



CHAPTER 4:

Shifting towards “green growth” in Asia and the Pacific

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Rapid economic growth has enabled significant economic and social progress, but the goal of global sustainable development remains elusive. The unmet socio-economic development needs of the region grow with every new birth and environmental pressures continue to mount in an effort to meet them. Developing economic growth patterns which do not compromise environmental sustainability is an urgent priority globally, but one which is most relevant to the dynamic Asia and the Pacific region. Environmentally sustainable economic growth, or green growth, was endorsed by government delegates from more than 50 countries in Asia and the Pacific in March 2005 as a new policy focus aimed at resolving the current conflict between efforts to reduce poverty and efforts to ensure environmental sustainability, which stymies progress towards sustainable development.

Promoting more eco-efficient growth patterns is the first step to green growth. In addition to fostering eco-efficient consumption patterns and increasing the efficiency of resource use in production processes, this means ensuring that transportation, energy, water and other critical infrastructure is developed in a way that maximizes long-term eco-efficiency. Green growth is also achieved by developing and capitalizing on synergies between economic growth, social development and environmental protection. The promotion of environmental protection as a business opportunity, increasing equitable access to resources, reducing social vulnerability and investing in natural capital, all benefit the economy, society and the natural environment in the long term.

Green growth must be "incentivized". Public policy that supports green growth seeks to internalize environmental costs and use market mechanisms to drive economic decision-making at all levels in environmentally sustainable directions. More environmentally sustainable public sector decision-making also requires a realistic evaluation of economic and social progress, including assessments of natural capital.

As economies grow and are able to improve pollution control and increase the efficiency of production processes, they need to pay greater attention to the environmental impacts of increasingly unsustainable consumption patterns. They also need to become more responsible for supporting greener growth in other countries. Cooperation on green growth will be an essential element of the Asian and Pacific response to the green growth challenge. There are many hurdles to overcome, particularly in developing countries, but many positive initiatives hint at the possibility for a brighter future for all.

4.1 Sustainable development: from a zero-sum game to building synergies

Governments have made significant improvements in institutional and legislative frameworks intended to protect the natural resource base, and many stakeholders have taken action to improve environmental quality. However, as the global population expands and the unmet needs and environmental pressures continue to mount, the goal of sustainable development still appears to be a long way from being achieved.

Dialogue on sustainable development has thus far focused on integrating or balancing economic, social and environmental objectives. Decision-making that achieves the right level of integration is a challenge in any country, but particularly in developing countries. Mainstream economics used as the basis for national planning is ill-equipped to give appropriate value to natural, human and social capital in all countries. In developing countries in which the intrinsic value of natural and social capital can be assumed to be higher because of the larger proportions of the population directly dependent on them, economic systems which do not appropriately reflect these values, become further flawed.

Decision-making is based on a value system defined by the prevailing political economy, itself a reflection of the often unequal social and economic relationships among stakeholders. Lack of access to environmental information coupled with weak governance and social inequity also diminish incentives to take serious action to integrate environmental and social objectives in economic decision-making.

Trade-offs are therefore often spoken of as necessary evils. These take the form of infrastructure development projects that proceed without meaningful public consultation or environmental impact assessment; industries which are allowed to continue to operate without penalties for polluting; or local communities which are excluded from forest use in the name of conservation, without the provision of alternative income-earning opportunities. The relationship between the environment and the

“The world we have created today as a result of our thinking thus far has problems that cannot be solved by thinking the way we thought when we created them.”

Albert Einstein

economy is too often viewed as a ‘zero-sum game’ – when one wins, the other loses. The widespread acceptance of such trade-offs removes the pressure to find solutions that can make sustainable development a reality.

Focusing only on the limited number of improvements in environmental quality that have been achieved distracts from the real issue – the sustainability of the region’s production and consumption patterns which are the key drivers of environmental change. In the current systems of production, consumption and societal change, the short-term achievement of economic growth is taking place at the expense of environmental sustainability. The challenge lies in finding ways to continue the economic growth needed for poverty reduction without compromising environmental sustainability. Resolving this conflict requires that stakeholders move from a ‘zero-sum’ mindset to one in which synergy between economic growth and environmental protection is paramount, placing the region on a viable path to sustainable development.

4.2 Regional strategy to achieve sustainable development: green growth

In the face of rising environmental pressures and signs of declining environmental sustainability, a choice must be made. The term “sustainable development” can be used as a roadblock: a rhetorical masterpiece and catch-all phrase that places a label of respectability on actions that may not, in reality, help to build a brighter future. Alternatively, the term “sustainable development” can be given teeth: it can be understood for the concept it truly represents – a nuanced and powerful paradigm. As the situation of Asia and the Pacific illustrates, the most urgent challenge is to replace the old “grow first, clean up later” paradigm by a synergized approach that enables economic growth to support and reinforce sustainability rather than undermine it.

"Is the rapid economic growth in the Asia and the Pacific region environmentally sustainable? It appears that the answer is 'no', if the current pattern of economic growth, which is 'Grow first, clean up later', continues. Time has come to shift towards a new paradigm of economic development".

Kim Hak-Su, Executive Secretary of ESCAP, at MCED 2005

Regional governments convened at the Fifth Ministerial Conference on Environment and Development in Asia and the Pacific, 2005, sought to move the sustainable development agenda forward and tackle the root causes of continued environmental degradation. Some 340 participants, including government ministers and other delegates from 52 member and associate member countries of ESCAP, United Nations bodies and other international organizations, agreed that rapid economic growth had exerted considerable pressure on the environmental sustainability of the region, and that effective, long-term poverty reduction that also improved quality of life, would require the protection of the natural environment.

