as integral parts of EIA.

This limited view of EIA, of course, simply reflects the current nature of government and government decision making in Hong Kong. But in the wake of recent economic and political changes and the greater demand for an open and democratic government, and because of the need for EIA to move into plans and strategies, it is likely that there will have to be a broadening of administrators' narrow perceptions of EIA to attempt to respond to the demand of the public for greater involvement, the desire of the people for a better living environment, questions of sustainability, and the need for Hong Kong to fulfill its international environmental obligations.

The existing interconnections between the EPD and other government agencies will likely make it easier to develop a policy of Strategic Environmental Assessment in Hong Kong than elsewhere. The important task is to strengthen the depth and cover-

age of this integration so that as much of the functions of EIA can be directly absorbed into the strategic, regional and land use planning processes (McDonald and Brown, 1996). Cumulative impacts are more amenable to assessment in these planning exercises than in project-level EIAs.

Can the experience of EIA in Hong Kong offer models or lessons for rapidly developing countries in the Asia Pacific region? Some key experiences, such as the re-orientation of EIA away from being a regulatory tool only towards being a project planning tool, are particularly useful. The procedural mechanisms which facilitate sensitization, integration and collaboration can be copied elsewhere, fostering interaction and creative problem solving and integration of environmental input into the project design. Another useful lesson is that much can be achieved through administrative arrangements — taking some of the pressure off what is probably too great a reliance on producing legislation to prosecute EIA activities. This admittedly is effective only if there is an efficient government machinery.

However, other features of the system are probably only appropriate for this time and this place. The current mode of public involvement, no matter how efficient it appears to be, is probably effective only in this unique setting, and is probably not a

model in the conduct and review of EIAs for other developing countries. The connections into land use planning, into policy and into strategic developments, while highly desirable, are unlikely to occur in governments which do not have the 'city-state' advantages of Hong Kong. Several countries, such as the Philippines, have attempted to delegate central EIA activities to the regions. Regional authorities in developing countries may have more lessons to learn from the Hong Kong system and be able to emulate the EIA and other environmental management activities there. However, it appears that where EIA delegation has occurred from central to regional authorities, the required resources for EIA are not always available.

The Hong Kong system has only worked effectively because of a small, highly centralized and efficient government machinery, again a function of city-state status and small area of jurisdiction compared to most other countries in the region. The EIA process has to be matched by the appropriate institutional set-up and with a high level of expertise and professionalism in the environment department. The relatively well-trained and efficient staffing for the EIA system in Hong Kong is something which is probably difficult to match, per capita or per square kilometre of jurisdiction, in other countries.

REFERENCES

- Advisory Council on the Environment EIA Subcommittee (ACE-EIA). 1995. *Review of the Work of the ACE-EIA Subcommittee 1994-95*. ACE Paper 55/95
- Au, E.W.K. 1991. Planning against Pollution — an Art of the Possible. In J. Boxall (ed.) *Polmet '91: Pollution in the Metropolitan Environment*, pp. 957-974.
- Au, E.W.K. 1994. Towards Policy and Program Environmental Assessment (EA) in Hong Kong. *Hong Kong Canada EIA Workshop*. Hong Kong March 1994. pp. C3-C8.
- Au, E.W.K. 1995. Environmental Assessment of Policy Initiatives — The Hong Kong Experience. Mimeograph.
- Au, E.W.K. & Baldwin, P.J. 1994. Application of the EIA process in Hong Kong — Toward a more Effective and Formal system. *Paper presented at the IAIA '94 Conference*. Quebec City.
- Ashcroft, B. 1984. Environmental Planning and Assessment in the Non-western World — the Hong Kong Example. *Paper presented at the International Training Course on Environmental Impact Assessment and Land-use Planning*. Hong Kong, January 1984.
- Brown, A.L. 1992. Beyond EIA: Incorporating Environment Into the Engineering Design Process. *National Conference on Environmental Engineering*, Gold Coast, Queensland, 1992. pp. 229-233.
- Brown, A.L. & Hill, R.C. 1996. Decision-Scoping: Making EA Learn How the Design Process Works. Submitted to *Project Appraisal*, 10, 223-232.
- Carbon, B. 1994. An Australian Perspective on Environmental Impact Assessment. *Paper presented at International Summit on Environmental Assessment*. Quebec, 1994.
- Environmental Protection Department. 1991. *Environmental Guidelines for Planning in Hong Kong*.
- Environmental Protection Department. 1992. Application of the Environmental Impact Assessment Process to Major Private Sector Projects. *EPD Advice Note 2/92*.
- Environmental Resources Limited. 1977. *Control of the Environment in Hong Kong — Final Report*. Prepared for the Secretary of Environment, Hong Kong Government.

- Goodland, R. 1994. Priorities in Environmental Assessment. *Paper presented at the International Summit on Environmental Assessment*, Quebec, 1994.
- Hills, P. 1986. Environmental Impact Assessment and New Town Planning in Hong Kong. *Landscape and Urban Planning*, 14:253-273.
- Lam, K.C. 1990. EIA of Castle Peak Thermal Power Station. in P. Hills & K.V. Ramani (eds) *Energy Systems and the Environment*, pp. 99-137.
- Lam, K.C. 1996. Public Participation in the EIA Process in Hong Kong: the role of a consultative committee. *Paper presented at the IAIA '96 Conference*, Lisboa, Portugal, June 1996.
- McDonald, G.T. & Brown, A.L. 1995. Going beyond EIA: Environmental Input to Planning and Design. Submitted to *Environmental Impact Assessment Review*, 15: 483-495.
- Morris, M.L. 1987. In the Evolution of Environmental Impact Assessment — A Time of Change for Australia. *Environment & Planning Law J.*, 1985(4): 295-303.
- Nash, J.M. 1993. Environmental Monitoring and Audit of a Major Construction Project in Hong Kong: The West Kowloon Reclamation. *Asian J. Environmental Management*, 1(2), 23-38.
- Planning Department Hong Kong Government. 1996. *Territorial Development Strategy Review: Strategic Environmental Assessment of the Medium Term Options*, Hong Kong Government.
- Planning, Environment and Lands Branch (PELB) 1992. Environmental Impact Assessment of Major Development Projects. *PELB Technical Circular 2/92*.
- Planning, Environment and Lands Branch (PELB) 1995. *The Shape of Things to Come: An Overview of the Role of Harbour Reclamation in the Future Development of Hong Kong*. Hong Kong Government.
- Reed, S. 1992. Managing Hong Kong's High Pressure Environment. *Environmental Policy and Practice*, 2(1): 51-68.
- Saddler, B. 1996. Environmental Assessment in a Changing World: International Study of the Effectiveness of Environmental Assessment. *Final Report presented to IAIA '95 Conference*, Lisboa, Portugal.
- Sanvicens, G.D.E. & Baldwin, P.J. 1995. Environmental Monitoring and Audit: The Hong Kong Experience, *Paper presented at the IAIA '95 Conference*, Durban, South Africa.
- Wondolleck, J. 1985. The Importance of Process in Resolving Environmental Disputes. *Environmental Impact Assessment Review*, 5: 341-356.
- Wright, D.S. and Greene, G.D. 1987. An Environmental Impact Assessment Methodology for Major Resource Development. *J. of Environmental Management*, 24, pp. 1-16.

Hong Kong's Environmental Accomplishments and Continuing Challenges: A Commentary From the Hong Kong Government's Environmental Protection Department

Robert J.S. Law

ABSTRACT

Hong Kong's rapid economic growth in recent decades has placed considerable pressure on the local environment. Within the last ten to fifteen years, the community has begun to demonstrate a desire and a willingness to tackle the growing environmental problems. Within this short time frame, Hong Kong has made remarkable progress in resolving the worst of these problems and has put in place solutions and remedial programmes of a very high standard. This paper reviews Hong Kong's progress on major environmental issues within the last decade and proposes some measures for dealing with the environmental problems that pose a challenge for the next.

Keywords: *Hong Kong, government, environment, pollution control, sustainable development, polluter pays principle, air pollution, water pollution, waste disposal, noise control*

INTRODUCTION

I have been asked to write an article for this special edition of the *AJEM* to provide an overview of Hong Kong's past, present and future environmental challenges and the government's response to meeting these challenges. In the space available this is a tall order. I will, therefore, confine myself to dealing only with those issues which are the most important and which fall within my own department's areas of responsibility. Before addressing the details, it is important to establish the historical context in which work on environmental protection has been carried out in Hong Kong.

In the very early 1970s, when some of the more enlightened and economically advanced countries

were beginning to take a real interest in environmental matters, Hong Kong was still struggling to satisfy the most basic needs of its society, such as the provision of adequate housing. It is hardly surprising, therefore, that the local population generally had little interest in environmental issues at that time. The focus was very much on nurturing and sustaining the economic growth that was then beginning to take place.

It is fortunate indeed, therefore, that in the mid-1970s some forward-looking individuals within the Hong Kong Government realized that if the rapid pace of development that was by then taking place were to continue, without any regard to the implications for the environment, we would be laying in store very serious problems for the future. This concern eventually led to the appointment in the late

Robert J.S. Law, Director, Environmental Protection Department, Hong Kong Government, 24-28/F Southorn Centre, 130 Hennessy Road, Wanchai, Hong Kong, Tel: (852) 2835-1018, Fax: (852) 2838-2155.

1970s of an individual to be the Government's Environmental Protection Advisor, Dr Stuart Reed, who by the early 1980s managed to establish a small Environmental Protection Agency (EPA) within the government, with a handful of staff. The focus within the community, however, and certainly within the government at that time, was still very much on economic development, which by then was really starting to accelerate.

The role of the EPA during the early 1980s was restricted to monitoring pollution and to preparing proposals for tackling pollution. The agency had no executive pollution control functions nor did it have any responsibility for dealing with conservation matters or for planning environmental infrastructure. These functions and responsibilities were scattered throughout a number of government departments. A strong focal point for coordinating government action on environmental endeavours was, therefore, lacking.

During the early to mid-1980s a great deal of effort was made by the EPA and also by some non-governmental organizations, or 'green groups,' to educate the public about the need to give more consideration to environmental matters. Not surprisingly, with the community still very much preoccupied with economic development, this was no easy task. Indeed, there was considerable opposition to many of the EPA's proposals for controlling pollution and limiting environmental degradation, not only from industrialists and developers, but also from within the government itself. There was a widely held belief that environmental protection could be bought only at the expense of economic development and prosperity. Unfortunately, some people still appear to hold this view even today.

By the mid-1980s, however, things began to change. As the community became wealthier — in 1995, the Gross Domestic Product per person was about \$US23,000.00 (Hong Kong Government, 1996) — so people's expectations began to rise and they became far more interested in quality of life issues. A much more broadly based community demand for action to protect and respect the environment started to emerge. At the same time, a number of key senior officials within the government also started to take more of an interest in environmental matters.

In 1986 the EPA was upgraded to the Environmental Protection Department (EPD) and given additional responsibilities. Specifically, the department was given the task of enforcing pollution

control legislation and also for planning for all new environmental infrastructure, for sewerage and solid waste disposal. Responsibility for conservation and ecological matters remained with the Agriculture and Fisheries Department, as it does today.

While the formation of the EPD may not have seemed all that significant to members of the public, within the Government it made a tremendous difference in advancing the environmental cause. With a larger number of staff, wider responsibilities and the support of senior members of the Government, it was possible for the department to have much more influence in the shaping of government policies and actions concerning environmental protection. The department was able, also, to play a much greater role in assisting to educate the general public on environmental matters and generally was more successful in pressing home the environmental message.

By this time, the green groups had also become more robust and vocal in their demands for government and community action. A number of academics were making their voices heard and the 'Letters to the Editor' columns of the local newspapers frequently contained pleas from ordinary members of the community for action to deal with Hong Kong's environmental problems.

By 1989 the Government was ready to publish its first White Paper on the environment (PELB, 1989). This was a major milestone, as the document set out clearly for the first time what the government's policies and targets were for protecting the environment and committed the Government to a number of new programmes. The Government agreed that progress on implementing the White Paper should be publicly reviewed every two years. This in turn led to a considerable strengthening of the EPD's resources over a four-year period in order to enable it to respond to the challenges and commitments set out in the White Paper. Today our staff strength is approximately 1600.

Well, what has been achieved with these resources? In the sections that follow I will describe what I regard as some of our more significant achievements, followed by a review of our current problems and will then go on to consider the challenges we will face in the future.

PAST ACHIEVEMENTS

What follows is necessarily just a summary of selected

activities from the last ten years or so. For a fuller account of progress on environmental protection, readers should refer to the EPD's annual publication, *Environment Hong Kong* (EPD, 1989–1996).

Fuel Restriction Regulations

Arguably, one of our greatest successes came with the introduction in 1990 of regulations to restrict the sulphur content of industrial fuel throughout Hong Kong to less than 0.5%. Prior to this we had a great many situations where factory chimneys were emitting extremely high concentrations of poisonous sulphur dioxide fumes directly into the bedroom and living room windows of neighbouring residential developments. In one case the iron railings around the residential development on the side facing the chimneys had been almost completely eaten away by the acidic deposits. In another, the pollution from the 80 chimneys surrounding the residential block was so severe that it was impossible to stay on the roof of the block of flats for more than a few seconds without choking.

The problems were so pervasive and serious that we quickly realized that making use of existing legislation to try to control individual factory emissions could not possibly provide an adequate response. A blanket ban on the use of high sulphur fuels was therefore seen as the only realistic solution.

When we introduced the regulations, sulphur dioxide levels fell by as much as 80% overnight and are now well within our Air Quality Objectives. Epidemiological studies suggest that by this initiative alone we have saved the lives of thousands of people and kept many more thousands out of hospital. We should not forget, either, that stopping people from getting ill has another valuable side benefit of avoiding lost income and productivity due to absences from work.

Interestingly, at the time of trying to get these regulations passed, it was asserted by our opponents that the bleaching and dyeing industry would collapse as a result of our proposals, and the entire Hong Kong textile trade would be put at risk. Not only did this not happen, but several of the companies involved actually outperformed the stock exchange index at the time!

Intervention in the Planning Process

Another achievement of considerable importance has

been our intervention in the town planning process in Hong Kong. In the past, very little attention was paid to the need to plan our urban developments in an environmentally sensitive manner. As a result, we can still see today many past examples of appalling planning, where high-rise residential buildings were allowed to be built surrounded by low-rise factory chimneys; where high-speed elevated roadways were built within a few feet of bedroom windows; and hazardous industries were placed too close to residential buildings or vice versa.

Now, however, there is a special chapter in the Hong Kong Planning Standards and Guidelines which sets down minimum environmental standards that must be achieved when planning new developments (EPD and Planning Department, April 1991). As the Director of Environmental Protection I am also a member of the Town Planning Board and am represented on all of the Government's senior planning committees, where I am able to ensure that environmental issues are properly addressed.

The Government has also initiated a system for ensuring Environmental Impact Assessments are carried out for major development proposals, and this system has recently been formalized in a new Environmental Impact Assessment Ordinance. Our approach to dealing with environmental assessment is recognized internationally by practitioners in this field as being among the best in the world.

All papers and proposals submitted to the Executive Council, the government's chief policy making body, and the Public Works Sub-committee and Finance Committee of the Legislative Council also now have to clearly set out their environmental implications, so that these are properly considered in the decision-making process.

Through this intervention in the planning process we can avoid repeating the worst mistakes of the past. I cannot pretend, however, that we are always 100% successful. Indeed, there are many occasions where, because of overriding competing priorities, environmental considerations must take second place, or compromises must be made. But at least there is now a proper and informed debate about the relative merits of each case, which is a considerable step forward.

Protecting Schools from Noise

A related issue concerns what we have done to protect schools in Hong Kong from environmental noise.

In the past, a great many schools were built within a few feet of major roads or immediately under the flight path to our international airport, which is one of the busiest in the world. As a result, and due to the climate in Hong Kong which makes it essential for classroom windows to be opened for much of the year, the noise levels within the classrooms were unbelievably high. In many cases the noise levels were so high that teachers had to communicate with the children inside the classrooms by using megaphones! How children ever managed to learn in such deplorable circumstances is beyond one's imagination.

The response to this problem was to initiate a programme to provide noise insulation for badly affected classrooms together with air-conditioning for ventilation. At one stroke the noise problem was removed and the children also obtained a more comfortable environment in which to be taught. In this way we have now insulated more than 7,000 classrooms and each year benefited more than 350,000 students. The location and design of new schools is subject to the environmental planning standards mentioned earlier.

Provision of Environmental Infrastructure

A very important further area of work in which I believe we have made considerable progress is in the planning for and provision of environmental infrastructure. By the time the EPD assumed responsibility for this area of work, in 1986, the provision of environmental infrastructure had not kept pace with demand, particularly concerning the provision of sewerage. Most of our sewers were hopelessly overloaded, and many of what had been intended to be separate stormwater drains had been intercepted for the discharge of sewage and other polluted effluents, to the point where the overwhelming majority of the polluting flows were going directly into the waters of the harbour untreated. We also had an inadequate and inefficient system for dealing with the disposal of solid wastes, and no proper treatment system for toxic wastes.

Now, however, after a relatively short period of time, we have planned for, and built, three of the world's biggest and most environmentally safe landfills, with an expanding network of refuse transfer stations for the containerization of the waste. This system of dealing with our solid wastes is highly efficient and cost-effective. We also have built one

of the world's most advanced and comprehensive chemical waste treatment plants which, together with tight enforcement of our regulations, has brought about a dramatic drop in the amount of toxic metals entering our harbour waters. These projects have been completed in such a speedy manner by involving the private sector and the use of innovative Design, Build and Operate contracts, which are also extremely cost-effective.

To address our sewerage problems, we have been spending billions of dollars systematically rebuilding Hong Kong's sewerage network. Already a great many local sewerage problems have been solved. When the first stage of our Strategic Sewage Disposal Scheme is completed we will also have intercepted for proper treatment 70% of the polluting flows entering Victoria Harbour. The implementation of later stages of the scheme will ensure that all of our existing sewerage problems will have been brought under control.

Other Achievements

I will just quickly mention some of our other successes and some initiatives taken by others before turning to our current problems.

To contribute towards the protection of the Ozone Layer, we have enacted an Ozone Layer Protection Ordinance and brought in tough controls on the importation of ozone depleting substances, so that our consumption of these substances in Hong Kong is now negligible compared to the period before the controls were introduced.

We have brought lead emissions from motor vehicles down from nearly 200 tonnes per year to almost nothing and managed to achieve the highest take-up rate of using unleaded petrol in the world. This has enabled us to bring in extremely tough emissions standards for petrol engined vehicles.

We have brought noise from construction activities under strict control and reduced the number of hours noisy piling can take place to just three hours per day. We hope shortly to phase out the use of the noisier piling methods completely.

We have managed, also, to tackle the problem of livestock waste successfully in many parts of Hong Kong, so that streams that were once clogged up with a disgusting solid crust of this waste are now running freely and once again contain fish and other aquatic life.

We have established six Local Control Offices

around the territory to deal in an efficient manner with the implementation at the local level of the various pollution control ordinances that have been enacted and also to build links with the local communities.

The Government, matched by a major private sector company, has established an Environment and Conservation Fund to support community environmental awareness activities, educational projects and research studies by community groups and academics. The Government has also established an Environmental Campaign Committee to help provide a focus for sponsorship funding support and coordination of environmental community awareness activities by green groups and other community organizations.

A Private Sector Committee on the Environment has been established to provide a focus for the business community in Hong Kong to consider environmental issues and to provide information and technical support to industrialists and businessmen. The Hong Kong General Chamber of Commerce has established its own Environment Committee as have many other business and industrial associations.

Lastly, and by no means least, the Legislative Council has established for many years now a special Environmental Affairs Panel to consider draft legislation and policy initiatives relating to environmental protection and to address general environmental issues within Hong Kong.

All of these achievements and activities, particularly those by the private sector, illustrate that the community's interest in, and attitude to environmental issues have matured considerably in recent years. Considering that it is only about ten years since the Hong Kong community really started to take any major interest in the environment, progress has been remarkably good. That is not to say, however, that we should feel complacent. Much more needs to be done to tackle our outstanding environmental problems which are, indeed, serious.

CURRENT CHALLENGES

Air Pollution

Arguably, Hong Kong's most pressing environmental problem is once again air pollution. This is frustrating for us, as a number of years ago we felt we had a good grip on this. We had successfully

managed to deal with the sulphur dioxide emissions problems, and factory emissions generally were under control. Due to the prevailing winds, Hong Kong also rarely suffered from other classical air pollution problems such as photochemical smog.

Unfortunately, we did not reckon with the incredible growth in motor vehicle numbers that we have seen in Hong Kong. Vehicle numbers have virtually doubled in recent years and most miles are driven by diesel engined vehicles, primarily taxis and minibuses, which emit large quantities of fine respirable particulates (RSP). Some of them also emit large quantities of dark smoke, but it is the almost invisible fine particulates that we are most concerned about, as these can cause severe respiratory problems and other illnesses.

The problem is further compounded by the additional contribution of dust emissions from the numerous construction sites in Hong Kong and also from vehicle and industrial emissions from neighbouring China. The combined effect is that we now have many more days with low visibility than ever before, and the prime cause of this is fine particulate emissions. We believe that the problem of diesel emissions is very serious indeed. For this reason we developed a scheme which we felt would enable us to achieve the statutory Air Quality Objectives for RSP in the shortest time possible. The scheme involved the phasing out of diesel taxis and minibuses and replacing them with much cleaner, catalytic controlled petrol engined vehicles.

Unfortunately, for a variety of reasons the taxi and minibus operators strongly opposed our proposals, and in the face of such strong opposition from the trades we were unable to convince the Legislative Councillors to support the scheme. At the time of writing (mid-December 1996) we are, however, looking into the feasibility of an alternative scheme, involving the use of gas as a fuel, which is common in many other countries and which we hope will find favour with both the trade and the Legislative Council. We hope to make real progress on this and also to introduce new controls on construction dust emissions early in 1997.

We also hope to introduce tougher penalties on dark smoke emissions from diesel vehicles which can be applied under our smoky vehicle control scheme. This control scheme was introduced several years ago and involves calling in for test any vehicle seen on the roads by EPD staff or other accredited 'spotters' emitting excessive smoke. Al-

though more than 50,000 vehicles are tested each year, the programme has had limited success, mainly due to the low level of penalty involved. We are hoping to revitalize this programme with the use of higher financial penalties and other sanctions.

Waste Disposal

Another major problem we face is how to cope with our ever growing mountains of waste that we produce as a community every day of the year. At one stage in 1995, we were producing a staggering 23,000 tonnes of waste per day for disposal at landfills. The amount of waste we produce in Hong Kong has been increasing at a frightening rate in recent years; in fact, at a rate so fast that if it were to go on unchecked our waste disposal facilities would be completely exhausted within 15 years from now. This is all the more astonishing given that we have probably the three largest and most modern landfills in the world, which were planned to have a productive life of at least 25 to 30 years.

Why do we have this problem? Well, it is really because we are the victims of our own success. As our community has become more affluent, so we have begun to produce more waste. We purchase a larger number of more expensive products that tend to come with more and more unnecessary packaging that has to be disposed of. And we redevelop and build more buildings which produces more and more construction waste. Such a rapid growth in the amount of waste to be disposed of cannot, however, be sustained. Apart from the practical difficulties involved in finding sites for establishing future waste disposal facilities, there is a high dollar price to pay for disposing of large quantities of waste.

To provide an indication of the costs involved, our three existing strategic landfills together with their network of refuse transfer stations have been built at a cost of roughly \$7 billion and their annual operating costs amount to about \$600 million. These costs do not, however, include the costs borne by the Urban and Regional Councils or the private sector in actually collecting the wastes. Clearly, to allow such valuable resources to be exhausted well short of their planned life-time would be sheer financial folly.

In response to this problem, in the latter half of 1996 the Government completed a major study to recommend a waste reduction strategy for Hong Kong. The consultants proposed an integrated strat-

egy incorporating measures aimed at waste avoidance, waste minimization and recycling, and also with an element to further reduce the bulk of the waste requiring final disposal. Based on these recommendations, at the time of writing the Government is formulating a draft Waste Reduction Plan for Hong Kong that should be available for public consultation in early 1997. In addition, funding approval is also being sought from the Finance Committee of the Legislative Council to commence as soon as possible a preparatory study for the construction of a new, large-scale, waste-to-energy incinerator.

In the space available it is not possible to provide more detail, but we are hoping that through the measures proposed for the waste reduction strategy, together with public education, we will be able to make a real assault on our waste problems and considerably extend the life of our valuable landfills.

Polluter Pays Principle

In the 1989 White Paper on the Environment (PELB, 1989) the government adopted as policy the intention to apply the Polluter Pays Principle as far as practicable, whereby the costs for dealing with environmental problems are passed back to, and internalized by, those causing the problems. The aim was to encourage those contributing to our environmental problems to improve their performance through the financial incentive involved.

When this policy was announced it was warmly welcomed by the community at large and by our legislators. Unfortunately, however, we have so far not been very successful in applying the policy in practice. It would seem that many people in Hong Kong believe in the Polluter Pays Principle, but only if it is someone else that has to pay! Whenever our schemes for applying the policy have come forward, there has been considerable opposition from those who would have to pay. This is perhaps not surprising, but I am afraid that our legislative councillors have not seen fit to provide the support needed to override these objections. Reasons are always found as to why those who are to pay cannot afford it, even when the amounts involved are extremely small, and the government is asked to shoulder the costs.

What this means, of course, is that it is the community as a whole that has to bear the financial burden and subsidize those who are polluting or producing waste for disposal. This hardly seems fair. It is clear, however, that unless those who are causing

our environmental problems adopt a more responsible attitude, or unless our legislative councillors stiffen their resolve, there is little hope for introducing the Polluter Pays Principle in a meaningful way.

FUTURE CHALLENGES

Sustainability and Economic Development

Although I have placed this issue under the heading of Future Challenges, it is very much an issue we must grapple with today if we are to avoid major problems in the future.

At the risk of being too simplistic, what I am talking about is that we need to consider how we can ensure that decisions taken today about our future economic growth do not cause unacceptable environmental problems for future generations of Hong Kong citizens. Put another way, the trick is to devise new ways of ensuring that we can continue to enjoy strong economic growth, with all the benefits that brings to the community, without destroying the very essence of what makes our lives in Hong Kong enjoyable and healthy. This is by no means easy.

There is no escaping the fact that Hong Kong is physically very small. Although it may be an unpalatable thought, we cannot keep on building roads and container ports forever, or allow our vehicle numbers to grow unchecked. In a very real, practical sense there are limits to physical growth in Hong Kong. There are also practical limits as to how much the natural environment can stand if we wish to avoid it being dealt a death blow.

I am not despondent, however. I have faith in the flexibility and adaptability of Hong Kong people, and I am sure we will see our way through this problem. We have already seen how resourceful our industrial sector can be in adapting to change. To provide a catalyst and a focus for thought on this issue, the government is now conducting a major study to examine all of the key issues concerning sustainability. Specifically the study, Sustainable Development for the 21st Century (SUSDEV21), will be producing a proposed set of social, economic and environmental sustainability indicators, together with a proposed mechanism for assessing the likely impacts of future policy and development proposals against these indicators. The intention is not that any one of the three areas I have mentioned should

automatically be given overriding priority, but rather that decision makers will have available to them information as to how new proposals stack up against the three sets of indicators. In this way they will be able to consciously balance society's competing needs based on sound information. A more detailed description of challenges and progress may be found in *Heading Towards Sustainability: The Third Review of Progress on the 1989 White Paper* (PELB, March 1996).

Regional Problems

For those not familiar with the geography of the area, a look at a satellite photograph or map of southern China will show that Hong Kong is a very small place at one of the outer corners of the Pearl River Delta. This area of southern China is now experiencing unprecedented economic growth and there is, therefore, significant new potential for regional environmental problems to emerge.

Air pollution and water pollution do not respect territorial boundaries, and for many years now we have been liaising with our counterparts in neighbouring Shenzhen and Guangdong on transboundary environmental problems through the Hong Kong and Guangdong Environmental Protection Liaison Group. The overall increased level of economic activity in the area, however, suggests that we will need to build on and intensify these liaison efforts in the coming years.

CONCLUSION

Whilst it cannot be said that Hong Kong has a clean, healthy and pristine environment, it would be equally wrong to suggest that our problems are extreme. Indeed, an objective evaluation of our problems will show that, whilst some are certainly serious, they are by no means as serious as those existing in many other major cities in the world.

It would be wrong, also, to suggest that little has been done to tackle our environmental problems. I believe that we can be proud of what has been achieved in such a short time of community affluence in Hong Kong and that our record compares favourably with past performances by many other advanced economies at a similar stage of development.

Some commentators have suggested that Hong

Kong will lose its resolve to tackle environmental issues after the handover of sovereignty on 30 June 1997. I do not share this view at all. Indeed, I am encouraged by the bold steps to curb pollution now being taken in China under the leadership of the

National Environmental Protection Agency. Under the new Special Administrative Region Government of Hong Kong our department will continue to tackle environmental problems with as much resolve and enthusiasm as we do at present.

REFERENCES

- EPD, Environmental Protection Department, Hong Kong Government. 1989–1996. *Environment Hong Kong 1989 through to 1996*. Hong Kong: Environmental Protection Department.
- EPD and Planning Department, Hong Kong Government. 1991. *Environmental Guidelines For Planning In Hong Kong*. Hong Kong: Hong Kong Government.
- Hong Kong Government. 1996. *Hong Kong 1996*. Hong Kong: Hong Kong Government.
- PELB, Planning, Environment & Lands Branch, Hong Kong Government. 1989. *White Paper: Pollution In Hong Kong — A Time To Act*. Hong Kong: Hong Kong Government.
- PELB. 1996. *Heading Towards Sustainability: The Third Review of Progress on the 1989 White Paper*. Hong Kong: Hong Kong Government. March, 1996.

A Little Green Dragon?

Mei Ng and Lisa Hopkinson

ABSTRACT

Despite the introduction of new laws, policies and programmes for environmental protection, the rapid pace of development in Hong Kong is overtaking conservation efforts. Air pollution, particularly from diesel vehicles, is a serious problem, and set to worsen due to an increase in the number of vehicles. Half of the territory's population is affected by traffic and other noise. The lack of a proper sewage system has resulted in seriously polluted waters and harbour sediments. There is a lack of landfill space for the rapidly increasing amount of solid waste. Many sensitive ecological areas remain unprotected. Though predictions for Hong Kong's future environmental quality are alarming, there are some positive signs that attitudes within government are slowly changing. Instead of accepting declining environmental quality as an inevitable by-product of economic growth, Hong Kong should grasp the opportunity, afforded by its significant resources, to become a little green dragon.

Keywords: *sustainability, Hong Kong, environmental protection, conservation, air pollution, traffic, noise, waste, water, energy, ecology, development*

INTRODUCTION

David Bellamy was quoted in 1994 as saying that Hong Kong was an example of good environmental management in Asia. One suspects that he was still in shock after visiting Bangkok, Manila or Beijing (lately named the tenth most polluted city in the world). Yet visitors to Hong Kong routinely shake their heads in disbelief that there is still no sewage treatment for the harbour, that the air quality is so poor and noise pollution so stressful. Situated at the hub of one of the most rapidly developing regions of the world, Hong Kong is an economic miracle and an environmentalist's nightmare. A first world economy with a third world environment.

Admittedly, government officials responsible for environmental protection face impressive obstacles

in Hong Kong, including densely populated areas, historical lack of planning controls, low public awareness of environmental problems, inherent conflicts with other sectors of government and vested interests intent on maintaining the status quo. The Environmental Protection Department (EPD) was officially established only in 1986 and over the last ten years has introduced a staggering number of new environmental laws, policies and programmes. The first White Paper on Pollution, which laid out a ten year programme of pollution control, was published in 1989 and is reviewed every two years (EPD, 1989). Many people complain that Hong Kong's environment is in worse shape than it was before the huge injection of resources into environmental protection during the last decade. In some cases this is true but many programmes have yet to be imple-

Mei Ng and Lisa Hopkinson, *Friends of the Earth*, 2/F, 53-55 Lockhart Road, Wanchai, Hong Kong. Tel: (852) 2528-5588. Fax: (852) 2529-2777. Email: foehk@hk.super.net. (Internet: <http://www.hk.super.net/foehk>.)

mented and one can only wonder at what a sorry state the environment would be in without such expenditure. With so many years of neglect of Hong Kong's environment, there is a lot of catching up to do and with development proceeding at breakneck speed, Hong Kong is having to run just to keep still on the environment.

AIR POLLUTION

If there is one area in which Hong Kong is really failing, it is with the control of air pollution. In 1994 Governor Patten promised that policies on air pollution are 'expected to reduce vehicle pollution by 20% over the next two years' (Patten, 1994). However, a lamentable lack of progress has meant air pollution has deteriorated further.

More than most countries, Hong Kong has a particular problem with diesel fumes, mainly from taxis, buses and trucks in the urban area. In addition to the visible black smoke classified as Total Suspended Particulates (TSP), there is the invisible menace of the microscopic Respirable Suspended Particulates (RSP), which are produced by even well-run diesel engines. These carcinogenic and health-threatening particulates are linked to respiratory disease, cardio-vascular problems and even general increases in mortality (Dockerey *et al.*, 1993). Air Quality Objectives (AQOs), Hong Kong's statutory health guidelines for air quality, are regularly breached for both TSP and RSP (EPD, 1995). Studies have ably demonstrated the deleterious effects of air pollution in Hong Kong on children's health (Hedley *et al.*, 1992; Yu *et al.*, 1994) and during periods of poor air quality some schools prevent children playing outdoors.

Since the late 1960s the administration has recognized the problem of smoke emissions from poorly maintained diesel engines (Committee on Air Pollution, 1970). Yet it was not until 1989 when the policy solution, the diesel to petrol switch (DTP), was first proposed. This stop-gap solution aimed to phase out small diesel engines (less than four tonnes) and replace them with (unleaded) petrol engines with catalytic converters. Due to opposition within government — from Transport Branch, unwilling to disrupt traffic and the transport trade, and Finance Branch, unwilling to lose revenue from petrol duties — it was another six years before any detailed proposals even reached the public.

The administration had not reckoned with Hong Kong's taxi drivers. This well-organized and powerful lobby group argued against the DTP switch on the grounds that government figures had underestimated the maintenance costs of petrol engines and that diesel was a far more efficient, less polluting fuel than petrol. What was not widely reported was the fact that there is a large trade in low quality illegal diesel fuel smuggled from China which enables taxi and light buses to obtain diesel for half the cost. The lobbying efforts of the transport trade (which included the staging of go-slows) had a strong effect on the Legislative council. When a motion debate on the DTP switch was held only three out of the 60 legislators voted in favour of it. The DTP switch was put back on ice.

