



Environment and Climate Change in Asia:

Ecological Footprints and Green Prospects

Victor R Savage and Lye Lin-Heng



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PRENTICE HALL

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This book is dedicated to all the endangered organisms on Earth. May we listen to the voices of Nature, find wisdom in indigenous knowledge, nurture leaders with political will and moral courage, and may each of us take on the responsibility of ensuring the sustainability of our beautiful world.



The MEM programme would like to thank Shell Companies in Singapore for generously sponsoring the publication of this book.

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PREFACE

This book marks a significant milestone in the history of the Master of Science in Environmental Management (MEM) Programme in the National University of Singapore (NUS). This book is only one of the celebratory events to mark the MEM's 10th anniversary (2001–2010).

We celebrate the anniversary for three reasons.

Firstly, there are few postgraduate programmes in NUS that are as multi-disciplinary in pedagogical practice. The MEM was initiated with the academic inputs of seven Faculties: Arts and Social Sciences, NUS Business School, Engineering, Law, Medicine, Science, and the School of Design and Management (SDE) which hosts the Programme. It also has teaching staff from the Lee Kuan Yew School of Public Policy (which was not yet in existence at the programme's inception in 2001), and the expertise of professors from the Yale School of Forestry and Environmental Studies, with which the programme has a Memorandum of Understanding since its launch in 2001. Few postgraduate programmes, locally or overseas, have the distinction of being able to run modules so successfully based on the teaching inputs from varied Faculties and disciplines. Students are thus fortunate to be exposed to a wide-range of disciplines, from public health to green technologies, environmental law to economics, and environmental planning to industrial ecology. The success of the Programme is best measured by the number of foreign students it attracts annually – 40 per cent of the students are from the Asia-Pacific region and beyond.

Secondly, the MEM is a rewarding academic experience for students by exposing them to the linkages between 'town and gown'. Not only are certain modules taught by people involved in the private sector and non-government organizations (NGOs), there are also the fortnightly seminars on Friday evenings which tap the expertise of industry experts and government officials on their views in environmental management. These seminars may take the form of public forums. They form part of the MEM students' curriculum, designed to broaden their perspectives on environmental issues and effective management.

Thirdly, it is heartening to state that this MEM Programme was not a top-down directive from the University's Administration, but rather a bottom-up initiative from environmentally-interested faculty members. It was these passionate faculty members across Faculties and disciplines who pulled together their interests and helped establish, with their respective Dean's endorsement, the MEM programme. Their environmental interest has continued to sustain and support it over the last 10 years. Indeed, many of these faculty members are also

involved in the newly-initiated (AY2011–2012) multi-disciplinary undergraduate Bachelor of Environmental Studies (BES) programme.

Given the cascading impacts of climate change affecting environments and organisms, including human beings, no programme can be more pertinent in understanding the science of Nature and the need to effectively understand the socio-economic, political and cultural perspectives in managing environmental sustainability. The contributions in this book are as varied and multi-disciplinary as is required to comprehend environmental management. I am sure there are many lessons and insights from varied disciplinary and practitioners' vantage points for both the research and applied environmental benefits of students, corporate personnel and public administrators. Most of all, I hope this book serves as a focus for continuing debate and dialogue among interested stakeholders in ensuring a sustainable world.

I applaud all the administrators, Faculty deans and faculty members for their support of the MEM Programme. In particular, I thank various institutions and corporations (Shell Group of Companies in Singapore, Tan Chay Bing Educational Fund and the National University of Singapore Society) for sponsoring bursaries and scholarships for our MEM students. Specifically, I thank the Shell Group of Companies in Singapore for their unwavering financial support for the programme; this book is one such outcome of their corporate endorsement of the Programme.

Professor Tommy Koh,
Chairman of the International Advisory Committee,
MEM Programme,
and Singapore's Ambassador at Large

ABOUT THE AUTHORS

Marian CHERTOW



Marian Chertow is a professor of industrial environmental management at the Yale University School of Forestry and Environmental Studies. Her research and teaching focus on industrial ecology, business/environment issues, waste management, and environmental technology innovation. She is also appointed at the Yale School of Management and the National University of Singapore where she is an adjunct member of the faculty of the M.Sc in Environmental Management program, teaching the course on Business and the Environment. Professor Chertow serves on the National Advisory Council for Environmental Policy and Technology (NACEPT) that advises US EPA and is incoming President of the International Society of Industrial Ecology (2013–2015).

CHOU Loke-Ming



CHOU Loke-Ming is Professor in the Department of Biological Sciences, National University of Singapore. His research interests include coral reef ecology and restoration, and integrated coastal management. He serves on the Science & Technical Advisory Committee of the Global Coral Reef Monitoring Network (International Coral Reef Initiative) and is a member of the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection. He has provided consultancy services in the field of marine environment management to UNEP, FAO, World Bank, WorldFish Center and many national agencies. He is a member of the MEM's Programme Management Committee, representing the Faculty of Science, and teaches the module "Environmental Science".

Esther Sekyoung CHOI



Esther Choi graduated in 2011 from the master's program in environmental management at the School of Forestry and Environmental Studies at Yale University. She holds a bachelor's degree in environmental sciences from the University of California, Berkeley. Her research interests include economic and social incentives to influence consumers' behavior and challenges associated with industrialization

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Richard T Corlett is a Professor in the Department of Biological Sciences at NUS. His major research interests include terrestrial ecology and biodiversity conservation in tropical East Asia, plant-animal interactions, urban ecology, invasive species, and the impacts of climate change. He is the author of several books, including *The Ecology of Tropical East Asia*, published in 2009 by Oxford University Press, and *Tropical Rain Forests: An*

Ecological and Biogeographical Comparison, co-authored with Richard Primack, published by Wiley in 2011.

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Dr. Asanga Gunawansa holds a Ph.D. in law from the National University of Singapore (NUS) and a LL.M in International Economic Law from the University of Warwick. He is an Attorney-at-Law of the Supreme Court of Sri Lanka and has over 15 yrs of experience as a legal counsel. Dr. Gunawansa is currently attached to the School of Design and Environment of NUS. His current teaching and research areas include:

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Carsten M Hüttche is the founder and director of environmental consultancy firm Environmental Professionals (Enviro Pro), which he started in 1998 in Singapore. Since then, he has expanded his business activities to include green infrastructure projects for Asia's water resources sector. He is a green entrepreneur aiming to push the envelope for more

natural environments and green designs in Asia's fast growing cities. In 2006, his firm and partners were awarded Singapore's "Innovator of the Year" award.

He holds a Masters Degree in Biology from the Freie Universität Berlin, Germany and held a position as a Senior Adjunct Lecturer for the School of Design and Environment, National University Singapore, between 2008 and 2010, teaching in the MEM programme.

Carsten is a regular senior consultant for International Funding Institutions such as the Asian Development Bank, World Bank and bi-lateral development agencies. He specializes in environmental safeguards and climate change adaptation.

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Dr Ho Hua Chew is currently a member of the Executive Committee (EXCO) and also the Vice-Chairman of the Conservation Committee in the Nature Society (Singapore). He helps to co-ordinate the conservation activities & projects of the Society, such as the formulation of conservation proposals, feedbacks to government land-use & development plans, biodiversity surveys, etc. He has been doing conservation work for the Nature Society for more than a decade, in the course of which he was involved with the formulation of the conservation plan for Sungei Buloh and the Master Plan for the Conservation of Nature in Singapore. His main fields of expertise are biodiversity conservation and environmental ethics. He also lectures part-time on Environmental Ethics as well as on Biodiversity Conservation at tertiary institutions.

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Professor David Koh is Director of the Centre for Environmental and Occupational Health Research in the Saw Swee Hock School of Public Health in the NUS. He is an editorial board member of several journals, including Occupational and Environmental Medicine (UK), Occupational Medicine (UK), Journal of Occupational Health (Japan) Australasian Journal of Dermatology, and a member of the International Advisory Panel of the East West Centre, USA. His research interests are in occupational and environmental health. He is a member of the MEM's Programme Management Committee, representing the Medical School.

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Dr Kua Harn Wei graduated with a Master's degree in theoretical physics from the National University of Singapore, before joining the Department of Building, School of Design and Environment, in 1999 as a full-time teaching assistant. After graduating with Masters degrees in Civil & Environmental Engineering, and Technology & Policy, from the Massachusetts Institute of Technology (MIT), he went on to earn his Ph.D.

from the MIT Building Technology Program in 2006. His research interest is in creating integrated science-based sustainability policy models (related to energy and resource management) for climate change mitigation/adaptation in the built environment. Integrated policies are those that consider the complex interactions among different sustainability-related issues and prescribe multidimensional yet coordinated measures to address the problems arising from these interactions. Dr. Kua uses a range of concepts and methodologies in his analyses of problems and formulations of solutions, including industrial ecology, case studies and action research. He is a member of the MEM's Programme Management Committee, representing the School of Design and Environment, and co-teaches the course on Business and the Environment.

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George Ofori is a Professor at the Department of Building, National University of Singapore. He is a Fellow of the Chartered Institute of Building, Royal Institution of Chartered Surveyors, and Society of Project Managers (Singapore). He is Director of the M.Sc. (Environmental Management) programme and a Co-Director of the Centre for Project Management and Construction Law. His research is on construction

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Nicholas A ROBINSON



Nicholas A Robinson is University Professor for the Environment at Pace University, and holds positions as the Kerlin Distinguished Professor of Environmental Law at Pace Law School, and as adjunct professor at the Yale University School of Forestry & Environmental Studies. He specializes in international and comparative environmental law, edited the proceedings of the 1992 UN Conference on Environment & Development, and

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edited and co-wrote the recently published *Singapore Biodiversity: An Encyclopaedia of the Natural Environment*.

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Asia's 'Sustainability' Quests: An Introductory Overview

Victor R SAVAGE, LYE Lin-Heng and George OFORI

We are now twelve years into a unique century, the first century in the 35 million centuries (3.5 billion years) of life on Earth in which one species can jeopardize the planet's future.

—*Holmes Rolston III* (2012: 1)
American environmental philosopher

I. Motivation and Occasion

Having published two volumes of the research of our Masters in Environmental Management (MEM) students over the last decade (2001–2011) (see *Sustainability Matters: Environmental Management in Asia*, World Scientific, Lye *et al.*, 2010; and also, *Sustainability Matters: Challenges and Opportunities in Environmental Management in Asia*, Pearson Custom Publishing, Lye *et al.*, 2011), the Programme's Management Committee felt it was fitting for faculty members who teach and supervise students' research work (Dissertations and Study Reports) to pen their views on relevant aspects of the environment from their disciplinary perspectives, personal vantage points or research interests. These contributors are, by no means, exhaustive of the faculty involved in teaching the MEM programme, but reflect the wide-ranging disciplinary engagement in MEM; from Science to Building, from the Social Sciences to Law, and from Medicine to the Humanities. We also have contributions from adjunct faculty as well as non-faculty members – people who might be seen as applied practitioners of environmental management contributing their insights from a non-government organization (NGO) or industry vantage point. In addition, we are glad to have the inputs of American environmental lawyer, Nicholas Robinson, a member of the advisory committee and former external examiner of the MEM Programme. Given the wide-ranging nature of environmental issues and the current climate change interventions, one can expect that a book of this nature would be multidisciplinary and interdisciplinary in scope and theme.

The tenth anniversary (2001–2011) of the MEM programme is cause for academic celebration. Since its inception in 2001, the Programme has grown and stabilized over the last decade not only because of administrative support but also due to the dedication of environmentally-conscious and passionate faculty members who are personally engaged in environmental issues, both international and local. This interdisciplinary and multidisciplinary dialogue and commitment amongst faculty members are testimony to the world we live in, where we all want a sustainable world for all creations, including humankind. Indeed, the National University of Singapore (NUS) can be proud that this multidisciplinary programme has developed over the years with a large number of foreign students (about 40 per

developed over the years with a large number of foreign students (about 40 per cent annually), public-sector endorsement and private-sector financial support in the form of bursaries and scholarships. The MEM programme is indeed fortunate to have a growing body of corporations and foundations contributing to the welfare of students, outreach programmes and academic vitality. We are glad to have support from environmental-active corporations. In our time, nothing can be more important and immediate than dealing with environment and climate change challenges because they have such profound impacts on ecosystems and, in turn, human life, health and property.