The event serves as a milestone in regional sustainable development dialogue. The conference endorsed green growth as a new approach to help countries in Asia and the Pacific to achieve real progress towards sustainable development and poverty reduction. Delegates adopted the *Ministerial Declaration on Environment and Development in Asia and the Pacific, 2005*, the *Regional Implementation Plan for Sustainable Development in Asia and the Pacific, 2006-2010* and the *Seoul Initiative on Environmentally Sustainable Economic Growth (Green Growth)*.¹

The *Seoul Initiative on Environmentally Sustainable Economic Growth* addresses selected policy issues highlighted in the Ministerial Declaration and the *Regional Implementation Plan for Sustainable Development in Asia and the Pacific, 2006-2010*. The Seoul Initiative Network on Green Growth (SINGG) will act as a policy forum and capacity-building mechanism to promote green growth throughout the Asian and Pacific region and within the framework of the Seoul Initiative.²

4.3 Green growth: decoupling economic growth from environmental pressure

Green growth is economic growth that maintains or restores environmental quality and ecological integrity. Green growth recognizes that ecosystem goods and services are critical to long-term economic and social viability – the environment is “an envelope containing, provisioning and sustaining the entire economy.”³

Green growth provides the key to a sustainable economy. Table 4.1 seeks to summarize some key characteristics of the industrial economy of the last century, the eco-efficient economy and a sustainable economy. Indicators that an economy is growing ‘greener’ would include progressive increases in eco-efficiency and low-impact consumption growth paths (see chapter 3).

Green growth is not only an issue for developed countries. There are compelling reasons for least developed and developing countries, as well as economies in transition, to proactively develop greener growth paths. There are still many needs to be met in these countries; their consumption patterns are not yet fully entrenched. Because a focus on green growth reduces both present and future economic costs by increasing the efficiency of resource use and can increase the efficacy of poverty reduction efforts, this policy approach is perhaps most relevant to developing countries. For least developed countries and economies in transition, developing more efficient production processes and improving pollution control are critical in the drive to meet the basic needs of their populations.

For developed countries in which high consumption levels exert unsustainable environmental pressures beyond their borders, ensuring eco-efficient consumption patterns is a key priority. However, whether economic growth will continue to threaten global sustainability is not only dependent on changing the consumption patterns of developed countries. The responses of the large and rapidly growing developing countries of the region will be critical, given their limited resource bases and the role that these countries are playing in determining future global consumption levels, flows of resources and production of waste.

Table 4.1. Aspiring to a sustainable economy

Industrial Economy (20th Century practice)	Eco-Efficient Economy (Today's objective)	Sustainable Economy (Today's aspiration)
<i>Environment (Pollution)</i>	<i>Environment (Pollution)</i>	<i>Environment (Pollution)</i>
<ul style="list-style-type: none"> • Emits billions of pounds of toxic material into the air, water and soil every year • Produces some materials so dangerous they will require constant vigilance by future generations • Results in very large amounts of solid waste, which is predominantly land-filled • Requires thousands of complex regulations, mainly oriented towards the end-of-pipe control of pollution rather than avoiding the creation of pollutants 	<ul style="list-style-type: none"> • Releases fewer pounds of toxic waste • Seeks to replace hazardous substances and emissions with those that are less hazardous • Innovates by producing more effective end-of-pipe controls and new processes that produce fewer pollutants • Innovates by using energy and materials more efficiently, producing fewer emissions and less waste • Where appropriate, replaces regulations with economic incentives (e.g. environmental taxes, trading schemes) • Through separate collection and investment in waste management infrastructure, increases re-use and recycling of materials and reduces land-filling 	<ul style="list-style-type: none"> • High material and waste costs drive systematic energy efficiency, material efficiency (dematerialization) and waste minimization • Systematic substitution of renewable for non-renewable resources, and benign for hazardous substances and emissions • 'Design for environment' greatly facilitates re-use and recycling and promotes "eco-effectiveness" • Industrial ecology and industrial symbiosis (life-cycle thinking and use of wastes as raw materials for another process) become standard concepts and practices
<i>Environment (Resources)</i>	<i>Environment (Resources)</i>	<i>Environment (Resources)</i>
<ul style="list-style-type: none"> • Fails to account adequately for either the depletion of non-renewable resources or the non-renewal of renewable resources • Fails to account adequately for ecosystem functions and services • Results in widespread destruction of renewable resources, habitats and ecosystems and threatens millions of species with extinction 	<ul style="list-style-type: none"> • Appropriately values the depletion of renewable and non-renewable resources, promoting their more efficient use, re-use and recycling • Recognizes the value of ecosystems and gives them appropriate protection • Builds a global network of conservation areas to conserve habitats and species and the basic integrity of the biosphere 	<ul style="list-style-type: none"> • Use of primary non-renewable resources (including energy) diminishes as a result of substitution by renewables • Output of material renewables is increased through better management and stringent observance of sustainable yields • The full range of marine, freshwater and terrestrial species, habitats and ecosystems is maintained by an internationally enforced combination of conservation and sustainable use
<i>Economic wealth creation</i>	<i>Economic wealth creation</i>	<i>Economic wealth creation</i>
<ul style="list-style-type: none"> • Measures wealth largely by economic output and human welfare by consumption • Regards labour productivity as the key production indicator, to the exclusion of resource productivity • Ignores many important aspects of human welfare, including environmental quality and the quality of work and working conditions and – in the social realm – families, social relationships, cultural integrity and ethical and spiritual issues • Tends to distribute economic wealth unequally 	<ul style="list-style-type: none"> • Adopts a broader framework of measures of wealth creation and welfare than those of economic output and consumption • Pays as much attention to resource productivity as to labour productivity • Has little in general to say about social aspects of wealth creation • Focuses on cleaner production rather than sustainable consumption 	<ul style="list-style-type: none"> • Humans value the ecosystems and habitats that comprise the biosphere, both for the functions that benefit humans and for the functions that benefit other life forms • Economies recognize that economic output and consumption are important contributors to welfare, but also that the biosphere is important in sustaining these • The social dimension of development, in terms of both the distribution of wealth and cultural and spiritual values, is given weight

Source: Paul Ekins, 2006, adapted from Mc. Donough, William and Michael Braungart (2002). *Cradle to Cradle: Remaking the way we make things* (New York: North Point Press).