At the time of writing (late 1996), there have been no concrete proposals to address air pollution, though the EPD are now investigating the option of replacing diesel with gas, and planning to introduce a regular inspection programme for all diesel vehicles. However, opposition to any measure which will increase transport fares are likely to be bitterly opposed, though health costs from air pollution remain unquantified.

TRAFFIC GROWTH

Notwithstanding any improvements resulting from cleaner fuels or emission standards, air pollution is going to get worse simply as a result of increasing numbers of road vehicles. Emissions of NO_x are predicted to increase by 60% by 2001 (PELB, 1993).

Hong Kong actually has one of the best public transport systems in the world, a credit to far-sighted planning in the past, with 80% of trips by public transport. However, three-quarter of the road space caters to only one-quarter of the total passengers. Due to Hong Kong's steep topography there are few roads which partly accounts for the fact that Hong Kong has one of the highest density of vehicles per km (Lee and Yeung, 1994). A 10% growth per year in private vehicle ownership is rapidly exacerbating the situation.

Hong Kong's highway strategy has for too long been one of 'predict and provide.' This has led to massive expenditure on roads, with HK\$55 billion pledged to 12 major road projects between 1998–2011 (Transport Branch, 1994). Much of the land space on the new harbour reclamations is also dedi-

cated to new roads or so-called 'open space' which is actually the sterile land adjacent to new highways.

Private cars, whilst representing a significant proportion of vehicles during peak traffic hours, are only part of the congestion problem. Goods vehicles are the number one road user (accounting for 42% of road space in 1986) and numbers are predicted to increase three-fold by 2001, putting further strain on the already overloaded road infrastructure. Despite the environmental and social costs of road freight there is little or no regulation of road freight traffic and no firm commitment to a freight railway from either the existing port facilities at Kwai Chung or the proposed new facilities on North Lantau.

NOISE

Traffic is also a major contributor to noise problems. Noise pollution, mostly from traffic, affects more than 700,000 households, comprising about half of the territory's population (EPD, 24/8/95). An estimated 350,000 people are exposed to severe aircraft noise (PELB, 1993). Add to this the din from construction activities — percussive piling, hammering, demolition — and it becomes clear why teachers in many schools need to use microphones.

In many ways Hong Kong cannot avoid being a noisy city. As a result of poor planning in the past many residential areas are located near to busy roads or noisy factories, and construction activity is a constant feature of Hong Kong's rapid development. Noise is the number one source of pollution complaints from the public. The construction of new roads and railways in the future will no doubt increase the number of complaints.

EPD regulations have led to the introduction of quieter equipment and vehicles, which are in line with international standards, and required a permit for any construction work using mechanical equipment at nighttime or on public holidays. However, Hong Kong still lacks any legislation to control daytime construction activity, other than percussive piling, although this is now under review.

WATER

Years of neglect and uncontrolled effluent discharges have left Hong Kong's Victoria Harbour sediments

contaminated with a highly lethal cocktail of toxic metals and organic pollutants, and its water highly polluted. It is to Hong Kong's shame that we have no comprehensive sewage treatment. There is next to no treatment (other than basic screening) for sewage discharged directly into the harbour from the urban areas. The costly Strategic Sewage Disposal Scheme (SSDS), proposed in the 1980s but left to flounder when the government decided to build a new airport instead, was resurrected in the 1990s. Stage I of the scheme, consisting of a Chemically-Enhanced Primary Treatment plant with a short outfall discharging into the inner harbour, was due to be completed in 1997. A legal row with the contractors working on the deep tunnels led to a re-tendering of the contract. Consequently it is unlikely that Stage I will be completed before the end of 1998. However, there is still no long-term solution after the original proposal for Stage II (to pump primary treated sewage into Chinese waters) was reviewed following public outcry and China's disapproval (Pypun, 1995).

A particularly controversial aspect of the SSDS has been the means of funding. Sewage charges, based largely on water consumption, were introduced in 1995 as the first of a number of hypothecated taxes based on the Polluter Pays Principle. Whilst it is hard to find someone in Hong Kong who disagrees with this principle, the public registered much resistance to the SSDS taxes. The issue of polluter pays became highly politicized with some objectors citing the inequity of regressive pollution taxes. In the end it was a missed opportunity to educate the public about environmental equity.

With the continuing lack of a proper sewage system the Hong Kong public has paid the price in terms of public health, loss of amenity (including beach closure) and impacts on ecology. One of the most high-profile victims of the deteriorating water quality is the Chinese White Dolphin, *Sousa chinensis*, the highly threatened official mascot of the 1997 handover ceremony. Out of an estimated maximum number of between 112 and 126 in existence (Porter, 1997; Jefferson, 1996), a total of ten dolphins died in 1996 alone, cause of all but one death unknown. The designation of a 1200 hectare marine park in November 1996 was little more than a symbolic gesture towards protection of the dolphins since experts agree that its dimensions, less than the size of the platform at Chek Lap Kok airport, are too limited (UNEP, 1996). In addition, there

have been no measures to address the dolphin's main threats including pollution, loss of habitat, over-fishing and high-speed boats. To add insult to injury the Airport Authority has sited an aviation fuel receiving facility in the middle of the park.

The scale and intensity of reclamation in the harbour has also attracted controversy. Concerns about reclamation's impacts on the integrity of Hong Kong's spectacular harbour have been voiced by many professional bodies in Hong Kong, some of whom have joined in the establishment of the Society for the Protection of the Harbour. Over the last 150 years the total land mass of the territory has increased by more than 4100 hectares due to reclamation; however, past efforts pale in comparison with the government's future plans, which call for an additional 660 hectares with a further 640 hectares proposed. The massive Lantau Port Development will reclaim another 460 hectares from the Western Harbour.

Apart from the obvious visual impacts of such large-scale mega-infrastructure projects, the dredging and dumping impacts are taking their toll on the marine environment. Reclamation projects leading up to and including the year 2000 will require approximately 400 million cubic metres of fill material (FMC, 1996), most of which will be dredged from the seabed. In addition, much of the heavily contaminated bottom sediments from Victoria Harbour will be dredged and dumped elsewhere, increasing the risk of remobilization and dispersion of contaminants.

The government views reclamation as the quickest and easiest solution to the land shortage problem, but others have pointed to urban renewal or degraded land in the New Territories as the answer. Whilst there is no perfect solution, the government plans have certainly promoted a real public debate about strategic planning issues. Whether the government scales down its plans remains to be seen.

WASTEFUL WAYS

Hong Kong established its first waste disposal strategy in 1989, which entailed the construction of three enormous engineered landfills (one of which is partly in a country park!), yet to date still lacks any strategy for waste reduction. Originally the life of Hong Kong's landfills was anticipated to be between 25 and 40 years; with ever-increasing rates of waste

generation, the three strategic landfills will last only 17 years and the only urban landfill 13 years (ERM, 1996). An EPD-commissioned study on waste reduction, completed in 1996, made a number of recommendations including establishment of waste separation and recycling schemes, introduction of producer responsibility and investigation of various waste reduction technologies including Waste Fired Power Generation.

However, internal government wrangling about the costs of the proposals have meant that by the end of 1996 no government plan had been published for consultation and none of the recommendations carried forward. This, despite the fact that the report clearly shows that investment in waste reduction can save the government by year ten of the programme an estimated 15% of annual waste management costs or HK\$559 million (ERM, 1996). The proposed reliance on voluntary rather than statutory measures and the long timetable for implementation means that by the time that any serious measures start to take effect, Hong Kong's waste situation is truly going to be in crisis.

The Waste Reduction Study did not address construction waste, which in 1993 formed 55% of the overall waste tonnage of 20,000 MT of solid waste per day (this compares to an average of 5% in Europe). The biggest elements of the construction waste stream is derived from building demolition and mixed site clearance, much of which is inert and suitable for public dumps (for instance in reclamation) rather than dumping in expensively managed landfills. It is anticipated that there will be a shortage of public dumps after 1999 (PELB, 1996d).

A construction waste sorting site was established in 1996 to facilitate recycling of construction waste, but there is no policy to restrict it at source. Construction waste generation is closely tied to economic activity (CED, 1994) and with a projected increase in expenditure on property and construction in Hong Kong by the year 2006 of between 35 and 123% (Walker et al, 1995), it is likely the construction waste problem will continue unabated.

ENERGY

Hong Kong is also wasteful in terms of energy usage. Between 1983 and 1992 energy demand, and with it wastage, increased at an average annual rate of 7.7%. It is estimated that the energy routinely

wasted in Hong Kong is equivalent to the output of one power station (Reed, 1991).

Hong Kong is reliant on non-renewable fuels for its energy supply — coal, oil, natural gas — as well as nuclear electricity from Daya Bay Nuclear Power Plant, just across the border. Due to a declining manufacturing sector and a transportation sector with a large proportion of electrified transport, much of Hong Kong's primary energy is used to generate electricity.

Hong Kong has been well served in the past by the power companies who have provided a secure affordable electricity supply such that Hong Kong rarely experiences the outages which plague many of our Asian neighbours. However the very trusting relationship between the power companies and the government has given Hong Kong an electricity grid totally reliant on non-renewable polluting fuels, no integrated plan for energy efficiency and an outdated Scheme of Control Agreement (SCA). For example, the power stations in Hong Kong are the main sources of nitrogen dioxide and sulphur dioxide as well as the largest source of carbon dioxide.

The problems are manifold; institutionally there is no one government department responsible for energy needs and no coherent energy policy. The SCA bases the power companies permitted return of 13.5% entirely on their net fixed assets, regardless of whether the assets are used or useful. This leads to a nonsensical situation whereby the government is asking one power company to defer expansion of its new power station due to overcapacity, whilst giving permission to another to investigate the feasibility of building a new power station.

Commercial and residential buildings consume 40 to 50% of primary energy, the largest proportion of any sector, in Hong Kong. Whilst the government is developing a set of building energy codes, which will set minimum energy efficiency standards for building design and building services, there are doubts that these will provide sufficient incentives for change. To achieve an integrated energy policy, Hong Kong needs a unified energy department and/or regulatory body. Hong Kong would also benefit from planning tools which can help to derive least-cost solutions and policy options for achieving energy and environmental objectives. Most of all Hong Kong needs to replace the SCA with a more socially responsible policy which decouples the utilities revenues from their fixed assets, and to compare the costs of investing in energy efficiency with the avoided costs of capacity expansion.

ECOLOGY

It often comes as a surprise to visitors to Hong Kong to find that the territory has some fine landscapes — ranging from the mountains of Sai Kung, to the wetlands of Mai Po, to the forests of Tai Po Kau. Hong Kong has an exceptionally diverse flora and fauna for such a small area, more native plant species than the United Kingdom which is 225 times larger, and more tree species than all of Western Europe. Hong Kong also has recorded 421 bird species compared to 1243 species in China (Dahmer, pers. comm.), as well as over 102 dragonfly species (Wilson, 1995), over 200 butterfly species (Bascombe, 1995), 23 amphibians, 73 reptiles and 53 mammal species (Felley, 1996). New species for Hong Kong are still being found as a result of a territory-wide biodiversity study carried out by the University of Hong Kong but local flora and fauna are still poorly known (Dudgeon, pers. comm., 1996).

That so many species can survive near one of the most densely populated places in the world is partly attributable to the existence of the 22 country parks and 14 special areas. Due to far-sighted legislation in 1976 over 40% of Hong Kong's landmass is now protected under the Country Parks Ordinance for the benefit of conservation and recreation. Pressures on the country parks are enormous as shortage of developable land and a growing population shifts attention to this potentially massive landbank. However, what is forgotten is that much of the country parks' steep topography made them unsuitable for development in any case. Develop the country parks and Hong Kong loses a vital green lung, water catchments, recreational space and a wealth of biodiversity.

Yet not all of the valuable ecological areas are afforded protection. There are many areas excluded from the country parks, such as old *fung shui* woodlands planted behind villages and abandoned paddy fields, which are ecologically very valuable. The government claims lack of resources and other priorities in terms of extending statutory planning controls to these remote rural areas.

One such excluded area, Sha Lo Tung, is an upland valley set amidst, but outside, the surrounding mountains and ridges of the Pat Sin Leng Country Park. The valley, combined with a nearby Site of Special Scientific Interest, is thought to be 'the second most important conservation area in the Territory behind the Mai Po Marshes Nature Reserve' (Axis,

1995). Sixty-eight species of dragonfly have been recorded there, including one species new to science, *Macromia katae*, whilst the substantial established population of another dragonfly, *Gomphidia kelloggi*, is the only population known to exist anywhere in the world (Wilson, 1995). For an area of only 100 hectares, it is of exceptional conservation significance — it supports almost 50% of the larger mammal species of Hong Kong and over half of the butterfly and amphibian species. Over 450 species of plants have been recorded here, including 171 medicinal plants (Chong and Lee eds., 1978).

Despite Sha Lo Tung's impressive ecology, a proposal to build a luxury housing development won in-principle support from the government. The Administration has even denied that the loss of a particular species amounts to a breach of the Convention on Biodiversity (PELB, 1996a). This illustrates how conservation policy in Hong Kong is being led more by 'development strategists than by individuals with an understanding of the significance of biodiversity and the irreversibility of its loss' (Felley, 1996).

The jewel in Hong Kong's conservation crown is undoubtedly Mai Po Nature Reserve/Inner Deep Bay which was formally listed as a site of international importance under the Ramsar Convention in 1995. The Mai Po Marshes is the last remaining wetland of its size in Hong Kong (and the sixth most extensive in China) and is a feeding and resting ground for thousands of migratory birds, including many species of rare, vulnerable or endangered birds. Mai Po supports a number of globally threatened birds, including 25% of the world's population of black-faced spoonbill (*Platalea minor*) and 16% of the world population of Saunders's Gull (*Larus Saundersi*) (WWFHK, 1996). It is of special value because alternative sites in the region are rapidly diminishing in number and extent. In addition it supports a variety of local animal species and over a dozen invertebrate species new to science have been recorded there. Managed by an NGO, World Wide Fund for Nature Hong Kong, Mai Po is also an important educational resource, visited by over 40,000 local people a year (WWFHK, 1996).

Yet this area is threatened — by pollution, and loss of surrounding wetland areas to development. The Mai Po hinterland is the growth corridor to China, with expanding new towns, new road and rail links and increasing urbanization. Belatedly the

government has recognized the importance of maintaining a buffer area around Mai Po but many areas have already been designated for residential development, whilst several court battles are in process.

Pollution from Hong Kong and China has turned Deep Bay into Hong Kong's second most polluted waterbody after Victoria Harbour. A river widening project along the border between Hong Kong and China, together with a number of reclamation projects on the Chinese side of the Bay, are taking their toll on this already stressed area. In autumn 1996 WWFHK noted a serious reduction in the numbers of crabs feeding in the mudflats (Melville, pers. comm.). No one knows the cause of this, or how serious the consequences will be, but there are fears that continuing degradation of this unique habitat will lead to unpredictable and possibly catastrophic reduction in the carrying capacity of the Ramsar site. Undoubtedly coordinated cross-border action is needed to protect Mai Po. Several ongoing studies on wetlands will be completed in 1997 to 98 and it is hoped that serious efforts to conserve and enhance existing wetlands will be a priority.

The marine environment has been the poor cousin of conservation in Hong Kong, since much of the conservation efforts have focused on the terrestrial environment. This is surprising since Hong Kong has always lived and been defined by the sea and has a coastline one-fifth that of England and Wales (Morton, 1983). A strong plea for marine conservation has been made for nearly 20 years (Morton, 1979) but it has only become more of a priority in recent years. In 1996 the first marine protected areas were established at Cape D'Aguiar, Hoi Ha Wan, Yan Chau Tong and Sha Chau. These include important centres of marine biology research, important coral communities and fish spawning and nursery grounds. Whilst an important step for marine conservation it should be noted that these areas cover less than 2% of Hong Kong's territorial waters (Ruxton, pers. comm, 1996).

Hong Kong's once thriving fisheries have suffered from over-fishing, pollution and the continued reclamation of fish spawning and nursery grounds. The low catches of commercially important, higher value fish species are indicative of very high fishing pressures (Wilson and Wong, 1995). There are no controls on fishing (except the establishment of a licensing system for fishing in the new protected areas) and destructive fishing techniques such as dynamite fishing are difficult to police. A rapidly

growing restaurant trade in live reef fish in Hong Kong is also prompting an environmental crisis in other Asian waters where fishermen (mainly from Hong Kong) are pumping hundreds of tonnes of cyanide into pristine and remote reefs (Johannes, 1995).

The Agriculture and Fisheries Department, responsible for protecting the interests of fishermen, is also in charge of marine conservation. Whilst the department is reviewing legislation on fisheries and are conducting the first inventory of fish stocks for many years, much more is needed to be done to control the impacts of fisheries on the marine environment. Ironically, despite opposition from local fishermen, the designation of more marine areas as marine parks and reserves offers the best hope for the long-term survival of a fishery industry in Hong Kong.

Overall, Hong Kong has no comprehensive coastal management strategy and has yet to come to grips with conservation outside of protected areas. In 1992 FoE called for a 'conservation program . . . implemented by a responsible government department with a strong leader and a mandate for active enforcement on the basis of very stiff penalties for infraction.' (FoE, 1992). In 1997 Hong Kong still lacks an overriding comprehensive conservation policy or a department or policy branch with unfettered interest in protecting our biodiversity. This is due to a number of institutional problems. Whilst pollution control and prevention is the responsibility of a rapidly growing and pro-active department (the Environmental Protection Department), conservation is within the remit of a timid department struggling for resources and lacking strong leadership (the Agriculture and Fisheries Department). The problems are compounded by the fact that the Planning, Environment and Lands branch, which includes both these departments, is more concerned with generating short-term income through land sales than with appreciating the long-term capital position in terms of conservation. Until such institutional problems are resolved and until government recognizes the necessity of conserving biodiversity, conservation in Hong Kong will continue to lag behind development.

THE FUTURE

What will the future bring for Hong Kong's environment? There are positive signs. In early 1996 'Heading Towards Sustainability — The Third Re-

view of Progress on the 1989 White Paper' (PELB, 1996b) was published. This showed, at least on paper, how far Hong Kong has come in environmental thinking in only seven years. The 1989 emphasis on the more elementary environmental infrastructure and pollution clean-up has been replaced with a more enlightened approach, including discussion of sustainability indicators, green accounting and proposals for a study on sustainable development.

However, the engine of growth continues. The long-awaited Territorial Development Strategy Review (Planning Department, 1996), the review of the government's long-term strategic plan for Hong Kong, was also released in 1996. An Environmental Impact Assessment (EIA) for the TDS (Planning Department, 1995) concluded that there will be serious environmental consequences arising from both TDS development scenarios. These impacts include:

- exceedance of statutory Air quality Objectives (AQOs) due to vehicular emissions
- overloading of planned sewerage infrastructure
- overloading of the assimilative capacity of receiving water bodies
- a reduction in the planned capacity of landfills
- exceedance of noise guidelines

The TDSR raises the possibility that 'the population of the Pearl River Delta might grow from about 23 million in 1990 to about 40 million in the long term. Such a level of growth raises concern of such matters as the provision of adequate supplies of electricity, potable water and fresh food' (Planning Department, 1996). The EIA further 'casts doubt on the long-term sustainability of the proposals within the framework of current policies and proven technology' (Planning Department, 1995).

It was largely as a result of the alarming prediction articulated in the TDSR that the Legislative Council granted funding for a HK\$40 million consultancy on sustainable development in the twenty-first century, entitled SUSDEV21 (PELB, 1996c), meant to take place over a period of 30 months. Due to the broad scope and long length of the study, concerns have been raised that SUSDEV21 is a way of justifying the present development path or delaying any changes to the current programme until three or four years later, thus precluding the present administration from making any unpopular decisions. Certainly the new SAR administration will have more problems to contend with and fewer choices about how to solve them.

Another concern for Hong Kong's environment is that it is still viewed largely in isolation from China. We lack a good database on cross-boundary pollution and there is still only limited communication and data exchange with environmental officials in China. A case of 'One Country, Two Environments'?

THE PEOPLE

The state of Hong Kong's future environment depends as much on its people and their behaviour as on government policies and programmes. Certainly population growth is going to be one of the toughest obstacles to sustainability. With a 1996 population of 6.3 million, forecast to increase to 8.1 million by 2011, Hong Kong can expect to see approximately one million new residents per decade. Much of this expected population growth is externally driven, resulting from net immigration from China, for which a daily quota is fixed by the HKSAR's mini-constitution, the Basic Law. The challenge of providing housing, jobs and infrastructure for all these people is posing tremendous problems for government planners as well as inspiring predictions of a degradation in environmental quality.

Whilst environmental attitude surveys conducted over the years indicate that more Hong Kong people recognize environmental problems exist, there is still an unwillingness to change behaviour as a result. Environment is still a low priority for most people compared to livelihood issues such as employment and housing, and there is little sign this will change in the near future. A recent survey conducted in 39

other countries and cities in the world ranked Hong Kong at the very bottom of the list in terms of the degree of public support for environmental protection (Yok and Chiu, 1996). Paradoxically, whilst a minority of people were willing to pay more taxes to help prevent environmental pollution, over 80% rated pollution problems as urgent or very urgent and believed that their quality of life had been seriously affected as a result.

The next decade is going to be a critical period for Hong Kong's environment. If Hong Kong people want to maintain or achieve a higher quality of life, they will have to accept some serious trade-offs in the coming years. Even with those concessions, can Hong Kong's environment wait that long? Hong Kong is a wealthy city with the human and financial resources to enable it to pre-empt and solve many of its future problems. Yet this is going to require a significant shift in thinking away from the mindset evident in the past, which regards economic activity as independent from environmental protection and conservation.

As FoE pointed out in a recent report on sustainability for Hong Kong, there are alternative ways for Hong Kong to develop which address future development needs without necessarily compromising environmental quality. There is significant scope in Hong Kong for innovative ideas to be developed and solutions applied, but in order for that to happen the territory needs a fundamental, practical vision of sustainable development. Decision makers in government and the private sector should grasp the opportunity for Hong Kong to become a little green dragon, and a true example of good environmental management in Asia.

REFERENCES

- Axis Environmental Consultants Ltd. 1995. *Sha Lo Tung Revised Development Plan*. Supplementary Environmental Impact Assessment for Sha Lo Tung Development Co. Ltd. October 1995.
- Bascombe, M. J. 1995. *Check list of the butterflies of South China*. *Memoirs of the Hong Kong Natural History Society* 20: 1-205.
- Chong, S.C. and Lee, N.H. eds. 1978. *Chinese Medicinal Herbs of Hong Kong*. Vol 1; other vols in subsequent years. 6 Vols. Pub: Commercial Press.
- Civil Engineering Department (CED). 1994. *The Government's Public Dumping Strategy*. Works Digest, Hong Kong Government.
- Civil Engineering Department (CED). 1996. *Construction Waste Disposal (ACE Paper 64/96)* presented to the Advisory Council on the Environment on 16/12/96.
- Committee on Air Pollution. 1970. Report to His Excellency the Governor. Chairman J. L. Marooned.
- Dahmer, T. 1996. *Ecosystems (Ltd.) Hong Kong*.
- Dockerey, D. W., Ardent Pope, C., Piping, X., Sponger, J. D., Ware, J. H., Fay, M. E., Ferris, B. G. and Speeder, E.

1993. 'An Association between air pollution and mortality in six US cities.' *The New England Journal of Medicine*, Vol. 329, No. 24, pp. 1753-1759.
- Dudgeon, D. (1996, pers. comm.) Department of Ecology & Biodiversity, University of Hong Kong.
- Environmental Protection Department (EPD). 1996. *Air Quality in Hong Kong 1995. Results from the Air Quality Monitoring Network*.
- ERM-Hong Kong Ltd. 1996. *Waste Reduction Strategy. Consultants Findings & Recommendations*. A report for the Environmental Protection Department, Hong Kong Government.
- Felley, M. 1996. *A Biodiversity Conservation Policy and Legal Framework for Hong Kong*. A M.Sc. thesis completed to meet the partial requirements of M.Sc. (Environmental Management) Centre Of Urban Planning and Environmental Management, University of Hong Kong.
- Fill Management Committee Secretariat. 1996. FMC Database of Fill Requirements & Surpluses. Geotechnical Engineering Office, Civil Engineering Department, Hong Kong Government.
- Friends of the Earth . 1992. *Conservation in Hong Kong: Preserving Our Future*.
- Hau, T. D. 1993. 'Road pricing: An advisable option?' in *Keep a City Moving: Urban Transport Management in Hong Kong*. Asian Productivity Organization, Tokyo.
- Hedley, A. J., Peters, J., Kam, T. H., Ong, S. G., Wong, C. M., Tam, A. Y. C., Betson, C. L., Liu, J. and Spiegelhalter, D. J. 1992. *Air pollution and respiratory health in primary school children in Hong Kong, 1989-1992*. Department of Community Medicine, The University of Hong Kong
- Jefferson, T. 1996. *Multi-disciplinary research programme on the Indo-Pacific Hump-Backed Dolphin population*. 2nd Quarterly Progress Report submitted to the Agriculture & Fisheries Department, Hong Kong Government.
- Johannes, R. E. 1995. *Environmental, Economic and Social Implications of the live Coral Reef Food Fishery in Asia and the Western Pacific*. The Nature Conservancy.
- Lee, Barry C. H. and Lung, Denies Y. C. 1994. *Air pollution due to transportation in Hong Kong in the next decade*.
- Lee, Y. S. and Chi, W. K. 1996. *Public Support for Environmental Protection in Hong Kong. A summary report*. Department of Geography and Geology, University of Hong Kong & Department of Sociology, Chinese University of Hong Kong.
- Melville, D. 1996. pers. comm. World Wide Fund for Nature Hong Kong.
- Morton, B. and Morton, J. 1983. *The Sea Shore Ecology of Hong Kong*. HK University Press.
- Morton, B. S. 1979. 'Future Plans for the Hong Kong sea shore: conservation and protection,' in *The Future of the Hong Kong Seashore*, ed. B S Morton. Hong Kong, OUP.
- Patten, C. 1994. 'Hong Kong: A Thousand Days and Beyond.' Address by the Governor The Right Honourable Christopher Patten at the opening of the 1994/95 Session of the Legislative Council.
- Planning Department. 1995. *Territorial Development Strategy Review: Strategic Environmental Assessment of the Preferred Options*. Planning Department, Hong Kong Government.
- Planning Department. 1996. *Consolidated Technical Report on the Territorial Development Strategy Review*. Planning Department, Hong Kong Government.
- Planning, Environment & Lands Branch (PELB). 1993. *A Green Challenge for the Community. Second review of the 1989 White Paper Pollution in Hong Kong — A time to act*.
- Planning, Environment & Lands Branch (PELB). 1996a. *Response to Friends of the Earth's letters dated 9/10/96 and 25/10/96 on Proposed Sha Lo Tung Development, 19/11/96*. Presented to the Advisory Council on the Environment 25/11/96.
- Planning, Environment & Lands Branch (PELB). 1996b. *Heading Towards Sustainability. The Third Review of Progress on the 1989 White Paper — Pollution in Hong Kong — A time to act*.
- Planning, Environment & Lands Branch (PELB). 1996c. Outline Brief for Study on Sustainable Development for the 21st Century (SUSDEV21). ACE paper 33/96 presented to the Advisory Council on the Environment on 3/7/96.
- Planning, Environment & Lands Branch (PELB). 1996d. Construction Waste Disposal. ACE paper 64/96 presented to the Advisory Council on the Environment, 16 December 1996.
- Porter, L. J. 1997. 'The Taxonomic Status, Ecology and Conservation of I{*Sousa chinensis*} (*Osbeck*) (*Cetacea:Delphiniidae*) in Hong Kong.' Unpublished Ph.D. thesis. The University of Hong Kong, Hong Kong.
- Pypun Engineering Consultants Ltd. 1995. *Review of Strategic Sewage Disposal Scheme Stage II Options*. Report of the Environmental Protection Department, Hong Kong Government.
- Reed, S. 1991. 'Environmental Implications of the use and misuse of energy in Hong Kong. In Energy Efficiency: Hong Kong's Challenge for the '90's,' in Peter Hills, ed., A symposium organized by Friends of the Earth (Hong Kong) Hong Kong Institution of Engineers, Hong Kong Institution of Architects.
- Ruxton, J. 1996. World Wide Fund for Nature Hong Kong. Pers. comm.
- Transport Branch. 1994. *Report of the Working Party on Measures to Address Traffic Congestion*.
- UNEP. 1996. 'Report of the workshop on the Biology and Conservation of Small Cetaceans and Dugongs of Southeast Asia, Dumaguete,' June 1995. UNEP (W)/EAS WG.1/2. Bangkok: UNEP.
- Walker, A., Wing, C. K. and Chung, L. W. 1995. *Hong Kong in China: Real Estate in the Economy*. A study by the Department of Surveying, the University of Hong Kong for Brooke Hillier Parker.
- Wilson, K. D. P. 1995. *Hong Kong Dragonflies*. Urban Council, Hong Kong.

- Wilson, K. D. P. and Wong, E. C. K. 1995. 'Fisheries, Mariculture & Marine Protected Areas in Hong Kong,' in Coastal Infrastructure Development in Hong Kong: A Review, Symposium on Hydraulics of Hong Kong Waters, Hong Kong, November 1995. Civil Engineering Department, Hong Kong Government.
- World Wide fund for Nature Hong Kong. 1996. Website.
- Yu, T. S., Wong, T. W., Wong, S. L. and Hazlett, C. B. 1994. 'Effects of indoor and outdoor pollution on respiratory symptoms,' in Abstracts, Joint Sixth Conference of the International Society of Environmental Epidemiology, 4th Conference of International Society for Exposure Analysis.

Thinking Globally: Hong Kong's Participation in International Environmental Forums

W.K. Chan

ABSTRACT

According to the principle of 'One Country, Two Systems', post-July 1 Hong Kong will enjoy autonomy in participating in international forums which are constituted on the basis of economies or territories, but not in those which are made up of sovereign states. Hong Kong already participates actively in international forums on trade and investment as an independent customs territory. In international environmental forums, however, the nature of membership (i.e. as a territory or as a sovereign state) is often less well defined. Consequently, the Hong Kong government has been less active than its private sector counterparts, including non-governmental organizations, in global environmental forums. As the environment is truly a global matter that recognizes no borders, Hong Kong should seek to take a higher profile in these forums and should not be deterred from involvement merely because of its non-sovereign status.

Keywords: *sovereignty, autonomy, trade, green groups, global forums, Basic Law*

INTRODUCTION

It was June 1992 in Rio de Janeiro, Brazil. The seven-member delegation of the Hong Kong Conservancy Association was attending Global Forum 1992, the forum for non-governmental organizations (NGOs) associated with the United Nations Conference on Environment and Development (UNCED, better known as the 'Earth Summit'). The Earth Summit itself was a conference of government representatives, but NGOs were allowed to participate as observers (Ng, 1993). In one of the official Earth Summit sessions, the Conservancy Association found, next to the representative of Guam, an empty chair designated 'Hong Kong.' That picture of an empty chair was subsequently reported in Hong Kong's press.

That embarrassing picture reflects the less than enthusiastic attitude of Hong Kong government

towards global governmental forums related to the environment. Although in the official report of the Environmental Protection Department there is a long list of publications and papers presented by government officials in overseas conferences, those events are often of a more academic and technical nature. Hong Kong does claim to abide by international obligations on environmental conservation such as the Convention on Wetlands of International Importance (the Ramsar Convention), which the United Kingdom has signed and applied to Hong Kong, and the Convention on Biological Diversity [which has not been officially applied here — ed.]. However, it does so on a *de facto* basis; Hong Kong is not itself a signatory to any environmental treaties or conventions. When it comes to international involvement the Hong Kong government's environmental departments are not as

W.K. Chan, Secretary General, Hong Kong Coalition of Service Industries, c/o The Hong Kong General Chamber of Commerce, 22/F United Centre, 95 Queensway, Hong Kong. Tel: (852) 2529-9229. Fax: (852) 2527-9843.

active as their trade counterparts or the environmental NGOs.

TRADE AND INVESTMENT FORUMS

Hong Kong is a member of the Asia Pacific Economic Cooperation (APEC) organization, together with China, Taiwan and 15 other member governments. Like other international bodies, APEC business proceeds in the form of discussions and negotiations through international meetings, seminars and conferences. The usual APEC matters are conducted by trade and industry officials. In Hong Kong's case, the Director-General of Trade is Hong Kong's representative at the 'senior official' level and the Secretary for Trade and Industry represents Hong Kong at the 'ministers' level. The highest level of APEC meetings is the heads of state, or summit meeting, at which Hong Kong is usually represented by the Financial Secretary. APEC sometimes produces agreements in various forms such as 'declarations' or 'statements' but these agreements are all non-binding in nature, reflecting the organization's informal, non-legalistic nature.

On a much more formal basis, the Hong Kong government became a member of the General Agreement on Tariffs and Trade (GATT) in 1986 and is now a founding member of its successor the World Trade Organization (WTO) (Hong Kong Government, 1996). The WTO and the GATT were both formed by a treaty agreed to among governments. Being a signatory to the WTO signifies Hong Kong's acceptance of rules and obligations as defined by an international legal document. Macau is also a member of the WTO and both China and Taiwan are in the process of joining.

APEC and WTO are not the only international economic forums, but they are the only major ones of which Hong Kong is member. Hong Kong is not a member of the Organization for Economic Cooperation and Development (OECD), which comprises the more developed economies of the world. Even though economies less advanced than Hong Kong, for example, South Korea, are expected to become members, it is highly unlikely that Hong Kong will be able to join the OECD. Likewise, Hong Kong is not a member to any of the sub-organizations under the United Nations, for example, the United Nations Council for Trade and Development (UNCTAD); nor is it expected to become member of these bodies in future.

Since the agendas of the WTO, APEC, OECD and UNCTAD are often very similar, one might have expected the Hong Kong government to participate equally in all of these forums. Instead, Hong Kong is a member of APEC but not of OECD, of WTO but not of UNCTAD. The difference highlights an important principle governing the Hong Kong government's participation in international forums, namely, that of sovereignty.

The WTO's membership is made up of 'customs territories' while APEC consists of 'economies'; membership in the UN and OECD is at the level of sovereign nations. Hong Kong is an independent member of the WTO because it is, for the purpose of customs clearance, a trading entity independent from both the United Kingdom and China (Hong Kong's sovereigns before and after 1 July 1997, respectively). It is an independent member of APEC alongside China and Taiwan because Hong Kong is recognized as an independent economy from that of China. On the other hand, Hong Kong is not — and cannot become — a member of the OECD or the UN because Hong Kong is not itself a sovereign state. Whilst Hong Kong government officials do sometimes attend OECD and UN meetings, these are never very high-level meetings and the officials attend only under the banner of the United Kingdom, Hong Kong's current sovereign. The international presence of the future Hong Kong Special Administrative Region (SAR) under Chinese sovereignty is detailed in Article 152 of the Basic Law, the SAR's mini-constitution (Consultative Committee, 1990), as follows:

Representatives of the Government of the Hong Kong Special Administrative Region may, *as members of delegations of the People's Republic of China*, participate in international organizations or conferences in appropriate fields limited to states and affecting the Region, or may attend in such other capacity as may be permitted by the Central People's Government and the international organization or conference concerned, and may express their views, using the name 'Hong Kong, China' (*italics added*).