II. Synthesis and Overview

Environmental issues sprung into the public consciousness since Rachel Carson's (1962) path-breaking book, *Silent Spring*, and this public profile was subsequently heightened with the 1987 Brundtland Report (World Commission on Environment and Development, 1987), which gave the global community the concept of 'sustainable development'. Indeed, politicians and governments have bandied the term 'sustainable development' around to demonstrate their commitment to being 'green' and environmentally friendly. Both George Ofori and Asanga Gunawansa critically review the concept of 'sustainable development' and provide different criticisms and interpretations as well as interventions of its concepts and the term 'practical usage'. In most cases, however, the use of the term 'sustainable development' has merely served as environmental lip service and 'green' hypocrisy. Governments and corporations have, unfortunately, pursued less-than-friendly environmental policies and programmes. Ho Hua Chew, in his chapter on conserving biodiversity in Singapore, demonstrates that, even in a model state like Singapore, the authorities also have their struggles with regard to their commitment to 'green' causes and environment-friendly living.

Environmental concerns ironically took on a new dimension and high public profile with the increasing problems arising from climate change. Ever since climate change was brought to the public's attention by the American climatologist James Hansen in the late 1970s, the issue has become internationally legitimized with the Kyoto Protocol. Since then, many books and several United Nations (UN) conferences (in Bali, 2007; Copenhagen, 2009; Cancun, 2010; and Durban, 2011) have been held to discuss the global response to climate change and global warming (Flannery, 2005; Stern, 2007, 2009; DiMento & Doughman, 2007; and Linden, 2007). The difference between environmental impacts and climate change is that the latter is more deadly and more impactful; as hazards are more frequent and more damaging to environments than have ever been experienced by communities. The impact of climate change, which climate scientists would prefer to call 'weather changes', is relentlessly unfolding its venom and destruction almost every week in Asia. However, Nicholas Robinson notes in his chapter that carbon dioxide emission increases over the last 420,000 years based on Antarctic ice cores have never been higher than the current rates. This points to Victor Savage's endorsement of the view that the 'Anthropocene', or 'Anthropozoikum',

has arrived and become an 'integrated part of the Earth System'. Such weather changes hint at human-induced climate change outcomes. The link between current environmental global disasters and natural hazards to climate change, as well as the link between such disasters to human causes, is now finally getting public endorsement by the global community of scientists. A draft document of the report of the United Nations Inter-Governmental Panel on Climate Change (IPCC), to be tabled in Kampala in November 2011, has come to the conclusion that man-made climate change has boosted the frequency or intensity of heat waves, wildfires, floods and cyclones. More importantly, such disasters are likely to multiply (*The Straits Times*, 2 November 2011: A19).

In 2011, one sees massive floods in Pakistan, Thailand, Cambodia and Malaysia; endless typhoons and cyclones hitting Bangladesh, the Philippines and Vietnam; prolonged droughts in parts of China, India and Indonesia; and rising sea levels that threaten the Mekong Delta and the islands of Indonesia and the Philippines. In their articles, both Carsten Hüttche and Victor Savage delineate some of the impacts of climate change in the Asia-Pacific region, arguing that small and poor Asia-Pacific countries have little ability to mitigate global warming, hence having to find ways to adapt to climate change at both national and local levels. They cannot be passive observers but must become active participants in global forums to ensure that their climate change plights are heard.

While the main theme of this volume of essays is environment and climate change, the regional amplification and setting is Asia – a massive continental region with vastly different communities, cultures, states, urban systems, ecosystems and bio-regions. Every political entity in Asia, however, shares the same problems with environment and climate change, and seeks to find a common pathway to minimize environmental damage, avert human impacts and uncover green solutions. Hence this book provides a whole array of case studies at various scalar spatial levels ranging from the local level (villages along the Kampar River in Sumatra), cities (Singapore), national state levels (China, Timor Leste, India, the Solomon Islands, Indonesia), regional representations (Association of the Southeast Asian Nations, Asia) and global interventions.

Unfortunately, while there might be a science to physical environment and climate change, there is no science for evaluating social and cultural sustainability, political development or economic progress. Responses to environmental and climate change should be customized for each society's and community's cultural and social ballasts, levels of economic and political development, as well as the ecosystem parameters it resides in. There is thus no 'one size fits all' remedy for any community or state facing environmental problems. This makes the subject of ensuring national goals of environmental sustainability and quality of life immensely challenging for Asian governments. In large countries like China, India and Indonesia, there is as much ecosystem diversity as there is cultural and social heterogeneity. In short, every sector (government, private corporations, educational institutes or NGOs) needs to constantly engage in dialogue with other sectors to find common-pool solutions to the variable problems faced by

countries. This book of interdisciplinary and multidisciplinary essays is but one contribution to this dialogue. The academic interventions reflect a variety of disciplinary and interdisciplinary environmental perspectives: biological science, building, architecture and real estate, medicine, law, economics, geography, ethics, ecology and industrial ecology, including the viewpoints of nature lovers, bird watchers and environmental consultants.

The themes in this book can be organized in many ways. However, we would like to offer our own perspective of what central issues they have in common. Firstly, all the chapters clearly note that environment and climate change outcomes reflect human interventions and impacts. In short, environment and climate change cannot be seen as a product of natural phenomena and elements *per se* – they are taking place because of human activities, negligence and greed as well as environmental commodification, economic motivations and political mismanagement of natural resources. In the essays by Chou Loke-Ming on Southeast Asia's coral reefs and by Darren Yeo, Richard Corlett and Hugh Tan on biodiversity issues in Singapore, the evidence is clear that human activities are directly and indirectly undermining natural ecosystems, already leading to the extinction of aquatic and terrestrial species alike.

Clearly, while there are alternative views on the current environmental crisis that the regions face, it seems evident from the various papers that human beings cannot be absolved of liability in creating the environmental mess we are currently trying to solve. Chou Loke-Ming's intervention on coral reef deterioration in Southeast Asia demonstrates the anthropogenic causes (global climate change, local overfishing and marine pollution) arising from developmental initiatives and population pressures in coastal areas. The identification of these causes cannot be over-emphasized, as, without identifying the real causes of problems, one can never prescribe the right solutions. Hence grounded academic research such as David Koh and Judy Sng's work on the pollution of the Kampar River in Sumatra is pertinent in addressing real-world environmental problems. Their chapter on villagers residing along the Kampar River in Sumatra is evidence of environmental impacts on human health and diseases.

Secondly, all the papers have tried to discuss the issue of 'sustainability', whether it is environmental sustainability, sustainable development, sustainable buildings, sustainable cities or generally sustainable societies. It is difficult to operationalize the concept of 'sustainability' since it covers a wide range of subject matters. But using various disciplinary vantage points, the papers have tried to engage ideas of sustainability in specific areas. It ranges from Ho Hua Chew's questioning of whether the current economic (capitalistic) trajectory of Singapore's developmental agenda can, in fact, bring forward a more sustainable way of living in the city-state, to Lye Lin-Heng's perspective on sustaining cities by developing various infrastructure (legal, administrative, environmental), land use laws and other benchmarks such as the ISO 14000 certifications. Quite the opposite of Hua Chew's views, Asanga Gunawansa is a firm advocate of the compatibility of economic growth and environmental sustainability when he states the way to

go is to realize that 'we cannot revert to living in caves, and it will be difficult to convince masses in the developing countries to give up their dreams of economic development. We condemn the poor to aspire to less prosperity'.

Thirdly, given that cities now hold 50 per cent of the world's human population and that 44 per cent of Asia's population live in urban areas, one cannot deny the relevance of finding the right environmental nexus for sustaining cities. Renowned environmental lawyer Nicholas Robinson puts it succinctly that cities are 'already artificial experiments in sustainability'. While city governments deal with the challenges of managing natural ecosystems for water supplies for survival, they also have to manage an artificial landscape (refuse, sewerage, pollution) that requires sustainable management. Two chapters, by Kua Harn-Wei and George Ofori squarely address the urban hardware (infrastructure and buildings) and the challenges of keeping cities 'green'. Both papers focus on issues of sustainable building materials. In Harn-Wei's paper on the cement industry in China, he argues that much needs to be done to ensure the sustainability of the industry as cement is a major resource in laying down the urban concrete landscape. The prescription is for a more integrated approach for the environment, economy and employment. In the case of George Ofori, the new pathways to eco-friendly cities lie in developing green buildings. This is a complex issue that involves a matrix of eight drivers: financial incentives, building regulations, client awareness, client demands, planning policies, taxes and levies, investments, as well as labelling and measurements. Among his suggestions for underscoring green buildings is the need for strong leadership, the development of human resources and greater regional collaboration on green building programmes.

Fourthly, 'sustainability' underscores the complex human-nature relationships in societies and that untangling the variables and finding solutions to issues are never an easy direct cause-effect relationship. Hence several authors reflect on trying to find an ecological loop that minimizes waste and hence imitates the lessons of nature in creating a sustaining system. Marian Chertow, Esther Choi and Keith Lee's chapter deals squarely with an industrial ecology approach by using the material flow analysis (MFA) tool to analyze Singapore's 'urban metabolism'. Basing their findings on 2000, 2004 and 2008 statistics, the authors show that only 56 per cent of Singapore's waste was recycled in 2008; that Singapore imports considerable sand from the region (Malaysia, Indonesia, Cambodia and Vietnam) to support its economic growth, to the environmental detriment of its sand exporters; and that Singapore's reliance on foreign food production has led to increasing 'virtual water' imports. The authors demonstrate that there are considerable fluctuations in material imports and exports that affect 'Domestic Material Consumption inversely as compared to global economic activity'. This MFA study underscores the ongoing debates on the scale of the ecological footprint that cities leave on other ecosystems in their consumption habits. In another vein, Nicholas Robinson argues for the need to operationalize the Chinese model of the 'circular economy' to create a more sustainable economic model for dealing with waste and recycling. Given that cities stick out like sore thumbs in the natural environment, the discussion of the concept of eco-cities by Nicholas

Robinson and Victor Savage is meant to convey ecosystem closure and ensure more sustainable cities, attuned to the rhythms of nature rather than just human schedules and time-keeping.

Fifthly, any book discussing a pertinent theme such as eco-development with sustainability objectives is bound to consider issues of development versus nature trade-offs, economic versus environmental assessments and the whole debate about land-use options. According to Dodo Thampapillai, one needs to consider the 'minimum threshold level of ecosystem support' in considering the trade-off between, say, the issue of water conservation versus that of housing development. Ho Hua Chew's argument is more bio-centric – that one has to accept the view that pristine-nature areas are irreplaceable and hence no economic trade-offs can be made. Robinson views the nature development issue in more anthropocentric terms in relation to sustaining, restoring and maintaining the 'resilience of the natural systems' where human life exists. Both Carsten Hüttche and Asanga Gunawansa take a more developmental perspective to sustainable development. Hüttche places priority on 'poverty' alleviation when he states 'addressing poverty in ecologically sustainable ways will reduce vulnerability to climate change by increasing the ability of both social and environmental systems to adapt to climate change'. However, Gunawansa argues that there is no trade-off between a 'healthy environment' and 'healthy growth' of the economy because both could lead to an 'improved environment, together with economic and social development'. Clearly, embarking on the green economy can be a new catalyst for economic development for many countries in Asia. George Ofori, for example, notes that the retrofitting of Singapore's 210 million square metres of built-up space to meet the government's Green Mark standards is estimated to be some SGD300 billion'.