Maintaining and restoring the limited environmental carrying capacity is an urgent priority that can only effectively be achieved in two ways – by building more eco-efficient economies and by promoting patterns of economic growth in which environmental protection supports economic growth, and vice versa.

4.4 Building eco-efficient economies – creating wealth not waste

While dramatic rates of economic growth have enabled the reduction of poverty in most parts of Asia and the Pacific, there are still significant unmet needs. Poverty, continuing hunger and underdeveloped infrastructure still feature prominently in discussions on the future of the region. The efficiency with which these development challenges will be met will determine future environmental pressures, not only within a country but also beyond its borders. Green growth is about developing economic growth patterns that maximize the efficiency with which the material needs of human populations are met, both in terms of the resources used and with respect to the waste produced.

Increasing the efficiency of resource use is an important element in improving the eco-efficiency of both production and consumption; but it is not only an environmental issue, it is also an economic priority. Recent increases in energy and raw material prices, as well as the rising costs of waste disposal, highlight resource-use efficiency as a key indicator of the economic sustainability of growth patterns.

Japan is set to play a significant role in promoting resource-use efficiency beyond its borders through its 3R Initiative. The government has established quantitative targets to improve resource productivity by almost 40 per cent, to increase the cyclical use rate from 10 to 14 per cent, and to halve the total amount of waste between 2000 and 2010.⁴ While Japan's policy interest in, and support for, resource-use efficiency seems to be motivated by its mounting waste problem, China's recent policy realignment to focus on building a resource-efficient economy (Box 4.1) is based on the sheer scale of its demand for resources and the

evidence that it is relatively resource-poor. By the government's own assessment, it also uses its resources relatively inefficiently. China's unit area building energy consumption for heating is two to three times that of developed countries with similar climates and over 20 per cent of water is lost in the supply networks of Chinese cities.⁵ The efficiency of resource use was adopted as a basic principle in all economic sectors, and has been written into the Eleventh Five-Year Plan. Building a "circular economy" and a "conservation-minded society" are seen as important elements of the Five-Year Plan.

The World Resources Institute⁶ shows that certain economies seem to be predisposed to creating amounts of waste disproportionate to the amount of durable material wealth created (Figure 4.1).⁷ In their study, 'net additions to stock' (NAS in figure 4.1) represented the material in manufactured goods and infrastructure that would remain in the economy for more than a few years, while the 'domestic processed output' (DPO in figure 4.1) was an estimate of the waste output from the economy. In a green growth context, countries would progressively increase the ratio of durable material wealth created to waste produced. The amounts of durable wealth created annually would decline

Box 4.1 Targets for a resource-efficient China

By 2020 (compared to 2000 levels)

Decreased resource use intensity (resource consumption per unit GDP)

- Energy intensity - 50-60% ↓
- Water intensity - 80% ↓
- Cement intensity - 55% ↓
- Steel and iron intensity - 40% ↓
- Non-ferrous metals intensity- 20% ↓

Decreased pollution intensity (emissions or discharge per unit GDP)

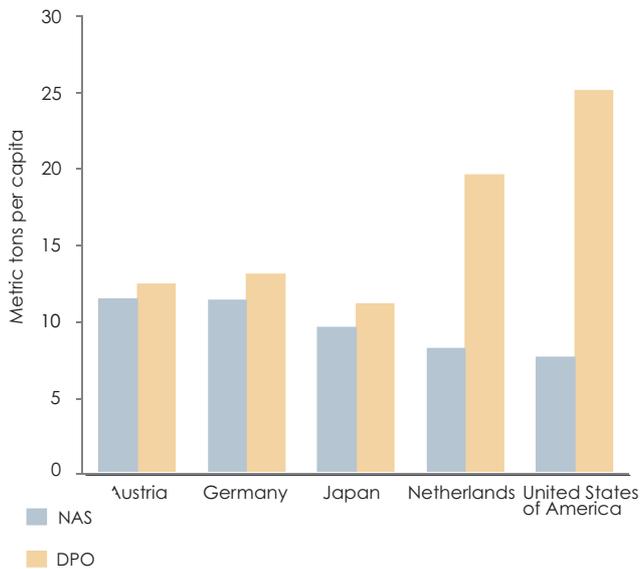
- SO₂ emissions intensity - 75% ↓
- CO₂ emissions intensity - 60% ↓
- Wastewater discharge intensity - 70% ↓

Increased recycling rates

- 55% of waste steel recycled
- 50% of non-ferrous metal recycled

Source: Eleventh Five-Year Development Plan of China (2005)

Figure 4.1 Durable material wealth and waste production, 1996



Source: World Resources Institute (2000). *The Weight of Nations: Material Outflows of Industrial Economies* (Washington DC, World Resources Institute).

over time once population growth stabilized and basic infrastructure needs had been met.⁸ Whether economic development patterns encourage a disproportionately high output of waste is an issue of economic and environmental policy concern.

While it has been acknowledged that the eco-efficiency of production is improving, there is global consensus that this progress is not occurring quickly enough to reverse global declines in environmental sustainability.⁹ Eco-efficient consumption has not received enough attention, beyond ecolabelling and green procurement initiatives.