The Hong Kong Special Administrative Region may, using the name 'Hong Kong, China', participate in international organizations and conferences not limited to states.

Thus Hong Kong will retain its membership in the WTO and APEC, as they are 'not limited to states' and fall within the domain of Hong Kong's autonomy as a Special Administrative Region of

China. All that will need changing will be the designation from 'Hong Kong' to 'Hong Kong, China.' Furthermore, membership in the WTO has been specifically safeguarded by the Joint Declaration between the United Kingdom and China signed in 1984. Annex II of the Joint Declaration makes specific reference to the GATT (the WTO's predecessor), to the effect that the British and Chinese governments should take actions 'to enable the Hong Kong Special Administrative Region to maintain its economic relations as a separate customs territory, and in particular to ensure the maintenance of Hong Kong's participation in the General Agreement on Tariffs and Trade, the Multifibre Arrangement and other international arrangements' (italics added).

Even so, to reinforce the economic rather than sovereign role of Hong Kong in the WTO and APEC, the drafters of the Joint Declaration and the Basic Law avoided political connotations in the statements listed above. Thus Hong Kong's chief negotiating representative in Geneva is not designated, like those of other countries are, as 'ambassador' to the WTO. In APEC's summit meetings it is the head of Hong Kong's economic affairs, the Financial Secretary, rather than the Governor (the political leader), who sits alongside the Chinese and US Presidents.

The clear principle of the documents governing the HKSAR is that the future Hong Kong government is free to participate in international forums, even to the extent of signing international treaties, as long as there is no sovereignty implications and Hong Kong participates as an 'economy' or a 'territory'; otherwise, Hong Kong can only participate through its sovereign state. In practice, while Hong Kong's autonomy is well recognized in some of the trade and sports arenas such as WTO, APEC and the Olympics, there are a large number of international institutions for which Hong Kong's autonomy or otherwise has not yet been well-defined, such as the World Intellectual Property Organization and the International Telecommunications Union.

In the case of global environmental forums, the Hong Kong government has not been as proactive as it has in the trade arena because the 'autonomy-versus-sovereignty' issue has not been clearly resolved. Insofar as the environment has been made an agenda of the WTO — as mandated by the Uruguay Round agreement of the GATT — the Hong Kong government is uninhibited in being involved in the WTO's Committee on Trade and Environ-

ment. Even so, its environmental officials have been much less assertive than their trade colleagues; it seems these officials have yet to learn from their private sector counterparts.

NGO PARTICIPATION IN GLOBAL FORUMS

As Hong Kong is an externally oriented economy, its business sector has naturally developed strong international contacts. Hong Kong is, for example, represented on the International Chamber of Commerce (ICC) by the Hong Kong General Chamber of Commerce which also runs the Hong Kong Committee of the Pacific Basin Economic Council (PBEC). Established in 1966, PBEC now has 19 member economies; this includes China, which holds its membership through the China Council for the Promotion of International Trade (CCPIT). Hong Kong's business sector also takes part in the Pacific Economic Cooperation Council (PECC) which was established by APEC as a tripartite (government, business and academics) advisory body and as such has the same membership as APEC.

While the business sector's main agenda has been trade and investment, they sometimes also discuss environmental issues, thanks to the global attention on the 'green' movement over the past decade. The International Chamber of Commerce, for instance, has promulgated the Business Charter on Sustainable Development. In Hong Kong 80 companies have signed up to the Charter as a result of a campaign by the Hong Kong General Chamber of Commerce's Environment Committee. Environment has also become a peripheral concern of bodies like PBEC and PECC.

Besides NGOs in the business sector, non-profit environmental organizations or 'green groups' are naturally even more active in international forums on the environment. Hong Kong's green groups have a good tradition of being global in outlook. The first, the Conservancy Association, was established in 1968. Its representative Father Harold Naylor participated in the 'Only One Earth' Forum in Stockholm in 1972, the first summit meeting of 140 countries on the environment. Twenty years later, at the Earth Summit at Rio de Janeiro, the Conservancy Association again served as the only Hong Kong representative through a seven-member delegation, one of whom also represented the Environment Campaign Committee. After meeting

with other NGOs as well as with official delegates from China, Britain and other countries, the Association representatives developed an 'Agenda 21 for Hong Kong', in lieu of a similar effort by the Hong Kong government. As the Association is Hong Kong's oldest and longest serving green group, it is worth outlining some of the Association's involvement in the international arena:

- In 1976 the Conservancy Association was the organizer of the Asian Youth Conference in Environmental Education together with the International Youth Federation for Environmental Studies and Conservation and the Indian Environmental Society.
- In 1978, following contacts with the Environment Liaison Centre in Nairobi, the Association became the first to bring the World Environment Day to Hong Kong through a series of events under the theme of 'Development within Environmental Constraints'.
- In 1978 the Association was involved in the development of the 'Conservation Strategy' following work by the International Union for Conservation of Nature and Natural Resources (IUCN) on a World Conservation Strategy, with an introductory draft of a 'Hong Kong Conservation Strategy' published in 1981. It was also during the course of developing this strategy that the concept of 'sustainable development' became the core theme of the Association.
- In 1989 the Conservancy Association established the Hong Kong Environment Centre as an affiliate group dedicated to environmental education, through a grant from the US-based Asia Partnership for Human Development (APHD).
- The Hong Kong Environment Centre plays a representational role in international environmental education and was appointed 'Adult Education Facilitator' of the Asia South Pacific Bureau of Adult Education in East Asia in May 1992, representing Hong Kong in related regional conferences in Macau, Japan and Thailand.
- Lately the Conservancy Association is also involved in the Korea-based Atmospheric Action Network of East Asia, a network of NGOs from seven countries/territories including China and Taiwan. One of the key aims of the Network is to promote the Framework Convention on Climatic Change, one of the results of the Earth

Summit. The Association is also involved in the various Conference of Parties related to the Framework Convention.

The other major green groups of Hong Kong have also developed strong international links. Friends of the Earth (FoE), for instance, started originally as a chapter of the UK-based FoE in 1983, and later became independent¹. World Wide Fund for Nature Hong Kong (WWFHK), another major green group, was established in 1981 and still maintains strong ties with the WWF in the UK. Recently, Greenpeace International announced its intention of expanding its activities in this region and is now in the process of setting up an office in Hong Kong.

One of the green groups' most important and strongest external links has been with China. The Conservancy Association was the first to make contact with China, when in 1979 the association's affiliate, the 'Youth Environment Action Group', visited Beijing and met with Environmental Bureau chief Mr Qu Geping. The association has also built up ties with the Ministry of Forestry, and served as a sponsor of the *Nature Magazine* published by the Ministry. Both FOE and WWF have cooperated with mainland bodies in organizing environmental training and activities. Often the green groups' initial contact was with official government agencies in China but in time a number of non-governmental bodies in the form of 'institutes' or 'foundations' — whose membership often coincide with official government departments — began also to emerge in China.

CONCLUSION

It is clear from the above account that Hong Kong's private sector, including NGOs, has been much more active than the government in global environmental forums. As Hong Kong's economy is becoming more globalized, the government's effort in global environmental policy is clearly lagging behind.

In trying to play a higher profile in international forums, however, Hong Kong has to contend with a good deal of misunderstanding about Hong Kong's future. Despite the attention over 1997, there is still a lot of ignorance in the international arena over Hong Kong's status as a Special Administrative Region of China. Such ignorance may sometimes undermine Hong Kong's ability to participate in in-

ternational bodies. A case in point is that of the newly created World Franchise Council, the constitution for which states that membership is restricted to one representative body only from one country. This has made it difficult for the Hong Kong Franchise Association (HKFA), one of the founders of the council, to become a member. In the case of the HKFA, this has been resolved through a few rounds of redrafting the constitution, but similar difficulties can be expected from many other sectors, including environment.

To take a more active role in global environmental matters, therefore, there are two major challenges which Hong Kong has to resolve. One is to persuade China that environment recognizes no

borders and as such should be a classic non-sovereignty issue over which the Hong Kong government should be able to exercise its autonomy. The other challenge is to convince the many global environmental forums that, like trade but more than trade, the environment is a truly global matter which calls for cross-border cooperation. This requires that participation in environmental forums should be on the basis of territories, rather than that of sovereign nations. In both cases, the Hong Kong government would be well advised to call upon NGOs in the environmental and trade sectors, who have decades of experience in their fields, to assist it in overcoming the barriers likely to be faced by the future HKSAR.

NOTE

1 Editor's Note: see the *Institutional Profiles* of this issue.

REFERENCES

- Ng, Gordon T.L. 1993. Observations on the Role of Non-Governmental Organizations in the Rio Conference of June 1992. *Asian Journal of Environmental Management*, May 1993. Vol. 1, No. 1, pp. 29-38.
- Hong Kong Government. 1996. *Hong Kong 1996*. Hong Kong: Hong Kong Government.
- Consultative Committee for the Basic Law of the Hong Kong Special Administrative Region of the People's Republic of China. 1990. *The Basic Law of the Hong Kong Special Administrative Region of the People's Republic of China*. Hong Kong: Consultative Committee.

The Hong Kong General Chamber of Commerce's Environment Committee

BACKGROUND

The Hong Kong General Chamber of Commerce's Environment Committee was established in October 1991, with the mission of monitoring and evaluating issues and legislation which have a bearing on the environment, and to provide appropriate advice to the Chamber's governing body, the General Committee. Committee members were drawn largely from the Environmental Science and Technology Sub-Committee, an entity which was founded in 1990, with the incorporation of the local chapter of the Pacific Basin Economic Council. The 31 members which made up the Committee in the early days, came from such diverse business backgrounds as chemical, pharmaceutical, trading, energy, banking, manufacturing, legal and other professional services. Mr Guy Clayton, former Managing Director of Ciba-Geigy, was the first elected Chairman of the Committee. He was succeeded by Mrs. Catherine Bacon, Partner with the law firm Deacons, Graham & James. Today, headed by Mr. Barrie Cook, Managing Director of Green Island Cement Holdings, the Committee counts among its members a senior official from the government as well as representatives from academia.

STRUCTURE

To enable the Committee to focus its energies more effectively in its assessment of emerging or prevailing environmental issues, it has created 7 specialist sub-committees in the areas of Air Pollution, Solid Waste and Landfill, Chemical Hazard Waste, Law, Vehicle Emissions, Energy Conservation and Water & Sewage. Convenors are appointed to coordinate projects assigned.

AIMS & ACTIVITIES

The work of the Committee is concerned mainly with the following:

- to monitor and to encourage the development of environmental awareness in Hong Kong, particularly in the commercial sector;
- to conduct and organize workshops, exhibitions, seminars or any other activities related to environmental issues;
- to appoint, as necessary, coordinators with the experience and expertise to lead working groups on the study of pertinent issues and to make recommendations to the General Committee on appropriate action; and
- to liaise and work with other Chamber and non-Chamber committees as well as the Hong Kong government in formulating a balanced approach to the business-environment relationship.

As the thrust of the Committee's agenda is to promote greater responsibility and to raise awareness among trade and industry for the conservation of Hong Kong's environmental resources, its fundamental approach to fulfilling its objectives is premised on education and persuasion. As described above, the Committee's initiatives in education include the mounting of symposiums, business roundtables and orientation visits. Persuasion measures relate to such undertakings as lobbying government on sensible legislation and providing regular updates to the General committee and the Chamber's Legislative Councillor.

The present Committee Chairman, Mr Barrie Cook, is the Chamber representative on the government's Advisory Committee on the Environment (ACE). Presently, the two main tasks of the Committee are related to seeking wider community acceptance of the Polluters Pay Principle and the implementation of the concept of Sustainable Development first advocated by the International Chamber of Commerce.

PUBLICATIONS

Since the Committee's inception, it has published a number of position papers and submitted its views to government on a wide-range of subjects. These included the Diesel-to-Petrol Scheme, charging for the Chemical Waste Treatment Centre, handling of construction waste, the Territorial Development Strategy Review, and the Study on Sustainable Development into the 21st Century.

FURTHER INFORMATION

For further information, please contact:

The Hong Kong General Chamber of Commerce
Secretariat for the Environment Committee
22/F., United Centre
95 Queensway, Hong Kong
Tel: 2529-9229
Fax: 2527-9843

INSTITUTIONAL PROFILE

American Chamber of Commerce in Hong Kong Environment Committee

BACKGROUND

The American Chamber of Commerce (AmCham) in Hong Kong Environment Committee was formed in the fall of 1992 to promote environmental awareness through education and the influence of AmCham members within the Hong Kong community. It is presently one of 26 committees within AmCham and has a standing membership of over 100. Membership is comprised of professionals, managers and scientists in the environmental field, academics, and concerned members of the business community.

MISSION AND GOALS

The mission of the AmCham Environment Committee is to encourage members to apply their skills, services and technology to improving the environment in Hong Kong and the South China region, as well as throughout Asia.

The goal of the Committee is to identify needs, evaluate issues and encourage members to pursue opportunities to benefit and improve the environment. The Committee aims to promote the interests of AmCham and its member companies and raise the awareness of environmental issues affecting business and quality of life in Hong Kong. The Committee advocates responsible action towards environmental improvement through:

- recommendations for the continuing development and enforcement of reasonable environmental standards;
- promotion of strategic, comprehensive development planning with practical ideas for environmental improvement;
- continuing dialogue with business, government and community organizations and leaders;
- timely and responsibly published positions on environmental issues; and

- promotion of environmental technologies in Hong Kong, with emphasis on US products.

SUBCOMMITTEES

Working Subcommittees include:

- Special Projects — which focuses on present, visible issues of interest to Chamber members; recently this has involved air quality issues.
- Technical/Standards — which addresses selected environmental issues which require technical advice or solutions; recently focused on international standards (ISO 14000).
- Education and Public Relations — which supports other committees (Community Relations) as well as focusing on education or public awareness opportunities.
- Business Development — which focuses on the local and regional political atmosphere and defines the opportunities that might result for AmCham members from regulatory or social changes.

ACTIVITIES

On-going activities include:

- monthly meetings to inform members and direct Committee activities;
- quarterly briefings to AmCham member committees on relevant environmental topics which may affect business, e.g. environmental legislation and standards;
- interface with AmCham Environment Committees in other Asian countries to focus on regional environmental issues;
- support for local forums which provide an interface for AmCham member companies and non-governmental organizations to discuss mutual goals and objectives;

- support for environmental initiatives which focus on air and water pollution, waste reduction and minimization, sustainable development and enhancement of public awareness to improve the quality of life in Hong Kong;
- monitoring of the environmental legislative process, maintaining dialogue with government bodies and providing input on legislation and decision-making; and
- sponsoring functions, site visits, speakers, case studies, etc, which raise the environmental awareness of AmCham members.

FURTHER INFORMATION

For more information on the AmCham Environment Committee contact:

American Chamber of Commerce in Hong Kong
Environment Committee
1904 Bank of America Tower
12 Harcourt Road, Hong Kong
Tel: (852) 2526-0165
Fax: (852) 2810-1289
Email: amcham@amcham.org.hk

INSTITUTIONAL PROFILE

Private Sector Committee on the Environment

BACKGROUND

The Private Sector Committee on the Environment (PSCE) was set up in 1989 by 10 leading Hong Kong companies, chaired by the Hongkong Bank. The aims of the Committee are to encourage a private sector approach to environmental issues, to support government in taking action on improving the environment, and to sponsor practical, business-oriented projects which help to clean up the environment. The PSCE is registered as a non-profit organization and now has a total of 22 members.

ACTIVITIES

In its early years, the PSCE looked at a range of environmental initiatives to help solve particular environmental problems. These included a feasibility study of a paper recycling mill, the privatization of the collection of floating refuse in the harbour, and the management of a waste exchange scheme. The PSCE also initiated the establishment of an Environmental Performance Award for Industry under the auspices of the Hong Kong government's annual Industry Awards competition.

Other Committee projects include exploration of the potential for electric vehicle use in Hong Kong with ongoing efforts to identify suitable, commercially viable vehicles for testing and use in the territory.

The PSCE is particularly interested in exploring market-oriented ways to promote environmental protection. This means working to ensure that prices properly reflect the costs of damage to the environment, thereby providing an economic advantage to more environmentally benign practices. The Committee is also interested in opportunities to promote and support commercially viable projects which are environmentally beneficial. These projects could involve recycling, waste minimisation, new environmental technologies or the manufacture of environmentally friendly products.

CENTRE OF ENVIRONMENTAL TECHNOLOGY LIMITED

The PSCE's major achievement to date is the establishment of the Centre of Environmental Technology Limited, a business-oriented organization dedicated to generating, marketing and implementing projects which have a direct impact on Hong Kong's environmental quality. Part of CETL's mission is to assist small and medium-sized companies in coping with environmental problems in a cost-effective manner. The Centre currently:

- operates a trilingual environmental hotline for industry;
- provides information on environmental technologies related to pollution prevention, waste minimisation, energy efficiency, recycling, and office management;
- operates a waste exchange information and recycling service;
- provides a Building Environmental Assessment service;
- organizes the government's annual Industry Award for environmental performance;
- organizes an Annual Business and Industry Environment Conference with international and local speakers.

In September 1996, the PSCE opened its new building designed to provide the CETL with greatly expanded accommodation to carry out the above functions and to develop its role more fully. The Centre's facilities include office accommodation, demonstration and exhibition space, a 160-seat conference room and meeting and seminar rooms.

SUPPORTING COMPANIES

The Committee is supported by: China Light & Power, First Pacific Davies, Gold Peak Industries, Great Eagle, Hongkong Electric, Hongkong Interna-

tional Terminals, Hongkong Telecom, Hong Kong Tourist Association, HongkongBank, Hutchison Whampoa, Inchcape Pacific, Jardine Pacific, Kowloon-Canton Railway, Modern Terminals, Shell Hong Kong, South China Morning Post, The Sino Group, The Swire Group, Ta Kung Pao, and Wheelock & Co.

FURTHER INFORMATION

For further information about PSCE, please contact:

Executive Director
Private Sector Committee on the Environment
2/F, 77 Tat Chee Avenue
Kowloon
Hong Kong
Tel: (852) 2784-3900 / 2784-3916
Fax: (852) 2784-6699

ENVIRONMENTAL ORGANIZATIONS

The Conservancy Association

BACKGROUND

The Conservancy Association (CA) is the oldest non-governmental voluntary organization for environmental protection in Hong Kong. Founded in 1968 by a group of concerned citizens, who wished to provide a better life for Hong Kong people by improving environmental quality, it has continued to play an active role in promoting the concept of environmental protection and nature conservation. CA is strongly community-based and emphasizes outreach activities to local people from all income and educational levels, on issues of environmental health and the conservation of nature, and related matters such as energy efficiency and consumer product information. In addition, CA member experts assess governmental policy (or the need for policy) for the broad spectrum of issues related to the environment, as part of the quality of life for people living in Hong Kong. These assessments are presented to government, other concerned groups and to the community at large.

STRUCTURE

The Association's members come from all walks of life, including professionals, civil servants, teachers, social workers, priests, District Board members, executives, industrialists, journalists, homemakers and students, etc.

The work of the Association is supervised by a 10-member Executive Committee who are elected from the membership. The Executive Committee is the governing body of the CA, managing and conducting the affairs of the association. The work of the Executive Committee is supported by five full-time and 2 part-time staff persons.

The Association's sources of funding include donations from the public (both from annual membership/donation drives and from special events) as well as from corporate sponsorship, and the

Environmental Conservation Fund. The annual budget is about US\$130,000.

ROLES

In order to promote concern for the protection of the environment, the CA has been playing the following roles:

A Constructive Pressure Group

CA monitors Hong Kong government policies on environmental protection and as feasible, participates actively in their formulation (e.g. through advisory or consultative groups).

A Supporting Community Organization

CA is a supporter and facilitator to other community groups in the planning and organization of activities to promote environmental protection.

An Environmental Educator

In 1988, CA set up the Hong Kong Environment Centre to promote environmental education. The Centre provides information resources and educational activities for the general public in Hong Kong. Since 1992, the Centre has also acted as the *Environmental Education Facilitator* of the Asia South Pacific Bureau of Adult Education in the East Asia Subregion. As part of this facilitator role, CA assisted the organization of Environmental Education Workshops in Japan, Macau, Thailand, Australia, and the Philippines. The main objectives of these workshops were to provide opportunities for experience sharing, the development of strategies for networking and the organization of common environmental education programs on a regional basis. Since April 1997, CA is assisting the government in operating the new Tsuen Wan Environmental Resource Centre.

ACTIVITIES

Recent local activities include: *The Environmental Pioneer Scheme* organized by the Hong Kong Environment Centre for youngsters; *Green Orienteering in Urban Parks* to promote nature conservation in urban areas; a *Study of Air Pollution Exposure to Secondary School Students*; *Walk for the Environment*, which the CA has been organizing since 1974; and *The Greening of Hong Kong — Tree Planting Programme*, which is an annual CA event involving more than 500 participants.

Recent internationally cooperated activities include the *International Conference on Atmosphere Pollution in East Asia* and some work for mainland China in nature conservation. Financial assistance has been implemented in the Provinces of Yunnan and Hainan, along with the production of the magazine *The Nature*.

The Conservancy Association also conducts regular research and analysis as well as publishing

books and magazines, giving talks and offering courses for schools, community groups and the public, on the environment.

FURTHER INFORMATION

For further information on the Conservancy Association or the Hong Kong Environment Centre, please contact:

The Conservancy Association
7B Capri Building
130 Austin Road
Tsimshatsui
Hong Kong
Tel: (852) 2728-6781
Fax: (852) 2728-5538
Email: cahk@netvigator.com
Internet: <http://www.netvigator.com/~cahk>

ENVIRONMENTAL ORGANIZATIONS

Friends of the Earth (Hong Kong)

BACKGROUND

Friends Of The Earth (Hong Kong) is an environmental charity, established in 1983, whose mission is to protect and improve the environment, locally and regionally, through research, education and campaigns.

FoE conducts research based on environmental issues in order to provide government, industry and individuals with the relevant information and practical advice on which to base decisions affecting the environment. It also offers education to Hong Kong schoolchildren and the public to foster their awareness of environmental issues and their responsibility to make a better tomorrow. FoE runs campaigns to lobby the government for appropriate actions and policies to ensure a healthy and sustainable environment.

FoE is a non-profit organization which receives no subvention from the government. With a team of highly motivated staff and an active network of members and volunteers, its goal is to voice concerns about Hong Kong's deteriorating environment, and to raise public awareness and interest. FoE currently has approximately 1100 members.

ACTIVITIES

Recent projects include: a year-long community outreach programme, *Adopt-A-Housing-Estate*, which aimed to encourage public housing estate residents to adopt greener lifestyles; *Plant for the Earth*, an annual tree and mangrove-planting event; and *Project Green Hope*, an annual summer student exchange programme between Hong Kong and Guangzhou. We have also organized recycling schemes in schools, public places, housing estates and businesses. Recent lobbying efforts have included campaigns on air pollution, energy policy and sustainability.

FoE's regular publications include a bilingual monthly newsletter and quarterly magazine *One Earth*.

FURTHER INFORMATION

For more information about FoE, please contact:

Friends of the Earth (Hong Kong)
2/F., 53-55 Lockhart Road
Wanchai, Hong Kong
Tel: 2528-5588
Fax: 2529-2777
Email: foehk@hk.super.net
Internet: <http://www.hk.super.net/foehk>

ENVIRONMENTAL ORGANIZATIONS

World Wide Fund For Nature Hong Kong

BACKGROUND

Established in March 1981, the mission of the World Wide Fund For Nature Hong Kong (WWF HK) is 'to stop and eventually reverse the accelerating degradation of our planet's natural environment, and to help build a future in which humans live in harmony with nature.' WWF HK presently has a membership of over 17,000 adults and children and is supported mainly by funds raised in fundraising activities and donations from its supporters.

CONSERVATION

The organization carries out its mission by promoting the concept of conservation of nature and natural resources. To this end, WWF HK has:

- established and is currently managing the internationally recognised Mai Po Marshes Wildlife Education Centre and Nature Reserve;
- worked with local divers to promote the protection of Hong Kong's threatened marine environment and has been instrumental in the establishment of Hong Kong's first marine parks and reserves;
- lobbied government for the development and implementation of conservation policies;
- supported the monitoring of legal and illegal trade in threatened plant and animal species and their by-products;
- supervised WWF wetland projects in China and run management trainee programmes for their reserve staff, as well as staff from other Asian countries, at WWF's Peter Scott Field Studies Centre — WWF HK is presently working closely with the WWF China Programme, assisting in the development of a China National Wetland Action Plan and an education project with the Shenzhen Education Bureau;
- commenced preparation for an environmental profile of Hong Kong, which includes a compi-

lation of ecological and environmental data for the general public.

EDUCATION

Education is the organization's principle tool in pursuing its objectives and its activities in this aspect include:

- developing environmental education programmes, especially its out-reach programmes for primary and secondary schools;
- developing and donating to schools, environmental educational materials for students and teachers, such as pamphlets, education kits, posters, slide packs, booklets and films;
- educating the general public on the wise use of nature and natural resources, through lectures and competitions;
- organizing tours for students and the public to visit the Mai Po Marshes Wildlife Education Centre and Nature Reserve, the Island House Conservation Studies Centre and other adventure visits; and
- organizing regular teacher seminars and workshops to provide in-service training for teachers to carry out environmental education in schools.

RESEARCH

WWF HK is also involved in extensive research with the view of finding scientifically plausible solutions to environmental problems. The implications of such research not only raises public awareness, but also facilitates real conservation action, as well as aiding the government in decisions for formulating conservation policies.

PUBLICATIONS

Regular publications include two quarterly newslet-

ters, one for adults (*About Life*), and the other for children (*Panda Club Post*).

WWF HK has produced many publications which include information pamphlets, booklets, books and posters. Some can be obtained free of charge, while most can be purchased by the public, the proceeds of which go to the Fund.

FURTHER INFORMATION

For more information, please contact:

World Wide Fund For Nature Hong Kong
G.P.O. Box 12721
1 Tramway Path
Central, Hong Kong
Tel: 2526-1011
Fax: 2845-2734
Internet: <http://www.wwf.org.hk>

Papers in this volume:

- E.G. Pryor and
Teresa L.Y. Chu* The Environmental Dimension of the Territorial Development Strategy
Review
- Christine Kung-wai
Lob* A Vision for Hong Kong's Future With Regard to Land Use: Sustainable
Urban Living in the 21st Century
- Cho Nam Ng* Conserving Hong Kong's Biodiversity
- Gordon T.L. Ng* Solid Waste Management in Hong Kong: Towards an Integrated Partnership
- J.H. Liu, Nicola
Atkinson and
Carlene Van Toen* Developing Practical Indicators of Environmental Sustainability for Hong
Kong
- K.C. Lam and A.L.
Brown* Environmental Impact Assessment in Hong Kong: Effective But Limited
- Robert J.S. Law* Hong Kong's Environmental Accomplishments and Continuing Challenges:
A Commentary From the Hong Kong Government's Environmental
Protection Department
- Mei Ng and Lisa
Hopkinson* A Little Green Dragon?
- W.K. Chan* Thinking Globally: Hong Kong's Participation in International
Environmental Forums



Hong Kong University Press
香港大學出版社

ISSN 1021-6634

ASIAN

Journal of Environmental Management



Volume 5 Number 2 November 1997

Asian Journal of Environmental Management

Centre of Urban Planning and Environmental Management, The University of Hong Kong, Pokfulam Rd., Hong Kong,
Tel. 2859-2721, Fax 2559-0468

Editor

Dr Bill Barron

Managing Editor

Professor Peter Hills

Editorial Associate

Ms Aileen Wong

Copy Editor

Ms Jeanne Ng

Subscriptions Manager

Ms Carrie Lee

International Editorial Board

Dr Binayak Bhadra
Member
National Planning Commission
His Majesty's Government of Nepal
Kathmandu, Nepal

Dr Lex Brown
Head
Australian School of Environmental Studies
Griffith University
Brisbane, Australia

Professor David R. Cope
Director
United Kingdom Centre for Economic and
Environmental Development
Cambridge, United Kingdom

Professor Huang Junxiong
Executive Director
Research Centre for
Eco-Environmental Sciences
Academia Sinica
Beijing, China

Professor Lee Sang-Gon
Director
International Affairs Office
Inha University
Korea

Mr C.M. Lin
Director
Materials and Process Branch
Hong Kong Productivity Council
Hong Kong

Professor Low Kwai Sim
Department of Geography
Universiti Malaya
Kuala Lumpur, Malaysia

Mr Kazunobu Onogawa
Director
Research and Information Office
Global Environment Department
Environment Agency
Government of Japan
Tokyo, Japan

Mr K.V. Ramani
Executive Secretary
Asian and Pacific Energy Environment
Planning Network
Coordinator, Energy Programme
Asian and Pacific Development Centre
Kuala Lumpur, Malaysia

Mr Katsunori Suzuki
Division of Environment
and Sustainable Development
Asia Technical Department
The World Bank
Washington D.C., U.S.A.

Dr Thomas Wilbanks
Corporate Fellow
Oak Ridge National Laboratory
Oak Ridge, Tennessee, U.S.A.

Management Board

Professor John Hodgkiss
Chairman
Department of Ecology and Biodiversity
The University of Hong Kong
Hong Kong

Dr Gordon T.L. Ng
Vice-Chairperson
The Conservancy Association
Hong Kong

Professor David Dudgeon
Department of Ecology and Biodiversity
The University of Hong Kong
Hong Kong

Dr Kerrie MacPherson
Department of History
The University of Hong Kong
Hong Kong

ASIAN

Journal of Environmental Management

Vol 5 No 2 Nov 1997

Contents

From the Editor	iii
Call for Papers	iv
Subscription Information	v
• Social Research Approaches to Agroforestry Management in Asia: A Primer on the Sociology of Agroforestry <i>Niaz Ahmed Khan</i>	103
• Reforestation Project Suitability: A Post-Facto GIS-based Evaluation in the Philippines <i>Armando A. Apan and James A. Peterson</i>	109
• The Sustainability of Large and Small Scale Developments in Kam Tin Valley, Hong Kong in Relation to Numbers of Nesting Herons and Egrets <i>Thomas D. Dahmer and Kwok Hon-kai</i>	125
• Changing Environmental Attitudes in a Changing Environment: The Case of Hong Kong <i>Rosemary Barnes</i>	137
• Agricultural Intensification Programme in Indonesia: A Study of the Environmental Impacts <i>Resfa Fitri and Samiul Hasan</i>	149

香港大學出版社

HONG KONG UNIVERSITY PRESS



Hong Kong University Press
The University of Hong Kong
Pokfulam Road, Hong Kong

© Hong Kong University Press 1997

ISSN 1021-6634

All rights reserved. No portion of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information storage or retrieval system, without permission in writing from the publisher.

Printed on 40% recycled paper by Caritas Printing Training Centre.

From the Editor

This issue of *AJEM* begins with a paper by Niaz Ahmed Khan on the 'Social Research Approaches to Agroforestry Management in Asia: A Primer on the Sociology of Agroforestry'. Dr Kahn sets out the social features of traditional agroforestry systems in south Asia and places these within a basic conceptual framework. Of particular interest in this paper is the traditional social systems which helped in the effective establishment of sustainable forest management in south Asia.

Forestry is also the topic of our second paper, this one dealing with the use of geographic information systems (GIS) to help in evaluations of reforestation projects in the Philippines. Armando Apen and James Peterson. Their paper, 'Reforestation Project Sustainability: A Post-Facto GIS-based Evaluation in the Philippines' argues that spatial analysis can and should play an important role in reforestation project site selection and evaluation. In this paper they apply GIS to study the Province of Occidental Mindoro where the majority of the reforestation project sites are in hilly areas, including many on slope of over 50%. The authors note that 'it is evident in the case study that current procedures and components of site suitability assessment for reforestation in the Philippines did not lead to systematic and comprehensive site evaluation... strengthened land resource survey and evaluation for tropical reforestation project planning and policy formulation would offer not only the opportunity to apprise the outcome of extant projects, but also the improvement of project siting and monitoring'.

Resfa Fitri and Samiul Hasan examine the successes and shortcomings of Indonesia's agricultural intensification programme which began in 1965, focusing in particular on the ongoing problem of pest control. They note that it is vital to move beyond the narrow successes of the integrated

pest management programme to bring in new measures for improved seeds cropping patterns.

Also on the theme of ecology, but in this case with a focus on the maintenance of natural areas under pressure from development, Thomas Dahmer and Kwok Hon-kai present their paper, 'The Sustainability of Large and Small Scale Developments in Kam Tin Valley, Hong Kong in Relation to Numbers of Nesting Herons and Egrets'. As indicated by this highly descriptive title, the authors are concerned about the decline in the number of nesting birds and attribute this in part to 'small-scale urbanization not regulated by the EIA process, and which incurs no obligation for mitigation'. They then propose a set of recommendations which they feel would better serve to protect the nesting areas, and hopefully permit the long term continued presence of herons and egrets in these areas.

Also dealing with Hong Kong, but this time on attitudes toward the environment, Rosemary Barnes reviews surveys conducted in Hong Kong from 1972 to 1996 which dealt in whole or part with environmental concerns. Her paper, 'Changing Environmental Attitudes in a Changing Environment: The Case of Hong Kong', finds that 'great changes are evident in some areas, but only moderate changes were observed in others'. For example while the perception of 'noise' as an environmental problem grew significantly, air pollution has consistently been perceived as a major environmental problem in Hong Kong. The paper reviews the problems which arise in an attempt to compare different types of surveys carried out by numerous agencies over the span of decades. Yet, despite the problems, a number of themes do emerge with regard to how people's attitudes toward the environment have changed and what elements appear to be relatively unchanging.

Call for Papers

The *Asian Journal of Environmental Management* (*AJEM*) invites articles on practical aspects of environmental management in Asia. Priority is given to papers involving (1) descriptions of efforts (or specific proposals) to *manage* problems associated with pollution or nature conservation, and (2) matters of concern to organizations involved in environmental management or public awareness (for example, environmental data, management tools, institutional developments).

The manuscript should be clear and concise. Where some of the material presented is highly specialized in nature, the text should include explanatory statements which convey its importance to a readership from different professional backgrounds. Submissions will be refereed by an international panel of experts in the field, and the referees will determine if the submitted papers are to be published as received, published following specific requests for revision, or not published. In keeping with *AJEM's* goal of facilitating information exchanges, comments on published articles are invited and these will be published. Comments and rejoinders should be between 50 and 800 words.