Managing environments is thus a multidimensional exercise that involves formal educational inputs, various stakeholders and the reliance on traditional knowledge and culture. It is, as Gunawansa advocates, the 'collective responsibility' amongst government, the corporate sector and the general public in each state to cultivate 'social responsibility'. This collection of essays has a plethora of solutions, suggestions and samples for getting our 'eco-logic' correct. It begins with well-tried examples like Carsten Hüttche's critical review of the applications of Environmental Impact Assessments in Asia-Pacific countries (China, Southeast Asian countries) to more current methods for risk assessment with regard to climate change impacts and ends with essays on environmental management. Lye Lin-Heng makes a strong call for education and ethics, advocating endorsement of the Earth Charter as well as environmental education, right to information, access to justice and public participation. Nicholas Robinson sheds light on the challenges of creating environmental educational programmes at the tertiary level to equip new-generation environmental managers. He argues that the new breed of environmental managers certainly require multidisciplinary knowledge to tackle sustainability challenges. These include using a whole gamut of expertise in new technologies, analyzing and applying public policy rules and incentives, analyzing financial costs and benefits, and managing organizational changes. In a broader context, Savage notes that sustainable management requires not only

Western developments in modern science but also a grounded understanding of Asian traditional, cultural conventions of 'relational nature' and the 'relational self', as referred to in Buddhism.

III. Conclusion

The twin themes in this book are: to uncover the human-nature relationships of communities at various scales (countries, cities, villages); and to discuss the options for the right pathways between state development and environmental and climate change. Needless to say, the natural hazards arising from climate change are undermining developmental programmes and disrupting the livelihoods of communities in Asia. The devastating floods in Thailand in October–November 2011 which has claimed over 500 lives is a poignant reminder that there is no easy human solution to containing the wrath of nature. Bangladesh and the Philippines, both poor countries, are also the most hazard-prone countries in Asia, which provides enormous challenges for their respective governments to move development projects forward. Unfortunately, despite the growing evidence of natural hazards taking place in Asia and around the world, there remain people who are skeptics about climate change. It seems as though the prognosis by the United Nations International Panel on Climate Change (IPCC) has been conveniently ignored by certain sectors of political leaders, government administrators and corporate titans. The reason is that accepting these environmental realities mean accepting Al Gore's view of 'the inconvenient truth' – oil and car companies do not want to hear that they are culprits of CO₂ emissions as it questions their industrial productivity and profit margins. In this light, one of the modest purposes of this book is to bring awareness of these pressing environmental challenges to the informed public, government administrators and the corporate world. There are many interpretations to the problems confronting countries, cities and communities, but rather than shying away from the problems, we all need to engage in dialogue and debate, so that clearer perceptions, rational perspectives and pragmatic views may prevail.

Most Asian countries have neither the financial muscle nor the technological and scientific expertise to deal with the mitigation of climate change. Indeed the research institutes that have these scientific and technological abilities are located in developed western countries (the US and Europe). Hence, what the British economist Nicholas Stern (2009) advocates, is for developing countries to concentrate on finding adaptive mechanisms to handle climate and environmental change. Environmental adaptation is not new to many Asian communities – it has been going on for centuries. There is tremendous folk wisdom and science that the 'little peoples' in Asia can tap on in confronting environmental challenges. This is best encapsulated in what Daniel Goleman (2009:43) defines as 'ecological intelligence' – "an understanding of organisms and their ecosystems, and *intelligence* connotes the capacity to learn from experience and deal effectively with our environment". Therefore, in advocating environmental dialogue, one needs to ensure that the dialogue is not only among academics, intellectuals, and the literati, but also among folk peasantry, tribal communities, entrepreneurs, administrators,

religious laity and the informed public. We cannot replace the knowledge and ecological intelligence of peasant and tribal communities who have developed intimate knowledge of their ecosystem they reside in through accumulated experience. Our conceptions of nature should not be based merely on the tyranny of modern science – one should welcome alternative points of view as well.

The authors in this book do not pretend to have the answers and prescriptions to all the life-threatening problems that Asian communities confront. But in grounded research we have also learnt and shared how other village, tribal and urban communities handle quotidian environmental challenges. At the end of the day, we want to ensure a better quality of life for all communities, a more effective and efficient management of ecosystems, and a more sustainable world. Time is ticking away for decisive action. We hope that in reading this book, you may be able to see different vantage points, critically evaluate our views and adopt ideas for a more sustainable environment.

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CHAPTER ONE

Whither the Sustainability and Development Twain Meet: Implications and Challenges for Asian States

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“Given that most Asian states are too poor, economically powerless and lacking in expertise to initiate climate change mitigation processes, they need to engage the developed countries to put in motion concrete steps to slow down global warming. Asian states cannot take a back seat position on climate change. They need to be actively involved to ensure that the international community acts responsibly and effectively in halting global warming. If not, developing Asian states will remain the losers in the unrelenting impacts of climate change in the latter half of the 21st century.”

– Victor R SAVAGE

Whither the Sustainability and Development Twain Meet: Implications and Challenges for Asian States

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Abstract

The increasing impacts of climate change on communities and countries in Asia have become more apparent over the last two decades and are likely to continue into the following decades of the 21st century. These unfolding natural hazards come at a time when the world's financial and economic problems continue to develop. Climate change is a global problem that requires global solutions, but the international meetings at Kyoto, Bali, Copenhagen and Cancun have not produced encouraging results. Asian states do not have the scientific knowledge, the research and development ballast or the financial capabilities to tackle climate change mitigation issues. All most Asian states can do is to find adaptive mechanisms at the local level to reduce the impacts of climate change.

Key words: adaptive mechanisms, climate change, floods, global warming, mitigation strategies, nature, prolonged drought, relational self, sea level rise

I. Introduction

If we are successful in finding a sustainable way of living in the twenty-first century, then perhaps the principles we develop will become the guiding principles of a truly sustainable global civilization.

– Flannery (2009: 105)

As we come closer to the vortex of one of probably the worst global economic crises in history in 2011, there is a growing sense of foreboding, despair and resignation amongst people around the world, and we may never see the light at the end of the tunnel. Given the massive loss globally of USD26 trillion (Laszlo, 2009: 17) during in the financial crisis in 2007–2008, one can understand the grave trepidation felt about the impact of the Euro crisis on international trade, jobs, inflation and food insecurity. Ancient Indian historians and philosophers would view this economic 'depression' as a cyclic process in history and accept that we are in a down cycle, a trough in history after experiencing the golden years. The Javanese would see this period as *zaman edan*, a crazy, dark period in

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which order would be upset, ‘the greedy and fools would thrive, the lazy would be rewarded and people would no longer know manners or shame’ (Mulder, 1994: 43). Does this description of our time sound familiar?

Yet, ironically, measured in other human terms and given a longer historical trajectory, we might be seen as enjoying a golden age in human history. From the viewpoint of *Homo sapien* history, we have arrived in the 21st century with the most positive balance sheet: we have the largest population to date (over seven billion), who are in better health, with a longer lifespan (67 years). We are more literate and wealthy, and live with greater comforts than those at any other time in human history. It is on this very optimistic note that the Danish political scientist, Lomborg (2001), shared his rather sceptical environmental views that the state of the world environment was much better than had been presented by environmental non-government organizations (NGOs) and environmentalists like Brown (2001) and the global green NGOs: Greenpeace, World Wide Fund for Nature, and the Worldwatch Institute. Environmentalists might disagree with Lomborg’s perspective, but there is evidence that human beings are clearly better off though the planet might be in deteriorating health. Lomborg’s ‘measurement of the real state of the world’ was an update of an earlier equally optimistic report card assessment of the ‘state of humanity’ by Julian Simon (1995). In his words: ‘The decrease in the death rate, and the attendant increase in life expectancy – more than doubling – during the last two centuries in the richer countries, and in the 20th century in the poorer countries, is the most stupendous feat in human history’ (Simon, 1995: 26).

There is no doubt that Lomborg (2001) and Simon (1995) are correct about the enormous strides human societies have made towards what the French historian Fernand Braudel (1995) views in his holistic and transnational perspective of human civilization. Holistically speaking, as a species, we progressed, albeit unequally. While 30 per cent of the world’s population consume 70 per cent of the world’s resources, the other 70 per cent of the world’s population live in poverty, malnutrition, starvation, disease and without proper housing, clean water and sanitation. Escobar’s (1995: 212) book, *Encountering Development*, puts the global inequality more starkly: ‘The industrialized countries with 26 per cent of the population account for 78 per cent of world production of goods and services, 81 per cent of energy consumption, 70 per cent of chemical fertilizers and 87 per cent of world armaments. One US resident spends as much energy as seven Mexicans, 55 Indians, 168 Tanzanians and 900 Nepalis’. In Southeast Asia, Cambodia, Lao PDR and East Timor have over 70 per cent of their populations living on less than USD2 a day.

We should be cautious about patting our own backs too quickly for our human achievements. After the fall of the Berlin Wall and the Soviet Union, capitalism seemed to have won a global victory. But the current Euro zone debt problems, the faltering US financial system and the moribund Japanese economy are wake-up calls and sobering reminders of how fragile the capitalist, laissez-faire model of economic, political and social systems is. As fast as developments have

enhanced the betterment of livelihoods in the 20th century, we might all see this slip away rapidly in the 21st century due to our callous behaviour, our inability to manage states and cities, and our indifference to the environmental writing on the wall of major impending problems. Certainly, the impact of climate change is undermining confidence further in whether states can find a sustainable model of development. In short, sustainability is a slippery objective for many states and communities in Asia.

This paper investigates the long-term impacts of climate change and the possibility that environmental issues and their dire ramifications for Asian states in the 21st century. Given the often-talked-about rising Asian zeitgeist in this century, with China and India forming the twin catalyst for global economic growth, such optimistic scenarios must be weighed against the environmental challenges Asian states face intranationally and the global impacts of climate change on Asian states, especially China and India. The specific focus is whether Asian states are able to manage the environmental and climate change challenges at the global, regional, state and urban levels. They undergird the usual twain of ‘sustainability and development’, a term that many essays in this book focus on and that I have serious reservations about. Two areas need attention in integrating both the adaptive mechanisms and mitigation offerings: by looking at the needs for a new global architecture in handling transnational and global environmental concerns and by critically evaluating the dominant national habitats of human beings, sustainable cities and eco-cities within states in Asia.

II. Climate Change: The Accumulating Evidence

Climate change across human history has been as much a narrative of both plus points as it has been a negative factor on human development. Over 80,000 years of *Homo sapien* history, the Ice Age made it possible for early human beings to cross over land bridges to explore and experiment as well as populate many areas around the world. Global warming has been taking place over the last 20,000 years and certainly over what scientists call the Holocene (10,000 before present [BP]) period. The global warming Holocene period was one of much human creative activity – agricultural origins, plant and animal domestication, genesis of cities, development of religions, technological developments, pottery and writing. Steven Mithen’s (2004: 504) book, *After the Ice*, documents these creative human developments well. He argues that human history between 20,000 and 5,000 BP ‘reached a turning point during a period of global warming’ and set the stage for the ‘origins of human civilization’. The moral of the story is that carbon dioxide (CO₂) is important for two reasons: (a) without it, all vegetative life will be eradicated and (b) CO₂ has helped to enhance global warming for the last 10,000 years to make planet Earth a habitable place for human life, the agricultural revolution, the birth of cities, and the development of civilizations (see Volk, 2008).

Despite the monitoring of the increase of CO₂ since 1958 by scientists from the Scripps Institute, climate change has registered rather slowly in the public imagination. It has taken a series of severe heat waves, prolonged droughts, intense floods, snow storms, heavy rains, typhoons and hurricanes, melting mountain snow caps, sea level changes, the melting of Greenland and arctic ice caps over the last four decades for the mass media and the public to become aware that these are not isolated natural events and phenomena but a product of climate change. Yet, among climate scientists, these erratic and frequent climate disasters define 'weather changes'. It would take a longer historical experience to accept that we are undergoing climate change. It is no surprise that one of the definitive statements by Flannery (2006) avoided the use of 'climate' and entitled his book 'The Weather Makers'.