4.4.1 Eco-efficient consumption – maximizing consumer utility, minimizing environmental impact

Chapter 2 concludes that in the rapidly growing developing and least developed countries (LDCs) of Asia and the Pacific, rapid urbanization and a burgeoning private sector are shaping consumer preferences as incomes rise and globalization proceeds. The production of waste and the consumption of energy, water and raw materials are increasing across the region. For many countries, but particularly the LDCs, the growth of consumption represents a much-needed improvement in access to

resources that enhance human welfare and social development. However, there is growing unease among consumers in developing and developed countries about the environmental impacts of their lifestyles and a sense of frustration with the limited possibilities for change. The view that consumption has a dominant role in delivering human well-being is also being questioned. The assumption that individual and social well-being are maximized by the freedom of choice that characterizes modern consumer societies is under examination. The range of social problems that are being experienced in affluent societies, ranging from family breakdown, mental instability, crime, obesity, inequality and economic insecurity to declining trust, are identified as signs that affluence does not assure human well-being.¹⁰

In high-income countries and countries in which large numbers of people are entering the consuming classes, the challenge lies not in meeting basic needs but in moving away from an economy geared towards constantly increasing supplies of goods, services and materials, to focus instead on improving the eco-efficiency of consumption patterns. There are two compelling reasons for this. The first is the combination of the growing potential demand for resources and levels of waste production that have environmental (and by extension social and economic) impacts even beyond the borders of the consuming countries. The second is the tendency of consumption pressures to become entrenched.

Chapters 2 and 3 conclude that while countries are, in the main, able to progress on improving the eco-efficiency of production processes, without strong policy intervention, resource consumption per capita and waste production per capita generally increase with income. In addition, eco-efficiency improvements at the product and firm level are proving inadequate in the face of expanding volumes of consumption. Developing countries have the opportunity to develop their own distinctive responses to shaping consumption patterns which recognize consumption as a means to improve human welfare, rather than an end in itself, and which maximize welfare in an equitable manner and create opportunities for economic growth.

It is important to bear in mind that economic planning does not yet take into account the impacts of economic development plans on future consumption patterns, resource use and waste production. For developing countries with significant poverty reduction needs and limited resource bases, whether financial flows are creating waste or lasting wealth is clearly a question to be addressed by policymakers.

Focusing on demand-side interventions rather than supply-side interventions – managing demand – is a key element of increasing consumption eco-efficiency. Much has been written about the application of economic instruments and ecolabelling to shift consumer choices in more environmentally friendly directions. Examples include tax breaks on more fuel-efficient cars, high licensing fees for cars (as applied in Singapore) or congestion charges (as applied in London). Demand side interventions should also capitalize on the often differentiated roles that men and women play in shaping consumption patterns at the household level.

A shift from an economy of exchange of money for goods to one of exchange of money for services improves consumption eco-efficiency by closing consumption and production process loops, resulting in less waste and maximized recycling rates and, importantly, in increased consumer utility and corporate profit. The authors of *Factor Four*¹¹ document how the sale of industrial solvents by one chemical company was transformed into the provision of ‘solvent services,’ with the firm taking back and recycling used solvents rather than selling new stock. This resulted in client factories saving the costs of disposing of used solvents, and avoided environmental damage from improper disposal.¹² This business model is now being applied to household appliances, carpets and office furniture, among other products, in Europe and the United States of America and is an approach that requires further attention and public policy support in the region.

While these measures have been effective in many cases, changing demand is not easy. The adoption of more eco-efficient consumption patterns must be a consumer-led process, which may not seem a

promising prospect in today’s market economy. Cultural values and indigenous knowledge which support a modest and judicious use of resources and which are already part of many traditional Asian cultures and values, need to be reasserted and strengthened. The Japanese Government’s efforts to revive the traditional value of “mottainai” (referring to modesty, appreciation and making full use of every resource) and the King of Thailand’s promotion of a “sufficiency economy” are instructive. As one essayist notes:

“We have to leapfrog foreign modes of consumption characterized by high use of non-renewable energy and resources. We have to look back to our ancestors’ culture and re-inculcate its treasures of sustainable living – organic farming, herbal healing, waste minimization, community spirit and many others. We have to deal seriously with impacts of [globalizing cultures and consumption patterns] so that these support rather than deflect us from sustainability.”¹³

Civil society groups play an important role in facilitating more eco-efficient and sustainable consumer choice. In Mumbai, India, Grahak Panchayat, a collective purchasing scheme for 16,000 households provides good quality food at a low cost, supports environmentally sustainable food production, improves farmer incomes and health and generates environmental benefits. In Japan, the Green Purchasing Network supports over 1,000 companies, public authorities and citizen groups by introducing practical guidelines to promote the purchase of sustainable goods and services.

4.4.2 Minimizing resource use and waste, sustaining profit

Effective policies to encourage sustainable consumption take into account the entire commercial cycle, to ensure that consumer demand can be met through eco-efficient production processes. The task is to bring environmentally sustainable consumer choice from the margins into the mainstream and to improve consumer capacity and support for choosing, using and disposing of goods and services in a sustainable manner. Eco-efficient production at the firm level is based on resource-use efficiency and

waste minimization as a first step, and is vigorously promoted by the World Business Council for Sustainable Development.