Submission of a manuscript will be taken to imply that the material is original and no similar paper has been published or currently submitted for publication elsewhere.

The manuscript should be between 3000 and 8000 words and the cover page must include the

title (less than 15 words), the author's correspondence address, fax and telephone numbers, an abstract of 100 to 200 words, and a list of up to 10 key words. The typescript must be submitted along with a photocopy of original illustrations (for example, photographs, drawings). Indications of appropriate style for references, and other points of style, may be taken from the articles in this issue. Manuscripts must be submitted double spaced with wide margins on all sides along with a copy on a computer disk. (If requested, *AJEM* will return computer disks or printed material to the author.)

Copyright of papers will be held by the publishers. Twenty-five reprints of each published paper will be provided free to authors with additional copies or alternative arrangements for reproduction to be worked out in consultation with the Editor.

Manuscripts submitted for consideration for publication in *AJEM* as well as comments on published papers should be sent to

The Editor
Asian Journal of Environmental Management
CUPEM
The University of Hong Kong
Pokfulam Road
Hong Kong

Prospective authors are recommended to use existing issues of *AJEM* for guidance on format, or they may write to the Editor for further information.

Subscription Information

The *Asian Journal of Environmental Management (AJEM)* is published twice yearly. Annual subscription rates within Asia — exclusive of Japan, Australia and New Zealand — are US\$50 for institutions and US\$30 for individuals. Rates for other subscribers are US\$70 for institutions and US\$40 for individuals. All rates cited above are inclusive of international airmail charges.

Subscriptions should be paid through INTERNATIONAL MONEY ORDERS drawn in United States dollars. Money Orders should be made payable to: THE UNIVERSITY OF HONG KONG. (Personal or regular bank cheques cannot be accepted.)

Organizations wishing to become **corporate sponsors** may do so annually by contributing US\$600. Such sponsorship will be acknowledged in each issue of *AJEM*, but will not be taken to indicate endorsement by *AJEM* of the sponsor's activities.

All subscription-related correspondence should be addressed to:

Subscriptions
Asian Journal of Environmental Management
CUPEM
The University of Hong Kong,
Pokfulam Road,
Hong Kong.

ORDER FORM

Please Indicate: INSTITUTION _____ PERSONAL _____

Amount Enclosed: US\$ _____

Subscriber's Name:

Subscriber's Address:

Please enclose payment and send to:

Subscriptions, *AJEM* c/o CUPEM, The University of Hong Kong, Pokfulam Road, Hong Kong.

(Subscribers should allow up to four weeks for delivery.)

SOCIAL RESEARCH APPROACHES TO AGROFORESTRY MANAGEMENT IN ASIA: A PRIMER ON THE SOCIOLOGY OF AGROFORESTRY

Niaz Ahmed Khan

ABSTRACT

This article is a primer on the sociology of agroforestry (AF). It raises some preliminary discussions on the issue, by tracing the basic research areas, approaches, principles and manifestations of AF as a social concept. Five major sociological research approaches to AF have been discussed including the analyses of roles, relations, institutions, functions, structures, and the processes of integration and fragmentation. The major social features of the traditional AF systems of south Asia have been identified which, as the paper argues, are of major significance and relevance for the present time. The paper ends with an exhortation for more social research on AF.

Keywords: agroforestry, farmer, research approaches, social aspects, sociology

INTRODUCTION

Agroforestry (AF) is one of the most spectacular and age-old manifestations of a serene and 'symbiotic relationship' (Anderson and Huber, 1988) between people and their neighbouring forests. The traditional forest based populace, more commonly coined as 'the indigenous people' (Gray, n.d.), have successfully evolved a forest-use system which synthesised human demand and sustainable production from the forest, and more importantly, joined the people and forests with a sacred bond of mutual dependence, love, care and gratitude. Thereby, the traditional forestry practices, including AF, have survived through generations. When we talk about social dynamics of AF, we are essentially

referring to a social synthesis and mutual sacredness of two of the greatest entities of nature — man and forest.

This paper is a primer — making a modest attempt to shed light on the social milieu of AF. It raises some preliminary discussions on the issue by tracing the basic research areas, approaches, principles and manifestations of AF as a social concept.

SOCIAL ASPECTS OF AF: SOME CONCEPTUAL REFLECTIONS

'Social aspects of AF' is nearly an all-encompassing term. Nothing transcends a society. Hence, there

Niaz Ahmed Khan, Assistant Professor of Public Administration at the University of Chittagong, Bangladesh and Visiting Scholar at the Centre for Development Studies, University of Wales, Swansea SA2 8PP, United Kingdom. Fax (UK) 1792 295682.

cannot be any rigid demarcation of the term 'social aspects'. All that is intended, given the severe limitations of the space and scope of this paper, is to create some artificial boundaries and to pick up and focus on some of the major social dynamics that have proven implications for the performance of AF in the field. The purpose is to facilitate understanding of the issues and to elucidate basic points that may provoke further academic discussions.

While trying to operationalize AF as a social concept, the following logical deductions and surmises may be helpful.

1. AF is a land use and production mix that runs through an intimate relational network of human beings (as producer, facilitator, consumer and so forth), land (as the principal means of production) and forest (as both the product and input). In other words, AF as a land-use and production system survives within a social process of roles and relations among forest, trees, land and people.
2. AF is by no means a purely techno-silvicultural strategy, it is rather an inseparable part of the aforesaid social process.
3. A failure to understand the social milieu of AF often leads to fatal consequences in the field. Numerous studies on Asia unequivocally emphasized the necessity for comprehending the social surroundings of AF (e.g., Burch, 1988; Cernea, 1985, 1988, 1989; Noronha and Spears, 1985; Barraclough and Ghimire, 1990; Brokensha and Castro, 1984; Ives and Pitt, 1988). Cernea (1988, 1989), to cite an example of the pre-eminence of understanding the social realities, presented a case of community forestry in Pakistan which planned to plant trees on village common lands on the wrong assumption that

this would spread the benefit throughout the community. In reality, to the utter failure of the project, it was found that the so-called commons were under de-facto control of some local rich and powerful families who ultimately monopolized the benefits from the project.

4. One good way to focus on AF as a social concept is to probe into the role and relational network which it contains. These are often reclusive, but very much in existence. The researcher can enter into the network at any convenient point and proceed through the hierarchies/chains of relations, ultimately to reach the farthest frontiers of the 'web'. Let us visualise an average AF farmer. Amidst his (her) innumerable day-to-day transactions and relations, the following table may give us some idea of the social milieu he (she) is living in and his (her) corresponding social involvement (see Table 1).

Studying roles and relations is a widely used socio-anthropological tool. Recent studies on rural life, class and economic relations in Bangladesh have successfully used this method (e.g., Jansen, 1988; White, 1992; Wood, 1994; Jahangir, 1979; BRAC, 1986). Role and relations study may further be fortified by placing it in the perspective of the 'political economy'. Put simply, political economy entwines the politics and economics of class and group relations in a given situation (e.g., Jahangir, 1989; Nikitin, 1983). This paper aims to approach the sociology of AF with a convenient blend of political economics, with primary concentration on 'role and relations study'. Of course, this mode of enquiry has to be tailored to the particular contextual realities.

Table 1
Relational Network of an Agroforestry Farmer: An Example

The Agroforestry Farmer	relation to fellow farmers, groups & families
	relation to land and other productive means
	relation to micro/macro power structure
	relation to other interest/pressure groups
	relation to local formal/informal institutions
	relation to market out-lets and consumers
	relation to concerned government & NGO offices
	relation to concerned state micro/macro policy

PROBABLE RESEARCH APPROACHES TO AF: A SOCIOLOGICAL PERSPECTIVE

While trying to list the probable research areas and approaches to AF as a social process, one gets the overwhelming feeling similar to that of trying to count waves in a turbulent ocean. To delimit the discussion to a manageable proportion, only the major areas, excluding the ramifications, will be highlighted, and exploration of the intricate details through, what Korten (1980) calls, a 'learning process' approach, will be left to prospective researchers. The next section illuminates some prospective sociological approaches to study the social aspects of AF.

Approach 1. Sociology of roles and relations (relational network study)

Focus

1. 'relationship between the acts and events and the aggregate pattern of behaviour and social system' (Jansen 1986:9);
2. studying roles and relations among diverse concerns/interests and stake-holders in AF;
3. comparative analysis of the role-players; qualitative and quantitative treatment of their influence (impact-assessment);
4. 'economic and social connections of village life' (White, 1992:4).

Comment

This is basically a political-economic approach which tries to focus on the relational network of human beings, materials and their surrounding. Traditional anthropological tools of long-term participant observation, personal attachment to research setting, detailed and cross-cultural interviews may be required, because this approach calls for profound insight on the part of the researcher. Nevertheless, this approach is still widely used.

Approach 2. Sociology of Institutions and Organizations

Focus

1. studying institutions concerned with AF;

2. observing institutional capacity, its credibility, public accountability and its competence in responding to local/client demands;
3. structural-functional analysis of the institutions.

Comment

It tries to observe the institutional dynamics, as it relates to the particular group or individual. Observing institution and its role may shed light on the competence and performance of a project/programme.

Approach 3. Sociology of Stress and Crises

Focus

1. studying human behaviour in any productive setting (in our case, AF) at the time of risk, uncertainty, 'stress' and to see how people respond to crises and 'contingencies';
2. tracing factors that contribute to unite the people towards collective action in an AF project.

Comment

Here human behaviour in a crisis setting is observed with the end of seeing how people respond to crises, what factors lead them to tackle the situation and also to ascertain whether these crucial factors can be replicated and 'institutionalized' in normal ('peacetime') situations. Sahabuddin's (1991) study is a recent example of this mode of inquiry.

Approach 4. Study of Fragmentation and Integration

Focus

1. studying the social surrounding of an AF project and its various components (e.g., organisation, policies, market-framework, land-dynamics, etc.) in light of 'integration' — i.e, to see how these discrete components integrate and perform collectively into a holistic system, as they do in real life;
2. studying the 'centrifugal tendencies', tensions and the neutralising agents or counter-responses which prevent fragmentation in a system and lead to integration.

Comment

This approach, again, may be seen as a part of the study of institutions and the human behaviour within. It has a particular focus on the tendency of fragmentation in the organizations/systems and as a counter response, on integration. Kaufman's (1963) study on the administrative behaviour of American foresters is a seminal case in this point.

Approach 5. Historical Analysis**Focus**

1. studying a particular (social) phenomenon by placing it in historical perspective;
2. time-series information and sequential analysis on a particular social variable;
3. comparing the forward and backward linkages of a particular phenomenon or situation.

Comment

Any analysis of resource-use over a particular time sequence almost certainly tries to make the best of this approach. It gives a precise direction of the data and facilitates comparative analysis. Nadkarni *et al* (1989), for example, substantially drew on this approach and conceptualised four major stages of forest use in the greater Indian sub-continent (also see, Roy Burman, 1987).

As regards the above approaches, the following should be noted:

1. the above list is not comprehensive in any way and is merely suggestive in nature;
2. these approaches are not mutually exclusive or isolated, but rather they should be treated as supplementary and mutually reinforcing;
3. they do not form a 'universal' prescription and have to be altered to the specific demand and nature of the research, contextual realities and regional peculiarities.

TRADITIONAL AF AND PRIMACY OF ITS SOCIAL ELEMENTS: LESSONS FROM THE FARMERS

At the very out-set, it was mentioned that Asian villages, notably, in India (e.g., Anderson and Huber, 1988; Heimendorf 1982; Fernandes *et al*, 1988;

Nadkarni *et al*, 1989; Guha, 1989), Bangladesh (e.g., Abedin and Quddus, 1991; Dalmacio, 1989), Sri Lanka (e.g., Wickramasinghe, 1992), Myanmar (e.g., Gujral, 1988) and Nepal (Adhikari, 1991; Grownow and Shrestha, 1991; Tuladhar, 1991), have a rich heritage of sustainable forest management through some forms of AF. What social elements helped these practices to wade through all the odds and sacrilegious attempts, to survive through the ages? What lessons can we learn from the farmers on the social dynamics of afforestation? These practices, in general, were successfully integrated into the social system and were in conformity with the contemporary values, popular perceptions and structures. Although there are regional variations in the answers to the above questions, the following presents a general picture regarding the characteristic social setting of these traditional systems:

1. due focus on and regard for local factors of regional ecology and society;
2. social restraints on unrestricted or destructive resource-usage;
3. multifarious and prudent ways of resource use, ensuring sustained yield;
4. a sacred and spiritual relation between local people and 'their' forest;
5. management of forest intimately linked to local socio-cultural beliefs and values;
6. reasonable degrees of control and leverage over the neighbouring forest by the local community.

Unfortunately, we are very often oblivious to these basic lessons on the social aspects of traditional forestry practices, which should be no less relevant in our time. It is time for us to recognize the fact that the traditional forest based people, 'have demonstrated that they are the best guardians of the environment. In spite of so many threats to their survival, (they) have managed to remain on their territories which have retained a sustainable production potential for many hundred ... years' (Gray, n.d.: back-cover).

EPILOGUE: SOCIAL RESEARCH AS A CONTINUOUS PROCESS

Our discussion on social aspects of AF can best be compared to a seemingly benign peak of an iceberg with a huge interior beneath. The purpose of this paper is to shed light on the surfaced portion, with

the hope of arousing further inquisitiveness towards the gigantic but equally interesting unexplored horizons of the sociology of AF. The social issues in AF are by no means static — they change frequently through the arduous process of shaping and reshaping. Questions we ask today culminate into further avenues of enquiry tomorrow and the researcher is never truly sure what lies ahead. Perhaps, this is why a sociologist, recollecting her experience of social research comments, ‘the question I was facing was How do you know what you need to find out before you have found it out?’ (White, 1992:5).

ACKNOWLEDGEMENTS

The initial drive for this paper came in the form of a personal request from Dr A. H. Majumder (Environmental Officer, USAID, Dhaka, Bangladesh). I express my gratitude to him, and also to Mr Farid Uddin Ahmed of the Bangladesh Agricultural Research Council for his interest in the paper. The paper partially draws on my doctoral thesis (Khan, 1997).

REFERENCES

- Abedin, M.Z. and Quddus, M.A. 1991. Agroforestry Systems in Bangladesh with Particular Reference to Economics and Tenurial Issues. In: W. Mellink, Y.S. Rao and K.G. MacDicken, eds. *Agroforestry in Asia and the Pacific*. Bangkok: Regional Office for Asia and the Pacific, Food and Agriculture Organisation, Bangkok, 13–33.
- Adhikari, J. 1990. ‘Is Community Forestry A New Concept ? An Analysis of the Past and Present Policies Affecting Forest Management in Nepal’. *Society and Natural Resources* 3:257–266.
- Anderson, R.S. and Huber, W. 1988. *The Hour of the Fox: Tropical Forests, The World Bank and Indigenous People in Central India*. Seattle and London: University of Washington Press.
- Barracough, S. and Ghimire, K. 1990. *The Social Dynamics of Deforestation in Developing Countries: Principal Issues and Research Priorities*, Discussion Paper 16. Geneva: United Nations Research Institute for Social Development.
- BRAC (Bangladesh Rural Advancement Committee). 1986. *The Net: Power Structure in Ten Villages*, 2nd edition. Dhaka: BRAC.
- Burch, W.R. 1988. ‘The Uses of Social Science in Training of Professional Social Foresters’. *Journal of World Forest Resource Management* 3(2):73–109.
- Brokensha, D. and Castro, A.P. 1984. *Fuelwood, Agro-forestry and Natural Resource Management: The Development Significance of Land Tenure and Other Resource Management/Utilization Systems*. New York: Institute for Development Anthropology.
- Cernea, M.M. 1988. Alternative Social Forestry Development Strategies. In: J. Ives and D.C. Pitt, eds, *op. cit.*, 159–190.
- Cernea, M.M. 1989. *User Groups as Producers in Participatory Afforestation Strategies*, World Bank Paper 70. Washington: World Bank.
- Cernea, M.M., ed. 1985. *Putting People First: Sociological Variables in Rural Development*. Washington: World Bank; London and New York: Oxford University Press.
- Dalmacio, M.V. 1989. *Agroforestry for Forest Land Management Systems in Bangladesh*, Working Paper 21, FAO/BGD/85/085 Dhaka: Forest Department.
- Fernandes, W. and Kulkarni, S. 1983. *Towards a New Forest Policy: People’s Rights and Environmental Needs*. New Delhi: Indian Social Institute.
- Fernandes, W., Geeta, M. and Viegas, P. 1988. *Forest, Environment and Tribal Economy: Deforestation, Impoverishment and Marginalisation in Orissa*, Tribes in India Series 2. New Delhi: Indian Social Institute.
- Gray, A. *Between the Spice of Life and Melting Pot: Biodiversity Conservation and Its Impact on Indigenous Peoples*, Document 70. Copenhagen: International Work Group for Indigenous Affairs.
- Gronow, J. and Shrestha, N.K. 1991. *From Mistrust to Participation: The Creation of a Participatory Environment for Community Forestry in Nepal*, Social Forestry Network Paper 12(b). London: Overseas development Institute.
- Guha, R. 1989. *The Unquiet Woods: Ecological Change and Peasant Resistance in Himalaya*. New Delhi: Oxford University Press.
- Gujral, R.S. 1988. *Homesteads and Agroforestry Systems in Asia*. Paper presented at the Workshop on Homestead Plantation and Agroforestry, 17–19 July 1988, Dhaka.
- Haimendorf, C. Von-Furer. 1982. *The Tribes of India: The Struggle for Survival*. Delhi: Oxford University Press.
- Ives, J. and Pitt, D.C., eds. 1988. *Deforestation: Social Dynamics in Watersheds and Mountain Ecosystems*. London: Routledge.
- Jahangir, B.K. 1979. *Differentiation, Polarisation and Confrontation in Rural Bangladesh*. Dhaka: Centre for Social Studies, Dhaka University.

- Jahangir, B.K. 1989. Political Economy of Local Government in Bangladesh. In: H.W. Blair, ed. *Can Rural Development be Financed From Below? Local Resource Mobilisation in Bangladesh*. Dhaka: University Press Limited.
- Jansen, E.G. 1986. Rural Bangladesh: Competition for Scarce Resources. Norwegian University Press, Oslo.
- Kaufman, H. 1960. *The Forest Ranger: A Study in Administrative Behaviour*. Baltimore: The Johns Hopkins Press.
- Khan, N.A. 1997. *A Political Economy of Forest Resource Use: Case Studies of Social Forestry in Bangladesh*. Ph.D. Thesis, University of Wales, UK.
- Korten, D.C. 1980. 'Community Organisation and Rural Development: A Learning Process Approach'. *Public Administration Review* September-October 1980:490-511.
- Nadkarni, M.V., Pasha, S.A. and Prabhakar, L.S. 1989. *The Political Economy of Forest Use and Management*. New Delhi: Sage Publications.
- Nikitin, P.I. 1983. *The Fundamentals of Political Economy*. Moscow: Progress Publishers.
- Noronha, R. and Spears, J.S. 1985. Sociological Variables in Forestry Project Design. In: M.M. Cernea, ed. *op. cit.*, 227-266.
- Roy Burman, B.K. 1987. 'Historical Process in Respect of Communal Land System and Poverty Alleviation Among Tribals'. *Social Action* 37(4):391-419.
- Shahabuddin, Q. 1991. *Peasant Behaviour Under Uncertainty: Decision-making Among Low-income Farmers in Bangladesh*. Dhaka: Bangladesh Agricultural Research Council, and Winrock International.
- Tuladhar, A.R. 1991. Agroforestry in Nepal. In: Mellink et al., eds. *op. cit.*, 106-109.
- White, S. 1992. *Arguing with the Crocodile: Gender and Class in Bangladesh*. London and New Jersey: Zed Books Limited; Dhaka: and University Press Limited.
- Wickramasinghe, A. 1992. *Women and Equity in Forestry: A Case Study in Sri Lanka*. Paper presented at the Workshop on Sustainable and Effective Management Systems for Community Forestry, 15-17 January 1992, Regional Community Forestry Training Centre, Bangkok.
- Wood, G.D. 1994. *Bangladesh: Whose Ideas, Whose Interests?* Dhaka: Intermediate Technology-Bangladesh, University Press Limited.

Reforestation Project Suitability: A Post-Facto GIS-based Evaluation in the Philippines

Armando A. Apan and James A. Peterson

ABSTRACT

Reforestation site selection effectiveness was tested for nine projects in Mindoro, Philippines and found to be far less than ideal in terms of the criteria set by government policy. The criteria range, from environmental through demographic, economic to political, represents a challenge in spatial analysis. Accordingly, 16 spatial data sets (corresponding to different site factors) were built so that results from logical queries and descriptive statistical analyses could be generated on demand by using a GIS.

It is argued that such spatial analysis can be an efficient substitute for field-based *post-facto* assessment. Moreover, if implemented during, or in preparation for, reforestation project formulation, it offers more effective land resource survey and evaluation. Accordingly, project site selection and *post-facto* appraisal can be better served with than without digital geographic information systems (GIS). This argument is worth following up by those charged with maximizing return on reforestation investment.

Keywords: reforestation, site factors, site suitability assessment, Philippines, GIS

INTRODUCTION

The world's forests, especially in the tropics, are dramatically shrinking. In the late 1970s, tropical deforestation was about 11.3 million hectares per year (Lanly, 1982). During the period 1980–1990, it increased to about 15.4 million hectares per year (Singh, 1993). In the Philippines, deforestation claimed 204,000 hectares annually from 1950–1978 (DENR, 1990a). This left millions of hectares of degraded lands which are currently creating countless environmental problems and socio-economic losses. In response to this, the National Forestation Program (NFP) was launched by the Philippine Government in 1986. It was initially funded by a US\$240 million loan from the Asian Development

Bank and Overseas Economic Cooperation Fund of Japan (NEDA, 1989).

In the first few years of its implementation, various problems and issues plagued the NFP (e.g., Apan, 1992; Tolentino, 1992; Lechoncito, 1987; UNAC-DENR, 1991). Many projects performed poorly and the objectives had not been met. A number of site specific problems were identified: unsuitable allocation of land, improper designation of silvicultural treatments, plant species-site incompatibility, land boundary conflict, misprioritization of areas, improper siting of forest nurseries, infrastructures, etc., and doubtful accomplishment reports (Apan, 1992; 1996a).

One of the main causes of reforestation problems is poor spatial planning of projects due to weak land

Armando A. Apan and James A. Peterson, Department of Geography and Environmental Science, Monash University, Clayton, Victoria 3168, Australia. Tel: (61)(3) 9905-3607. Fax: (61)(3) 9905-2048. Email: Armando.Apan@arts.monash.edu.au. Jim.Peterson@arts.monash.edu.au.

resource surveys and evaluation systems (e.g., Tolentino, 1992; Apan, 1992), such as the site suitability assessment, which is fundamental in forestation project planning. A site's capabilities and limitations must be well understood to ensure proper plantation establishment and because of the long-term investment in tree growth (World Bank, 1994). However, despite this realization, very little effort has been made to study site suitability assessment for tropical forest rehabilitation. Some concepts and procedures have been discussed (e.g., Evans, 1992, p. 49–66; World Bank, 1994), but it is site-specific first-hand knowledge and experience that are most needed for site suitability assessment.

Accordingly this study aims to make *post-facto* assessment of site suitability of some existing reforestation projects (tree plantations) that were established in the past, and of existing land resource survey and evaluation procedures. It is a part of an integrated GIS-based study on spatial planning and monitoring of forest rehabilitation projects in the Philippines.

SITE ASSESSMENT AND REFORESTATION

The complex of factors such as rock, soil, climate, topography and vegetation that characterize an area of ground, are referred to collectively as the site (Philip, 1994, p. 237). Its assessment for reforestation, just like other forest development projects, is a prerequisite to decision-making, the quality of which is crucial to project success. The analysis of site factors in project planning must be as thorough as possible — decisions based on incomplete information or guesswork will greatly increase the chance of error (World Bank, 1994).

Site factors and their interactions are complex, and so their assessment is not expected to be a simple process. Traditionally, sites are characterized in terms of their qualities. There is no universally accepted definition of 'site quality', although it has been considered synonymous with 'potential forest productivity' (Gholz, 1988). Its determination can be in respect of a single factor, or a combination of several factors. Two methods are used: the direct method (the productive capacity is measured directly from forest growth) and the indirect method (the productive capacity estimated from site attributes expressing this capacity) (Carmean, 1975 cited by Schonau, 1988). Direct methods measure site quality

in terms of various expressions of tree growth such as height, basal area, timber volume, etc. Indirect methods can be divided into quantitative methods, that entail site factor analysis, and qualitative methods, that partition the land surface into units with uniform attributes.

The most widely used measure, the site index (a direct method), is expressed as a single number that represents an estimate of the average height of trees of a given species and of a given age. Its main drawback, however, is its inability to make actual assessment of the site at the pre-planting stage, i.e. if the trees are not yet planted or grown. It is also specific to the species under consideration. Mean annual increment (MAI), the average rate of change (in cubic metre per year) over the whole life of the tree, is another index widely used in commercial forestry. The main drawback to using MAI is its dependence on stand density, as well as genotype, competing vegetation, disease, insects, site preparation, and fertilization (Schonau, 1988).

With the current thrust of increased forest rehabilitation, use of the indirect methods seems more applicable. Aside from the above-mentioned limitations of using a site index or MAI, the increased availability of spatial data and the enhanced capability of spatial information technologies such as remote sensing and GIS to characterize, map, and analyze forest site factors, pave the way for adoption of indirect methods. Moreover, land assessment for natural regeneration methods has become increasingly important, because a site's production capacity in terms of harvestable volume is not always the sole determinant. Tree planting activity is no longer solely commercial: protection of soil and wildlife, and other resources is also a motive.

GEOGRAPHIC INFORMATION SYSTEMS (GIS)

Geographic information systems (GIS) comprise a set of tools for collecting, storing, retrieving at will, transforming, and displaying spatial data from the real world for a particular set of purposes (Burrough, 1986, p. 6). Utilizing modern computer systems, GIS popularity has increased and gained many multidisciplinary applications during the last decade or so. It can provide an organized environment for a number of database management and analytical functions important in making more sensitive and

intelligent decisions. It has been recognized as a valuable spatial data analysis tool capable of providing useful information for planning and management in many fields.

The major difference between GIS and other systems, such as computer-aided cartography, is the provision of capabilities for transforming the original spatial data (Burrough, 1986, p. 81). GIS provides a much larger range of analytical capabilities that can operate on both the geometric and attribute aspects of spatial data. These capabilities include logical operations, arithmetic operations, geometric operations, statistical operations or a combination of two or more of these four types (Bernhardsen, 1992, p. 181). Of course no such applications are possible unless spatial data bases are in a compatible digital form.

SITE ASSESSMENT FOR REFORESTATION IN THE PHILIPPINES

Forestry project development planning in the Philippines was traditionally oriented to generating strategic plans for the components 'what', 'who', 'when', and 'how much'. The 'where', or spatial plan component, has been mostly weak and even totally ignored in some project level planning (DAI, 1993). Land resource survey and evaluation, if considered, is largely focused on dichotomized land classification, timber inventory, or close traverse surveys. It was mainly in the early 1980s that spatial concerns such as land use allocation, land capability, facility siting, site suitability, environmental impact assessment, special criteria mapping, building spatial data, etc., were given due importance in formulating and generating plans (e.g., Umali, 1986).

However, the implementation or operationalization of spatial planning has remained inadequate. Related problems have continuously plagued government planners and managers. Some of the research findings or comments are given below:

- Many reforestation contracts were awarded without a perimeter survey or a clear understanding of the location of the site. In some cases, this was attributed to the lack of maps and adequate baseline information on the uplands. The practice of assigning areas by crude estimates resulted in land-use and ownership conflicts and overlap in the DENR project areas (UNAC-DENR, 1991).

- Reforestation areas all over the country lack the necessary site classification to guide planners, including foresters, for determining the right type of species to be planted to match a particular site (Lechoncito, 1987).
- Studies conducted in 1989 by the University of the Philippines at Los Baños College of Forestry on 37 of the government's regular reforestation projects in eight regions showed that there were no comprehensive regional development plans containing complete information on soil analysis, site suitability and productivity, site-species suitability and land use sub-classification, among other attributes (UNAC-DENR, 1991).
- '*...forestation development confronted various problems such as location and accuracy of the area awarded for contract reforestation, species site matching...*' (DENR, 1990b, p. 1).
- Among matters requiring attention at policy and other levels in the National Forestation Program, are those referring to systems and skills for selection, appraisal, and monitoring of forestation projects (Tolentino, 1992).

The pre-1991 system of site selection and assessment, i.e., before the issuance of the 'surveying, mapping, and planning' (SMP) policy in contract reforestation, is mainly based on the arbitrary judgment of local government personnel. No serious effort in systematic land resource survey and suitability assessment for forest rehabilitation has been made. Only in 1991, after realizing the serious and costly consequences of weak site evaluation, did the government start to implement SMP as a policy order (DENR, 1991). This includes sectioning and blocking of project sites, monumenting and blocking of corner posts, perimeter survey, contour mapping and slope classification, preparation of control and operations maps, among others (DENR, 1991).

The government issued at least two sets of site selection criteria to be followed for forestation projects in the NFP (DENR, 1988). One is administered by the DENR Central Office (Table 1), and the other one is by the regional offices (Table 2). They require thoughtful consideration of site factors such as land cover, accessibility, site suitability and productivity, market potential, manpower availability, community support, political will, etc. They refer to spatially distributed variables that can be represented on thematic maps, some of

which exist, although this does not guarantee their use because there can be hard-to-face access, or retrieval, scale and projection compatibility problems (among others). Some maps that need generating can be produced from analysis of satellite imagery.

Others can be derived from existing data sets and images. Table 3 shows the spatial datasets used in the study, including the corresponding selection criteria they addressed in Tables 1 and 2. Clearly, there is the opportunity for testing the utility of

Table 1
Criteria for Selecting Areas for Contract Reforestation (Level I: Central Office)

<i>Criteria</i>	<i>Detail</i>
Accessibility	<ul style="list-style-type: none"> • Consider the road network developed by the Department of Public Works and Highways and if possible redesign their networks to fit reforestation needs. • Consider access trail construction. • When possible, consider assistance from foreign licenses. • When possible, consider sharing of road-building cost with other agencies who may benefit from the use of these roads.
Site Suitability and Productivity	<ul style="list-style-type: none"> • Give priority to inadequately-stocked brushlands (natural forest or reforestation project). • Consider the application of assisted-natural regeneration. • Package planning and Monitoring and Evaluation System. • High probability of success considering water, soil fertility, microclimate, ability to sustain tree crops. • In mangrove areas, availability of propagules. • Consider financial cost-benefit analysis as major plantation factor. • Consider species suitability vis-a-vis land use or market.
Community Support and Acceptability	<ul style="list-style-type: none"> • Give priority to areas within or adjacent to communities which manifest support and acceptability. • Occupants if any should be integrated into development operations; development plans should consider these. • Areas where community residents (within or outside project site) are willing to complement corporate development activities by developing their own areas for plantation.
Occupancy	<ul style="list-style-type: none"> • Give priority to areas with none or least occupants/adverse claims. • Not covered by Comprehensive Agrarian Reform Law.
Manpower Availability	<ul style="list-style-type: none"> • With manpower available, taking into consideration local labor demand for other economic activities.
Peace and Order	<ul style="list-style-type: none"> • Areas where the (local population) peace and order situation needs to be improved by creating economic opportunities. • Areas where the peace and order situation is relatively stable.
Climatic Conditions and Environmental Requirements	<ul style="list-style-type: none"> • In adverse sites, consider contracts for soil amelioration prior to tree plantation development. • Give priority to areas least subject to typhoon damage. • Higher priority to areas with adequate evenly distributed rainfall. • Areas where chances of rapid succession are high.
Land-use Sub-classification	<ul style="list-style-type: none"> • Consider results of land use subclassification and evaluation, and similar evaluations done by other groups.
Market Potential for Plantation Products	<ul style="list-style-type: none"> • Priority areas with well-established markets, existing processing plants, or those where processing plants are to be established.
Protection	<ul style="list-style-type: none"> • Areas with minimum risks to damage, pests, diseases, other destructive agents, illegal entry and occupancy.
Political Will	<ul style="list-style-type: none"> • Areas where local political will is supportive of the programme.

Source: DENR (1988)

Table 2
Priority Areas for Contract Reforestation (Level II: Regional Office)

Site Attributes

- Lands that are accessible by motorised transport (e.g. jeep or motorcycle) or not more than 2 hours hiking distance (about 8 km) from a road or trail accessible by motorised transport.
- Lands that are visible from roads traversed by public transport vehicles.
- Totally or partially denuded lands where there is an obvious need for reforestation.
- At least 60% of the land area is suitable for the establishment of production forests.
- The proposed site is a catchment area providing water for irrigation, household consumption or hydropower generation.

Source: DENR (1988)

digital GIS so that the extent to which the non-conformity to the site selection criteria of forest rehabilitation sites can be assessed.

METHODS

Study Area

The study area covers the municipalities of Abra de Ilog and Mamburao, Province of Occidental Mindoro, Philippines, with an area of about 84,795 hectares. It is located approximately 25 km south off the coast of Batangas, south of Manila (Figure 1). The area's topography is generally mountainous and rugged; dissected by many rivers and creeks. The elevation ranges from sea level to 1,709 m above mean sea level. The province has two pronounced seasons: dry from November to April, and wet during the rest of the year. The monthly average temperature ranges from 26.8°C to 31.7°C.

The National Statistics Office (1992) census data showed that the two municipalities under study had a total population of about 35,390 as of 1990. Most of the people work as farmers, fishermen, and laborers. Primary agricultural produce include rice, coconuts, bananas, fruits and vegetables. Towns and villages are mostly concentrated in the coastal and alluvial plains, although some inhabitants dwell on the lower and midslope portions of mountains. The province has indigenous inhabitants, the Mangyans. It is also the home of the endangered 'tamaraw' (*Bubalus mindorensis*), a buffalo-like upland animal that can be found only in Mindoro, Philippines.