Yet, there is now a growing body of scientific evidence to demonstrate that our earth is in the throes of CO₂ increases, global warming and climate change. The numerous scientific articles and publications testify to this issue (see Flannery, 2006; DiMento & Doughman, 2007; Intergovernmental Panel on Climate Change [IPCC], 2007; Linden, 2007; Stern, 2007; Walker & King, 2008). Between 1999 and 2010, the world has experienced some of the worst droughts of the century, the worst floods in 500 years, the strongest El Niño in 130,000 years and the worst tropical storms in recorded memory (Linden, 2007: 249). Despite the controversial book, *Skeptical Environmentalist*, by Lomborg (2001), the 935 peer-reviewed scientific papers on climate change between 1993 and 2003 have all accepted that 'humans are changing climate' (Linden, 2007: 228).

What has become alarming for the scientific community and the public is that climate change is not merely a natural phenomenon a product of climate cycles taking place over the centuries. For the first time in 'glacial time' (Castells, 2004: 183), climate change is viewed as a product of human-induced activities. Indeed, human influence on nature has led to scientists coining a new age, the 'Anthropocene' and 'Anthropozoikum' to underscore the need for an Earth science system that positions humankind as an 'integrated part of the Earth System' (Ehlers & Krafft, 2006: 11). At the root of this Anthropocene-based integrated earth system are the rising urban agglomerations around the world. Humankind has changed radically urban environments or what Spirn (1984) called the 'granite garden' to underscore the human-engineered built-up environment. For Martin (2007: 4) the 21st century is the 'critical century', or what he calls the 'make-or-break century', because it is not sustainability but 'survivability' that now matters. The 2007 IPCC Reports and the plethora of books on global warming and climate change portend a dismal scenario for the global climate and its impact on Earth and its varied species this century (Flannery, 2006; Linden, 2007; Stern, 2007; Walker & King, 2008), which will have profound impacts on countries and cities. The IPCC view in the March 2009 meeting in Copenhagen forewarns that climate change might lead to 'abrupt or irreversible climatic shifts' (*The Straits Times*, 14 March 2009: A12). How national and urban populations will have to adapt to the new environmental challenges is an issue that has no precedent in human history.

Clearly, human contributions to an increase in CO₂ and carbon emissions are becoming clearer. It seems evident that developed countries emit more CO₂ and carbon per capita than developing and poorer countries do. In 2002, the average global per capita CO₂ emission was 4 metric tonnes compared to North America’s 19.6 metric tonnes and Asia’s 2.6 metric tonnes (see Table 1.1).

Table 1.1: World’s human–environment indicators data sheet (mid–2008)

Countries	Population mid-2008 (millions)	% urban	Gross national income purchasing power parity per capita (USD) 2007	CO ₂ emissions per capita (metric tonnes) 2002	% of natural habitat remaining (2007)
World	6,705	49	9,600	4.0	78
More Developed	1,227	74	31,200	11.7	82
Less Developed	5,479	44	4,760	2.1	76
Less Developed (Excl. China)	4,154	44	4,560	1.9	76
Africa	967	38	2,430	1.1	84
Northern America	338	79	44,790	19.6	85
Latin America/ Caribbean	577	77	9,080	2.5	73
Asia	4,052	42	5,650	2.6	69
Southeast Asia	586	45	4,440	1.7	44
Europe	736	71	24,320	8.4	76
Oceania	35	70	23,910	12.2	89

Source: Population Reference Bureau, 2008 World Population Data Sheet, Washington, DC

Based on the 2006 global emissions of CO₂ of 7.5 billion tonnes of carbon, the global average per capita was 1.25 tonnes, while a US citizen emitted 5 tonnes. In his book, *CO₂ Rising*, Volk (2008: 115–20) noted that there was a distinct correlation between a country’s wealth, energy consumption and CO₂ emission. There is a clear correlation between economic growth and CO₂ emission: in Asia, China and Vietnam are countries with vigorous growth in CO₂ emissions (Volk, 2008: 120). How fast can the USA and other developed countries reduce their carbon emissions by economic methods? And how fast will developing countries want to increase their development trajectories that will inevitably increase CO₂ emissions? These are vexing issues with no easy answers in sight. They have been

debated vociferously in climate change global forums in Kyoto, Bali, Copenhagen and Cancun, and will continue in Durban in 2012.

III. Asian Century: Climate Change Challenge

Unlike other challenges (population, water, food, urbanization) that have plagued Asian states and communities in the 20th century, the new environmental challenge of the 21st century will certainly be climate change translated from CO₂ increases and global warming – an environmental issue that human societies have little experience in coping with and managing on a global or national scale. Unfortunately, there is no consensus amongst Asian states in finding a unified response to this global challenge.

Prolonged Drought, Heat Waves and Water Scarcity

History has proven that climate change and its unfolding impacts of prolonged drought have been the major explanations for the fall of many civilizations over the centuries (Linden, 2007; Fagan, 2008). In nearly all correlations of environmental causes to the fall of civilizations, protracted drought, fall in precipitation and aridity are the nails in the coffin of civilizations. Linden's (2007) book, *The Winds of Change*, documents several sudden climatic events that have affected the demise of several civilizations. He argues that a sudden hot and dry climatic event could have led to the end of the Akkadian civilization some 4,200 years ago, which was recorded in 'The Curse of Akkad' (Linden, 2007: 50–3). In the Southeast Asian region, the impacts of climate change have also had been known to have caused the expansion and downfall of civilizations (Lieberman, 2003). The current Southeast Asian situation is getting worse, and one sees a rise in droughts plaguing the region (see Table 1.2).

Table 1.2: Climate hazard hotspots in Southeast Asia

Climate hazard hotspots in Southeast Asia	Dominant hazards
Northern Vietnam	Droughts
Eastern coastal areas of Vietnam	Cyclones, droughts
Mekong region of Vietnam	Sea level rise
Bangkok and its surrounding area in Thailand	Sea level rises, floods
Southern regions of Thailand	Droughts, floods
Philippines	Cyclones, landslides, floods, droughts
Sabah, Malaysia	Droughts
Western and eastern area of Java Island, Indonesia	Droughts, floods, landslides, sea level rises

Source: Yusuf and Francisco (2009)

Given that 70 per cent of the world water usage goes into agriculture, any major prolonged drought is going to affect food production severely and lead to starvation for its resident populations. The US intelligence agencies have forewarned that between 120 million and 1.2 billion people in Asia 'will continue to experience some water stress' and that as many as 50 million could face hunger by 2020 (*The Straits Times*, 26 June 2008: 20).

Prolonged drought is a major cause of heat waves around the world. To date, the number of deaths from heat waves is rising: Chicago (700 deaths in 1995), Andhra Pradesh, India (1,000 deaths in 2002), Europe (35,000 in 2003). China is also going through one of the worst droughts in 50 years in eight of its provinces in the northern and central areas of the country – with a reported 4.3 million people and 2.1 million livestock affected as well as 43 per cent of winter wheat supply at risk (*The Straits Times*, 7 February 2009: B5).

In economic terms, however, the 1997–8 El Niño impact was disastrous for Indonesia. Per capita incomes fell by 75 per cent from USD1,200 to USD300; unemployment increased to 40 per cent; in May 1998, food prices escalated by 4 per cent; and poverty levels increased, with 22.5 million people identified as being poor or living at poverty levels in 1997 (before El Niño and the currency crisis) to over 100 million in the spring of 1998 (Linden, 2007: 209–10). The 1997–1998 El Niño spurred on forest fires that burnt some 8 million hectares of land (Schweithelm & Glover, 2006:1) and the total economic damages of haze and fires costs USD4.5 billion (Schweithelm *et al.*, 2006: 133). As more people live in cities, the drought causing El Niño's is likely to have devastating impacts (especially on food security and water supplies) on urban populations in the future. The question is whether countries and cities are fully prepared to handle the future impacts of such a drought.

Sea Level Rises

Evidence shows that sea levels have already risen in the 20th century by 0.1–0.2 metres and are predicted to rise between 0.90 and 1.7 metres by 2100 (Spash, 2002: 66). In Southeast Asia, the Asian Development Bank's (2009: 5) report on climate change notes that the region has been experiencing a rise in sea levels of 1–3 millimetres annually over the last several decades from the 1950s. Over 60 million people in Asia will be affected if the sea level rises by 0.5 metres. Southeast Asian states with 173,251 kilometres of coastlines are likely to be the most affected region in Asia. Already the results of climate change on the Maldives are so visible due to sea level rises that the newly elected president stated that the country needs to save money to buy land elsewhere in order to pursue a mass evacuation programme for its citizens. In the Pacific Ocean, people in the island states are equally worried about their future, as sea level rises are already drowning out their small islands, beaches and coastal areas. Australia and New Zealand are often seen as target countries for the mass evacuation of Pacific Islanders seeking refuge from sea level rises.

Throughout Asia, major coastal cities (Shanghai, Calcutta, Singapore, Ho Chi Minh City, Dhaka) are likely to feel the impact of sea level rises beside the low-lying delta and coastal areas where huge concentrations of population live. Bangladesh is one country where sea level changes will have devastating impacts on its dense coastal populations. It is already well known that the country that is most prone to natural hazards and widespread poverty does not present an encouraging picture that will enable the country to avert a major disaster like the flooding of its low-lying agricultural farmlands.

There seem to be three choices open to states in Asia to avert sea level rises: (a) build dykes or seawalls to prevent seawater from intruding into the land areas; (b) encourage people along coastal areas to migrate to higher areas or inland areas as part of a national development programme; and (c) conduct national mass evacuations of people from islands that are likely to be drowned out by sea level rise. The Maldives is a good national case in point. It seems unlikely that the people in this island country will be able to defend the drowning out of their island world. The question is, who will accept all these climate-change refugees?

Global Warming

The irony of global warming arising from CO₂ increases is that its impacts around the world are likely to have two major outcomes: economic in terms of agricultural activities and tourism venues and health wise in terms of an increase of diseases.

Clearly, a rise in temperatures in higher latitudes is likely to open up vast areas in Russia, Canada, America and northern Europe for agricultural production, provided there are water sources. This would mean that the traditional bread-baskets might be shifting with new beneficiaries while the current food baskets might be losing their agricultural advantage. In tropical Asia, increases in temperature might prove to be disastrous for agricultural productivity, be it rice, palm oil or rubber. Even in hilly areas, rising temperatures could affect the growth of tea, coffee and other highland vegetables and crops. To date, there are a few studies that have looked into the impacts of rising temperatures on agricultural productions.

The consequences of global warming are already visible in the tourism industry. Tourism is a major global industry and is important to many Asian national and local economies: China, India, Thailand, Singapore, the Maldives, Bali and Macau. However, the main academic studies on climate change on the tourist industries seem to be confined to Western countries. Given that Europeans place a lot of emphasis on tourist destinations with good weather (Amelung *et al.*, 2007: 286), global warming can have a detrimental impact on certain current tourist destinations if these sites become hotter or wetter. It is already predicted that, with global warming, northern Europeans will find the Mediterranean areas in summer less attractive. Increasing temperatures mean melting of ice caps in mountainous areas, shorter winters and snow periods, which have affected many ski resorts in Europe, the USA and Canada.

In Asia, global warming impacts on tourism are likely to take place in several decades. If tropical Southeast Asian beach resorts become hotter and coral reefs deteriorate, it seems unlikely that these sites will be able to attract tourists (Amelung *et al.*, 2007: 290). Southeast Asian beach resorts in Bali, Phuket, Krabi, Pattaya, Menado, Palawan, Vietnam, West Malaysia, the Indonesian islands and Sabah are also likely to face sea level rises that may inevitably wipe out their current beaches, coral reefs and diving sites. Chou Loke Ming (in this issue) has spelt out, in no uncertain terms, the massive impact of climate change (heating of the oceans) on the decimation of Southeast Asia's coral reefs and, with it, the rich marine biodiversity.