Effective and efficient environmental regulation continues to play a key role in supporting private sector innovation towards environmental sustainability. Applying whole-system design approaches (sometimes called “eco-design” or “design for environment” approaches) in industrial design seeks to ensure that the design of an appliance, building or industrial production process maximizes process efficiency and minimizes waste, and that each component and sub-process is designed with the efficiency of the whole system in mind. Perhaps one of the most important principles of these design approaches is that life-cycle costs are also taken into account and minimized at the outset. These approaches have been shown to reduce recurrent costs related to use of the product, building or service, and in some cases, reduce the plant, building or product costs. Several Japanese companies are at the forefront of eco-design. The Australian Department of Environment and Heritage actively supports the development of eco-design skills by undergraduate engineering students and professionals by integrating whole-system engineering within the Australian university curriculum, and is also supporting the development of curriculum resource kits for tertiary level teachers and students of industrial design.¹⁴

While eco-industrial approaches are gaining ground, industrial development planning and supportive FDI policy and fiscal incentives which explicitly seek to minimize industrial resource use and waste production both at the firm level and sector-wide, while creating jobs, earning tax income and facilitating technology transfer and skills upgrading, are lacking. Further, eco-efficient industrial development planning would not only focus on supporting improvements in efficient resource use, but would also take into account the resource intensity of the products, acknowledging the resources used throughout the whole cycle of production.¹⁵

Stakeholders such as the Asian Productivity Organization (APO) have been supporting Asian

private sector action on more eco-efficient production, the APO through its “green productivity programme.” Eco-efficient production not only applies to the industrial sector, but also to the agricultural and services sectors. In the agricultural sector, it is manifested by greater attention to sustainable agricultural practices: organic agriculture and a reduced use of mineral fertilizers in some countries, as well as integrated pest management and more efficient irrigation systems, as discussed in chapter 2.

In the future, the limits of eco-efficiency could be pushed further towards the paradigm of eco-effectiveness, in which the negative environmental impact of economic activity is not only reduced but reversed, in processes that contribute to augmenting the stock of natural capital. Examples include buildings that can produce more energy than they consume and purify their own wastewater, factories that can produce effluents that can be converted to valuable sources of nutrients or inputs to other industrial processes, and waste-management processes that can create a source of raw materials for human and natural ecosystem processes each year. Municipal solid waste plants that create agricultural-quality compost from solid waste, such as those in Sri Lanka, are examples of an eco-effective waste management process.

4.4.3 Investing in infrastructure to build eco-efficient growth patterns

It is not well recognized that infrastructure development “hard-wires” consumption patterns and can incur unnecessarily high economic, social and environmental costs for decades to come. On the other hand, making the right infrastructure decisions can also result in major energy, water and other resource savings, as well as avoiding high environmental, economic and social costs – an investment with a high rate of total return.

Infrastructure development and its impact on future consumption patterns is a critical issue for the developing countries of the region, given the underdeveloped, and sometimes, decaying energy, water and other infrastructure. Investment in grid-based energy systems based on centralized power generation from fossil fuels, for example, reduces the

incentive to utilize new renewable forms of energy. Building coal-fired power plants assures a future built on coal as a source of energy and continued increases in atmospheric CO₂ concentrations.

Urbanization is one of the biggest development challenges facing the Asian and Pacific region. On World Environment Day 2005, mayors from around the globe, including those of the Asian and Pacific cities of Delhi, Dhaka, Islamabad and Jakarta signed the *Urban Environmental Accords* which identify 21 specific actions to address issues relating to energy, environmental health, waste, water transportation and urban design. Asian and Pacific urban centres are expanding rapidly, based on western-style designs that require extensive cooling, heating, lighting and ventilation. China has taken up the challenge to apply environmental sustainability principles such as “cradle-to-cradle” design¹⁶ in order to reduce the resource demands of future population centres. Singapore’s Green Mark certification programme is projected to reduce energy and water consumption by up to 20 to 30 per cent per certified building;¹⁷ the programme represents an investment in improving the environmental sustainability of urban infrastructure that promises significant returns in the form of avoided energy and water costs. Current support for developing sustainable urban mobility focuses attention on developing transportation infrastructure and related policies with a view to minimizing greenhouse gas emissions, pollution and the attendant health, environmental and economic costs, now and in the long-term.

4.4.4 Improving access to resources – a pathway to more eco-efficient growth

The benefits of the rapid economic growth in Asia and the Pacific have not been equally shared. Only a few countries, including India, Kyrgyzstan, Tajikistan and Thailand managed to simultaneously reduce poverty levels and improve equity in income distribution during the 1990s. In China, Turkmenistan, the Philippines, Azerbaijan, Viet Nam and Pakistan, decreases in the US\$1 per day poverty rate were also accompanied by decreases in equity in income distribution.¹⁸ The majority of the poor

in the region live in rural areas and rural poverty is reported to be on the increase.¹⁹

Income inequality is often synonymous with inequitable access to resources and social vulnerability and manifested in social exclusion, lack of access to income-earning opportunities, exclusion from decision-making and lack of access to justice, among other conditions. Specific policies have been successfully formulated by governments to redress social inequality in areas such as access to health services and educational opportunities. Promoting more equitable access to resources on several other fronts can, in some cases, help to share the benefits of growth and, at the same time, lead to the development of more eco-efficient growth patterns.