Licensed logging in the area started in the late 1960s and ended in 1983. In 1978, there were about

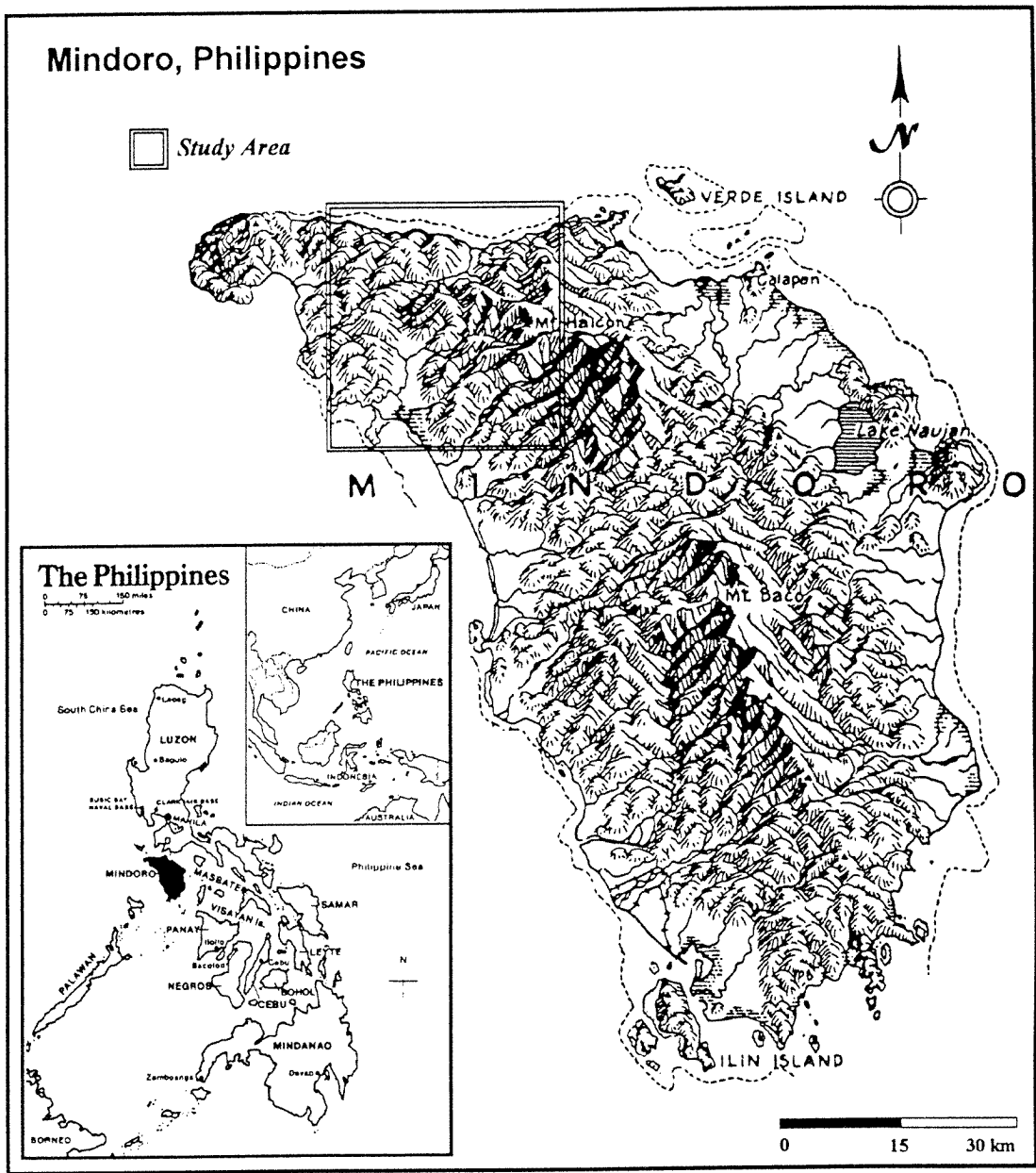
40 pasture lease agreement holders covering some 23,825 hectares. (Bureau of Forest Development-Occidental Mindoro, 1979). Permits to utilize 'minor forest products' such as charcoal, rattan, palm shingles and midribs, and beeswax, were likewise issued. Currently, a logging ban is enforced in the whole province, and forest rehabilitation is one of the main thrusts in natural resource management. In the late 1970s, two major government reforestation projects were established. In the early 1990s, the launching of the National Forestation Program through community-based approaches further sparked interest in forestation activities.

Site Assessment Procedures

The site assessment in this study followed the general procedures illustrated in Figure 2. It includes data acquisition, spatial data input and automation, and data analysis. Using the ARC/INFO Rev. 7 (ESRI, 1995) GIS software, these steps yielded tabular data and graphical display that were subjected to further statistical analysis. Detailed descriptions of each step are discussed in the following sections.

Data Acquisition

Existing literature on the subject (e.g., DENR, 1988; DENR, 1991; Evans, 1992, p. 6, 51, 173; JOFCA-ITTO, 1993; NPCO-DENR, n.d) provided a knowledge base for the initial selection of factors and data acquisition for this study. In assembling the data, the availability of reliable data, and the scope of expressing the factors as a map layer were considered. The following themes were finally



Adapted from *Allied Geographical Section (1944)*

Fig. 1 Location map of the study area.

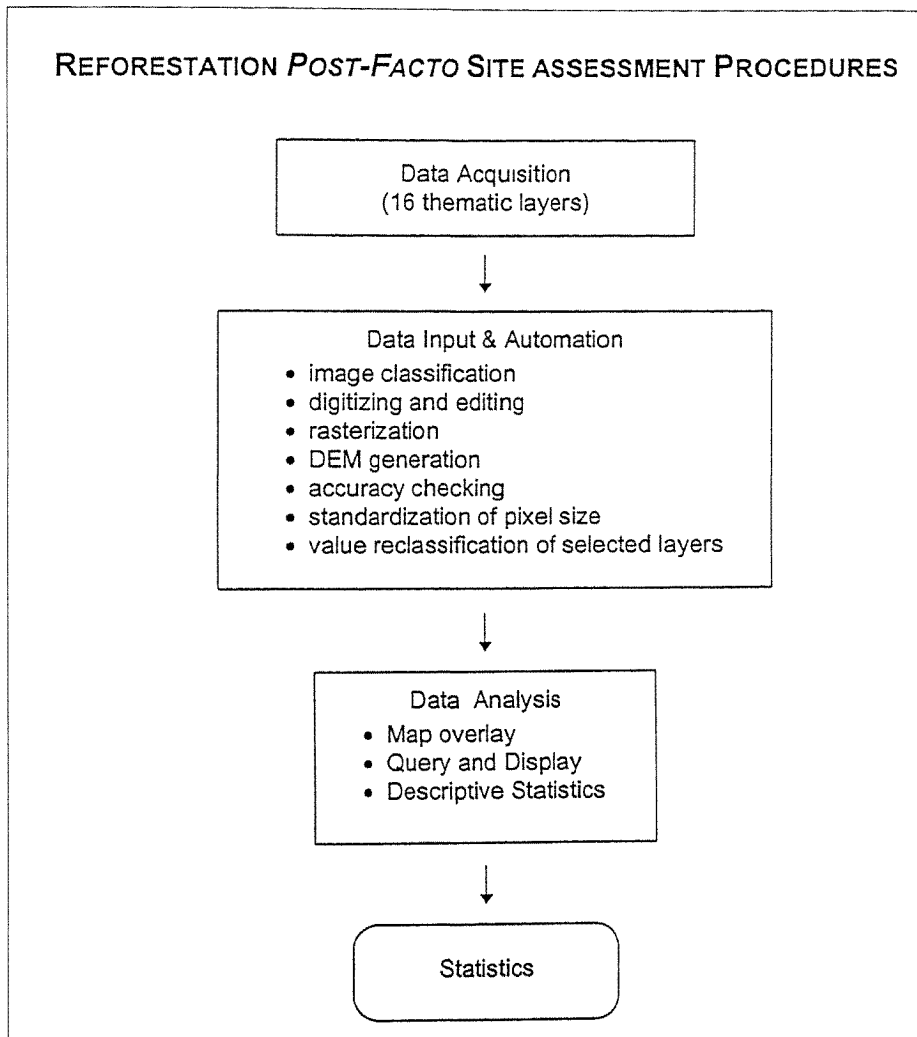


Fig. 2 Reforestation post-facto site assessment procedures.

selected: slope, elevation, aspect, land cover, soil erosion, soil depth, soil fertility, bedrock geology, rainfall, landform, land use, population density, land ownership, distance from road, distance from water bodies, and project site (Table 3).

For the land cover map, a satellite image was used to provide up-to-date and reliable information. A 1,420 x 1,350 pixel subset was used from a Landsat TM digital data (Path/Row 116-51), taken on 11 February 1992 at 1:40 p.m. The acquisition date falls within the area's dry season. The details of the image processing techniques employed can be found in Apan (1996a,b).

Spatial Data Input and Automation

The prerequisite for spatial analysis in this context is a digital spatial data base (i.e., a comprehensive assemblage of themes all referring to the same georeferencing system) in a format accessible to a data analysis system (i.e., a GIS) so that for any location the coincidence or otherwise of relevant criteria, can be tested by map overlays. For this study, no themes were available in digital form and so the spatial data base had to be built. The flowchart of data set generation is shown in Figure 3. A more technical and detailed account could be found in Apan (1996a,b).

Table 3
Spatial Datasets Used in the Reforestation Site Study

<i>Basic Data</i>	<i>Derived Map</i>	<i>Major Criteria to be Addressed (Table 1 and 2)</i>	<i>Scale of Source Map</i>	<i>Source of Basic Data</i>	<i>Year Acquired/Produced</i>
<i>A. Bio-physical</i>					
Topographic Map	Slope, Elevation, Aspect, Distance from Water	Site suitability and productivity, Accessibility	1:50,000	NAMRIA	1947–1953/1990
Landsat TM data	Land Cover	Protection, Site suitability and productivity, Occupancy	digital	NAMRIA	1992
Soil	Soil Depth Soil Fertility	Site suitability and productivity	1:200,000	Bureau of Soils	1976
Soil Erosion		Site suitability and productivity	1:250,000	BSWM	1988
Geology		Site suitability and productivity	1:250,000	BSWM	1988
Rainfall/Isohyetal		Site suitability and productivity	1:250,000	BSWM	1988
Landform		Site suitability and productivity	1:50,000	BSWM	1988
<i>B. Socio-economic</i>					
Land Use		Community support and acceptability, Occupancy	1:50,000	BSWM	1975–1985/1988
Population Density		Occupancy, Protection, Manpower availability,	1:50,000	NSO	1990
Land Ownership		Protection, Manpower availability,	1:50,000	PENRO-CENRO	
Topographic Map	Distance from Road	Accessibility, Market potential, Protection, Community support and acceptability	1:50,000	NAMRIA	1947–1953/1990
<i>C. Project Site</i>					
DENR Project	Reforestation		1:50,000	PENRO-CENRO	1994

NAMRIA — National Mapping and Resource Information Authority
 BSWM — Bureau of Soils and Water Management
 PENRO — Provincial Environment and Natural Resources Office
 CENRO — Community Environment and Natural Resources Office
 NSO — National Statistics Office (Occidental Mindoro)

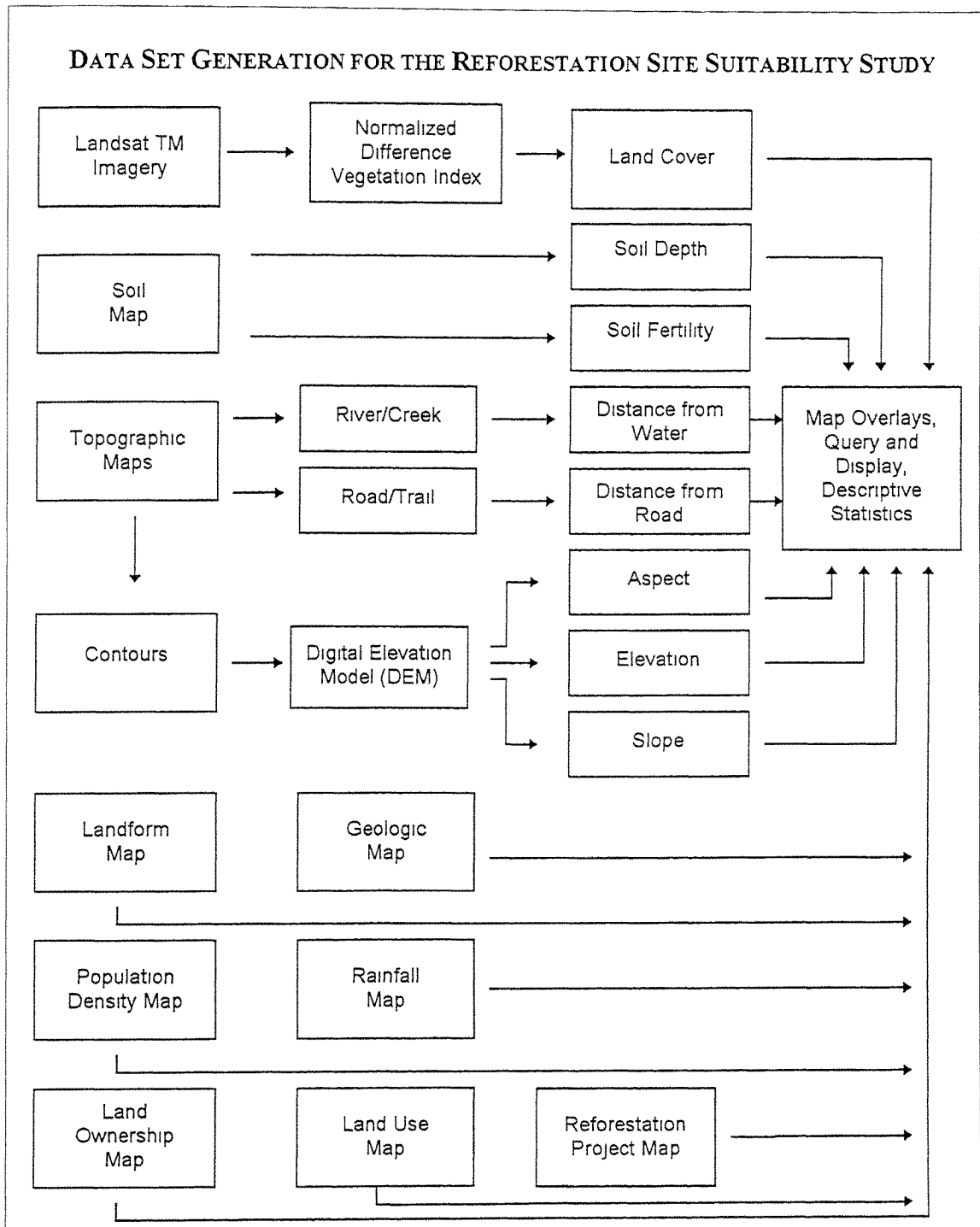


Fig. 3 Data set generation for the reforestation site suitability study.

Data Analysis Approach

Two basic GIS operations were performed in this study: map overlaying and attribute data query and display. A combined map from the overlays of reforestation project sites and all thematic layers was produced. Thereafter, attribute data analysis using TABLE operations was performed, mostly attribute query and display using the appropriate logical expressions. For example: 'RESELECT REFO = 3 AND LCOVER = 3 AND SLOPE = 6 AND ROAD = 5', where LCOVER = 3 refers to 'reforestation project no. 3', SLOPE = 6 refers to slope '> 50%', and ROAD = 5 refers to road class '>10,000 metres'.

The statistical analysis was reinforced by using a separate non-GIS statistical software. ASCII files containing desired attribute data were created in ARC/INFO, then brought into STATISTICA for Windows software (Statsoft, 1994). This allowed fast and more flexible calculations and displays of descriptive statistics. The statistics obtained from the preceding analysis were interpreted and compared with the site selection criteria (Tables 1 and 2) stipulated by the government in their policy issuances (DENR, 1988). The evaluation focused on the following considerations:

1. whether the site selection criteria were met,
2. to what degree, and
3. the key problems and issues.

RESULTS

Bio-physical Aspect

Land cover of reforestation project sites mainly contain medium and high crown cover vegetation (62% and 33%, respectively) (Figure 4a). Surprisingly, the majority of these areas are not covered with artificially planted trees, i.e., land cover is not the outcome of reforestation or tree plantation, but of naturally growing trees. Field verification reveals that most of these natural forests are secondary successional forests of the molave-dipterocarp type. It was found that most of the individual project sites are not the denuded or degraded lands that are given priority in the NFP, and this was shown to be true even before the projects started. Rather, most project areas were of mixed bareland and medium-high crown cover density areas. Reforestation project sites which are expected

to have been mainly bareland areas before planting commenced, were found to be comprised of a relatively small proportion (1.62%) of barelands.

A majority of the reforestation project sites are situated in the undulating hilly areas, i.e., 18–30% and 30–50% slope categories, comprising about 39% and 35%, respectively (Figure 4b). About 246 hectares (24%) are located on slopes greater than 50%. This situation is expected to apply to most reforestation projects: the problems of deforestation and land degradation are located in the uplands. Level to gently sloping areas (0–8%) are mainly allocated for agricultural and residential purposes. With regards to soil erosion, about 868 hectares (86%) of reforestation projects are situated in slightly eroded areas (Figure 4c). Only 11% of projects are located in moderately eroded areas, while none of the projects are located on severely eroded sites.

The entire landscape of the study area is dominated by landforms that evolved on metamorphic mountains and hills. Thus, the majority of project sites are located on metamorphic hill/high relief landforms (73%) (Figure 4d). The predominance of projects in this landform class seems understandable. An exception is the presence of about 35 hectares (3.4%) sited in minor alluvial plains. This begs the question of priority and flood hazard.

For the rest of the bio-physical factors, generally 'normal' to 'ideal' conditions prevail. The highlights are given below:

- The majority (68%) of reforestation projects are found between 0–400 m above mean sea level. No projects are located above 1,200 m.
- About 97% of the reforestation sites have shallow and low fertility soil.
- Regarding aspect, there is no dominant class where reforestation sites are located, except that about 29% of the sites are located in more or less flat areas.
- Closely related with landform, bedrock geology for reforestation sites is dominated (about 86%) by the complex metamorphic rocks (schists and phyllites, associated with marble and quartzite) category.
- Rainfall distribution in reforestation projects mainly falls in the 3,000–3,500 mm class, comprising about 71%. Only about 28% fall in the 3,500–4,000 mm class.
- With regards to the attribute 'distance from river or creek', the area of reforestation sites was

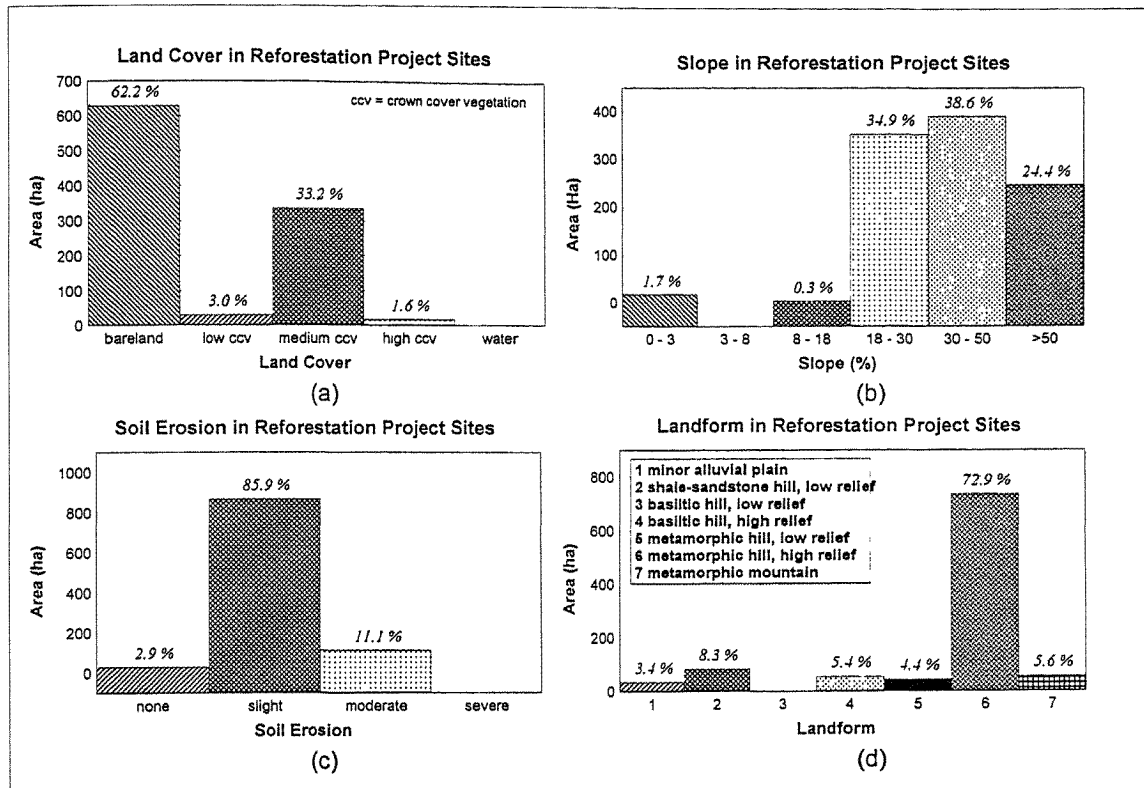


Fig. 4 Some bio-physical site factor attributes of selected reforestation projects.

found to be inversely related with the distance. Large portions of reforestation sites are found within the 0–200 m, 200–400 m, and 400–800 m categories (40%, 29%, and 25%, respectively). No project was sited beyond 1,200 m from a river or creek.

Socio-economic Aspect

Reforestation sites are mainly located in forestland zones (about 88%), while the rest are located in pasture and brushland areas (11%), except for a small area of agricultural lands (4 hectares or 0.45%) (Figure 5a). For obvious reasons, reforestation sites could not be found in other land use classes (e.g., built-up area, fishpond, beach, etc.). Forestland zones are largely dominated by a mixture of young and mature second growth forests, often mixed with relatively small patches of bareland and brushland.

Close to 80% of the reforestation project sites are quite near (1,000–2,000 m) to moderately

distanced (2,000–4,000 m) from the road and trail network (Figure 5b). About 10% (100 hectares) of the reforestation sites are within the 0–1,000 meters range, i.e. they are close to road or trail. On the other hand, some 9.8% (98 hectares) of the total project sites are located in a far 4,000–10,000 m range.

Reforestation sites are expected to be all located in state-owned ‘Forest Land’, and not within the privately-owned or to-be-released ‘Alienable and Disposable Land (A&D)’. This rule was not followed, as about 53 hectares of a project was sited in areas classified as A&D: currently not privately-owned but available for release for titling (Figure 5c). On the other hand, the expectation for population density classes is realised: reforestation projects are primarily located in low and medium density populated areas (Figure 5d). As expected, no reforestation site was located in high population density areas.

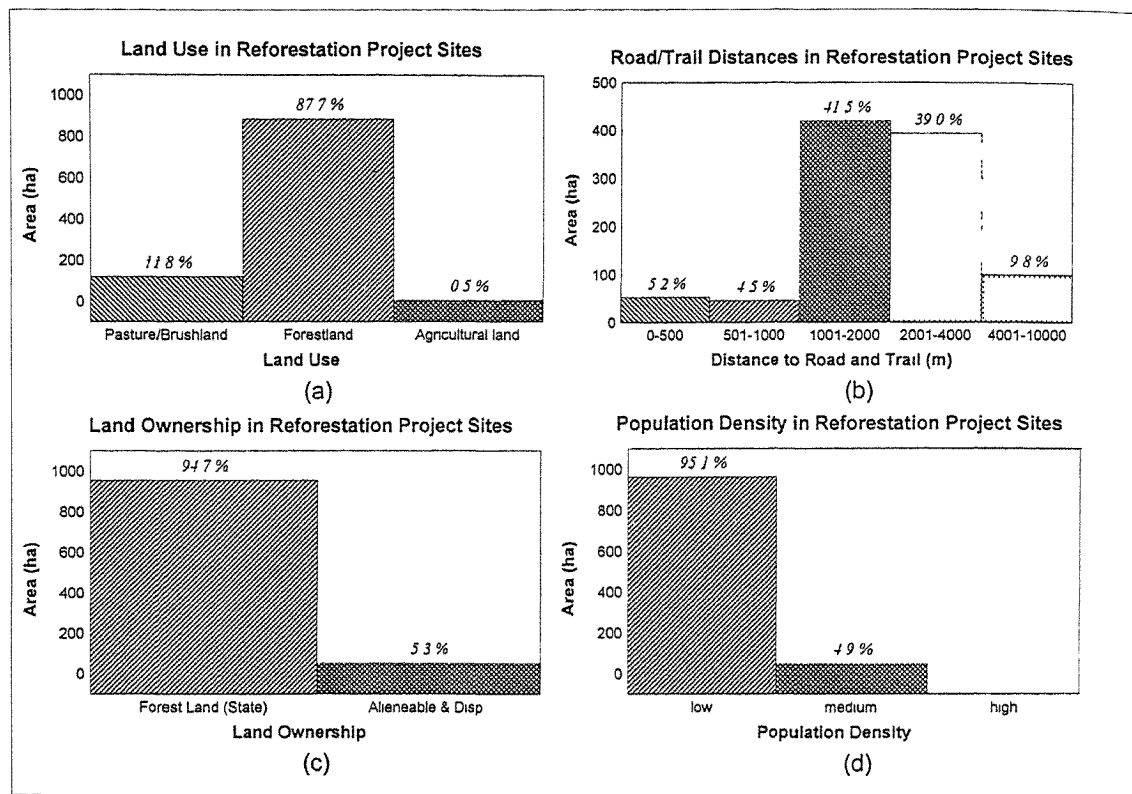


Fig. 5 Some socio-economic site factor attributes of selected reforestation projects

DISCUSSION

Site assessment of the sample reforestation projects indicate that some major site factors were not rigorously considered: prominent are land cover, soil erosion condition, land ownership, and distance from road/trail. Foremost, more than half of the reforestation projects are poorly sited with regards to land cover because they are mostly located in vegetated areas with medium to high crown cover density, instead of having been established in bareland or low crown cover vegetation areas. As described before, the dominant land cover in most project areas is composed of brushland and mature secondary forest succession. This means that the prevailing site selection criteria set in the policy guideline (DENR, 1988) were not followed. The guideline requires that priority be given to inadequately-stocked, brushland, totally or partially denuded lands where there is obvious need for reforestation (DENR, 1988). The major repercussions of this improper siting are as follows:

- There is an apparent misprioritization of

reforestation project areas. Open and low density vegetated areas should be prioritized instead. Most projects in the sample are intended for timber production, and not for natural regeneration, which may warrant site selection of projects in areas covered by medium density vegetation.

Financially, the government is on the 'losing side'. Since cost calculation in the pre-SMP years is per total project area basis, and not with the actual 'plantable area' (i.e., minus the medium and high density vegetation, rock outcrops, water courses, etc.), the government, in effect, is overpaying the contractor. Why pay for the planting and maintenance of areas already covered by forests? In the area covered by this study, with a project contract cost of about P20,400 pesos per hectare for three years (about US\$816) (DENR, 1988), the government lost some P19.6 million pesos (about US\$785,800) for the 963 hectares covered by medium and high density vegetation.

This discrepancy between desired and actual proportion of bareland reforestation may be partly explained by the two year time lapse between project initiation and February 1992 which is when the satellite image (from which came the crown cover map used in this study) was recorded. It was possible that the newly established tree plantations are the ones captured by the Landsat TM sensor and analysed in such a way that they are classified as belonging to the medium to high crown vegetation. However, the possibility was dismissed after field visits, examination of official records, and interviews were undertaken.

With regards to soil erosion conditions, about 86% (868 hectares) of the projects are located in slightly eroded areas, 11% (112 hectares) in moderately eroded, and none in severely eroded sites. From the viewpoint of ecosystem rehabilitation (which should be the major objective since the area contains two major important watersheds), most project sites were wrongly prioritized. The entire area has some 20,490 hectares of moderately eroded and 3,590 hectares of severely eroded ground that needs immediate rehabilitation. Although some of these areas might not be suitable in terms of slope or accessibility, there are, however, some 11,966 hectares that are suitable. Examination of the area also shows that other relevant site factors are not prohibitive. However, the objective of management may need to be changed from productive to protective forestation. Steep slopes are inappropriate for production forest because tree growth rates would be marginal, and road construction and harvesting cost would be very high (NPCO-DENR, n.d.). The forestation strategy might even be changed from tree plantation establishment to the natural regeneration method or cover cropping (i.e., direct seed sowing or planting of perennial leguminous plants or with other non-legumes which have the capability to revegetate inhospitable sites (DENR, 1991)).

Land ownership is a critical issue in the Philippine uplands. In some areas of the country, forest development projects failed because of land ownership problems such as ancestral land claims, boundary conflicts, illegal occupancy, etc. In the subject area, there was no land ownership problem at the time of the study, except that one reforestation project (covering some 50 hectares) is located on alienable and disposable lands (A&D). The land is not private property yet, but has already been 'released' and found to be not needed for forestry

purposes. Again, the problem of wrong prioritization is evident at this site. At P20,400 pesos per hectare (about US\$816), some US\$40,800 is involved for the 50 hectare-project.

The government site selection criteria consider accessibility as important (DENR, 1988). First, lands that are accessible by motorised transport or are not more than 2 hours hiking distance (about 8 km) from a road or trail should be prioritized. Secondly, priority should be given for lands that are visible from roads traversed by public transport vehicles. While the first criterion serves the need for easy access, the second criterion is probably intended to make reforestation efforts known to people as a 'showcase', to encourage them to plant trees, and in support of other information campaign messages. In the study area, the first criterion on accessibility was met by all projects, as no site is more than 4 km from road or trail. However, the second criterion was not totally followed, since more than 50% of the project sites are not visible from roads. Field trips revealed a substantial number of sites that could have easily satisfied this criterion and other site factor criteria as well.

These site selection problems, especially wrong prioritization, could generally be attributed to the lack of spatial planning at the landscape or regional level. Spatial planning in this sense encompasses land resource survey and evaluation, site suitability assessment, special criteria mapping (e.g., for seed production areas, fire hazard, etc.), and facility siting, among others. Even the current practice of SMP is not designed to meet most of the spatial information needs of project planning. Therefore, there is a pressing need to design a system for site assessment in the Philippines that will consider the spatial information needs of the country's forestation program. A pilot study should first be conducted that would significantly help in the design, validation, and refinement of the system.

CONCLUSION

It is evident in the case study that current procedures and components of site suitability assessment for reforestation in the Philippines did not lead to systematic and comprehensive site evaluation. Most of the important prevailing site selection criteria set in the policy guidelines of the government were not followed. More than half of the reforestation projects

are poorly sited with regards to land cover because they are mostly located in vegetated areas with medium to high crown cover density, instead of having been established in bareland or low crown cover vegetation areas. This highlighted the profound importance of recently acquired satellite imagery as a source of land cover information in project planning and monitoring. Other factors that were improperly considered were soil erosion conditions, land ownership, and distance from road/trail. It is clear that the current policy on site selection would be more easily brought to practice if GIS was deployed.

Thus strengthened land resource survey and evaluation for tropical reforestation project planning and policy formulation would offer not only the opportunity to appraise the outcome of extant projects, but also the improvement of project siting and monitoring. It is here, in 'pre-facto' application, that most of the benefits of a more comprehensive spatial analysis, in aid of applying long established and accepted site selection criteria, seem to lie.

However, the responsibility for deployment of digital GIS is unclear. Necessary revenue streams for its support are not obvious because the benefits are not immediate (unless applied to the conflict resolution necessary in choice of landuse). The

penalty for ineffective projects is spread nationally over a long period (as repayments) whereas the cost of implementation occur well before benefits accrue. Apart from overall incentives for the adoption of digital data/information handling for resource management (including, for instance, asset inventory and facilities management), the main incentive could be in the form of conditions for reforestation project loans. Implementation would ultimately bring progress to digital data transformation and digital spatial database building.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the help of Mr Ver Santos (NAMRIA), Mr Esteban Godilano (IRRI), Dr Rex Cruz (UPLB-CF), and PENRO Teodulo Ragudo and his staff (DENR Occ. Mindoro). Comments of Dr Gale Dixon, Monash University are greatly appreciated. Many thanks to Australia's Department of Employment, Education, and Training (OPRS Grant) and Monash University (MGS Grant, Overseas Study Grant, and PPA Grant) for Dr Apan's scholarships and travel grant.

REFERENCES

- Allied Geographical Section. 1944. Terrain Study No 96: Mindoro Province (Philippine Series), Allied Forces, Southwest Pacific Area.
- Apan, A. 1992. Planning Process for the Reforestation of Watershed Areas: The Case of Maasin Watershed, Iloilo Province, Philippines. Master's Thesis, Asian Institute of Technology, Bangkok, Thailand.
- Apan, A. 1996a. 'Forest Rehabilitation Need Index (FRNI) for Tropical Areas: Concepts and Derivations Using Satellite Data and GIS', *Geocarto International: A Multi-disciplinary Journal of Remote Sensing & GIS* 11 (2), 43-53.
- Apan, A. 1996b. 'Tropical Landscape Characterization and Analysis for Forest Rehabilitation Planning Using Satellite Data and GIS'. *Landscape and Urban Planning Journal* 34, 45-54.
- Bernhardsen, T. 1992. *Geographic Information Systems*. Arendal: Viak IT.
- Burrough, P.A. 1986. *Principles of Geographic Information Systems for Land Resources Assessment*. Oxford: Clarendon.
- Bureau of Forest Development-Occidental Mindoro 1979. Mindoro Occidental Comprehensive Plan CY 1979-1988, Mamburao, Mindoro Occidental.
- Dagdag, B., Renales, L. and Alcantes, H. 1961. *Soil Survey of Mindoro Province*. Manila, Philippines: Bureau of Soils.
- DAI (Development Alternatives Inc). 1993. Spatial Information for Natural Resources Management: A Report Submitted to the Department of Environment and Natural Resources. Quezon City, Philippines.
- DENR (Department of Environment and Natural Resources). 1988. Memorandum Circular No. 11, Implementing Rules and Regulations of Reforestation Contract. Quezon City, Philippines.
- DENR (Department of Environment and Natural Resources). 1990a. Land, Forests, and Mineral Resources Situationer. Quezon City, Philippines.
- DENR (Department of Environment and Natural Resources). 1990b. Memorandum of USEC Victor Ramos, Application and Implementation of Microcomputer Programs on the Evaluation of Reforestation Development Plan Prior to Its Approval. Quezon City, Philippines.
- DENR (Department of Environment and Natural Resources). 1991. Administrative Order No. 31, Revised Guidelines for Contract Reforestation. Quezon City, Philippines.
- ESRI (Environmental Systems Research Institute, Inc). 1995. ARC/INFO Rev 7.0.1. Redlands, CA: ESRI.