IV. Global Architecture for Climate Change: How Will Asia Benefit?

Given the above complex political issues, the new global architecture for dealing with climate change and environmental issues needs to have political focus, economic muscle and administrative abilities at two ends of the global political landscape. On the one hand, states in Asia need to do more nationally to develop and enforce controls and regulations to delimit CO₂ emissions. On the other hand, we need an international system that is able to harmonize, integrate and find consensus in tackling the many environmental challenges facing Asian countries. Given that most Asian states are too poor, economically powerless and lacking in expertise to initiate climate change mitigation processes, they need to engage the developed countries to put in motion concrete steps to slow down global warming. Asian states cannot take a back seat position on climate change. They need to be actively involved to ensure that the international community acts responsibly and effectively in halting global warming. If not, developing Asian states will remain the losers in the unrelenting impacts of climate change in the latter half of the 21st century. Specifically, the Asian Development Bank (2009: xxvii) advocates that developed countries need to provide 'adequate transfers of financial resources and technological know-how' to developing countries since all countries must find a common global solution.

Arising from the global economic crisis, there are views that the world might be seeing signs of what Filipino economist Walden Bello calls 'deglobalization' and that would be a worrying sign for all stakeholders. If countries become more economically nationalistic and impose trade protectionism like India, Russia and the European Community, then the global community will be poorer for it. This is an issue that the Association of Southeast Asian Nations has been most worried about because it will certainly hurt many small, developing, export-orientated countries. Given that developing Asian countries cannot overhaul the political ecology of our current 'nation-state' system, one can certainly put in place a more responsive, effective, efficient and comprehensive global system to handle cross-border climate change problems, environmental trade and green investments. Indeed, the reason for fleshing out the impact of the current financial chaos is to demonstrate that the international attempts to forge a common stand

in addressing the larger oncoming climate change scenario are clearly more daunting. So long as the European Community, the United States and Japan fall into economic recession, global cooperation and financial underwriting of climate change issues are likely to be postponed and politically marginalized. Asian states are likely to feel the brunt of greater social and economic impacts arising from global warming and climate change.

Finding Global Common Ground for Climate Change

Asian states need to ensure that there is some global consensus on climate change issues in the next meeting in Durban, South Africa, in 2012. Asian states must try to speak with one voice to halt global warming and precipitate mitigation action amongst the global community. However, finding common ground amongst the 196 countries to deal with climate and environmental changes is a daunting task for several reasons.

Firstly, the impact of climate change has winners and losers amongst states, cities and provinces in the short term. Hence, while the losers might want quick redress, the winners might be less interested in quick remedies. Studies show that, with global warming, new breadbaskets in temperate countries will shift further north in favour of Canada, the Scandinavian countries and Russia. Global warming will also affect current tourist meccas like the Mediterranean countries. At the same time, many skiing resorts in North America, Switzerland and Europe will lose their attractiveness as tourist sites because their snow-capped mountains are rapidly melting.

Secondly, many of the losers of climate change are in poor countries in the developing world that have little political and economic clout to change global opinions much less set applied and pragmatic mitigation agendas. In Asia, China, Bangladesh, India and many states in Southeast Asia are likely to be losers as global warming develops. Even in the USA, critics noted that the slow response of the Bush Administration to New Orleans in the aftermath of Katrina was due to the fact that the area was poor, politically marginalized and the Democratic Party's political turf.

Thirdly, the issues of energy changes and reductions are so tied with economic issues and technological systems (transport, air conditioning, heating and electrical generators) that it is difficult for many developed as well as developing countries to wean themselves away from oil and gas systems. Oil- and gas-producing countries (Brunei, Indonesia, Myanmar, Malaysia and many Middle East countries) and companies (Shell, Exxon-Mobil) are enjoying the benefits of the monopoly on energy supplies and the high costs and hence their reluctance to make drastic changes towards a carbon-free environment. It would take decades to change technologies using oil and gas to an alternative environmentally-friendly fuel. Unfortunately, time is running out if change does not take place in the energy sector.

Fourthly, the difficulty in dealing with a coordinated global response to climate and environmental change reflects the way the world has developed its own political ecological system across the natural ecosystem. How is this so? The world as one interconnected and interrelated natural ecosystem or organism – if you like the analogy of Lovelock's (2007) Gaia thesis – has now been subdivided into over 196 political territories, defined by the boundaries of political states. Hence the natural global ecosystem is now a product of subdivided political ecosystems defined by power relationships between the 196 political entities rather than a subdivision brought about by nature. Within these 196 constituent polities lie major political contradictions, economic failures, cultural disjunctions and social upheavals. Hence the national response to climate change challenges is governed more by national leveraging and comparative advantages than by a global perspective for the common good. The challenge for the international community is to accept that climate change needs a global perspective to mitigation and, at the same time, a national environmental adaptive mechanism to buffer climate change impacts at the local level.

Fifthly, as Fareed Zakaria (2007) so eloquently argues in his book, *Freedom Lives*, we are witnessing and experiencing illiberalism, which is undermining the fabric of democracy and liberalism in the USA and around the world. Hence the question of democracy and liberalism is no guarantee that relationships within and between countries would be balanced, rational and respectful in ensuring the common good.

Sixthly, globalization and its implications are seeing not only incredible economic, political and cultural transformations but also a changing global power system where Western political and economic supremacy is likely to have to accommodate the ascendant Asian powers. Over a century ago, the German historian, Georg Wilhelm Friedrich Hegel (1956: 116) in his thought-provoking book, *The Philosophy of History*, underscored his Euro-centric view of world history when he noted: 'China and India lie, as it were, still outside the World's History, as the mere presupposition of elements whose combination must be waited for to constitute their vital progress. The unity of sustainability and subjective freedom so entirely excludes the distinction and contrast of the two elements, that, by this very fact, substance cannot arrive at reflection on itself – at subjectivity'. How very different the Western perception of ascendant China and India currently is. As Huntington (1996: 308) argues, the emerging politics of culture of non-Western civilizations and the 'increasing cultural assertiveness of their societies' are widely recognized: China, India, Japan and the Middle East. Mahbubani (2008), in his book, *The New Asian Hemisphere*, has been less apologetic about this Asian assertiveness which he succinctly summarized as the political and economic rise of Asia, which the Western world needs to accommodate in the currently entrenched Western-dominated global system. Other commentators are less enthused by Mahbubani's analysis of China's rise given her ageing population (334 million over 60 years by 2050), her dependence on non-Chinese-owned factories (60 per cent in 1980) and her dismal environmental record (50 per cent of the population lack clean drinking water and 70 per cent of lakes and rivers

are polluted). Furthermore, not only for China but also most of the developing countries, the subtext of globalization and its capitalistic enforcer is its widening disparities of wealth between states and within states and cities. Needless to say, these changes in the developed world (North America, Europe, Japan, Australasia) are likely to have political ramifications and exacerbate realignments of trade flows, migration patterns, geopolitical restructuring, food and natural resource utilization and development patterns.

Seventhly, the costs involved in research and development on climate change are prohibitive and out of the reach of developing Asian countries. While Lomborg (2008) strongly advocates research and development on climate change, the global community will be handicapped in developing the right global and regional responses to climate change because few countries have the expertise and financial abilities. Clive Spash (2002) noted that there were only five major climate change monitoring centres in the whole world, all located in the Western world. Unfortunately, no Asian state has the research expertise and research and development capability to undertake climate change research. But, given that many Asian countries are losers and victims of climate change, it is imperative that Asian states raise their profiles in international forums on climate change. Asian states must voice their concerns and ensure that they are heard when it comes to mitigating climate change or finding adaptive mechanisms to reduce impacts.

Exploring Common Grounds in Asia

Given these major impediments to finding a common ground for climate change, the global community needs to put in place the right infrastructure to deal with the long-term repercussions of climate change. The issues here are too complex, but one can highlight several possible areas:

Firstly, we need to have a global system that actively puts in place cultural adaptive mechanisms and develops long-term mitigation programmes to reduce CO₂ emissions, the source of global warming and other climate changes. For example, the rise in sea levels is likely to make the Maldives and other Pacific Island states uninhabitable and will drown many islands in Southeast Asia. Countries will certainly have to develop mass evacuation programmes, and the global community will need to decide the number of climate change refugees that various countries are willing to accept. If these issues are not resolved in the next couple of decades, many people in the affected tropical islands are likely to be affected. Clearly, many coastal-based Asian cities (Shanghai, Manila, Singapore, Mumbai, Ho Chi Minh City, Penang, Kuching, Jakarta, Surabaya) are likely to face the full wrath of sea level rises.

Secondly, there are several lessons that we can learn from the current global economic chaos. We need to think not only in a global manner but also, on environmental issues, ecologically. The ecological perspective embraces the climate change challenge from a holistic, integrative and global system.

In short, climate change cannot be nationalized or politicized because its impacts observe no political boundaries and national borders. In 2003, 35,000 people in Europe died of a massive heat wave despite being in a regional community that was economically well-off by international standards. If each country keeps defending its national environmental positions, the Asian community will suffer in the long run.

Thirdly, arising from an ecological perspective, the global community needs to think in terms of common-pool resources and the fact that mother earth has finite resources and capabilities. Global warming is about environmental goods and common-pool resources. Even the infinite resources around us (like air, water) are only, relatively speaking, infinite. Indeed, even these resources are being polluted rapidly and hence become less usable. If we do not think in terms of common-pool resources, we risk thinking of selfish, greedy, exploitative and non-conservational ways of exploiting and using the environment around us. All the undergirding issues that have led to the current global economic crisis need to be understood if we want to find a common ground on common-pool resources: trust, reciprocity, social and political capital, holistic vision and sustainability. Without a common-pool vision amongst stakeholders, the global community in the long run will face Hardin's (1980) scenario of the 'tragedy of the global commons'. If 20 million Japanese in Tokyo can observe civic behaviour to keep their city clean and take their city as a common-pool resource, I think there is hope in extending this thinking to all citizens. At the end of the day, Gaia will not be able to support our extravagant consuming and rapacious polluting behaviour. The resulting problem, as Lovelock (2007) notes, is that Gaia is sick with a fever but there is wonder whether she is terminally ill.

Fourthly, given that the biggest culprits of climate change are the developed countries and major corporations, any mitigation issues would have to begin with the right economic incentives and equations. Climate change issues are so enmeshed with global capitalism, world trade and corporate profitability that no major country or corporation wants to take the lead in making changes. For example, in Spain, Tabara (2003) showed that climate change policies lagged behind because they were repeatedly portrayed as being a potential drag on economic growth. This is, in a nutshell, the message of Al Gore's 'inconvenient truth': that, while nations know the impact of climate change, they do not want to do anything because of the economic, political and social inconveniences it is likely to cause. This explains the lack of global leadership and political will to tackle climate change issues.

Economic Equations for Climate Change: Asian Implications

The lessons we are learning from the massive current global economic crisis demonstrate that, while economic activities are increasingly being globalized, the system of dealing with global economic problems is constrained in an outmoded political system of the 20th century. The magnitude of the 2008 subprime crisis is best seen in the fact that USD50 trillion of financial assets was wiped

out in 2008, including USD9.6 trillion of losses in Asia alone. The flows of trade, tourism, currencies, industrial relationships and labour are all increasingly moving rapidly across porous borders, but the way governments are handling the economic crisis still remains very much a national affair. Each country has been trying to solve its domestic economic problems and indeed showing signs of being nationalistic in its responses. The global economic system is flawed because one cannot expect the USA to remain the world's buyer of finished products and to remain at the forefront of a never-ending materialistic binge with an insatiable appetite seen in its consumer spending.