Social inequality can institutionalize the unsustainable consumption patterns of one group in society to the detriment of other groups. Policies which explicitly support more equitable access to resources would reduce the acceptability of such trade-offs and provide incentives to find ways of meeting the needs of all most efficiently. In the context of water resources management, a more equitable allocation of water between rural and urban areas would provide an incentive for more efficient water allocation and use both in cities and in agricultural areas, particularly in times of scarcity.²⁰ In the context of urban development planning, a commitment to a vision for Asian and Pacific cities that respects the rights of every citizen to enjoy clean air, water and access to efficient and affordable urban transportation would result in reduced environmental pressure through savings in energy and lowered pollution, as well as economic and social benefits in the form of savings in health costs.²¹

4.5 Creating synergies between economic growth and environmental protection

Building eco-efficient societies is about reducing the environmental pressure exerted by economic growth. Creating synergies between economic growth and environmental protection, however, means proactively identifying and promoting activities which can create economic benefits and, at the same time, expand the environmental carrying capacity

by maintaining or increasing the natural resource endowment

Promoting environmental protection as a business opportunity by capitalizing on the growing environmental markets is the first and most obvious way of doing this. Pro-poor business models have allowed the benefits of economic growth to be more equally shared by generating income, increasing access to key resources, and reducing environmental pressure. Although they are often not explicitly valued in mainstream economics, returns on investments in natural capital are also manifested in both the economic and social spheres.

4.5.1 Environmental protection as a business opportunity

There is strong evidence of the potential for new business and poverty reduction opportunities from environmental protection. The ADB’s *Environmental Outlook, 2005* concludes that the business opportunities presented by greater attention paid to environmental management are the fastest-growing in the world, estimated at some US\$37 billion and expected to triple by 2015. Other opportunities currently being exploited that synergize income-earning opportunities and environmental protection include the regional growth of the recycling industry described in chapter 2. Companies can profit from new income streams and assist customers in dealing with a mounting waste disposal problem. For example, mixed product/service businesses see chemical producers taking an active role in the on-site management, recycling and disposal of the potentially hazardous chemicals used in industry.²²

The business community is increasingly recognizing the potential of pro-poor business models that simultaneously generate income and reinforce environmental sustainability. Examples include pro-poor, public-private partnership projects for energy and water services provision that bring these vital services to needy communities efficiently and create income-earning opportunities, such as those piloted in Indonesia and Sri Lanka by ESCAP.

The growth of employment and entrepreneurship associated with the deployment of solar

photovoltaic (PV) systems in rural areas across the region has provided an enabling environment to empower rural communities to simultaneously improve their incomes, quality of life and reduce environmental pressure. For example, the Home Employment and Lighting Package (HELP™) Programme’s “Paper & Power” Project in Lekhani, Nepal, reduces the implementation costs of home solar PV systems. At the same time, the project encourages the use of the newly acquired energy to produce paper and paper products from locally available biomass in order to repay the costs of the system and to create new income streams.

Biodiversity conservation aims have been more effectively achieved in several parts of the world, including in South-East Asia, by providing alternative incomes for those who are often forced through poverty to resort to the overexploitation of natural resources. The environmental benefits that redound to the wider society and the increased income and quality of life gained by locals also clearly represent a synergized approach to sustainable development.

4.5.2 Investing in natural capital to maintain and restore environmental carrying capacity

Environmental carrying capacity, as described in chapter 1, is dependent on the per capita environmental pressure exerted and the natural resource endowment, or natural capital. Natural capital represents the total value of the functions and products of the natural environment and is reduced by environmental degradation (see box 4.2).

These functions are not valued within today’s mainstream market economies and their loss therefore often goes unnoticed or unmeasured. Environmental sustainability requires that continuous investments in natural capital should be made to ensure that the total stock of natural capital remains relatively constant. This would ensure the continued flow of environmental goods and services that support both the formal and informal economies.

Investing in natural capital has been discussed by environmental economists and others since the early 1990s.²³ Cash returns from investing in

Box 4.2 Natural capital

- **non-renewable resources**, such as oil and minerals, that are extracted from ecosystems;
- **renewable resources**, such as fish, wood, and drinking water, that are produced and maintained by the processes and functions of ecosystems; and
- **environmental services**, such as the maintenance of the quality of the atmosphere, the operation of the hydrological cycle including flood control and drinking water supply, waste assimilation and treatment, the recycling of nutrients, the generation of soils, the pollination of crops, protective functions, the provision of food from the sea and the maintenance of the vast genetic library.

Source: Adapted from Berkes, Fikret and Carl Folke (1994). "Investing in Cultural Capital for Sustainable Use of Natural Capital" in Jansson, A-M., M. Hammer, C. Folke, and R. Costanza, eds., *Investing In Natural Capital* (Washington DC, Island Press).

maintaining ecosystem integrity can be earned through ecotourism activity, for example. The Clean Development Mechanism (CDM) discussed in chapter 2 may provide a new financial mechanism for creating markets for the carbon sequestration services provided by forests or other forms of biomass. Innovative programmes in which payments for environmental services are made to communities which are active in preserving specific forms of natural capital, such as forested watersheds, are receiving increasing attention.

More often than not, however, the economic benefits of such investments are not obvious, since they are not directly captured by conventional economic measures. They often support informal or subsistence economies of the rural poor, or are only evident as long-term cost savings.

Countries invest in natural capital where they ensure the continued viability of critical wetlands in order to secure their continued use for biodiversity protection, freshwater fisheries or non-fish freshwater products, or for maintaining the hydrological cycle. Australia has taken steps to recognize this form of investment, taking a decision to release additional water from a major hydroelectric dam to restore depleted flows to the Snowy River.²⁴ Countries also reap the benefits of investing in natural capital when they maintain mangrove systems and coastal forests

that protect coastal settlements, as demonstrated in the December 2004 tsunami (see chapter 2), or maintain forest cover as a means of reducing the potential for flooding in watershed areas, for example.