- Evans, J. 1992. *Plantation Forestry in the Tropics*, 2nd edition. Oxford: Clarendon Press.
- Gholz, H.L. 1988. Problems in the Biophysical Determination of Forest Site Quality. In: D.W. Cole and S.P. Gessel, eds, *Forest Site Evaluation and Long-Term Productivity*. Washington: University of Washington Press, pp. 12–21.
- JOFCO-ITTO (Japan Overseas Forestry Consultants Association-International Tropical Timber Organization). 1993. *Rehabilitation of Logged-over Forests in Asia/Pacific Region: Final Report of Sub-Project II*. Yokohama: JOFCA.
- Lanly, J.P. 1982. *Tropical Forest Resources*, Forestry Paper 30. Rome: Food and Agriculture Organization.
- Lechoncito, J.L. 1987. 'Contract Reforestation — Prospects and Problems'. *The Philippine Lumberman* 33:18–21+.
- National Economic and Development Authority (NEDA). 1989. *Philippine Development Report*, Manila, Philippines.
- National Statistics Office. 1992. *Census of Population and Housing, Report No. 3–64D (OCCIDENTAL MINDORO) — Socio-Economic and Demographic Characteristics*. Manila.
- NPCO (National Program Coordinating Office). n.d. *Technical Guide on Contract Reforestation*. Quezon City, Philippines: DENR.
- Philip, M.S. 1994. *Measuring Trees and Forests*, 2nd edition. Oxon: CAB International.
- Schonau, A.P.G. 1988. Problems in Using Vegetation or Soil Classification in Determining Forest Site Quality. In: D.W. Cole and S.P. Gessel, eds, *Forest Site Evaluation and Long-term Productivity*. Washington: University of Washington Press, pp. 3–11.
- Singh, K. D. 1993. 'The 1990 Tropical Forest Resources Assessment'. *Unasylva* 174 (44), 10–19
- Statsoft, Inc. 1994. *Statistica for Windows (Volume 1): General Conventions and Statistics I*. Oklahoma: Statsoft, Inc.
- Tolentino, D.S., Jr. 1992. *The National Forestation Program: A Review of Lessons and Experiences and Formulation of Action Plans*. PENRO/CENRO Convention, 26 November 1992, Asian Institute of Tourism, Q.C., Philippines.
- Umali, R. 1986. *Availability of Data for Land Use Assessment in the Philippines*. Paper delivered in the Land Use Seminar sponsored by the Forestry Development Center and the Philippine Institute for Development Studies, 13–14 June 1986, U.P. at Los Baños, Laguna, Philippines.
- UNAC-DENR (Upland NGO Assistance Committee — Department of Environment and Natural Resources). 1991. *Review and Recommendations on the Contract Reforestation Program*. Manila, Philippines: UNAC.
- World Bank. 1994. 'Site Analysis and Outplanting'. *Forests & Forestry* 3:1–8.

The Sustainability of Large- and Small-Scale Developments in Kam Tin Valley, Hong Kong in Relation to Numbers of Nesting Herons and Egrets

Thomas D. Dahmer and Kwok Hon-kai¹

ABSTRACT

The numbers of pairs of nesting herons and egrets in four egrettries in Kam Tin valley, Hong Kong were monitored as part of ecological impact assessments of two infrastructure projects between 1994 and 1997. The Ho Pui, Toll Plaza, Tung Shing Lei, and Ko Po Tsuen egrettries were monitored in relation to construction of a highway and a flood control channel. Of the four egrettries which were active in 1994, only two were still active in 1997. One of those was adversely affected by highway construction and agricultural practices, leaving only one of four original egrettries relatively intact. The single remaining egrettry was under direct threat from village housing development and indirect threat from losses of foraging habitat due to urbanisation and infrastructure development. We predict that it will be abandoned due to the continued encroachment of village housing or the progressive decline in surface area of nearby foraging habitats. This will potentially eliminate herons and egrets as breeding birds in Kam Tin valley. The decline in numbers of nesting ardeids (herons and egrets) in Kam Tin valley was caused in part by small-scale urbanization which is not regulated by the EIA process, and which incurs no obligation for mitigation. The threat to nesting herons and egrets from this type of development may exceed that from major infrastructure projects because the latter must at least partially mitigate their impacts. The combined impacts of regulated and unregulated developments are ecologically unsustainable. Therefore, we call for a coordinated effort on the part of government to ensure appropriate conservation emphasis is placed on the planning and implementation phases of future development projects.

Keywords: egret, heron, Hong Kong, ecology, conservation, biodiversity

INTRODUCTION

Ardeids use habitats for three primary activities: foraging, roosting, and nesting. This study focused on nesting habitats in Kam Tin valley, Hong Kong. Nesting habitats are readily identifiable because of the colonial nesting behaviour of ardeids. Kam Tin valley ardeid nest sites (referred to hereafter as 'egrettries') were all located in bamboo stands which

were mixed with broadleaved trees or were isolated patches of only bamboo.

The Hong Kong Wild Animals Protection Ordinance (Chapter 170) protects all species of birds, their nests and their eggs. However, a written permit may be granted to take birds, nests, or eggs at the discretion of the director of the Agriculture and Fisheries Department. In practice, the permitting procedure is typically used only where formal study

¹ Thomas D. Dahmer and Kwok Hon-kai, Ecosystems Ltd., 2/F Kingsun Computer Building, 40 Shek Pai Wan Road, Aberdeen, Hong Kong. Tel: (852) 2553-0468. Fax: (852) 2552-9191. Email: ecosys@hk.super.net.

of the proposed reason for taking birds, nests, or eggs is carried out. This would apply to larger development projects where environmental impact assessments (EIAs) are required, but typically not to smaller projects where EIAs are not required, and the issue of potential avifauna losses does not arise.

Many nests of non-ardeid birds are small, deteriorate quickly after the young are fledged, and are not constructed in exactly the same locations in successive years. Therefore, the nests are difficult to locate except during the breeding season. In contrast, ardeid nest sites are easier to locate because the birds and nests are larger, the birds typically nest colonially, and egrettries may be used for many years in succession in the absence of severe disturbance. The conspicuousness of egrettries focuses more conservation attention on them than on other bird nesting sites in Hong Kong.

The conservation interest in ardeids in Hong Kong has been addressed by the Planning Department (PD, 1995), which has designated six local egrettries as Sites of Special Scientific Interest (SSSIs). Two other SSSIs support egrettries (Centre Island, SSSI no. 39; A Chau, SSSI no. 44), but the sites were designated SSSIs based on geological (SSSI no. 39) and migratory bird interest (SSSI no. 44), rather than egrettry interest. The eight egrettry SSSIs constitute 13.6% of all the SSSIs designated in Hong Kong (total includes SSSI no. 59 which was designated in January 1997). Ten of the SSSIs list birds among the issues of interest, but none of them include egrettries.

Outline Zoning Plans (OZPs) are developed by the Planning Department to control land use in Hong Kong. SSSIs which lie within the boundaries of an OZP may be afforded statutory protection by way of the zoning category designated for the SSSI. Outside OZP boundaries, SSSI status does not provide effective protection for the egrettry site. This is because many of the egrettry SSSIs are on lands which are partly or entirely privately owned, and on which land use is not controlled.

Because of the recognized scientific interest in ardeids and the need for ardeid conservation in Hong Kong, and because ardeid nest sites are colonial and therefore relatively easy to monitor, environmental impact assessments of three infrastructure projects in Kam Tin valley included ecological studies which monitored nesting at egrettries. Because colonial nest sites are useful bio-indicators of ecosystem health (Kushlan, 1993), and are useful at various spatial

scales (Sadoul, 1997), two major infrastructure projects also selected Kam Tin valley egrettries for long-term monitoring of ecological impacts during project construction or operation.

This study reports the results of EIA and monitoring studies of nesting ardeids in Kam Tin Valley in Hong Kong over a four-year period from 1994–97. Our objective is to show that urbanization of the rural environment through (a) village housing construction and (b) infrastructure development for transport and flood control are the two primary threats to ardeids in Kam Tin valley. Although both of these are threats, only the latter are subjected to EIAs. Therefore, only those projects provide some level of impact mitigation. In contrast, proponents of the smaller, village housing projects typically do not carry out EIAs, and are not required to enact any type of impact mitigation. Although the scale of development is smaller on a project basis, the cumulative impacts of habitat loss and fragmentation can be critical in terms of wildlife conservation.

Although the focus was on nesting herons and egrets in relation to large-scale infrastructure projects, the impacts of small-scale village urbanisation over a four-year period were also observed. This enabled the formulation of broader perspective on the adequacy of impact mitigation and the ecological sustainability of large- and small-scale projects with regard to the survival of herons and egrets as breeding birds in Kam Tin valley.

METHODS

Four egrettries in Kam Tin Valley were studied during the ecological impact assessment and a subsequent ecological monitoring programme for a highway construction project in 1994–97. The four egrettries included: the Ho Pui egrettry, the Toll Plaza egrettry, the Tung Shing Lei egrettry and the Ko Po Tsuen egrettry (Figure 1). The same egrettries were also studied for an EIA and long-term monitoring study of a river channeling project for flood control. All egrettries were searched for active nests between April and June in 1995–97. All active nests were counted, and the species of nesting birds were recorded. Only nests with adult birds or juveniles were counted. The annual estimate of the total number of active nests in Kam Tin valley was taken to be the sum of the highest count of each species over the nesting season survey. As dense vegetation made accurate

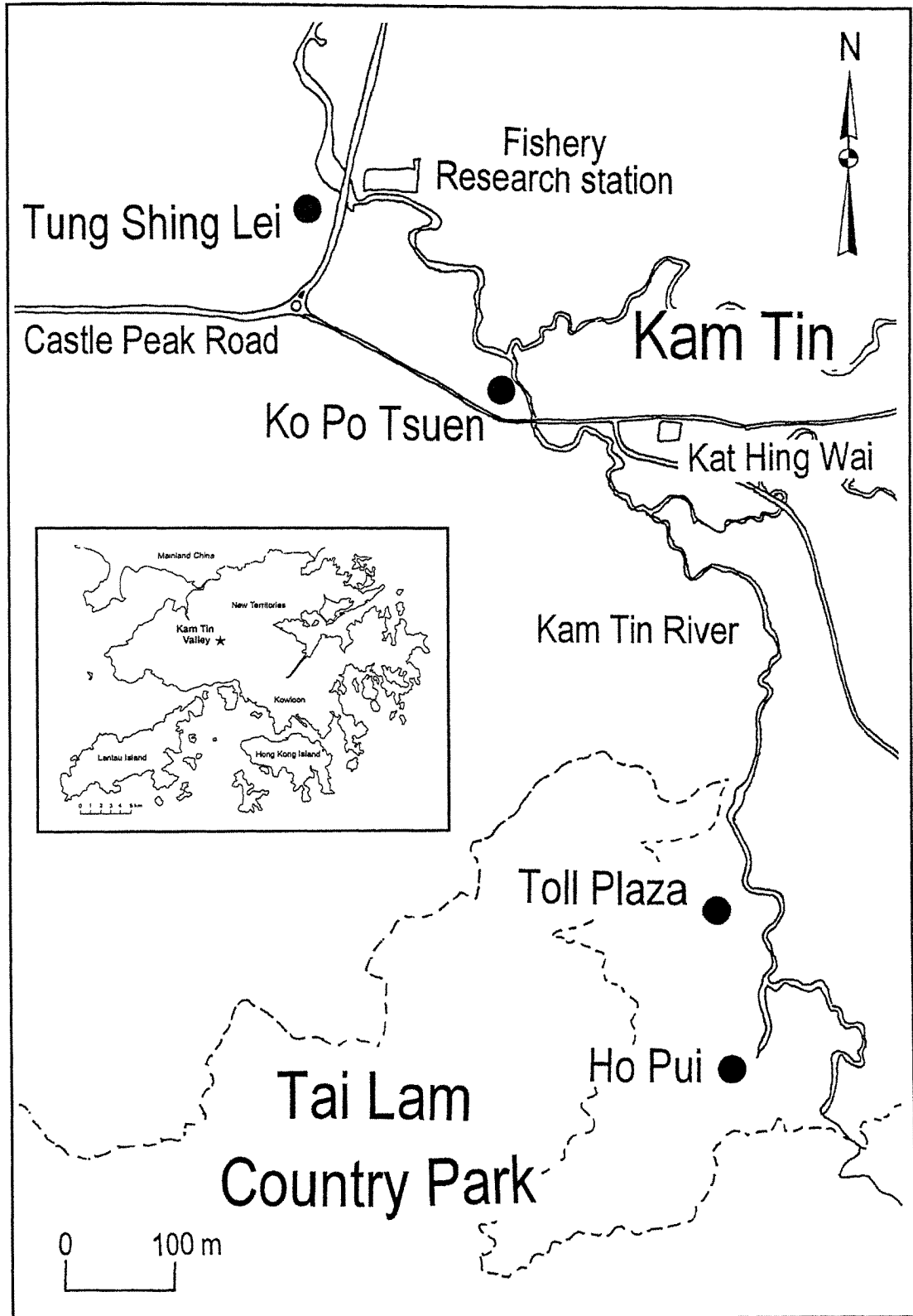


Fig. 1 Locations of four egrettries in Kam Tin Valley, Hong Kong.

counts impossible, the nest counts were considered to be minimum estimates of the actual numbers of nesting pairs. Data from this study were supplemented by previous nest count records for the Kam Tin valley reported by Young and Cha (1995).

Dominance (d) was calculated using the Berger-Parker index d , which expresses the proportional importance of the single most abundant species:

$$d = n_{\max} / N$$

where n_{\max} is the number of individuals of the most abundant species and N is the total count.

RESULTS

Based on 1995 nest counts for this study and for all of Hong Kong (Young and Cha, 1995), the numbers of breeding ardeids in Kam Tin valley constituted 9% of the Hong Kong breeding population. Although three ardeid species which breed in Kam Tin Valley are locally abundant year-round residents (Little Egret *Egretta garzetta*, Cattle Egret *Bubulcus ibis* and Chinese Pond Heron *Ardeola bacchus*), they have been hunted intensively in the Pearl River Delta, and regional populations have declined (*ibid.*). The results of the study of the four Kam Tin valley egrettries between 1994–97 are discussed in the following sections.

Tung Shing Lei Egretty

The Tung Shing Lei egretty (Figure 1) was first reported in 1995 (CES, 1995) but according to nearby village residents it had been active for over five years. The nest sites were located in isolated stands of bamboo along the shore of a fish pond near Au Tau and Tung Shing Lei villages.

There were 17 pairs of nesting Chinese Pond Herons in 1995 (*ibid.*; Table 1). The egretty and many of the nearby fish ponds were destroyed in late 1995 for highway construction. Nesting was not possible in 1996 or 1997 due to complete loss of the egretty. In partial mitigation for lost fish ponds and destruction of the egretty, the highway project will restore wetlands for foraging habitat and replant bamboo for nesting habitat near the former egretty location. It is thus possible that a new egretty will become established on or near this site.

Ko Po Tsuen Egretty

The Ko Po Tsuen egretty (Figure 1) was first reported in 1994 (K. W. Cheung, Agriculture & Fisheries Dept., pers. comm.) and was supporting the second largest number of active nests in Kam Tin Valley (Table 1) at the time. The egretty held 27 nests of three species (Little Egret, Cattle Egret and Chinese Pond Heron) in 1994, and 34 nests of Chinese Pond Herons in 1995 (Table 1; CES, 1995). The bamboo (*Bambusa flexuosa*) at the egretty flowered and died following the 1994 breeding season. In 1995, 31 Chinese Pond Herons returned to nest on the dead bamboo. The dead bamboo deteriorated between the 1995 and 1996 nesting seasons, and no nesting attempts were observed in 1996. The abandonment of Ko Po Tsuen was probably caused in part by death of the bamboo stand. However, progressive urbanization also contributed to the loss of this egretty. A large residential housing project of over 20 blocks was completed in 1994–95 at a distance of some 50 m from the nesting area. In early spring 1996, six village house blocks were constructed over most of the former egretty location. By December 1996, no more than 5% of the bamboo remained from the stand present during the 1995 breeding season. Had birds returned to attempt nesting in April 1997, even the dead bamboo was no longer available. As expected, there was no sign of attempted nesting at the egretty in May 1997. Additional new housing projects were under construction on the periphery of the former egretty site during 1997, effectively eliminating all but a small fragment of the original potential nesting areas. Due to the congested nature of the recently constructed housing projects near the egretty, it is unlikely that this site will be reoccupied.

Toll Plaza Egretty (Figure 1)

The Toll Plaza egretty was first reported in 1995 (CES, 1995). Similar to Ho Pui egretty, all nests at the Toll Plaza egretty were in bamboo stands which were growing in an orchard on a poultry farm. The Toll Plaza egretty supported 11 nests of three species (Little Egret, Cattle Egret and Chinese Pond Heron) in 1995 (Table 1).

A highway project began near the egretty in mid-1995, which resulted in the installation of construction plant on the periphery of the egretty. In

early 1996, some potential nest sites within the egretty were lost due to destruction of bamboo stands by poultry farmers. In spring 1996, 12 Chinese Pond Herons nested at the egretty, but no Little Egrets or

Cattle Egrets nested. In July 1997, only three Chinese Pond Heron nests were active.

This amounted to a decline of 75% from the 1996 total of 12. The decline was attributed to the

Table 1
Number of Active Nests Counted at Kam Tin River Egretties in Breeding Seasons in 1991–1997

Year	Egretty				Total in Kam Tin Valley
	Ho Pui	Toll Plaza	Ko Po Tsuen	Tung Shing Lei	
1991 ³					
Little Egret	13	egretty	egretty	egretty	13
Cattle Egret	7	unknown	unknown	unknown	7
Chinese Pond Heron	32				32
Night Heron	0				0
Total	52				52
d	62%				62%
1994 ²					
Little Egret	√	egretty	5	egretty	5+
Cattle Egret	√	unknown	20	unknown	20+
Chinese Pond Heron	25		2		27
Night Heron	0		0		0
Total	25+		27		52+
d	100%		74%		52%
1995 ¹					
Little Egret	7	4	0	0	11
Cattle Egret	25	2	0	0	27
Chinese Pond Heron	17	5	34	17	73
Night Heron	1	0	0	0	1
Total	50	11	34	17	112
d	50%	45%	100%	100%	65%
1996 ¹					
Little Egret	5	0	0	0	5
Cattle Egret	10	0	0	0	10
Chinese Pond Heron	38	12	0	0	50
Night Heron	0	0	0	0	0
Total	53	12	0	0	65
d	72%	100%			77%
1997 ¹					
Little Egret	8	0	0	0	8
Cattle Egret	22	0	0	0	22
Chinese Pond Heron	15	3	0	0	18
Night Heron	0	0	0	0	0
Total	45	3	0	0	48
d	49%	100%			46%

¹ data from this study

² Ho Pui data from Young and Cha (1995) and Ko Po Tsuen data from AFD

³ data from AFD and Young and Cha (1995)

√ = present but no count

+ = minimum number

loss of nesting habitat and to noise and other disturbances due to farm management and highway construction.

Clearance by farmers of bamboo and trees in the egretty was probably the primary long-term threat to ardeid nesting. Although severe, the noise and activity caused by highway construction is a short-term threat that will cease in 1998 on completion of the highway construction project. The egretty will then be restored using native tree and bamboo species.

The Toll Plaza egretty may be lost to future construction of a proposed railway project, but the loss would probably be mitigated by restoration of a nesting habitat at a nearby location. However, even in the absence of the railway project, future ardeid productivity at the Toll Plaza egretty will depend on the success of nesting habitat restoration following removal of the highway construction facilities, and on the remaining area of foraging habitat. Also, because the egretty lands are privately owned and occupied by a poultry farm, future ardeid nesting will depend on the land management practised by the owner. During the course of this study, the poultry farmer felled bamboo to accommodate farm operations. Should such practices continue, the egretty would be lost over a period of a few years.

Ho Pui Egretty

The Ho Pui egretty held the highest number of breeding ardeids among the four egretties over all survey years (Table 1). At the Ho Pui egretty, almost all nests were built on bamboo growing in a broadleaf woodland which was originally a longan (*Dimocarpus longan*) orchard (Figure 2).

The Ho Pui egretty was first reported in 1989 (Young and Cha, 1995), and active nests were counted in 1989 and in each succeeding year except 1990 and 1993. Three species (Little Egret, Cattle Egret and Chinese Pond Heron) were recorded nesting every year. In addition, one pair of Night Herons (*Nycticorax nycticorax*) nested in 1995 (Table 1). The dominant species in this egretty was the Chinese Pond Heron in 1991, 1994 and 1996, and Cattle Egret in 1995 and 1997 (Table 1).

The number of active nests peaked in 1996 at 53 (Figure 3) and declined to 45 in 1997. The 1994 nest count did not accurately reflect the total number of active nests because Little Egrets and Cattle Egrets were present, but their nests were not counted (Table

1). Based on the absence of significant changes in the landscape in and near the egretty between 1992–94, it was assumed that the number of active nests during that period was stable at around 50–52, similar to the counts in 1991 and 1995 (52 and 50, respectively).

Village houses were constructed in and around the egretty during the course of this study (Figure 2). A house on the north perimeter of the egretty was built before the 1995 breeding season, but construction work stopped before the house was finished. The project did not destroy nesting habitat, but construction may have been underway during the 1994 breeding season. Since the work site was some 30 m from the nearest active nests, it may have disrupted nesting.

On the south perimeter, one house was built during the 1995 breeding season, and was occupied shortly thereafter. A stand of bamboo within the egretty was partially felled to clear a site for the house. In the remaining portion of the bamboo stand there were two active nests of Chinese Pond Herons from which young fledged (two chicks per nest). The active nests were less than 5 m from the housing project. In 1996 the bamboo which supported the two 1995 nests was felled, and no further nesting was possible.

Two houses on the east perimeter were constructed in the 1997 breeding season. This resulted in loss of nesting habitat (bamboo) which was estimated to represent some 10–15% of the total available nesting area in the egretty. The riparian bamboo stand which was destroyed had supported nests of Cattle Egrets and Chinese Pond Herons in previous years.

Additional new houses were under construction on the south perimeter of the egretty in 1997, but these caused no further loss of bamboo. They were, however, occupied on completion, resulting in increased levels of human activity on the south edge of the egretty.

Villager-caused habitat changes away from the Ho Pui egretty also threatened local ardeid productivity. The losses of fish ponds due to abandonment (at least 4.9 ha) and losses of agricultural lands due to housing construction (at least 6.3 ha) were probably the most important threats in 1996–97. These unregulated and unmitigated losses represented 23% of the total losses of similar habitats due to construction of the nearby section of highway (13 ha of fish ponds and 34 ha of

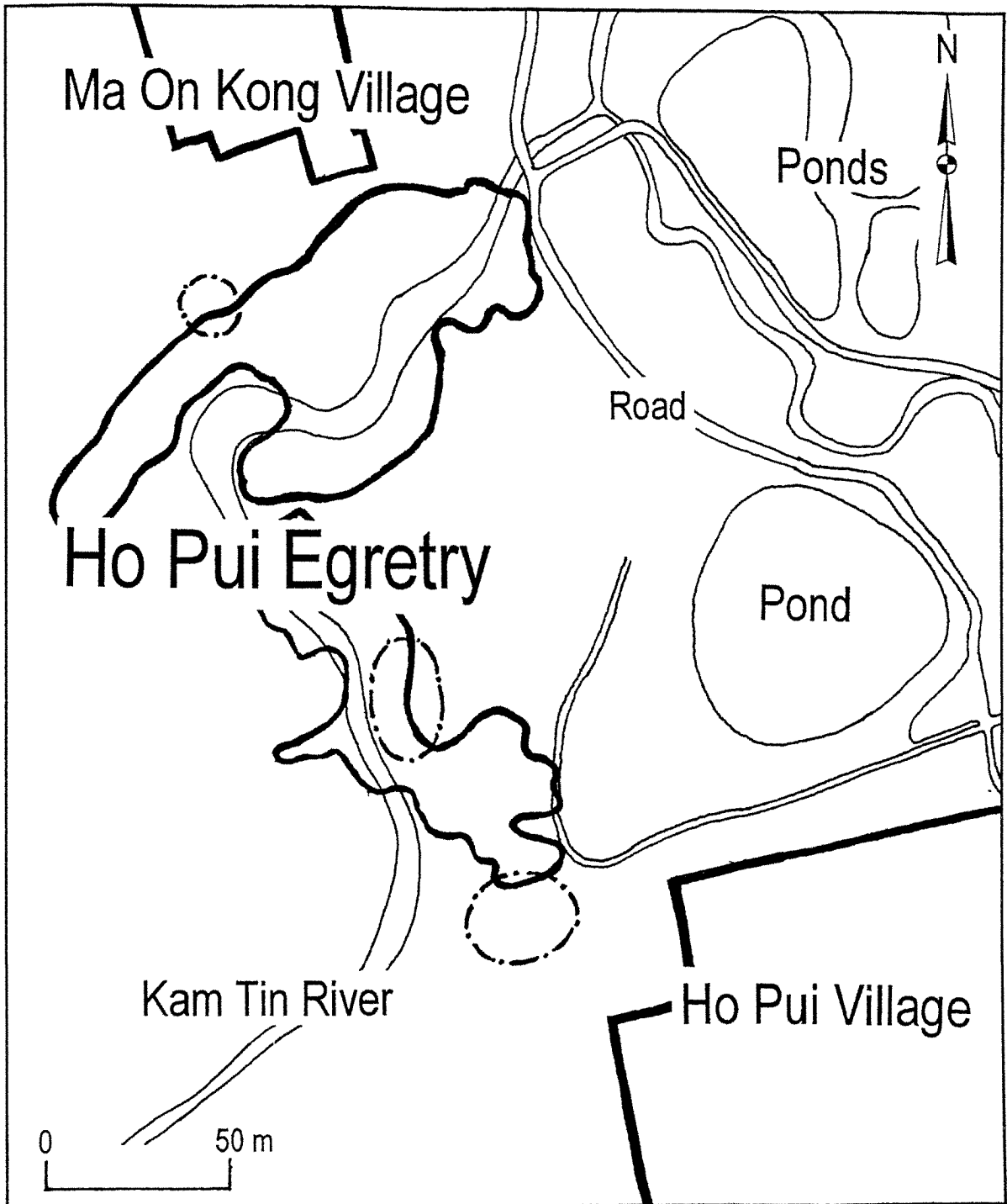


Fig. 2 Locations of house construction projects (broken lines) near Ho Pui Egrety.

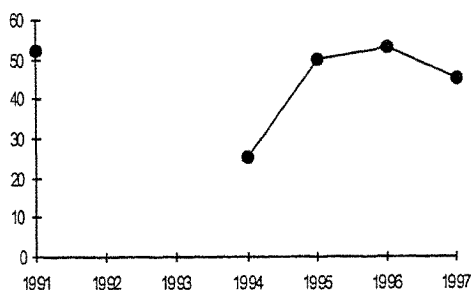


Fig. 3 Number of active ardeid nests at Ho Pui egretty between 1991–97

agricultural lands) (CES 1995).

Fish ponds are important foraging sites for Little Egrets and Chinese Pond Herons (Young 1995), while agricultural lands are important for Cattle Egrets (pers. obs.). Loss of fish ponds due to draining and conversion to other uses causes permanent loss of wetland foraging habitat for Little Egrets and Chinese Pond Herons. In contrast, loss of fish ponds due to abandonment is a less serious problem because the unattended ponds are typically colonised naturally by herbaceous vegetation. These habitats are less favoured by Little Egrets and Chinese Pond Herons but can still be used by Cattle Egrets and other species of wetland birds. The combined effect of abandonment and conversion of fish ponds in the upper Kam Tin valley may be responsible for the change in species dominance at Ho Pui egretty from Chinese Pond Herons to Cattle Egrets between 1991 and 1997 (Table 1).

Replacement of agricultural lands with houses or infrastructure results in permanent loss of ardeid feeding sites. Many researchers have documented the importance of agricultural wetlands to ardeid productivity and survival (Prosper and Hafner, 1996; Fasola and Ruiz, 1996; Fasola, *et al.* 1996). Thrower (1984) documented the loss of all but one of Hong Kong's egrettries following the change from irrigated rice to vegetable cultivation in the New Territories. Land uses surrounding Ho Pui egretty are a mixture of flood-irrigated and hand-irrigated farming, fish farming, grazing, village housing, and limited light industry. Sustained conversion of agricultural lands to other uses would continue to favour Cattle Egrets over other ardeids, but could eventually lead to loss of the Ho Pui egretty.

Kam Tin Valley — All Egrettries

Long-term, detailed information on the breeding population of ardeids in Kam Tin valley is lacking, and reasonably complete data have only been available since 1995. Because of the discovery of three of four egrettries in 1994 and 1995, and the subsequent loss of two of them in 1995 and 1996, estimates of the breeding population in Kam Tin valley are difficult to produce. Figure 4 shows both the recorded and assumed numbers of active nests in Kam Tin valley since 1991.

Assumed nest numbers were calculated to compensate for the absence of nest counts during the early 1990s at three of the four Kam Tin valley egrettries. Assumed nest counts were calculated by adding the sum of the 1995 nest counts at Ko Po Tsuen, Toll Plaza, and Tung Shing Lei (62 nests) to the actual counts at Ho Pui for the years 1991 (52 nests) and 1995 (50 nests). The resulting totals were

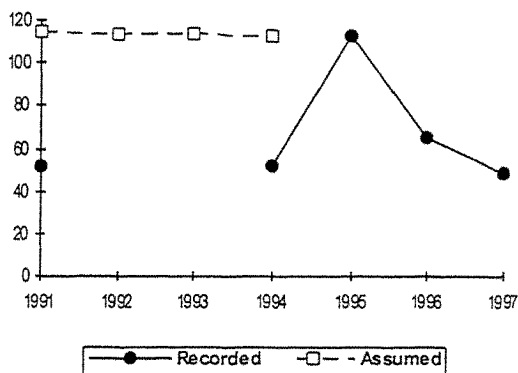


Fig. 4 Recorded and assumed numbers of active herons and egrets nests in Kam Tin Valley between 1991–97.

114 and 112 nests, the average of which was projected for the years 1992–24 (Figure 4).

This method of estimation was used because there had been little change to the Kam Tin valley landscape prior to July 1995, when the highway construction project began. Based on the stability of land use over many years, egretty nesting activity was assumed constant. To confirm the stability of land use in Kam Tin valley, Hong Kong Mapping Office aerial photographs dating to the 1960s were examined. These showed that the mix of

conservation, village, and agricultural land uses was remarkably unchanged over the three decades prior to 1995.

Interpretation of Figure 4 using the assumed total counts for the years 1991–94 and the actual counts for 1995–97 shows a sharp decline in the number of active nests after 1995. This reflects the loss of the Tung Shing Lei and Ko Po Tsuen egrettries in 1996, and the decline in a number of nests at Ho Pui and Toll Plaza between 1995 and 1997.

The nest count at four known egrettries in 1997 (48 nests) was the lowest recorded in the study for Kam Tin valley. Significantly, the 1997 counts at the two remaining active egrettries (Ho Pui and Toll Plaza) were lower than the counts in 1991 and 1994 at Ho Pui egrettry alone.

Most ardeid species, including those in this study, nest colonially at egrettries. Because of the concentration of reproductive activity at egrettries, the loss of an egrettry can affect a significant portion of a local population. Loss of the egrettries at Ko Po Tsuen and Tung Shing Lei resulted in a decline of at least 51 Chinese Pond Heron nests based on 1995 counts. This represented 24% of the 214 Chinese Pond Heron nests reported in Hong Kong in 1995 (Young and Cha, 1995; Table 2).

Loss of Ko Po Tsuen egrettry caused a decline of at least 20 Cattle Egret nests based on 1994 counts. This represented 8% of the 261 Cattle Egret nests reported from Hong Kong in 1994 (Young and Cha, 1995; Table 2).

Over the same time period, the number of breeding ardeids at the Toll Plaza egrettry also declined considerably. Since there was no increase in the numbers of nesting birds at Ho Pui egrettry, and no discovery of a new egrettry in the region, we

concluded that the breeding population in Kam Tin valley declined between 1994 and 1997.

Highway construction works accounted for loss of the Tung Shing Lei egrettry and a decline in the breeding population at the Toll Plaza egrettry. Although highway construction did not cause further losses of wetland foraging habitats after 1996, the number of breeding ardeids continued to decline in 1996 and 1997. The decline was probably due to losses of nesting habitat at Ho Pui and Toll Plaza, the two remaining active egrettries. Those losses were unrelated to the highway project, but were caused by housing construction and farming by villagers.

DISCUSSION

Loss of nesting sites caused a 57% reduction in the number of active nests of herons and egrets in Kam Tin valley from 112 nests in 1995 to 48 nests in 1997. Although two of four Kam Tin valley egrettries were lost as nesting sites and one was severely degraded, two of the lost egrettries (Tung Shing Lei and Toll Plaza) would be restored by the infrastructure projects responsible for the losses.

One of the three lost egrettries (Ko Po Tsuen) would not be restored because its loss was attributed to a combination of a natural factor (death of bamboo) and village housing development.

The single egrettry which was least directly affected by development (Ho Pui egrettry) was the largest, and probably the oldest, of the original four egrettries in Kam Tin valley. Even this egrettry was reduced in surface area, and previously occupied nest sites were destroyed by village expansion during the four-year study period. Losses of wetland

Table 2
Losses of Chinese Pond Heron and Cattle Egret Nests in Kam Tin Valley in 1994 and 1995 Expressed as Percentages of Each Species' Nesting Population in Hong Kong During the Same Year

	Ko Po Tsuen Egrettry Egrettry	Tung Shing Lei Egrettry	Total Nest Losses	Total no. nests in Hong Kong*	Percent of Hong Kong nests lost
1995 Chinese Pond Heron nest count	34	17	51	214	24%
1994 Cattle Egret nest count	20	no data	20	261	8%

*data from Young and Cha (1995).

foraging habitats due to progressive urbanisation, and losses of nesting habitat due to village house construction and farming were the most significant threats to nesting ardeids at the two remaining Kam Tin valley egretries.

Destruction of nesting sites or habitats is an obvious agent of pressure on ardeid breeding populations in Kam Tin valley. However, losses of foraging habitats (Prosper and Hafner 1996; Young 1995) and reduced forage availability (Maddock and Baxter 1991) also affect survival and productivity of nesting ardeid populations. Young and Cha (1995) demonstrated that the area of wetland foraging habitats can affect the number of breeding Little Egrets in Hong Kong. They described situations where egretries were lost due to disturbance at the egretty and nearby loss of wetland feeding habitats.

The flood control project underway at the time of this study will cause losses of 17 ha of fish ponds, 1.7 ha of marsh, and 22.3 ha of agricultural lands in Kam Tin valley (ERM, 1996). Each of these habitats was used by foraging egrets and herons during this study. The resulting reduction in surface area of wetland foraging habitats is expected to reduce forage availability for herons and egrets, thereby adversely affecting their survival and productivity. The flood control project will, however, re-provide some wetland habitat within the engineered channels to be constructed. In addition, abandoned segments of the original river channel could be retained as wetlands and could provide some foraging habitat. This potential was addressed through the EIA process for the project (ERM, 1996).