The academic discourses from the social sciences on climate change have produced a rather unilateral frame of reference. If one looks at the social science inputs on climate change, it would seem that the major voices have come from only economists. Three books by economists have made interesting contributions to the debate about cultural adaptive and mitigation issues: they are Spash's (2002) *Greenhouse Economics*, Stern's (2007) *The Economics of Climate Change* and Nordhaus' (2008) *A Question of Balance*. While all three books make important contributions to the understanding of the economic costing and equations of climate change, an understanding of the global framework on climate change must certainly be more interdisciplinary in substance and outlook. Clearly, the economic perspective tends to resonate most amongst private-sector entrepreneurs, businessmen, industrialists and governments. Everyone seems to think that climate and environmental change is an economic issue that can be solved by using carrot (economic incentives, tax rebates) and stick (polluter pay, fines, carbon taxes, regulations) economic policies. Certainly, many governments see climate change challenges as either economic opportunities (carbon trading) or liabilities (reductions of CO₂ affecting businesses).

Using his DICE model, Nordhaus (2008: 195) calculates that climate change damages in the baseline (uncontrolled) case will amount to USD22.6 trillion compared with USD17.3 trillion in an optimal case. Stern (2007: 179) has estimated that the economic impact of a baseline-climate scenario would be 2.6 per cent globally but that the mean costs for India and Southeast Asia would be 6 per cent of regional gross domestic product (GDP) by 2100. Based on social costing, Nordhaus (2008: 196–7) using the 2005 baseline of USD28 per metric ton of carbon, calculates that carbon price will rise to USD95 by 2050 and USD202 per tonne carbon by 2100. Depending on the targets of carbon reduction by 2050, economic costs and mitigation measures will need to be calculated accordingly. Stern (2007: 233) suggests a reduction target of 85 per cent to meet its 450 ppm targets by 2050; the 2007 German proposal limits global CO₂ emission by 50 per cent of the 1990 levels by 2050; and Al Gore advocates a 90 per cent reduction of CO₂ emissions from current levels in the USA (Nordhaus, 2008: 201). Hence, based on these targets, Gore's reduction would cost USD17 trillion, while Stern's (2007) would cost USD22 trillion.

V. National Strategies in Adaptation and Mitigation

The importance of the nation-state in managing climate change and environmental problems cannot be ignored because, despite all the talks about globalization, the nation-state in Asia still remains the political controlling body for populations and territorial autonomy. In ecological terms, Asian states are political ecosystems in that their ecosystems are defined by the power of the state governments and competing commercial enterprises. Hence the state is the definer and bearer of national standards, benchmarks and regulations, which are important requisites in containing climate change emissions at the domestic level within national boundaries. Given that the international system is still very much a state-based system, one needs to work with countries to ensure that nations have effective climate change control systems. While Asia is often seen as the global dynamo of the 21st century, the economic catalyst for the rest of the world's economic growth and development, this huge continent also carries the seeds of her own destruction if she does not take into consideration the environmental equation in her modernizing and developmental programmes. What makes the Asian continent so vulnerable? I suggest five factors: population growth, its widening disparities of wealth, its weak governments, urban growth and the growing expectations of its citizens for a better quality of life. All these issues are supported by the environmental equation and climate change complications.

In the Asian landscape, we are already witnessing various categories of states based on their government's ability to manage the state. These include the failed states, the lesser developing and fragile states, the developmental states and the developed states. Several Asian states have been written off as failed states. These include Pakistan and, to some extent, Afghanistan and Iraq. Other Asian countries are in a fragile state that are tottering on the brink of political and economic collapse. These include North Korea, Laos, Bangladesh, East Timor and Nepal. The bulk of the Asian states might be termed developmental states seeking modernization and development. These include China, India, Jordan, Indonesia, Mongolia, Myanmar, Vietnam, Thailand, South Korea, Sri Lanka, Saudi Arabia and the Gulf States. And, finally, we have the more developed countries of Japan, Singapore, Brunei, South Korea and Israel, which have achieved high levels of development, political stability and economic prowess. None of these categories are rigid classifications given the dynamic nature of politics and economic development. Given the wide diversity of states in Asia, it is difficult to apply blanket prescriptions for environmental management and climate change adaptation and mitigation solutions. What every Asian country needs is enlightened political leaders, good governance and non-corrupt government machinery. The tragedy is that state formation in Asia, like elsewhere in the developing world, is of recent vintage, a product of colonialism and hence very much in the throes of political development.

While China and India have become the current poster countries of rapid development and successful capitalism, they have also become the pin-up states of environmental degradation, inequality and poverty. Rapid development

has meant that both countries have not been able to consider and reflect on the environmental lapses in their quest for modernization and development. Indeed, what is ironic is that both states have a strong indigenous tradition of ecological principles and practices enshrined in their religions and cultural traditions: the Taoist beliefs and *feng shui* practices in China; the Hindu and Buddhist religions and philosophies; and the *Vastu Sastra* practices in India. Yet, the paths to human-nature relationships have met with different outcomes in both countries. In China, indigenous beliefs and religious worship have not led to a moral responsibility of Earth care and conservation. Tuan (1972) noted that the Chinese landscape was already devoid of forest by the 19th century because of centuries of demand for wood for various purposes. His view is that eco-friendly world views do not necessarily dictate eco-friendly human behaviour in Chinese history. To compound the matter, the communist regime that took over in 1949 changed the eco-centric traditional Taoist culture of the Chinese into a 'possibilistic' ideological credo (environment provides *possibilities* for human usage), where human beings were placed in the centre and above nature. Mao grew the Chinese forests in his ambitious tree-planting programme on the Marxist ideological position that human beings need to conquer nature and take over the power of nature. Such a Marxist credo, if followed blindly, would have undermined China's environment even further. The idea that human technology, intelligence and power are above Mother Nature is clearly what environmentalists feel uneasy about and is in total opposition to ecological thinking.

In India, human-nature relations had a better historical outcome. The Indian culture is embedded with deep reverence for nature in Hinduism and Buddhism, the idea of the transmigration of the soul that unifies all nature with human beings, an adherence to vegetarianism and the respect for cows, which, Harris (2008) has argued, provides important ecological and sustainable ways for living. When the philosopher Passmore (1974) compared India and Australia in the 1970s, he noted that India, despite its 850-million population, conserved and lived in more ecologically correct ways than the 18 million Australians, who, through their mining, pasture systems and agrarian activities, left the landscape heavily degraded. In both the Indian and Chinese cases, we see how environmental relationships are important in understanding the long-term sustainability of productive landscapes.

In the long run, it is difficult not to be worried about the Malthusian equation in assessing the sustainability of Asian states, especially the large states of China, India, Indonesia, Pakistan, Bangladesh and even Japan. Asia accounts for three-fifths of the global population, and a major proportion resides in two countries. Will both China and India, with over one billion population, be able to sustain their population's livelihood, their standards of living, their increasing expectations of a better life and the state's trajectory for national development, modernization and urbanization? I have my doubts.

Besides the broad global initiatives, cities and countries can act collectively to work together on important environmental initiatives arising from climate change

challenges in the future through adaptive and mitigation measures. Despite the fact the decision-making on environmental issues lies with governments concerned with their nation-states, major environmental impacts unfortunately will affect cities and urban agglomerations. Hence, unless adaptive measures are put in place for urban communities, the outcomes of climate change and accompanying environmental impacts will have serious consequences for the global urban populations. Adaptation is defined here as ‘any adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities’ (Stern, 2007: 458). There is probably an exhaustive list that one could compose, but I will highlight a few important areas that need attention.

Water

Given the onslaught of global warming and climatic change for the rest of the 21st century and the likely outcomes of aridity, water shortages and decreasing precipitation, countries and cities should be mindful that they need to take steps to mitigate the anticipated long drought in the near future. In this area, a tripartite arrangement needs to be forged amongst city governments, companies (multinational companies) and universities/research institutions to research and develop new technologies for increasing drinkable and clean water. Here is one area where environmental concerns can also have positive economic outcomes. The International Water Week (23–25 June 2008) in Singapore, for example, attracted some 390 companies in the water technology business. Singapore’s long-term research in water technologies, in conjunction with private companies, is likely to see some interesting results. When our water agreements with Malaysia run out by 2061, the city-state will probably be self-sufficient in water, provided that our annual precipitation rates remain the same. Singapore consumes 1.3 million cubic litres of water, or roughly 550 swimming pools, per day. Through more prudent and efficient usage and higher water charges, water consumption in Singapore is being reduced from 176 litres per day in 1994 to 158 litres in 2006. The target is to bring daily water consumption down to 155 litres a day by 2012. Many cities around the world could embark on a similar venture: using the urban environment as a test bed for many innovative water systems such as desalination, recycling water and reclaiming water. No matter how affluent and economically buoyant a city is, if there is severe and prolonged water scarcity, urban residents will migrate, the urban economy will fizzle out and the city will collapse.

We have already successfully tested methods of making deserts into agricultural oases. The fertile Napa and Santa Clara Valleys were once deserts, but, with a 400-mile irrigation scheme put in place decades ago, the California government has changed these barren areas into one of the most productive agricultural areas in the USA, producing all sorts of vegetables, fruits and so forth.

Food Security

Nothing is more worrying for political leaders than the national threats of food insecurity. If one is without transport, one can walk. If housing is inadequate, one

can live as a slum or squatter dweller. But, without food, there is no alternative. Without food, you either die from starvation or become sick and prone to fatal illnesses. But before that, a hungry person is an angry person, willing to revolt and demonstrate violently. The twin problems in Asia and globally of prolonged drought and massive floods are causing havoc to agricultural production and food supplies. With over 45 per cent of the population living in cities in Asia, food scarcity creates inflation and urban dwellers suffer the most. In 2008, the food crisis caused riots and strikes in 30 countries and brought down two governments. In 2010–2011, the food crisis is hitting with greater venom. The Arab Spring is said to be fuelled by inflation in food prices in major cities caused in part by global warming. The result is the collapse of governments in Tunisia, Egypt, Libya and likely also in Syria and Yemen.

Asia, with countries containing states with the world's largest populations (China, India, Indonesia, Pakistan, Bangladesh and Japan), is vulnerable to climate change-induced food insecurity. Rich countries and political entities like Singapore, Brunei, Japan, Hong Kong and Taiwan might view food inflation with less worry. According to former Prime Minister of Singapore, Lee Kuan Yew, price inflation of food was not worrying because, he argued, 'it doesn't matter whether you grow your own food or you buy your food. The question is the price. If there is a food shortage worldwide, the price of food, produce, will go up. Thus, the answer for a country like Singapore is to make sure that our incomes rise, our total GDP rises faster than our food prices'.

Such logic assumes that the world produces enough food to feed every one of the seven billion people and that food-exporting countries do not stop exporting food. Given the climate change problems and food insecurity in 2010–2011, many Asian countries are following strictly national policies with regard to their rice production. India has introduced a rice export ban; Myanmar has curbed rice exports; Cambodia, suffering from its worst floods, has halted rice exports because of domestic price increases; and Vietnam, another rice exporter, has cut rice exports to ease its domestic inflation. In addition, the new Thai Government is adding inflation to food by trying to double its rice price to meet its election promise to increase incomes of farmers. Overseas rice producers like Brazil and Egypt have likewise banned rice exports. These national policies by rice exporters are likely to reverberate amongst Asian rice importers, and the impact is likely to spiral and undermine the already gloomy economic situation.

Agriculture is threatened by two global trends. Firstly, agricultural land use is diminishing. In 1950, per capita arable land was 0.45 hectares per person, but, by 1997, it was 0.25 hectares per person; by 2050, it is estimated to be 0.15 ha per person. The availability of land for meeting human requirements has shrunk from 19.5 acres per person in 1900 to 5 acres per person in 2005 (Laszlo, 2009: 16). The other worrying trend is shrinking water supplies, a major variable in agricultural production. In 1950, fresh water per capita was 17,000 cubic metres but, by 1999, it was reduced to 7,300 cubic metres. The estimate for 2025 is 4,800 cubic metres (Laszlo, 2009: 9). Unless we find new agricultural techniques and technologies to

grow crops on less land and with less water, the future global food security situation looks dismal.