The work of the Millennium Ecosystem Assessment stresses that maintaining natural capital is an important basis for poverty reduction. This is particularly relevant to Asian and Pacific developing countries with large rural populations depending directly or indirectly on natural capital for their livelihoods and as a cultural and spiritual reference point, and in which social equity concerns fuel conflict related to resource use. Improving ecosystem management can also contribute to improving livelihoods. For example, in Nepal, one study of forest resources shows that forest use that resulted in more sustainably managed forests and capital accumulation was characterized by "manageable mature forest, high prices for forest products, a system of charging for all forest products, and sales of surplus forest products outside the forest user group".²⁵

In order to mainstream decision-making that takes into account the essential, and in many cases irreplaceable, goods and services provided by natural capital, more appropriate measures of economic growth and human progress that recognize their value must be developed. In the absence of other universally acceptable methodologies to do this, the use of economic instruments is necessary to internalize the costs of ecosystem goods and services, and thereby incentivize green growth.

4.6 Incentivizing green growth

In a market economy in which ecosystem goods and services are not valued, building eco-efficient economies and promoting synergies between environmental protection and economic growth requires targeted intervention. The application of economic instruments in the form of green budgets and tax reform, for example, is one way of promoting more eco-efficient consumption and production patterns that minimize resource use, pollution and waste, and of fostering creative approaches to capitalizing on synergies between economic growth and environ-

mental protection. More environmentally sustainable public policy requires complementary, more realistic evaluation of economic and social progress, including assessments of natural capital. Initiatives such as the development of ‘green GDP’ by several countries in Asia and the Pacific hold much promise.

4.6.1 Green budget and tax reform

Green budget and tax reform (GBTR) covers a range of public policies directly aimed at influencing market prices and internalizing the costs of environmental degradation, either directly, through the national accounts, or indirectly, through fiscal policy, including taxation systems. Revenue-neutral GBTR could be a useful and powerful tool for improving the eco-efficiency of economic development, since public policy must systematically use prices to drive markets in the direction of greater resource efficiency, reduced emissions and more innovation for environmental sustainability.

Green taxes, budget reform and other economic instruments are not new to Asia and Pacific region (see table 4.2), but in many cases revenue neutrality, a key concept of GBTR, is overlooked. Revenue neutrality indicates that a new tax is not meant to introduce new revenue streams; the tax burden is relieved in one area (such as the tax on corporate profit) and increased in another (such as energy or water use). There is a need to further promote the concept of revenue neutrality so that governments, industries, consumers and all stakeholders consider GBTR not as an additional tax, but rather as a re-weighting of the tax base from penalizing income earned to penalizing behaviour that diminishes environmental sustainability. There is also a need to further promote the understanding that GBTR, when appropriately designed, pays a double dividend in that it supports economic growth while improving environmental sustainability.

Table 4.2 Economic instruments for reducing environmental pressure – selected countries

Goal	Instrument	Description
Natural resource conservation	Ownership rights Subsidy restructuring	Land redistribution reduces pressure on common property resources, while restructuring subsidies encourages the reduced use of chemical fertilizers in India
	Tradable permits	Tradable permits for abstracting groundwater in the Philippines to limit groundwater use
	Export tax	Export tax in Papua New Guinea on crocodile skin to protect biodiversity resources
Pollution reduction and waste minimization	Tax differential	Promotion of unleaded gasoline consumption in Thailand and other countries
	Tradable permits	Nanpan river water pollution management in China
	Market creation (non-tradable permits)	Case of Singapore car use as a solution to congestion and air pollution
	User rights (licensing)	
	User charges	
	Pollution charge	Household waste pricing in the Philippines, wastewater treatment fees in China
	Pollution tax	Palm oil production pollution in Malaysia
	Environmental performance bonds	Bonds secure funds for possible damage to the Great Barrier Reef by commercial activities in Australia

Green taxes may be used in combination with other tools (ecolabelling, public disclosure, green accounting, legal instruments, etc.) to improve the eco-efficiency of economic growth. The design and implementation of green taxes must be country-specific.

4.6.2 Greening of national accounts and complementary indicators of progress

The System of National Accounts (SNA) is an almost universally recognized system of keeping national accounts on the basis of which GDP is calculated. GDP and GNP are now the widely accepted indicators of economic growth of a country, with per capita values routinely used as indicators of income, development and welfare.

However, these indicators are recognized as having limited capacity to represent and assess the social and environmental dimensions of national development. International institutions as well as individual countries have searched for feasible ways to alter national accounts to represent a more complete picture of a country's situation. Several concepts and indicators have been developed in an attempt to capture the non-market values of national wealth relating to human, social and natural capital. These include the Human Development Index, the Index of Sustainable Economic Welfare – which attempts to provide “a theoretical challenge to the GNP as a measure of welfare”²⁶ – and the Genuine Progress Indicator (GPI), which attempts to adjust GDP and GNP calculations to include social and environmental costs and benefits.²⁷ A significant gap between the progress shown when GDP is used as a measure of welfare and when measures such as the Index of Sustainable Economic Welfare or the Genuine Progress Index are used has been observed.

The concept of Gross National Happiness (GNH) was introduced by the King of Bhutan three decades ago as a more holistic measure of development. The proposed Gross National Happiness Measure is built upon four main pillars: 1) the promotion of equitable and sustainable socio-economic development; 2) the preservation and promotion of cultural values; 3) the conservation of the natural environment; and 4) the establishment of good governance.²⁸ The concept is incorporated

as a key consideration in national strategic planning, but there is as yet no way to calculate GNH; the full operationalization of the concept is therefore still a topic of debate.

The governments of China, the Republic of Korea and Thailand are all working on developing green GDP measures that adjust national accounts produced using the SNA for flows of environmental goods and services. Environmental accounting based on the System of Integrated Environmental and Economic Accounting (SEEA), developed by the United Nations Statistics Division, serves as a standardized system for environmental accounting analogous to the SNA for conventional national accounting. It allows for the assessment of natural resource flows and can thereby facilitate their incorporation into the system of national accounting and subsequently into GDP measures as a basis for green GDP.