Threats to ardeid foraging habitats would increase if the railway project were implemented. In Kam Tin valley it would be located primarily on the Kam Tin River flood plain, an important area for ardeid foraging. Because the rail is a major infrastructure project, its ecological impacts will be assessed formally in an EIA, and opportunities will arise to mitigate impacts.

We predict that the threat of habitat loss due to large-scale urbanisation in Kam Tin valley will increase due to improved transport access and control of flooding. Planning Department acknowledged this potential in planning documents for Kam Tin valley (PD, 1994).

In addition, and perhaps more importantly, small-scale village urbanisation is expected to intensify due to escalation of land values and the continued drift of local economies away from crop

and fish farming. Each of these factors would be expected to cause additional losses of ardeid nesting and/or foraging habitats. In spite of mitigation measures that may be implemented, the large-scale projects would be a threat because of the opportunities for land use change which they generate in Kam Tin valley. The importance of these land use changes to Hong Kong's biodiversity was documented by Ng (1997).

A draft OZP for Kam Tin South (plan no. S/YL-KTS/1) designated three plots in and near the Ho Pui egretty as Conservation Area (CA), and noted that there was a pending SSSI application for the egretty. Unfortunately, not all of the egretty was included within the areas zoned CA. CA zoning precludes all developments other than agriculture, tree plantations, farm houses, and education/tourism without written permission from the Town Planning Board. However, even the permitted CA landuses could result in destruction of the egretty.

A portion of the Toll Plaza egretty was designated Green Belt (GB) under the same draft OZP. The GB designation is less restrictive than CA, and many of its permitted uses could cause destruction of the egretty.

Neither the Tung Shing Lei nor the Ko Po Tsuen egretty was designated GB or CA on an OZP. Therefore, they were both vulnerable to destruction due to normal agricultural land use or village expansion.

While the major land use changes (infrastructure) will be somewhat controlled by the EIA process, the smaller village developments will not. As observed by Lam and Brown (1997), it is the large-scale or controversial developments which have been subject to EIA studies in Hong Kong. We predict that this loophole for small projects in the regulatory process will cause losses of ardeid and other wildlife habitat in Kam Tin valley. These losses could lead to localised extinctions of breeding species such as herons and egrets.

The combination of reduced availability of foraging habitats and nesting sites would, over time, be expected to cause complete abandonment of Kam Tin valley by nesting ardeids. Because some of the agents of habitat loss are subject to control or compensation through the EIA process, there are mechanisms to protect or recover some of the lost habitats. However, habitat losses due to progressive village urbanization and farming practices are not addressed by the EIA process, therefore habitat

protection and restoration are not currently pursued in a systematic manner. To ensure preservation of adequate nesting and foraging habitats for Kam Tin valley ardeids, a coordinated inter-departmental government effort towards sustainable development/conservation planning and project implementation is needed. As an initial step, we recommend that strategic ecological impact assessments (at the policy level) be followed by development of government policy for conservation. In the case of egretries, a possible outcome of such a process might be

government purchase of private lands at egret sites, and subsequent allocation of funds for conservation management by Hong Kong's conservation authority, the Agriculture and Fisheries Department.

ACKNOWLEDGEMENTS

We are grateful to Mary Felley, Meeling Yau, Karen Woo, and the anonymous editors of drafts of this manuscript for their helpful reviews.

REFERENCES

- AFD. 1994. Categorization of Fish Ponds, unpublished government map. Hong Kong: Department of Agriculture & Fisheries.
- AFD. 1995. Categorization of Agricultural Land. Hong Kong: Department of Agriculture & Fisheries.
- CES. 1995. Route 3 Tai Lam Tunnel and Yuen Long Approach. Northern Section. Volume 1. Detailed Environmental Impact Assessment. Final Report. October 1995.
- ERM. 1995. Yuen Long-Kam Tin-Ngau Tam Mei Main Drainage Channel Environmental Impact Assessment.
- Fasola, M.L. and Saino, N. 1996. 'Rice Fields Support a Large Portion of Herons Breeding in the Mediterranean Region'. *Colonial Waterbirds* 19:129-134.
- Fasola, M.L. and Ruiz, X. 1996. 'The Value of Rice Fields as Substitutes for Natural Wetlands for Waterbirds in the Mediterranean Region'. *Colonial Waterbirds* 19:122-128.
- Freeman Fox Maunsell. 1995. Supplementary Flora and Fauna Surveys for the Tai Lam Tunnel and Yuen Long Approach Road (TLT & YLA) of Route 3, Winter 1994-5.
- Gibbs, J.P. and Kinkel, L.K. 1997. 'Determinants of the Size and Location of Great Blue Heron Colonies'. *Colonial Waterbirds* 20(1):1-7.
- Kushlan, J.A. 1993. 'Colonial Waterbirds as Bioindicators of Environmental Change'. *Colonial Waterbirds* 16(2):223-251.
- Lam, K.C. and Brown, A.L. 1997. EIA in Hong Kong: effective but limited. *Asian J. Environmental Manage.* 5(1):51-65.
- Maddock, M. and Baxter, G.S. 1991. 'Breeding Success of Egrets Related to Rainfall: A Six-year Australian Study'. *Colonial Waterbirds* 14(2):133-139.
- Ng, C.N. 1997. 'Conserving Hong Kong's Biodiversity'. *AJEM* 5(1):25-29.
- PD. 1994. Draft Kam Tin South Outline Zoning Plan No. S/YL-KTS/1: Notes. Planning Department, Hong Kong Government.
- PD. 1995. Register of Sites of Special Scientific Interest (SSSIs). Planning Department unpublished report, Hong Kong Government.
- Prosper, J. and Hafner, H. 1996. 'Breeding Aspects of the Colonial Ardeidae in the Albufera de Valencia, Spain: Population Changes, Phenology, and Reproductive Success of the Three Most Abundant Species'. *Colonial Waterbirds* 19:98-107.
- Sadoul, N. 1997. 'The Importance of Spatial Scales in Long-term Monitoring of Colonial Charadriiformes in Southern France'. *Colonial Waterbirds* 20(2):330-338.
- Thrower, S.L. 1984. *Hong Kong Country Parks*. Hong Kong: Government Printer, 216pp.
- Viney, C., Phillipps, K. and Lam, C.Y. 1994. *Birds of Hong Kong and South China*. Hong Kong: Government Printer, 244 pp.
- Young, L. 1995. 'Focus on Fishponds II: The Heron & Egret Perspective'. *Porcupine!* 13:17. Newsletter of the Dept. Ecol. & Biodiv., Hong Kong University.
- Young, L. and Cha, M.W. 1995. 'The History and Status of Egrettries in Hong Kong with Notes on Those in the Pearl River Delta, Guangdong, China'. *Hong Kong Bird Report 1994*, 196-215. Hong Kong: Hong Kong Bird Watching Society.

Changing Environmental Attitudes in a Changing Environment: The Case of Hong Kong

Rosemary S. Barnes

ABSTRACT

This paper reviews a study based on 36 independent surveys conducted between 1972 and 1996 in Hong Kong which dealt in whole, or in part, with environmental concerns. The study aimed to establish whether there have been any evident changes in the attitudes of the Hong Kong public toward the environment in general, as well as the more specific aspects of it. The results reveal that great changes are evident in some areas, but only moderate changes are observed in others. For example, over one ten-year period, the number of people regarding noise pollution as being a very serious problem almost doubled. On the other hand, about the same percentage of people regarded air pollution as a serious problem back in the early 1970s, as they do today. The paper also identifies key environmental issues which have emerged, and attempts to place Hong Kong people's concern for the environment in an international context. In conclusion, the likely development of environmental attitudes in the future is also discussed.

Keywords: Hong Kong, environment, attitudes, values, perceptions, surveys

INTRODUCTION

Numerous surveys have been conducted worldwide on the environmental attitudes of a given population, such as the 1992 *Health of the Planet Survey* (Gallup International Institute, 1992). Such surveys have attempted to ascertain the nature and extent of people's attitudes toward the environment, aiming to determine what significance, if any, the public attaches to environmental issues. In Hong Kong, a substantial number of surveys have been carried out by a wide variety of organizations.

The common theme underpinning the Hong Kong surveys has been the compilation of data on people's perceptions, attitudes and values concerning issues related to the environment. What is notable, however, is the distinct lack of an analysis of these

attitudes *over time*. One would assume that, over a significant length of time, say 20 or so years, people's awareness, knowledge and concern for the environment would change. This assumption is particularly applicable to the last two decades which have seen a consolidation of economic growth and a blossoming of environmental awareness in many parts of the world.

In Hong Kong, much of the population resides in overcrowded, dense conditions, usually in high-rise apartment blocks. This issue of population pressure, coupled with others, such as rising air pollution and the decline in Hong Kong's dependence on the manufacturing sector, could all be seen to lend potential influence on how people perceive the environment.

Other factors such as the rise in the number of

Rosemary Barnes, Centre of Urban Planning and Environmental Management, University of Hong Kong. Knowles Building, Pokfulam, Hong Kong, Tel 852-28578598. Fax 852-25590468.

'green' environmental groups in Hong Kong could also be considered as having an impact on any changes which had taken place and could also be regarded as being a *reflection* of these changes. Similarly, the increased attention paid to environmental issues by the media, or the improvements made in environmental education, could also be seen as potential contributing factors to changes in people's attitudes over the years.

This paper seeks to analyse the scope of the surveys collected (36 in total), dating from 1972 to 1996, and to ask the following questions: Have attitudes toward the environment changed? If so, how? What areas of the environment cause the most concern? Moreover, have people's perceptions of the environment expanded beyond pollution clean-up to include issues such as conservation and environmentally-friendly purchasing? By looking at the range of surveys comparing like data with like, it is possible to create an overall picture of how the Hong Kong public perceived the environment in the past, and how they perceive it more recently.

METHODOLOGY

After the 36 surveys had been obtained, it was a case of identifying comparable data from each survey. It must be noted here that given the scope of data collected, comparisons were rendered difficult due to the diverse ways in which the surveys were conducted, in varying districts, and the different questions posed in each. However, common elements were identified and selected environmental issues were used to steer the analysis in a coherent direction. Responses from these surveys were retrieved for five broad sets of comparisons related to the environment, and for four sets of more detailed comparisons. These categories are outlined below:

- the overall level of concern about the environment;
- the relative concern about the environment as compared to other issues;
- the general level of satisfaction with the living environment;
- respondents' awareness of local issues; and lastly,
- environmentally-friendly behaviour among the respondents themselves.

Space limitations prohibit the review here of all

of the results in each of these categories. However, key results have been extracted in a bid to provide a clear portrait of how people's values and perceptions on environmental issues have changed over time. In addition to assessments of general environmental awareness, findings with respect to the more detailed issues of air pollution, coastal/marine pollution, noise pollution and solid-waste disposal were used as the detailed comparisons.

It is important to point out that many of the surveys were, as far as can be ascertained, conducted in Cantonese. The reports are, however, published in English. Caution should thus be applied when interpreting the results because various details may have been lost in translation. Similarly, data collection methods varied from one survey to another. Some involved telephone surveys, whilst others were conducted on the street, or at the respondents' home. With such cautions noted, the overall outcome of the study of people's attitudes toward the environment over time in Hong Kong proved to be of considerable interest.

RESULTS

Key results were obtained in a number of areas, including *the degree of concern about the environment*. The extent of this concern could be seen to influence other factors, such as how environmentally-friendly the respondents were, or wished to become. Indeed, concern can be measured in a number of ways, including how *urgent* or *serious* people perceive environmental issues to be. Table 1 illustrates how serious the respondents regarded the state of the environment to be over a period of approximately ten years.

Table 1 above shows a significant increase over time, of more than a doubling in the number of respondents who considered environmental problems in Hong Kong to be 'very serious'. Similarly, the table illustrates a decrease, falling by more than half over the same period of time, in those who regarded the problem as 'not serious'.

One survey, carried out by Green Power in 1995, revealed that over 70% of the respondents perceived environmental conditions in Hong Kong as requiring 'urgent' or 'very urgent' attention (Green Power, 1995, p.30). However, despite this apparently high level of concern about environmental problems, one study by the same organization observed that there

Table 1
A Comparison Between Respondents' Perceived Level of
Concern for the Environment in 1986, 1988 and 1996 (%)

Level of Concern	1986	1988	1996	1986-96
Very Serious	10	24	22	+12
Serious	52	51	54	+2
Not Serious	29	21	20	-9
Don't Know	10	4	4	-6

Source: adapted from statistics in Lau, S.K. *et al.* (eds.), 1988 and Ho, R., 1996.

was only 'moderate environmental concern', with the respondents scoring a mean of 3.56 out of 5 where 1= 'not urgent' to 5= 'very urgent' (Green Power, 1993, p.3). Table 2 highlights the concern among different age groups.

The results in Table 2 illustrate the disparities between different age groups, with 16% fewer respondents aged over 55 regarding the problem of environmental pollution as 'very serious' than in the other two age groups. Conversely, the same percentage of respondents in both the over-55 and the 29 or under categories felt the problem was 'serious', suggesting a basic level of concern across a broad spectrum of people.

How the public rate environmental problems as compared with other issues is also of interest when estimating levels of concern. For example, in the late 1980s, a survey was carried out in Tuen Mun to better understand what local residents felt were the most needed public facilities (Chow, 1988). Of eight main facilities, namely environmental improvement, transport, school places, medical facilities, cultural and recreational facilities, employment opportunities, markets and an 'unspecified' category, environmental improvement was ranked in seventh place. Only 5%

saw this as their first priority, 6% as their second and 7% as their third. Indeed, environmental improvement came ahead only of the 'unspecified' category.

By contrast, in the early 1990s a survey conducted in another district, Kwai Tsing, presented quite different results compared to the 1988 Tuen Mun survey. The respondents were asked to state which of eight main problems (plus the option of an 'others' category), they regarded as the most serious. Environmental pollution in this instance was seen as the most serious problem, being ranked in first place most frequently (Lai On-Kwok, 1992, p.8). These results illustrate the considerable variation in opinion from place to place and over time, and hence the caution which must be taken when extrapolating from the results of any one survey.

This point is further illustrated in the results of a 1986 survey which found that *none* of the respondents had placed environmental pollution on their list of the most serious problems in Hong Kong, and yet, only two years later, 10% of the interviewees listed environmental pollution as being one of the most serious problems (Lau, S.K. *et al.* (eds.), 1988, p.30).

Table 2
Perceived Levels of Environmental Pollution
Within Different Age Groups in 1988 (%)

Age Group	1*	2	3	4	5
Young (aged 29 or under)	0	4	10	56	30
Middle (aged 30-54)	0	8	15	52	26
Old (aged 55 or over)	1	14	16	56	14

* 1 = very minor, 2 = minor, 3 = average, 4 = serious and 5 = very serious
 Source: adapted from statistics in Lau, S.K. *et al.* (eds.), 1988, p.33.

Such findings can be confusing but do serve to illustrate the diversity in people's perceptions of the environment, over time and indeed, from place to place. Table 3 highlights this point, with much higher percentages of people regarding the environmental quality in their residing district as being far more acceptable than that of the whole of Hong Kong.

Table 3
Perceived Levels of Environmental Quality in 1991 (%)

Level	Residing District	Hong Kong
Low	18	40
Acceptable	70	57
High	12	3

Source: adapted from statistics in Ng, 1991.

Paramount to a discussion of people's attitudes toward environmental issues, is the extent to which they are aware of these problems. Difficult to determine though it may be, several authors in the field have tried to analyse people's knowledge and awareness of environment-related matters.

Chan (1995) revealed that of 80 questions asked on local and more general environmental issues (in terms of *knowledge* of them, and not opinions), only 34% were correctly answered by 70% of the respondents. The average score for local environmental knowledge was 28.5, using a maximum score of 50 (p.9).

In a later survey, which again asked a range of questions concerning local and general environmental issues, Chan (1996) suggested that '...respondents are more knowledgeable about general issues than local environmental issues' (p.9). For example, when asked about how pollution levels on beaches are measured, only 41% answered correctly. Perhaps more surprisingly, only just over half of the respondents (53%) were aware that switching to unleaded petrol was one significant way to help reduce the emissions of leaded exhaust-fumes from vehicles (p.19).

Some of the data in the various surveys presented curious results. In one particular study in the early 1990s, 40% of the sampled population had never heard of the Environmental Campaigns Committee, yet 85% had heard of the slogan 'Environmental Protection Starts With Me!' (ECC, 1993). This could, however, simply be a case of people recognizing the

jingle but not the group responsible for it. With that said, however, in another study, 75% of the respondents correctly identified the Environmental Protection Department as being the main government department responsible for environmental protection (Lai On-kwok, 1992).

Linked with people's degree of concern and knowledge is the way in which they translate this concern into action or whether they do so at all. Surveys conducted from the 1990s onwards began to include questions on the ways in which people express their attitudes in their day-to-day activities. Striking results can be found within the surveys, such as the data illustrated below.

Table 4
Participation Rates of Respondents in Environmental Activities and Green Groups in 1993 (%)

Response	Ever participated in environmental activities?	Ever joined a green group?
Yes	12	6
No	87	93
Not sure	1	-

Note: figures may not add up to 100% due to rounding.
Source: adapted from figures in ECC, 1993.

From the table, we can identify, amongst the sampled population, very low participation rates in activities and groups concerned with the environment. To exemplify these figures, Table 5 below goes one step further.

The figures in Table 5 are quite discouraging: 92% never made an effort to buy products which don't harm the environment and 89% never bought recycled paper. Such statistics clearly illustrate a fairly high level of inaction amongst these particular respondents in terms of trying to behave in an environmentally-conscious manner.

To provide further insight, people's views on environmentally-friendly behaviour, such as recycling, can be ascertained.

The above results show a contradiction in people's views on factors affecting recycling. For example, 90% of the respondents were in favour of recycling, but only 18% knew how to do it, and were limited by the very fact that only 10% of them

Table 5
The Percentage of Respondents who Act in Various Environmentally-conscious Ways, 1993

Activity	Never	Occasionally	Frequently
Make a special effort to buy environmentally-friendly products	92	8	0
Buy environmentally-friendly products even if they are more expensive than others	94	5	0
Buy recycled paper	89	11	0

Note: figures may not add up to 100% due to rounding.
 Source: adapted from statistics in Chan, 1993, p.292.

Table 6
Respondents' Views on Recycling as an Example of Environmentally-friendly Behaviour, 1993

Response	% in favour of recycling	Knowledge of how to recycle	Willingness to participate in campaign	Availability of recycling unit in supermarket
Yes	90	18	53	10
No	6	82	27	90
Don't know	4	—	20	1

Source: adapted from statistics in FoE, 1993.

had access to a recycling unit at their local supermarket. Such data implies wider issues, such as a lack of education and lack of facilities available to the general public on how to be a more environmentally-conscious citizen.

In the surveys, concern about more specific issues was noted, such as air and noise pollution, coastal/marine pollution and solid-waste disposal. The results were mixed, with levels of concern about air pollution remaining consistently high over the last twenty years, and concern for noise pollution increasing dramatically over the same period.

If we look at air pollution first, three surveys conducted in 1972, 1991 and 1995 revealed similar results. In each survey, the respondents were asked to rank a given set of issues in Hong Kong (not all of them related to the environment), depending on how severe or urgent they felt them to be. The data indicates that air pollution was considered to be very urgent and/or severe in all three surveys, being ranked in second place twice and achieving a first-priority rating in 1991.

Most noteworthy, however, were the results of a study conducted in 1996, between August and October, and released to the *South China Morning Post* (12 December 96). The survey asked both males

and females similar questions, including their main concerns. At the *top* of the list for both males and females was air pollution. This strongly suggests that this particular environmental issue has retained its status as being of particular concern to people over the last two decades.

Noise pollution, on the other hand, was seen to be an issue which had generated *increased* concern over the years. For example, a survey conducted between 1973 and 1976 measured how noisy the environment was *thought* to be. In Table 7, these figures are compared to those in a much later study in 1993.

It is clear that a substantially larger percentage

Table 7
A Comparison of How Serious Noise Pollution Perceived to be, Between 1973–76 and 1993

Responses*	1973–76 (%)	1993 (%)
Very Serious	46	88
Not Serious	54	12

* Note that the categories of responses for each survey were aggregated for ease of comparison.
 Source: adapted from Millar, S., 1979 and ECC, 1993.

of people in 1993 felt the noise pollution problem was very serious compared to 20 years ago.

Coastal/marine pollution was also seen to be of concern among the sampled populations. However, the information was somewhat limited as the surveys which addressed this issue dated back only to 1991. With that said, some findings were particularly significant. For example, in one survey, coastal/marine pollution was ranked *first* out of a total of ten issues (in terms of the level of concern attached to each) among the student population, and second among the teachers interviewed (Green Power, 1995, pp. 23 and 36). In an earlier study, a survey on community attitudes toward the environment showed that 58% of the sample felt that this form of pollution was 'very serious' (ECC, 1993).

Much of the data which is available on attitudes toward solid-waste disposal leaned not toward people's *concern*, but more toward who they thought should be responsible for tackling this particular problem. In one survey, the government was cited most frequently as being one of the main bodies responsible for the present unsatisfactory state of solid-waste disposal (Chan, 1996, p.27). One survey in the Kwai Tsing district outlined people's expectations of the government as to how long it should take to tackle successfully the mounting problem of solid-waste disposal. A high 27% felt it should be done in 1–3 years, 18% in 4–6 years, 2% in 7–10 years, 11% in over 10 years. Interestingly, 22% regarded the problem as altogether insoluble (Lai On-kwok, 1992, p.21).

Asking people to reveal who they thought was responsible for various types of pollution was not unique to the issue of solid-waste disposal. For example, one 1995 study revealed that 95% of respondents felt that manufacturers were very significant air polluters in Hong Kong (Ng and Ho, 1995, p.7). Similarly, 94% of the respondents regarded manufacturers as also being very significant noise polluters. This is interesting in the current context given that the majority of manufacturing industry in Hong Kong had by this time either relocated to other countries or had closed down.

Overall, we have seen how attitudes have altered toward different environmental issues over the years. Despite the differences in the type of questions asked and the responses given, it is possible to adopt a holistic approach by drawing all the information together and defining patterns in the changing attitudes toward given environmental issues. The next

section attempts to extract the main findings of the study.

MAIN FINDINGS

From the results presented here, it is clear that significant changes have taken place in people's attitudes toward particular environmental issues. For example, levels of concern about the environment have risen over time and have remained at a comparatively high level. Similarly, the way in which people prioritized their environmental concerns relative to other issues has changed drastically over the last decade, with environmental issues becoming more important. This change could cautiously be attributed to various reasons. It could be that environmental issues have been projected into the forefront of people's minds by the increasingly widespread education and information on environmental problems. On the other hand, it might be that, over the years, environmental problems have been affecting people increasingly more than they had done before.

Since 1990, the data revealed a medium to high level of awareness, depending on which environmental issues were being discussed. In terms of expressing this increased concern and awareness in day-to-day activities, the results suggested a disparity between belief and action, with figures in a recent survey indicating that a high percentage of people do not actively participate in efforts to improve and maintain the environment.

Other interesting results were to be found when survey information on more specific issues was extracted. For example, over the last 20 years, it was found that concern for air pollution had remained *high* and *constant*. Concern for noise pollution, however, presented an altogether different picture. Over the last two decades, concern has risen drastically.

Why then, has concern for air pollution remained so high for so long and concern for noise pollution increased dramatically to a similarly high level? It could be argued that regarding noise as a form of pollution has only recently been integrated into discussions on the environment, particularly at the layman's level, so that only more recently have people felt ready to comment on it as being an *environmental* problem. Air pollution could also be considered as a more tangible and obvious problem

than noise pollution. Nonetheless, it is clear that these two issues are of paramount concern to the population and seem likely to figure as major concerns in the future in Hong Kong.

However, unlike the level of concern for and awareness of air and noise pollution, solid-waste disposal appears to be an issue of less concern. The main focus of any questions asked about solid-waste disposal in the surveys appear to relate to who should decide what should be done about problems related to the disposal of solid waste. The government was cited as being the main body whom the respondents thought should take responsibility for this problem. However, just under half the respondents in one survey were unaware of any measures the government had already taken to deal with this problem. This could be seen to reflect a lack of awareness-building about the solid-waste disposal activity carried out by the government.

The final issue discussed was that of coastal/marine pollution. As already mentioned, analysis is somewhat restricted because there was insufficient data from before the 1990s. Noteworthy are the findings which indicate that in a recent survey, students ranked this form of pollution first among ten problems. Similarly, in another study, just over half of the respondents regarded coastal/marine pollution as being a very serious problem. This illustrates a consistently high degree of concern for this particular issue.

EMERGING ISSUES

The very act of assessing changes in people's attitudes over time reveals much about the way in which people perceive objects and ideas: '...most contemporary social psychologists seem to agree that the characteristic attribute of attitude is its evaluative dimension' (Ajzen, 1989, p.241). Consequently, as people's surroundings change, which includes changes in the state of the environment, so too does the way in which they evaluate this change and respond to it, possibly by altering their attitudes toward it. In the context being deployed here, Hong Kong has witnessed various significant changes in its economic structure, its physical development and landscape, and its political framework. From the results here, it would appear that people have certainly evaluated their environment and have either formed or re-formed their attitudes toward it over

the years. To put it another way, Atkinson *et al.* (1993, p.75) defined attitude as likes and dislikes, or favourable and unfavourable evaluations and reactions towards given objects, people and situations.

On this basis, while various changes in the attitudes of the Hong Kong people have already been noted, it is now possible to look for emerging themes. The following attempts to outline a number of key concepts which seem to have arisen over the years.

The Increase in the Number of Attitudinal Surveys

Perhaps, most notable is the large increase in the actual numbers of attitudinal surveys which have been carried out since 1990, as compared to the 20 or so years prior to that. Only 6 of the 36 surveys used in the study were conducted before 1990. Bearing in mind that some earlier, smaller surveys may have been overlooked, these figures represent an interesting point: the very fact that significantly more attitudinal studies on the environment have been carried more recently is testimony to the fact that environmental issues are now being given more weight by researchers.

Since the early 1980s, environmental issues have been addressed in an increasingly comprehensive manner by the government. In addition to direct environmental protection measures, the government has also promoted environmental education and awareness through such measures as the establishment of the Environmental Campaign Committee (1990), Announcements of Public Interest (APIs) in the mass media, the opening of environmental information centres, and the provision of funding support through the Environment and Conservation Fund. Given this more widespread acknowledgement of the environment, it is hardly surprising that the number of surveys carried out on environmental issues has risen dramatically since the early 1990s.

The Need for Environmental Education

Despite the promotion of the environment over the years by the government, many believe that there is not enough environmental education in schools, with only a '...piecemeal and ad hoc policy (of environmental education)' (Green Power, 1995, p.44). Indeed, one survey revealed that 95% of the

respondents 'strongly agreed' or 'agreed' that environmental education should be strengthened (Ho, 1996, p.12). It would appear that despite the government's efforts to promote the environment, there seems to be a perceived shortfall in the provision of education about environmental issues.

However, mediums used by the government to promote environment slogans, and so on, have been found to have *some* effect. In Chan (1996, p.13), for example, a positive correlation was found to exist between the use of the mass media for environmental news on the one hand, and environmental knowledge on the other. Indeed, in one study, a scheme to educate the residents of a particular housing estate on the need for household-waste recycling, showed many benefits. Once educated, considerably more people began separating their household waste for recycling purposes. This seems to indicate a parallel between the need for environmental education if people are to be expected to act in an environmentally-responsible manner: 'Education is indispensable in changing people's environmental worldview' (Wong, 1996, p.381).

Further Awareness-Building and Public Participation

The above discussion included the various efforts made by the government to promote environmental awareness. These would seem to indicate a commitment to environmental issues in Hong Kong. However, this commitment should be extended to include channels through which the public may actively participate in improving and maintaining the environment; 'Slogans...will remain rhetorical if there are no concrete and specific behaviour instructions which citizens can follow and comply with' (Chan, 1993, p.16).

Currently, a potentially confusing message is being sent to the public — according to the government's public-education efforts, one should become more concerned and involved in protecting the environment yet one is unable to effectively participate in centralized decision-making. It would seem that people are given little or no discretion to become actively involved in a 'bottom-up' manner on environmental issues.

Discrepancies Between Beliefs and Action

Bearing in mind the limited scope for public

participation in the decision-making process, some commentators in the field have noted a discrepancy between people's attitudes and beliefs about the environment, and the way in which they behave on a day-to-day basis.

A number of surveys revealed that while the respondents felt there was a need to protect the environment, only a fraction of those same people practised pro-environment behaviour (i.e., participated in environmental events, chose to buy certain environmentally-friendly goods, and so on). Similarly, where people felt that other people/sectors (e.g., the manufacturing sector) were the main polluters, they were often unwilling to bear the cost/effort for the clean-up. This suggests a less than collective effort in helping to protect the environment; that people are often 'anti-environment when there is a conflict of interest' (Ng, 1991, p.9).

Some surveys asked respondents to indicate whether they would be willing to pay more tax, donate a day's pay (City University, 1992), pay more for environmentally-friendly goods or contribute time and/or money to an organization committed to the environment (Chan, 1996). While the results were fairly encouraging, such statistics should be viewed with caution as they represent scenarios and not reality. Some people might claim they would give up a day's pay, or pay more tax, but when it came to actually doing so, it is debatable whether or not they would. A case in point is a Friends of the Earth survey in 1993 which asked its respondents what they would do if supermarkets started charging for plastic bags: 67% were not willing to pay, and would opt to bring their own bag. Although this is inadvertently pro-environment behavior anyway, the point is that when faced with a charge, a large number of people are not willing to pay: would this same 67% have changed to using their own bag (and thereby be opting to act in an environmentally-sensitive manner) had no charge been levied on plastic bags?

The Integration of Sustainable Development as a Concept

The long-term goal of sustainable development as a key guiding concept is gaining considerable importance worldwide. If sustainable development is to be pursued, the education of the public about this concept is of the utmost importance.

Throughout the surveys, however, the

respondents were rarely questioned about what they perceived the longer-term implications of environmental damage to be. Underpinning the majority of the surveys was a sense of 'short-termism'. One reason for this could be the '...short history of Hong Kong's increasing awareness of the need for environmental protection' (To, 1989, p.103). People might not yet have had time to embrace the extended concept of sustainability.

The surveys have revealed, by the very exclusion of sustainable development, that it is not a popular theme among the public in Hong Kong. Again, an improved education system might help to reverse this scenario to some extent, in order that attitudes toward the environment become more forward-thinking and that environmental goals are perceived as being also longer-term goals.

The Wider Context and a View to the Future

Where does Hong Kong stand in the international context? Recent data compared Hong Kong to the rest of the world in terms of environment-related issues. Despite the information about increasing environmental awareness presented here, Hong Kong was seen to rank the lowest out of 39 other countries in terms of the degree of support for environmental protection (Lee, 1996). In his report, Lee clarifies

the scenario very succinctly when he states that '...the results paint a somewhat paradoxical picture'. This is particularly relevant here in that we have seen increasing levels of concern amongst the Hong Kong public, but that this concern does not reach far enough compared to other countries.

What does all this mean for the future? Various measures have been considered which could conceivably help to rectify the gloomy statistics outlined above. Increased and improved education, the integration of sustainability issues in discussions that are concerned with the environment, and facilitating the public to try and act in a more environmentally-responsible manner, are all key measures which could be implemented to better improve protection and maintenance of the environment in Hong Kong.

At present, Hong Kong is undergoing massive changes, including structural changes in the economy, and of course, the return of the territory to China. It is important that the environment remains on the agenda at the forefront of key issues in Hong Kong. Allowance should also be made for the assumption that there will potentially be environmental consequences to these changes, as well as structural, economic and social changes. Above all, Hong Kong should aim to proceed on a sustainable trajectory far into the future, in keeping with the global context.

REFERENCES

- Ajzen, I. and Fishbein, M. 1980. *Understanding Attitudes and Predicting Social Behavior*. New Jersey: Prentice-Hall.
- Atkinson *et al.* 1993. Attitude Structure and Behavior. In: Pratkanis, Breckler and Greenwald, eds, *Attitude Structure and Function*. USA: Lawrence Erlbaum Association Publishers.
- Barron, W. 1996. The Environment and the Political Economy of Hong Kong. In: D. Mole, ed, *Managing the New Hong Kong Economy*. Hong Kong: Oxford University Press.
- Barron, W. and Cottrell, J., eds. 1996. *Making Environmental Law in Asia More Effective*, Participants' Report of a Regional Workshop held in Hong Kong, 7-8 March 1996, Centre of Urban Planning and Environmental Management, University of Hong Kong.
- Boyden, S., Millar, S., Newcombe, K. and O'Neill, B. 1981. *The Ecology of a City and Its People: The Case of Hong Kong*. Canberra: Australian National University Press.
- Chan, C. 1993. Grassroots Mobilization in Environmental Protection. In: C. Chan and P. Hills, eds, *Limited Gains: Grassroots Mobilization and the Environment in Hong Kong*, pp.15-28. Hong Kong: Centre of Urban Planning and Environmental Management, University of Hong Kong.
- Chan, R. 1993. 'Study of the Environmental Attitudes and Behaviour of Customers in Hong Kong'. *International Journal of Environmental Education and Information* 12(4):285-296.
- Chan, C. and Hills, P., eds. 1993. *Limited Gains: Grassroots Mobilization and the Environment in Hong Kong*. Hong Kong: Centre of Urban Planning and Environmental Management, University of Hong Kong.
- Chan, K. 1994a. 'Study on Public's Attitudes in Using Waste Receptacles'. *Green Productivity* 2.
- Chan, K. 1994b. *Survey Report on Environmental Attitudes and Behaviours of Secondary School Students in Hong Kong*. Hong Kong: Baptist University.
- Chan, K. 1995. *Mass Media and Environmental Knowledge of Secondary School Students in Hong Kong*. Hong Kong: Baptist University.
- Chan, K. 1996. *Mass Media and Environmental Protection in Hong Kong*. Hong Kong: Baptist University.