Urban Transportation Systems

With the invention of the car, cities of the 20th century have become automobile cities. Cars in cities have grown almost five-fold. In 1970, there were 200 million cars globally. But, by 2006, there were 850 million cars, and it is estimated that, by 2030, there will be 1.7 billion cars (Newman & Kenworthy, 2007: 67). Essentially, cities of the 21st century are going to be shaped more by their transportation systems. This has dire environmental consequences due to carbon emissions from vehicles, and economic consequences, with oil prices hitting over USD140 per barrel in July 2008. The growth of the car population creates other problems in cities. Traffic congestion in Bangkok is the biggest cause of waste of time. The city has 5.7 million vehicles, a figure that is growing at 2,000 vehicles per day. Each day, 700,000 trips are made on Bangkok's metro train system compared to 6.5 million on public buses and 10 million in private vehicles (Beech, 2008: 43). In 1999, the average motorist spent an equivalent of 44 working days sitting in traffic jams (Brown, 2001: 194), which can be translated as USD1 billion lost in productivity annually (Beech, 2008: 44).

Given that cars are one of the most important culprits of CO₂ emissions in cities, it is appalling to read glowing reports about India producing a 'people's car', the Tata Motors Nano car, sold at INR 100,000 (about USD2,000). Right in the heart of climate change debates, the car is applauded for now being affordable to village Indians, riding on the villagers' sentiments that possessing a car is 'a status symbol' (Jyoti, 2009: 40). In China, India, Vietnam, Cambodia, Taiwan and Malaysia, there is a graduation of transportation from bicycles to motorcycles and, finally, cars of all brands and sizes. Hence, in the booming economies of China and India, car populations are likely to increase by 15 times and 13 times respectively over the next 30 years (Schaefer-Preuss, 2008: 26). Cars are marketed not only in India but also marketed around the world. While cars are excellent to the fuel economy (56 miles to the gallon), have Indians and the world community wondered what millions of these cars on the road will do in raising CO₂ levels? Are industrialists, entrepreneurs and government officials oblivious to the fact that public transportation is the most efficient means for transport? Unfortunately, the industrial economy seems to outweigh in many Asian countries a change to mass transportation systems. In Thailand, South Korea, China, India, Indonesia and Malaysia, there are national car industries that need to be protected economically above environmental concerns.

In a study of 15 cities around the world in 1995, the most energy-wasteful cities were Atlanta and New York, cities dependent on cars. The most energy-efficient cities were Ho Chi Minh City and Shanghai. With regard to gasoline usage, each citizen in these two US cities, Atlanta (2,962 litres annually) and New York (1,237 litres), were using 110 times and 45 times more gasoline respectively than a resident of the Vietnamese city of Ho Chi Minh (27 litres annually) (Newman &

Kenworthy, 2007: 68). If urban transport systems are held hostage to oil, then the current steep increases in fuel prices are creating urban inflation across the board for all products, which will make urban living unbearable for the urban poor.

The most important equation in energy-efficient and environment-friendly urban environments boils down to the use of public transportation systems. Tokyo and Hong Kong are highly densely populated cities, but they use 10–25 times less gasoline than Atlanta because of a dense network of public mass transit and rail systems (Newman & Kenworthy, 2007: 68). Based on the various modes of urban transport, a study of 32 cities in 1990 showed clearly that cars have the lowest fuel efficiency and lowest occupancy rates amongst the five main modes of urban transportation: cars, bus, heavy rail on electric, diesel and light rail (see Table 1.3). The economic efficiency of urban transport system demonstrates that, while freeway traffic carries 2,500 people per hour, buses carry 5,000–8,000 persons; light rails support 10,000–20,000 persons and heavy rails carry 50,000 persons per hour, 20 times more than freeways (Newman & Kenworthy, 2007: 83). The economic savings of city residents is enormous in the choice between cars and transit systems: a transit-based urban system spends about 5–8 per cent of GDP on transportation, while car-based cities spend 12–15 per cent or, in the case of Brisbane, 18 per cent of GDP (Newman & Kenworthy, 2007: 82).

Table 1.3: Average Fuel Efficiency and Occupancy by Mode in 32 Cities, 1990

Mode	Average Fuel Efficiency	Measured Average Vehicle Occupancy
	(megajoules per passenger kilometer)	(number of occupants)
Car	2.91	1.52
Bus	1.56	13.83
Heavy Rail (electric)	0.44	30.96
Heavy Rail (diesel)	1.44	27.97
Light Rail/Tram	0.79	29.93

Note: Rail mode occupancies are given on the basis of average loading per wagon, not per train. The average occupancy of cars is a 24-hour figure.

Source: Starke, Linda (ed.) (2007) *State of the World 2007: Our Urban Future*, New York and London: W.W. Norton & Co., p. 73.

Solving Brown Issues: Public Housing

Of the estimated one billion people living in informal settlements worldwide (Chafe, 2007: 115), more than 900 million urban dwellers live in slums in low- and middle-income nations (Satterthwaite & McGranahan, 2007: 28). The rural urban migration that feeds slum and squatter settlement growth in cities explains why cities in poor countries are expanding rapidly. Over and above this, the lack

of electricity means that more firewood and charcoal are used for cooking, for example. This creates indoor pollution, which is a major problem in slum and squatter settlements (Lomborg, 2001).

A city that cannot house its population in reasonably good housing can never solve its intra-urban environmental challenges. The brown issues within cities will not be resolved if public housing projects are not addressed for slum and squatter dwellers. Without the ambitious public housing programmes by the Housing Development Board since 1960, which now houses 85 per cent of Singapore's 5.18 million population, Singapore's rapid and outstanding development over the last 40 years would never have been possible. The city-state's transformation from Third World to First World could not have taken place if 35 per cent of its urban population in the 1960s still remains in slum and squatter settlements today. The quality of life and living for the majority of all urban residents is what makes cities the beacons of human civilization and sustainable systems.

The nature of housing policy varies from country to country as it does at different periods of time. In the UK, while sustainable housing has been in place since the early 1970s, there have been changes in the values, direction and technological practices employed over the decades (Lovell, 2004). Clearly, the objectives of sustainable housing are different (smart housing) in the UK in the 1970s from those in the 2000s and onwards. Sustainable housing today is geared towards climate change issues: low-carbon housing and low-carbons discourses. Low-carbon housing is defined as housing that 'has lower greenhouse gas emissions (principally CO₂) compared with an average new house built to the UK 2000 Building Regulations – that is less than one tonne of carbon per year' (Lovell, 2004: 36). In Singapore, on the other hand, public housing has moved from merely adequate shelter at the barest minimum to upgrading programmes that best reflect 'ecological modernism' goals that underscore the use of eco-efficiency and technological solutions in housing while keeping up with the domestic rise of social standards and aspirations of its residents. In Singapore's new housing policies, the issues seem directed less at carbon reductions (energy efficiency, renewal energy) than at saving space and ensuring spatial efficiency in building higher-density housing (40- to 50-storey-high flats). Hence one meets environmental efficiency through economies of scale.

The earlier Singapore model of bare environmental technologies and eco-efficiency is what the United Nations is looking at for the lesser developed countries. So is China. The move to sustainable ways of solving intra-urban housing problems is thus geared to providing public housing flats with clean water, modern sanitation and a well-managed refuse disposal system.

Eco-Cities and Sustainable Cities

The challenge of sustainable living in the light of climate change would lie in how we manage our cities. Given that cities will become the norm of living for the world's population this century, one would need to ask whether Asia's

environmentalists, economists, technologists, social scientists and think-tank scholars have paid sufficient attention to how cities are going to become liveable environments and sustainable nodal entities for 50 per cent of Asia's population. Asian states need to pay attention to the pan-European network, referred to as the Building Environmental Quality Evaluation for Sustainability, which foregrounds urban sustainability, provides a road map that links spatial and time frame and adopts assessment methods (Vreeker *et al.*, 2009). Globally, by 2030, four of the five global urban residents will be in what we refer to now as the 'developing' world. This huge urban population will be residing in 377 cities of between one to five million residents spread over Africa (59 cities), Latin America and the Caribbean (65 cities) and Asia (253 cities) (Flavin, 2007: xxiii). The largest expansion of urban population between 2000 and 2030 will be in the less developed countries, which will see a more than 15 per cent increase in urban population as opposed to the 7 per cent increase in the More Developed Countries during the same time frame. In Asia, rapid urbanization means that 44 million people are added to cities annually. This means, on a daily basis, that a further 120,000 people are added to Asian cities, requiring more than 20,000 new dwellings and 250 kilometres of new roads and other infrastructure facilities to supply more than six megalitres of potable water (Roberts & Kanaley, 2006: 1).

Specifically, governments and planners around the world have attempted to green the urban development agenda by building 'eco-cities'. What is an ecological city? According to geographer White (2002: 194), an ecological city is a 'city that provides an acceptable standard of living for its human occupants without depleting the ecosystems and bio-geochemical cycles on which it depends'. China, in particular, seems to be going into partnership with various governments and corporations to build its new green-friendly eco-cities (Tianjin, Guangming, Yangzhou, Changzhou, Gegu and Guiyang). The British Government has scheduled as well to build 10 eco-cities by 2020. But are these eco-cities the panacea for arresting global warming? In my view, they are not. The eco-cities have been maintaining intra-urban environmental standards for some time and have been progressive, but they are less able to deal with reducing extra-urban ecological footprint challenges. Reducing the ecological footprint of cities requires not just technological inventions but also the more difficult changes in our thinking, which should be geared towards an economic system, our capitalistic system of trading, our materialistic value systems, our consumer-based ethos, our endorsement of common-pool resources and our ethical relationships to nature and community. Currently, there are two models of the eco-city: Singapore and British. The Singapore model of the eco-city essentially addresses the intra-urban environmental issues that are often referred to as brown issues (clean water, clean electricity, garbage disposal systems, modern sanitation and sewerage). There is no doubt that the Singapore model provides an apt model for many Asian developing countries in solving their major brown issues, the environmental underbelly for creating sustainable cities. The Singapore model looks at housing through the prism of ecological modernism, in which public housing provides a badge of modern status for its residents. Hence, it is not surprising that given their heavily polluted and unclean cities, the Chinese Government is looking

to Singapore as a model for their eco-cities, a model that can solve their brown issues sustainably and cleanly. The reason why Singapore can deal with its intra-urban brown equation is that the country is a city-state. The British model of the eco-city is perhaps more geared towards finding a balance between residents within the city with that of its hinterlands. The British model is thus concerned more about the ecological footprint of its urban residents.

The challenge of Asian urbanization falls within two spheres. Firstly, there is the intra-urban environment and urban space that one needs to address and deal with. Essentially, do we have the ability to develop an expanding and plastic infrastructure that can accommodate an expanding resident and floating population (tourists, mobile labour) within the city? The term 'plastic' is used to emphasize the flexibility at which city officials need to expand essential infrastructures to accommodate increasing urban populations. The academic discourses are on adequate housing, clean water, modern sewerage systems, garbage disposal and efficient public transport networks.

Secondly, with massive populations concentrated in spatial nodes, the city becomes a major importer of many natural resources, food, water and other creature comforts to sustain its population. Based on White's (2002) definition of the eco-city, this is the real critical challenge for many cities in the near future. Are they sustainable in terms of getting supplies to feed their citizens? This becomes a major problem because in many Asian cities, poverty reigns, and a two-tier social system of the haves and have-nots becomes starkly evident. The question of supporting and sustaining urban populations is thus not an issue of the relationships to immediate hinterlands but whether urban populations can afford the imports of food, water, energy supplies and natural resources to sustain their living. Hence, if cities essentially are not economically sustainable entities, it would be difficult for resident populations within cities to lead sustainable livelihoods.

Reducing and Changing Energy Consumption

The whole global economy is lubricated with oil. The consequences of changing to other alternative energy sources are really mind-boggling. Where does one begin unless there is a global mindset change and political will amongst state heads, political leaders, corporate honchos, and entrepreneurs to reduce carbon-emitting sources of energy and switching to other clean-energy sources? Given that the major coal-using energy countries are also the major global powers and countries: China, India, the USA, and Germany, it seems unlikely that changes in energy policies will come rapidly. Despite all the talk of clean coal, that is still yet to be realized. Hence many of these countries have been less than enthusiastic in raising the bar in tackling the problems of CO₂ outputs.

As cities become major population nodes, they are also major consumers of energy due to domestic consumption. Put these figures together and it explains the 140 per cent surge in electricity capacity in China and the 80 per cent rise in India in the next decade (2008–2017) (*The Economist*, 2008: 78). With the estimated

75 per cent rise in electricity demands in the emerging economies over the next decade (2008–2017), all of which are dependent on fossil fuels, the vision of air pollution and global warming in our near future looks grim. Currently, the USA and China are major urban emitters of greenhouse gases because they still use coal for the generation of electricity.

The long dependence on cheap fuels has lulled the global urban community into accepting oil as the main energy provider from power plants to motorcycles. Research on alternative energy sources began only recently. Furthermore, cheap oil means that it is difficult to embark on other alternative fuels, which are more expensive to run than petroleum. Secondly, unlike coal, oil and gas are relatively portable fuels and hence are technologically compatible with mobile vehicles. Oil and gas also are less polluting than coal and hence are seen as environmentally friendly. Thirdly, the non-carbon and renewable energy sources have had limitations. Wind and solar powers are not easily available in many cities and countries because of their less predictable supplies.

The more radical alternative, as seen in the current international political climate, is for urban governments to adopt Lovelock's (2007) prescription of nuclear energy. Given the problems with fossil fuels in a Gaian world, where deteriorating global warming predominates, Lovelock (2007: 196) puts his argument this way: 'Nuclear energy is free of emissions and independent of imports from what will be a disturbed world. We would be right to cut back all emissions to a minimum, and this includes emissions of methane from leaking pipes and landfill sites. But most of all, we need electricity to sustain our technologically based civilization'. After the disastrous Fukushima nuclear plant accident due to the tsunami in 2011, Germany and Italy decided to terminate their nuclear energy programmes in two to three decades. No country in Asia, however, has negated the option of using nuclear energy. Yet, the adoption of nuclear energy is contingent on heavy government financial involvement and management, the question of how cities will be able to treat and store nuclear waste materials safely and effectively, and the vexing issue of security in a terrorist-phobic global environment – hence the developed world's reluctance to approve of Iran and North Korea's nuclear energy programmes.

VI. What is Asia's Response to the American Model of Unsustainable Development?

Huntington's (1996) clash of civilization thesis, like Hardin's (1980) lifeboat ethics, remains an outmoded Western cold-war thinking: that the Western global supremacy or hegemony is being eroded and undermined by new players in the global political landscape. The capitalistic-driven, modern, developed 'civilized' societies now comprise countries in the far-flung corners of the globe. North America, Europe, Japan, Australia and New Zealand that Huntington defined as the 'West' versus the rest of the other civilizations. His grim threats of the impending 'fall' of Western civilization were attributed to Islamic and Confucian

states, located in Asia. One can see the ghost of Said's Orientalist ideology being resurrected again.

But the West versus the rest thesis in economic terms lies more in the restricting of the global demand and supply of natural and human resources. The whole economic synergy in the US model of development around the world has led to massive demands of commodities globally. Currently, speculators from the developed countries still control the commodities futures. The commodity index over the last four years (over the period 2003–2008, for example) rose from USD13 billion in 2003 to USD260 billion in March 2008. The price of 25 commodities has been raised to an average of 183 per cent within those four and a quarter years. Such price increases have created major inflation trends worldwide, food shortages and commodity price increases in basic utilities that have become the source of urban riots, strikes and political tensions especially in the developing world. For example, the *China Daily* reported that there were 50,000 environment-related riots, protests and disputes in China in 2005 (Roseland & Soots, 2007: 153). But, if this current scenario plays itself out in the remainder of the 21st century, it can have unhealthy outcomes as alluded to by various academics and policy commentators. Clearly, while Western models of capitalism are criticized for being unsustainable by Speth (2008), Stoll (2008) and Parr (2009), the rest of the developing world seems oblivious to their inherent environmental dangers, economic overkill, unsustainable development and widening disparities of wealth. The poster boy of development, the USA is too shiny a model for any developing, poverty-stricken country to see the downside of the capitalistic model.

On the other hand, the developed Western world is resisting competition and the new threats of the nouveau riche societies especially in Asia – China and India. The main challenge to the Western control of commodities reflects the changing geopolitical and political ecological scenario. The burning question is whether the current developed club of the Western 'world' (North America, Europe, Japan, Australia, New Zealand) will accommodate new entrants from Asia, Africa and Latin America. Specifically, whether there is a global hinterland that can accommodate all the new entrants into consumerism and capitalistic commodification. The complication of globalized hinterlands is that the agricultural produce grown is no more than a product of demand from the immediate cities they used to serve. Today, with demand for various raw materials globally, hinterlands have been turned from food-producing fields (rice, wheat, corn) into biodiesel and biofuel plantation (palm oil, soya bean, corn, sugarcane), livestock foods (maize), raw materials (rubber plantations), beverages (coffee, tea, cocoa), dairy farm (cattle, sheep) lands and timber plantations. Is there any wonder that food prices have escalated, food supplies have dwindled, urban inflation is rampant and food insecurity is becoming a major political and security problem?

The new czars of the global economy are now in Asia. Not surprisingly, *The Economist* (2008: 13) labelled China as the 'new colonialists' on the basis of its voracious appetite for global commodities. China's demand for oil rose from

1.88 billion barrels at the end of 2003 to 2.8 billion barrels in March 2008, an increase of 920 million barrels in just four and a quarter years. China currently consumes 50 per cent of the world's pork, 50 per cent of the world's cement, 33 per cent of the world's steel, 25 per cent of the world's aluminium and it has bought four-fifths of the increase in the world's copper supply since 2000 (*The Economist*, 2008:13). China's development, based on the Western model of development (the fossil-fuel-based, automotive-centred, throw-away economy), will not 'work for China's 1.45 billion in 2031' according to Brown (2001: 11). Given this dependence on fossil fuels, China's oil imports are likely to triple by 2030 (*The Economist*, 2008: 13).

This is not the only worry of the developed countries, but it is a major concern for environmentalists, whether the global hinterland can accommodate the massive consumption and consumerism in the lesser developed world. Will this capitalistic consumer-based economic system work for India or the three billion in the developing world? Unfortunately, the global politics of natural resources and development has less to do with the world's environmental problems and sustainability issues than with the developing countries feeling cheated of not attaining the 'American dream'. If the developed countries in the global community thwart China's or India's purchasing powers, the global competition for commodities is going to be the new fault lines of the international economic and political systems. Can international trade then ever be free, fair and open ended in a fixed pie scenario? As each national stakeholder tries to maximize his share of Gaia's natural resources at whatever costs, the tragedy of the global commons seems an inevitable future scenario. As Cahill (2002: 165) argues, the ecological footprint is meant 'to demonstrate the practicalities of resource conservation, social justice for the world's poor countries today and equity for future generations'. But this might be more of a theoretical statement than an underscoring of practical realities.

VII. Concluding Thoughts

What after all today's ecological movement is advocating is a return to isolation, and the abandonment of treasure and knowledge to tribes and nations in foreign lands that pose no threat to us. Consciously or otherwise, this is a death wish. We are not talking here about eschewing food additives and colouring matter, whole food in a whole land, as were the earlier ecologists, but something different – and deathly. For today's ecologists, their hope of regeneration presupposes a return to primitivism, and, thus, whether they wish to enunciate it or not, concomitant anarchy, the burning before the replanting, the cutting down of the dead tree. The father of the movement is an utter rejection of all that is and, for at least three millennia, all that was.

–*Bramwell* (1990: 248)

Bramwell's dismal concluding statement in her history of ecology in the 20th century would come as a surprise to most environmentalists. It seems difficult to imagine that concerned ecologists are actually advocating a return to primitivism or a return to a state of indigenous living by adopting an ecological approach to our way of living. On the other hand, even if the key to sustainable living lies with indigenous peoples, should we write them off as unrealistic examples? What is needed is not to write off the value of indigenous livelihoods, folk culture and folk science as an 'oddity' (Orr, 2004: 10) but to embrace such indigenous knowledge as part of the wider fund of knowledge that can support the building of a sustainable society. And, within the kernel of indigenous folklores and culture lies important knowledge about human-nature relationships and ecological ideas. It seems a myth to believe that education is about giving students the means for upward mobility and success in life framed within a unilineal view of development and state progress. The tragedy, as Orr (2004: 12) notes, is that our planet does not need more 'successful people'. Rather, it needs more 'peacemakers, healers, restorers, storytellers and lovers of every kind'. And Asia still has a storehouse of many of these indigenous healers, folk restorers and storytellers.

While cities have traditionally served as the catalyst for human progress and civilization as well as to sustain high culture, climate change is likely to have major impacts on cities both directly and indirectly. The growing global environmental problems and the unpredictable climate change outcomes point us in another direction of caution, circumspection and reflection of the trajectory of global civilization. Apart from Fernández-Armesto's (2002), Linden's (2007), Fagan's (2008) and Whyte's (2008) books, which discuss the impacts of climate and environmental changes, circumstances and limitations of varied civilizations, few historical studies have considered the environmental dimensions, the abuse of nature in the equation of what makes civilizations sustainable. If one accepts Braudel's (1995: 7) view that civilization is 'the common heritage of humanity', then all cities and civilizations around the world should share the responsibility in sustaining not just their cities but also global Gaian civilization. The software of Gaian civilization should include the way society relates to nature in an ecologically responsible manner as well as the use and conservation of environmental resources. Asia has a lot to share because, on a global scale, it is more than any other region, has produced a plethora of civilizations in the Middle East, South Asia, Southeast Asia and East Asia. Indeed, in his history of civilizational peaks over the centuries the American anthropologist Alfred Kroeber noted that India had more civilizations that peaked than any other region or country in human history.

While the West has given the world modern scientific discoveries and knowledge from the time of Copernicus to the end of the 20th century (see Gribbin, 2003), which enable us to deconstruct our environments and nature, as well as to provide a better understanding of natural processes, it is in Eastern religions and philosophies that the solutions to sustainable living and a harmonious balance in human-nature relationships are likely to be found. The sociologist, Nisbett (2004), in his thought provoking book, *The Geography of Thought*, argues that

Western and Eastern worldviews undergirded different relationships to society and nature. Greek civilization undergirding Western civilization was ethnocentric and concerned with freedom and individuality, while Chinese civilization was concerned with harmony, the collective spirit of family, village and clan (Nisbett, 2004: 4–5). The Greek interest was in defining human and non-human objects, deconstructing nature that finally allowed for identity of atoms and molecules in modern science, while the Chinese mind was trying to maintain harmony in contradictory and dynamic forces of yin-yang relationships and accepting the *resonance* between man, earth and heaven (Nisbett, 2004: 10–17). Maintaining harmony and balance for the Chinese was always predicated in relationships, and, unlike the Greeks, the Chinese could not separate human beings from nature. Hence nature could never be studied independently. In her interesting book, *Being Human*, Peterson (2001: 85) takes this argument further by demonstrating that Asian views of nature and human nature were embedded in the ideas of *relational self* and *relational nature*. The idea is best exemplified in Buddhism where individuals are always relational and hence ‘relational nature must be found within man’s own nature and not in something external’. The world needs both modern science as developed in the West and Eastern-based philosophies of *relational nature* and self to find the pathways to sustainable life and living. In short, environmental sustainability requires both the ‘hard’ certainties of science and the soft, plastic and risky uncertainties of the social sciences (economics, sociology, geography, political science).

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