- Choi, P. 1993. Environmental Protection in Hong Kong: An Historical Account. In: C. Chan and P. Hills, eds, *Limited Gains: Grassroots Mobilization and the Environment in Hong Kong*. Hong Kong: Centre of Urban Planning and Environmental Management, University of Hong Kong.
- Cheng, K.K. and Bacon-Shone J. 1993. *A Public Opinion Survey on Measures Related to the Control of Smoking in Hong Kong*. Hong Kong: Dept. of Community Medicine and Social Sciences Research Centre, University of Hong Kong.
- Chow, N. 1988. *Social Adaptation in New Towns: A Report of a Survey on the Quality of Life of Tuen Mun Inhabitants*, Resource Paper Series No.12. Hong Kong: Dept. of Social Work and Social Administration, University of Hong Kong.
- City University. 1992. *Environmental Movement — Words or Action?* Hong Kong: Business and Management Department, City University.
- City and New Territories Association. 1996. Report on a Telephone Opinion Poll. Hong Kong: CNTA.
- Community Building Committee. 1990. Report on a Survey of Community Needs of Yau Tsim District. Hong Kong: CBC.
- Dunlap, R.E. and Mertig, A.G. 1995. 'Global Concern for the Environment: Is Affluence a Prerequisite?' *Journal of Social Issues* 51(4): 121–137.
- Environmental Campaigns Committee. 1993. *Survey on Community Attitudes to the Environment*. A study commissioned by the Education Working Group, undertaken by the Social Science Research Centre of the University of Hong Kong.
- Environmental Campaigns Committee. 1995. *Survey on Community Attitudes to the Environment*. A study commissioned by the Education Working Group, undertaken by the Social Science Research Centre of the University of Hong Kong.
- Friends of the Earth. 1992. 'How Green Are Hong Kong's Hotels?' *One Earth* Autumn (16): 22–27.
- Friends of the Earth. 1993. Plastic Bag Awareness and Attitude Survey. Hong Kong: FoE.
- Friends of the Earth. 1994a. 'District Board Scorecard'. *One Earth* Autumn (24):8–19.
- Friends of the Earth. 1994b. 'How Green is Business?' *One Earth* Autumn (24): 6–10.
- Green Power. 1993. *Study of Environmental Attitudes and Concepts of Environment and Environmental Education of Geography Student-Teachers: Implications for Teachers' Education in the 21st Century*. Hong Kong.
- Green Power. 1994. *Survey on Public Opinion on Water Pollution and Sewage Treatment Plan*. A report commissioned by the ECC, Hong Kong.
- Green Power. 1995 Survey Report of Green Attitudes and Behaviour of Secondary School Teachers and Students. Hong Kong: Environment and Conservation Fund.
- Hills, P. 1991. *The Household Energy Transition in Hong Kong*. Hong Kong: Centre of Urban Planning and Environmental Management, University of Hong Kong.
- HK Council of Social Services. 1991. *Environmental Protection and Social Development: Role of NGOs*. Proceedings of the International Council on Social Welfare: Asia and Pacific Regional Conference, 26–31 August 1991, Hong Kong.
- Ho, R. 1996. *Opinion Survey on the Relative Importance of a List of Environmental Issues and Strategies Perceived by Hong Kong People*. Hong Kong: Social Science Research Centre, University of Hong Kong.
- Ladd, E.C. and Bowman, K.H. 1995. *Attitudes Toward the Environment: Twenty-five Years After Earth Day*. Washington D.C.: AEI Press.
- Lai On-kiok. 1992. Citizens' Views on Environmental Monitoring in Kwai-Tsing District. Hong Kong: Department of Social Work & Social Administration, University of Hong Kong.
- Lau, S.K. et al., eds. 1988. *Indicators of Social Development in Hong Kong: 1988*. Hong Kong: HK Institute of Asia-Pacific Studies, Chinese University of Hong Kong.
- Lee, R.P.L. 1972. *Study of Health Systems in Kwun Tong*, Preliminary Research Report No. 1. Hong Kong: Social Science Research Centre, Chinese University.
- Lee, Y.S. 1996. *Public Support for Environmental Protection in Hong Kong*. Hong Kong: Faculty of Social Science, Chinese University of Hong Kong.
- Martin, E.F. 1992. The Greening of Hong Kong: Environmental Concern Among Hong Kong Residents. In: Martin, E.F., ed, *Green Journalism: Environmental Consciousness and the Mass Media*. Hong Kong: Baptist University.
- Millar, S. 1979. *The Biosocial Survey in Hong Kong*, The Hong Kong Human Ecology Programme for UNESCO. Canberra: Centre for Resource and Environmental Studies, Australian National University.
- Mok, H.L. and Lau, K.K. 1993. Environmental Education for the Public: A Rubbish Recycling Scheme in a Middle Class Housing Estate. In: C. Chan, C. and P.Hills, eds, *Limited Gains: Grassroots Mobilization and the Environment in Hong Kong*. Hong Kong: Centre of Urban Planning and Environmental Management, University of Hong Kong.
- Ng, G., ed. 1991. *New Environmental Paradigm Survey 1991*. Hong Kong: Hong Kong Environment Center.
- Ng, G. and Ho. 1995. *Polluters Pay Principle Report*. Hong Kong: Conservancy Association.
- Ng, P. and Man, P. 1988. *The Effects of Peer Orientation, Parent Orientation and Schooling Subculture on Leisure Behaviour and Life Satisfaction of Youths in Hong Kong*. Hong Kong: Department of Sociology, Chinese University.
- Roelofs, R., Crawley, J. and Hardesty, D. 1974. *Environment and Sociology. A Book of Readings on Environmental Policy, Attitudes and Values*. USA: Prentice-Hall.
- Shell Hong Kong Ltd. 1991. *Attitudes Towards Unleaded Petrol — The Second Survey*. Hong Kong: Shell Hong Kong Ltd.

- Shively, S. 1972. *Value Changes During a Period of Modernization — The Case of Hong Kong*. Hong Kong: Social Science Research Centre, Chinese University.
- Siu Oi-Ling. 1990. *Hong Kong Environmental Protection Attitude Survey*. Hong Kong: Dept. of Social Sciences, Lingnan College. Goldhall Co.Ltd., HK.
- South China Morning Post*. 1996. *Gadget-Crazed Men Put Career Before Family*. 12 December 1996, Hong Kong.
- To, E. 1989. The Future Trend of Environmental Education. In: *The Green Way Forward — Symposium on Environmental Policy 1989 (proceedings)*. Hong Kong.
- Wong, K.K. 1996. The Environment: Heading Towards Sustainability? In: M.K. Nyaw and S.M. Li, eds, *The Other Hong Kong Report 1996*. Hong Kong: Chinese University Press.
- World-Wide Fund For Nature. 1989. *Preliminary Results of a Survey of Public Attitudes to the Eating of Wild Animals in Hong Kong*. Hong Kong: WWF.

Agricultural Intensification Programme in Indonesia: A Study of the Environmental Impacts

Resfa Fitri and Samiul Hasan

ABSTRACT

This paper describes Indonesia's agricultural intensification programme which began in 1965 with an emphasis on the use of high yielding variety seeds, the promotion of the use of fertilizers, irrigation and water management and pest control. Each of these measures provided near and on-going benefits, but also brought with it associated environmental problems. Pest control in particular has become a very serious problem as pests have often benefited from the same changes designed to aid crop production. The introduction in 1987-88 of a government sponsored integrated pest management programme was helpful, but it was narrow in scope. What is needed is a much more broad based programme involving not only the direct biological control of pests but also changes in the seed varieties and in crop patterns among other options.

Keywords: *agricultural intensification programme, Indonesia, pest control, bio-physical impacts*

INTRODUCTION

Over the past 25 years the government of Indonesia has achieved remarkable success in economic growth and reducing widespread poverty in the country. World Bank data suggest that there has been a sharp decrease between 1970 and 1987 in the number of people below poverty line. The absolute number of poor people in Indonesia decreased from 67.9 million to 30 million during this period (World Bank, 1990a). The level of success is also demonstrated by the growth of per capita income to US\$650 in 1994 from US\$50 in 1967, reduction in adult illiteracy rate by two-thirds, and increase in life expectancy rate by 20 years (World Bank, 1994).

More than 55% of the 180 million people in Indonesia depends on agriculture and about 20% of the national income comes from the agriculture sector

(CBS, 1992). In the 1970s almost 62% of the labour force was involved in agriculture or agriculture-related activities. The number of people involved in agriculture has decreased now but it is still around 48% (FAO, 1991). Agriculture thus has been a major sector in the development process. The strategies to increase agricultural production involved four basic programs: extensification, intensification, diversification and rehabilitation. An agricultural intensification programme was given prominence over all other programmes. In 1979-80 the developmental budget for Indonesia's agriculture and irrigation sector was 419 billion Rp (14% of the budget), while industry received 402 billion Rp. In 1981-82, the budget allocation for the agriculture and irrigation sector (942 billion Rp. or 17% of the budget) was almost three times higher than the industry sector (330 billion Rp.) (Dick, 1979, Healey,

Resfa Fitri and Dr Samiul Hasan, Development Planning Program Department of Geographical Sciences and Planning, The University of Queensland, Brisbane, QLD 4072 Australia, Facsimile No: 617-3365 6899; Email: s.hasan@mailbox.uq.edu.au

1981). The allocation for agriculture and irrigation in the national budget in those years were around 15% — the highest for any one sector.

Sixty-two percent of the people in Indonesia lives in Java. Java is a very small island and comprises only 6.7% (130,000 km²) of the total Indonesian territory. Thus, while the average population density in the islands outside Java is only 50/km, in Java it is more than 660/km (CBS, 1992). Due to specific geomorphologic characteristics arable land in Java is very fertile. Therefore, an agricultural intensification programme was a necessity for Java; it had a great potential for implementation and was indeed carried out most rigorously.

The agricultural intensification programme was implemented through a package programme titled *Bimbingan Massal* ('guidance to the masses') or *Bimas*. The package included information guidelines for farmers, provision of agricultural inputs, and credit guarantees to farmers to pay for the inputs. The agricultural intensification programme through *Bimas* is expected to maintain agricultural growth, in the face of a decrease in arable land and an increase in population.

The objective of this paper is to review the agricultural intensification programme in Java and to examine the environmental impacts of the programme. The paper looks at the bio-physical impacts of the programme. Very specifically the paper analyses three most important aspects: biodiversity disturbance, water pollution and land degradation. At the end it suggests some policy measures that could balance the negative impacts of the agricultural intensification programme.

AGRICULTURAL INTENSIFICATION PROGRAMME

In the post-independence period from 1945 to the late 1960s, the government of Indonesia struggled to achieve self-sufficiency in food. The government undertook many programmes to boost food production in the country. Some of these programmes were: the *Kasimo* Welfare Plan (1952), *Padi Centra* Programme (1959) and Eight Year Development Plan (1960–68). All these programmes, however, failed to achieve self-sufficiency in food production (Mears, 1984).

The failure of these programmes inspired the Faculty of Agriculture of the University of Indonesia

to carry out a 'Pilot Research Project' known as 'Comprehensive Five Effort Pilot Project' to formulate the best programme to overcome food shortage (Nusantoro, 1992). The project was later implemented as the *Bimas* intensification programme.

The agricultural intensification programme involved far more than the production of rice. It aimed at a significant transformation of the Indonesian economy to establish the means to achieve high national output. The programme was targeted to:

- improve irrigation systems,
- develop the fertilizer industry,
- create a national transport and storage network for agriculture inputs, and
- establish research facilities, an extension service and an administrative machinery.

The agricultural intensification programme in Indonesia was launched in 1965 through the *Bimas* programme (Soemardjan and Breazeale, 1993). A nationwide campaign began in 1967 and the government of Indonesia institutionalized the *Bimas* programme in 1969. The *Bimas* programme was then used as a model in the series of Five Year Development Plans (REPELITAs). The agricultural intensification programme of *Bimas* involves three kinds of extension activity (Badan Pengendali Bimas, 1994):

- General Intensification (*Innum*),
- Special Intensification (*Insus*), and
- Large-Scale Special Intensification (*Supra-Insus*).

General Intensification (*Innum*) is extension to an individual farmer as an independent unit. The activities of an individual farmer covered by the *Innum* programme are not necessarily the same as those of other farmers.

Special Intensification (*Insus*) is extension to one farmer-group. The number of farmers in one farmer-group vary depending on the type and size of the village, but normally it consists of about 10–20 or more 'progressive' or 'modern' farmers. The working area of a farmer-group should be between 9 to 15 hectares within the boundary of a particular village.

Large-Scale Special Intensification (*Supra-Insus*) is extension to a number of farmer-groups. The integration of activities among the farmer-groups is, therefore, crucial. These farmer-groups must farm a

Irrigation and Water Management

Rehabilitation of the existing irrigation network was a major component of the agricultural intensification programme. The majority of water for agriculture in Java is supplied through different types of irrigation. Three different types of irrigation systems are used in Java: 'non-technical' or 'simple', 'semi-technical', and 'technical'. The term 'non-technical' or 'simple' refers to village constructed intake systems that are found mainly in the upper reaches of the rivers and streams. 'Semi-technical' and 'technical' irrigation systems both are managed and controlled by the Irrigation Service down to the tertiary canal heads from which village systems draw their supplies. The difference between 'technical' and 'semi-technical' is in the quality — 'technical' is better than 'non-technical' (Fox, 1993).

During the agricultural intensification programme, simple or 'non-technical' irrigation system was developed to a 'semi-technical' system, while the 'semi-technical' system was improved to a fully technical standard. Thus the end result has been an overall increase in the size of land under 'technical system'. In 1973 only 24% of the area under agriculture was watered through technical irrigation schemes, whereas within ten years the percentage of land irrigated by technical measures rose to 38%. On the other hand, the area under semi-technical and non-technical irrigation was 39% in 1973 and decreased to 32% in 1983 (Booth, 1988). The average use of irrigation water varies from 8,000 to 12,000 m³/crop/hectare, depending on the rainfall level, the crop type, and the extent of the water control facilities (World Bank, 1990a).

Pest Management

Pest management is an important aspect of any agricultural activity, so it was of the agricultural intensification programme. Actually the widespread Brown plant hopper infestation in Asia, particularly in Southeast Asia in the 1970s, established the need for the regular use of pesticides in agricultural land. The Indonesian government also conceived the need for pesticides in agriculture. Thus pesticides, along with fertilizers, were also subsidized and included in the *Bimas* programme. In 1980 only 6,360 tons of pesticides were used in Indonesia in 9.1 million hectares of rice fields, which was only 0.7 kg/hectare. The figure more than doubled in 1988 with 17,342

tons of pesticides used in 9.923 million hectares of land (1.75 kg/hectare) (Table 2).

Table 2
Changes in the Use of Pesticides and in Crop Production, Indonesia, 1980–89

Year	Pesticide Use (tons)	Rice (x 1000 hectares)	Production (x 1000 tons)
1980	6,366	9,105	20,161
1981	9,006	9,382	22,286
1982	11,256	8,988	22,837
1983	13,887	9,162	24,006
1984	13,816	9,764	25,933
1985	14,980	9,902	26,547
1986	17,216	9,988	27,014
1987	17,342	9,923	27,253
1988	10,840	10,090	28,340
1989	8,660	10,531	29,072

Source: Ministry of Agriculture, Indonesia in Kasryno, et al., 1991.

In the early years of introduction, pesticides became increasingly popular with the farmers in Indonesia. At the beginning of the agricultural intensification programme, the farmers were so frustrated with the situation that when the pesticides were made available they started to use pesticides excessively and indiscriminately, in order to boost agriculture production. This use influenced the natural selection process by destroying the natural predators as well. As a result the Brown plant hopper population grew rapidly, feeding on rice.

Indonesia suffered from the outbreak of Brown plant hopper (BPH) in the 1970s. The outbreak of BPH during 1976–77 destroyed 500,000 hectares of rice fields, that could grow about 350,000 tons of milled rice to feed three million people for a year (Oka, 1991). The destruction caused by the BPH continued for a long time.

The Indonesian government became frustrated with the fact that the excessive and indiscriminate use of insecticides and pesticides was creating a major problem. Thus government policy measures in 1986 allowed the use of pesticides only if other methods of pest management were insufficient. It also suggested that the application of various methods of pest management should not interfere with the population of biological predators. Any pesticides that could lead to another Brown plant

hopper outbreak, or harmful side effects for humans and the environment, were prohibited (Pontius, 1995).

The Use of Machines

A recent feature of rice production in Java has been the spread of double cropping, and in some areas the farmers have three crops a year. The introduction of double and triple cropping was made possible both by the construction of irrigation networks and the introduction of early maturing variety seeds. These factors ensured high intensity cultivation, but during the peak season of land preparation and harvesting, there is an insufficient supply of local labour. This aspect is particularly significant in West Java.

As a consequence, the use of machines became a requirement to modify the imbalance of demand and supply of labour. In the recent past agricultural machines have widely been used in rice cultivation in Indonesia. The use of machines is more extensive in land preparation than anything else. In 1992 in Java, 21,275 two-wheel tractors and 1,181 four-wheel tractors were used to cultivate 4.85 million hectares of land. On average, in Java one tractor (one or two wheels) was used for every 216 hectares, whereas in the whole of Indonesia, including Java, the figure was 236 hectares per tractor.

Agriculture in Java was more intensive than in other parts in Indonesia. The impacts of the programme on the environment are thus worth studying.

ENVIRONMENTAL IMPACTS

Biodiversity Disturbance

The major impact of the agricultural intensification programme on biodiversity in Indonesia is the disappearance of the natural predators of insects. There are three widely known predators of Brown plant hopper in Indonesia: *Laba-laba* (*Lycosa pseudoannulata*), *Kumbang Helem* (*Menochilus sexmaculatus*), and *Jamur* (*Hirsutella* sp) (Oka, 1995). All these predators were affected by pesticides and insecticides. The excessive use of pesticides and insecticides altered the predator-prey relationships in the *sawah* environment. Certain insecticides were more damaging to the parasites and predators of the

insects (spiders, dragon flies) than they were to their intended targets, the insects (Fox, 1991). By destroying the natural enemies, insecticides allow insect populations to explode.

The above situation explains the unsustainability of biodiversity (i.e. natural predators) in the *sawah* ecosystem in Indonesia. The reason is that every insect or pest has its own resistance and sensitivity, depending on its ecology, biology and specific character. It is very difficult, for example, to control the expansion of the Brown plant hopper population in Indonesia, because it is a herbivore in the food chain, has the ability to breed rapidly and spread quickly, and is highly adaptive to technology. On the other hand, the predators of the Brown plant hopper disappear very easily because of their position as predators in the food chain and their slow reproduction process. They can hardly adapt to technology. Thus, the outbreak of Brown plant hopper in Indonesia, or in Asia, takes place quickly and widely, causing loss of productivity.

In 1986 the government launched an integrated pest management programme. This programme embodied a series of ecological measures to control the spread of Brown plant hopper. The programme included non-pesticide agents for pest control by timing of planting, timing of irrigation, hand weeding, and using pest resistant crop varieties to control pest population. Other measures included in the programme were mechanical, physical and biological pest control. Mechanically, pests and insects were eliminated by hand, by traps, or by other equipment. Physical means of pest control involved the use of high or low temperature, moisture, light or sound waves. Biological means of pest control was natural predator pest control (Kasryno, et al., 1991). This programme was successfully implemented in the rainy season of 1987–88, and the use of pesticides decreased from 17,342 tons in 1987 to only 10,840 tons in 1988 (Table 2). The use of pesticides decreased by almost 37% in just a year, but the rice production maintained steady annual growth. In 1987 the rice production was 27.2 million tons and in 1988 the production increased to 28.3 million tons (Table 2). Using non-pesticide pest control measures is therefore effective, and the government should take advantage of this possibility.

The cropping pattern in Java also affects the *sawah* ecosystem. By 1987, a substantive portion of rice growing fields in Java and Bali came under

'three crops a year' pattern. There was an almost continuous succession of rice crops. This cropping pattern provided an ideal, near stable breeding environment for pests, thus allowing them to spread widely and quickly. The introduction of modern HYV seeds also influences the biodiversity balance. The distinctive cultivation practices and intensive selection over the years have produced an enormous genetic diversity. This introduction means expansion of modern varieties at the cost of indigenous species. The use of traditional variety seeds decreased from 45% in 1971–72 to 31% in 1979–80, while the use of modern variety seeds increased from 31% in 1971–72 to 67% in 1979–80.

Fox (1991:67) argues that 'genetic uniformity, heavy and routine use of pesticides high application of fertilizer, ... and a continuous monocrop culture involving double or triple cropping — all of these practices in combination — increase vulnerability' of crops to disease and insect destruction. All these are distinct features of agriculture in Indonesia, particularly in Java.

The above discussion reveals that the agricultural intensification programme in Java has negative effects on biodiversity. The effects include destroying the natural predators of insects (i.e. Brown plant hopper) through massive use of pesticides, provision of an ideal and stable environment for pest breeding by continuous monocropping system, and threats to the existence of indigenous species through the introduction of HYV seeds.

Water Pollution

The main causes of water pollution due to the agricultural intensification programme in Java are the extensive use of fertilizers and insecticides. Fertilizers that are used in the programme contain a large portion of nitrogen in the form of urea and ammonium sulfate. Nitrogen can easily be carried away in irrigation run-off. Thus, while *sawah* in lowland area benefits from the availability of nitrogen, the fertilizers would contaminate rivers and lakes. Ironically, a comparatively large quantity of fertilizers and pesticides is used in lowland *sawah* for increased rice production.

Urea is the most common form of nitrogen in use in Indonesia. There is no problem with the application of nitrogen as urea. There is, however, a problem relating to the application method of nitrogen. In Indonesia prilled urea is usually

broadcast onto *sawah*, where there is limited control over the flow of irrigation water; this results in rapid volatilization and run-off loss (Roche, 1994; de Datta, 1986). Studies in China show that, under such conditions, an average of about 30% of applied nitrogen is recovered by the rice plant, 20% is retained in the soil, and the remainder is simply lost (Roche, 1994). In general, the average recovery rate of fertilizer nitrogen by the rice crop is only 40% (Chang, 1993). This means that the rest 60% nitrogen is lost due to run-off, leaching, or volatilization. In lowland areas, this inefficiency is more significant. This is because nitrogen is actually already available in lowland *sawah*, supplied by irrigation or run-off from upland areas.

Nitrogen also could be transported to ground water through vertical leaching, and therefore could affect the aquifer. The time required for nitrogen to reach the aquifer depends on the depth of the water table, the degree of permeability, and the rate of recharge from the surface. Since the water table is more than 50 m below the surface in places, it takes a few years for nitrate to leach from the soil into the water table (OECD, 1986). The effect will thus be seen a long time in the future.

The impact of pesticides on water quality is also generated through run-off. River systems are contaminated with pesticides, resulting in the disappearance of fish and other natural pest predator, and the disturbance of bacterial and fungal balances. The Environmental Impact Assessment (EIA) projects undertaken in 1983 and 1986, however, reported that agricultural chemicals were not a major contributor to water pollution in Indonesia. The reports argued that, since the government introduced degradable pesticides such as Thiodan, Aldrin, and Endrin in the early 1970s, only a little damage to water quality has been reported (World Bank, 1990a).

Unfortunately, recent data on water pollution due to pesticide residues in Java is not available. The data from Bali, however, could be used as a comparison. Bali and Java islands are similar, mainly in their soil type (both are dominated by volcanic soil), annual average rainfall, and the irrigation systems. The rivers in Bali and Java originate from the volcanic soil systems, and irrigation networks pass through volcanic sediments. In addition, Java and Bali have almost the same level of erosion due to their heavy rainfall and their mountainous topography, with slopes up to 15° (Donner, 1987;

Mickler, 1994).

Some recent research on pesticide residues in the river system in Bali has indicated that river systems in Bali were contaminated by pesticide residues (cited in Mickler, 1994). The main pesticide residues include organochlorines, organophosphate, and carbamates. According to Indonesian regulations, the sample results were within permissible limits. If the contamination level was compared with the limits of some developed countries, for example the limits accepted by the Canadian Environmental Protection Agency, the contamination was far more serious than the conclusion in these reports. The allowable limits in Indonesia for organochlorines is 0.1 mg per litre of water, but the Canadian limit is only between 0.00003–0.0003 mg per litre (cited in Mickler, 1994).

Land Degradation

Java island is dominated by uplands (6 m to 1,000 m above sea level), and only a small part of the island has lowlands. About 12.3 million hectares or 97.5% of the total island is upland area, while the rest is low land (<6 m from the sea level). Among these almost 57% or 7,164,660 hectares are arable land, while 20% of the total land area or 35% of the arable land (2,505,206 hectares) is under rice cultivation (CBS, 1992).

Many researchers argue that most of the land degradation in Java occurred in uplands due to inappropriate farming practices in the slopes with inadequate soil conservation techniques (Semaoen, 1988; Adiningsih, et al., 1987). The primary symptoms of such degradation is soil erosion, that is the loss of top soil by many agents such as run-off or wind. It has been found that erosion in upland areas is more significant than in lowland areas of Indonesia (World Bank, 1990; Semaoen, 1988). Thus the sedimentation rate in Java's rivers may be among the highest in the world (Semaoen, 1988).

The characteristic of farming practices in agricultural intensification is high intensity of soil tillage, and extensive use of fertilizers and pesticides. Up until 1987, many of Java and Bali's most intensive rice-growing areas produced three crops a year. This means that at least thrice a year farmers carried out land preparation, that included ploughing, harrowing and planting. These caused the deterioration of soil structure and soil fertility. Robinson et al. (1994) opine that intensity of tillage seriously influences soil structure. They argue that

an increase in tillage intensity results in decrease of surface residue coverage. Residue acts as an absorber during rainfall, and can decrease the kinetic energy of raindrops before they meet the soil surface. Residues also reduce run-off velocity since they can alter the soil surface configuration, and in turn decrease the amount of detached soil carried out in the flowing water.

Tillage intensity also influences soil compaction. Uncontrolled wheel traffic results in a uniform compacting over the whole field, which is characterized by high bulk density (BD) and decrease in macroporosity. This in turn causes reduction in water infiltration and increases run-off (Dexter, 1988 in Robinson, et al. 1994). In the agricultural intensification programme in Java, agricultural machines are intensively used in land preparation. About 21,275 two-wheel tractors and 1,181 four-wheel tractors were used in 1992 to till 4.85 million hectares of land. Thus, the cause of soil degradation in Java could be attributed to uncontrolled use of agricultural machines.

The decrease in soil fertility correlates to the loss of soil nutrients through run-off. Heavy rain in Java, for instance, could force an increase in the leaching of top soil. Further, repeated cultivation of the same crop or the same variety seed could reduce certain nutrient contents in the soil. At present the farmers use nitrogen responsive HYV seeds and apply excessive nitrogen for increased production. Thus, if the 'three crops a year' system of cultivation in Java continues, it would undermine the level of nitrogen in the soil, and affect soil productivity. As an implication the soil will be exhausted and vulnerable to new species (Fox, 1991). This in turn could decrease the levels of output and resistance of the HYV to Brown plant hopper invasion.

CONCLUSION

Since the introduction of the agricultural intensification programme, agricultural productivity in Java, mainly in *sawah* areas, has increased by more than 250%. At the same time this programme has resulted in some environmental damage. Indiscriminate use of pesticides has reduced the natural enemy of rice pests and has led to the resurgence of the Brown plant hopper. Continuous planting of the same HYV seeds in a single plot, as well as double and triple cropping in a wide area,

has provided a stable environment for the growth of pests, and in turn has enticed the appearance of new bio-types of insects or pathogens, and has influenced the resistance of new rice varieties. The introduction of new HYV seeds has endangered the indigenous species. All these have caused disturbances in biodiversity.

Agricultural chemicals, pesticides and fertilizers seriously contaminate surface water. This results in unsafe drinking water, and the loss of many aquatic lives, such as frog, fish and insects. Cropping of the same type of HYV seeds again and again in the same plot of land, and 'three times a year' cropping pattern result in the deterioration of soil structure and soil fertility. Uncontrolled use of agricultural machines results in soil compaction that eventuates in high bulk density and decrease in infiltration.

The agricultural intensification programme in Java has improved rice productivity, but has resulted in the degradation of the environment. The high rice productivity that has been achieved cannot be sustained, since in the long run, it would be halted by the increasing production costs due to environmental degradation. The Indonesian government should undertake some immediate policy measures to prevent these problems.

In 1987–88 the government implemented an integrated pest management programme that embodied a series of ecological measures to control the spread of Brown plant hopper. There were non-

pesticide agents for pest control including mechanical, physical and biological pest control measures. The programme, however, was very narrow in its scope. The government should undertake more measures in that direction, incorporating all the aspects involved in agriculture production. The government programmes should emphasize on biodiversity and on the development of more stable forms, and pest resistant but environmentally friendly HYV seeds. It also should emphasize the improvement of farming practices by incorporating crop diversification and agroforestry, so as to prevent pest epidemic and ensure that rice fields receive adequate nutrients. Agroforestry will also be important for the hilly areas to prevent erosion. The policy should ensure that the farmers are not forced to extract resource base and cause threats to the environment.

Further, an increase in agricultural production alone cannot bring about improvement in the life of the general people. The overall improvement in the quality of life depends largely on the improvement in all the other sectors of the economy. In order to ensure improvement in the quality of life of the general masses and the conservation of the environment, the Indonesian government should emphasize on the equitable development of all the sectors of the economy, not just the agricultural sector.

REFERENCES

- Adiningsih, J.S., Semali, A. and Hadiwigeno, S. 1990. Resources and Problems Associated with the Development of Upland Areas in Indonesia. In *Technologies for Sustainable Agriculture on Marginal Upland in Southeast Asia*, ACIAR Proceedings, 3 pp. 45–54.
- Badan Pengendali Bimas. 1994. *Program Bimas Intensifikasi Padi, Palawija dan Hortikultura Tahun 1995–96*. Jakarta: Sekretariat Badan Pengendali Bimas.
- Booth, A. 1991. *Agricultural Development in Indonesia*. Sydney: Allen and Unwin.
- CBS (Central Bureau of Statistics). 1992. *Statistik Indonesia 1992*. Jakarta: Biro Pusat Statistik.
- CBS. 1993. *Statistik Indonesia 1993*. Jakarta: Biro Pusat Statistik.
- Chang, Te-Tzu. 1993. Sustaining and Expanding the 'Green Revolution' in Rice. In: H. Brookfield and Y. Byron, eds, *South East Asia's Environmental Future*. New York: United Nations University Press.
- de Datta, S.K. 1986. 'Improving Nitrogen Fertilizer Efficiency in Lowland Rice in Tropical Asia. In: S.K. de Datta and W.H. Patrick, Jr., eds, *Nitrogen Economy of Flooded Rice Soils*. Boston: Martinus Nijhoff Publishers, pp. 171–86.
- Dick, Howard. 1979. 'Survey of Recent Development'. *Bulletin of Indonesian Economic Studies* 15 (1): 1–44.
- Donner, W. 1987. *Land Use and Environment in Indonesia*. Honolulu: University of Hawaii Press.
- FAO (Food and Agriculture Organization). 1991. *FAO Production Year Book 1991*. Rome: United Nations.
- Fox, J.J. 1993. The Rice Basket of East Java: The Ecology and Social Context of Sawah Production. In: H. Dick, et al., eds, *Balanced Development: East Java in the New Order*. New York: Oxford University Press, pp. 120–154.
- Fox, J.J. 1991. Managing the Ecology of Rice Production in Indonesia. In: Joan Hardjono, ed, *Indonesia: Resource, Ecology, and Environment*. Oxford: Oxford University Press, pp. 61–84.
- Healey, D.T. 1981. 'Survey of Recent Development'. *Bulletin of Indonesian Economic Studies* 17(1): 1–32.

- Kasryno, F. et al. 1991. Environmental Management in Indonesian Agricultural Development. In: Denizhan Erocal, ed, *Environmental Management in Developing Countries*. Paris: Development Centre of the OECD.
- Manning, C. 1988. *The Green Revolution, Employment, and Economic Changes in Rural Java: A Reassessment of Trends Under the New Order*. Singapore: Institute of Southeast Asian Studies.
- Mears, L.A. 1984. 'Rice and Food Self Sufficiency in Indonesia'. *Bulletin of Indonesian Economic Studies* 20(2): 122-137.
- Mickler, M. 1994. *Development at the Crossroads: Agriculture Versus Tourism Versus the Environment in Bali, Indonesia*, IOCPs Occasional Paper No. 37. Nedlands, WA: The University of Western Australia.
- Nusantoro, Adi. 1993. *Agricultural Land Use Policy in Indonesia: The implementation and Impact of Land-Use Targets at the Village Level in the Yogyakarta Region*. Unpublished Doctoral Dissertation. Brisbane, Australia: The University of Queensland.
- OECD. 1986. *Water Pollution by Fertilizers and Pesticides*. Paris: OECD.
- Oka, I. Nyoman. 1995. *Pengendalian Hama Terpadu dan Implementasinya di Indonesia*. Yogyakarta: Gadjah Mada University Press.
- Oka, I. Nyoman. 1991. 'Success and Challenges of the Indonesian National Integrated Pest Management Program in the Rice-Based Cropping System'. *Crop Protection* 10: 163-165.
- Pontius, J. 1995. 'Awal Pengembangan Revolusi Hijau'. *Prisma* 2: 62-77.
- Robinson, C.A., Cruse, R.M. and Kohler, K.A. 1994). Soil Management. In: J.L. Hatfield and D.L. Karlen, eds, *Sustainable Agriculture Systems*. Boca Raton, Florida: Lewis Publishers, pp. 109-134.
- Roche, Frederick C. 1994. 'The Technical and Price Efficiency of Fertilizer Use in Irrigated Rice Production'. *Bulletin of Indonesian Economic Studies* 30 (1): 59-83.
- Semaoen, I. 1988. Prospect of Development of Sustainable Upland Agriculture in Java, Indonesia'. Paper presented at the Seminar on the Role of ASAIHL Universities in the Transfer of Technology, Jakarta, December 6-8.
- Soemardjan, S. and Breazeale K. 1993. *Culture Change in Rural Indonesia: Impact of Village Development*. Surakarta, Indonesia: Sebelas Maret University Press.
- World Bank. 1990. *Indonesia: Sustainable Development of Forest, Land, and Water: A World Bank Country Study*. Washington D.C.: The World Bank.
- World Bank. 1990a. *World Development Report*. New York: Oxford University Press.
- World Bank. 1994. *Indonesia, Environment, and Development: A World Bank Country Study*. Washington D.C: The World Bank.

Papers in this volume:

- Niaz Ahmed Khan* Social Research Approaches to Agroforestry Management in Asia: A Primer on the Sociology of Agroforestry
- Armando A. Apan and James A. Peterson* Reforestation Project Suitability: A Post-Facto GIS-based Evaluation in the Philippines
- Thomas D. Dahmer and Kwok Hon-kai* The Sustainability of Large and Small Scale Developments in Kam Tin Valley, Hong Kong in Relation to Numbers of Nesting Herons and Egrets
- Rosemary Barnes* Changing Environmental Attitudes in a Changing Environment: The Case of Hong Kong
- Resfa Fitri and Samiul Hasan* Agricultural Intensification Programme in Indonesia: A Study of the Environmental Impacts



香港大學出版社
HONG KONG UNIVERSITY PRESS

ISSN 1021-6634

X19877580