In other approaches, satellite accounts based on the SEEA methodology keep stock of natural resources and assign values to non-market ecosystem goods and services. Satellite accounts make environmental statistics available for economic decision-making, but since the satellite accounts are not integrated with the main accounts, GDP calculations do not reflect costs to the environment and the depletion of resources.²⁹ Guam, India, Indonesia, Japan, the Republic of Korea, New Zealand and the Philippines have undertaken environmental accounting initiatives with the SEEA as a guideline. Some have established complete natural resource accounts, while others have developed accounts for specific natural resources only or have experimented and made adjustments to fit their own systems.

The most significant stumbling block for developing countries is the lack of human and financial resources for data gathering and maintenance to support such systems.³⁰ However, the case of the Philippines, which has used its environmental resources accounting to improve decision-making, illustrates the value of environmental accounting and valuation for decision-making (Box 4.3).

4.7 Regional and international cooperation for boosting green growth

There are a number of obstacles to green growth. A market economy which does not reflect the values of environmental goods and services, and so does not facilitate environmentally sound decision-making, and a lack of human capital or capacity feature prominently among them. In many countries a lack of access to information, public participation in decision-making and access to justice in environmental matters limits the potential of all stakeholders, and that of

disadvantaged groups in particular, to become empowered actors in a shift towards more sustainable societies.

In developing countries, the most important barriers may be the short time-scale of decision-making, the urgent need to increase income and a lack of government policy which directs investment towards green growth. Despite these restrictions, the positive steps (many from developing and least developed countries) highlighted in this chapter as well as in chapter 2 hint at the intriguing possibilities for delinking economic growth from environmental

Box 4.3 Environmental accounting and natural resource valuation in the Philippines

The implementation of the Environmental and Natural Resource Accounting Project (ENRAP) in the Philippines started in 1991 with funding from the United States Agency for International Development. The project was conceived and developed to provide environmentally adjusted economic indicators that support improved overall economic and environmental management and planning. The project lasted from 1991 to 1999 and consisted of four phases.

Phase I (1991-1992) focused on the examination of the environmental value of forest resources. Studies showed high levels of forest depreciation with a considerable degree of unauthorized use of forest-land-based resources.

Phase II (1992-1994) completed the general accounting of all environmental and natural resource services for incorporation into the SNA. It concluded that households were major contributors to air and water pollution.

Phase III (1994-1996) sought to institutionalize ENRAP within several government agencies, while refining and updating the accounting results from the two previous phases. It revealed a higher level of depreciation of renewable than non-renewable resources. Pollution management efforts with the active participation of the local populace and concerned agencies were stressed in the study.

Phase IV (1996-1999) institutionalized ENRAP within the Department of Environment and Natural Resources, the National Economic Development Authority and the National Statistical Coordinating Board, and re-named the project PEENRA (Philippine Economic Environmental and Natural Resources Accounting) through Executive Order (EO) No. 406 dated May 1997. It established an environmental and natural accounting system as one of the main strategies by which environmental concerns would be integrated into socio-economic policy decision-making. This process involves the adoption of a framework which is harmonized with the System of National Accounts. In the area of environmental statistics, the compilation and maintenance of sectoral accounts are ongoing and are continuously being developed and made an integral part of the regular activity of other sectors.

Several PEENRA studies have already been undertaken and integrated into the policy development process. In the forestry sector, these include the formulation and/or adoption of policies that establish the government share of the utilization of natural resources, rent on the use of forest land for purposes such as grazing and herbal medicine, the establishment of communication facilities and water pricing, among others. PEENRA-related studies have led to the formulation of a policy on wastewater discharge permits and their corresponding fees. For the protected areas and wildlife sector, the studies served as a basis for the establishment of appropriate charges for the use of protected area facilities and entrance fees.

Natural resource valuation methodologies have been completed by different government agencies, or are in the planning stages or process of completion, including on mangroves in Busuanga and Samar Island biodiversity, Malampaya Wetlands. Under the Mineral Action Plan of the Philippines, a proposal for site-specific valuation aims to determine the most appropriate land or resource use where there are competing land uses such as agriculture, biodiversity, mining, forestry, and agro-industry.

Source: Department of Environment and Natural Resources, Philippines (2005).

degradation and simultaneously improving human welfare. These require considerable further study.

As economies grow and change, their obligation to redress the global environmental impact of their consumption behaviour also grows. Because developed economies can become reliant on developing countries for producing resource- and pollution-intensive products, while the natural resource endowments of these countries also provide ecosystem goods and services that sustain global economies and societies, assisting least developed and developing countries to minimize production-related resource use, waste and pollution becomes a matter of self-preservation for all. Both within and beyond the borders of the region, greening growth in Asia and the Pacific region will require international cooperation.

The Government of Japan's global 3R initiative aims to promote waste reduction, the re-use of items, material and heat recycling and recovery. Japan plans to promote global zero-waste societies through capacity-building in developing countries, regional/global international cooperation, the enhancement of knowledge and technology bases, information sharing and networking.³¹ The Japanese Government has further proposed the establishment of a Pan-Asia recycling network to reduce illegal trade in potentially hazardous recyclables and increase resource-use efficiency by promoting recycling.

The Republic of Korea is also making a significant contribution to changing the paradigms of economic planners, policymakers and the private sector by supporting green growth approaches regionally through the Seoul Initiative on Green Growth. The ESCAP strategy to promote green growth includes analytical, conceptual and research work, the organization of regional policy dialogues, technical assistance and capacity-building, awareness raising and information exchange and outreach.

Chapter III of the Johannesburg Plan of Implementation adopted at the World Summit on Sustainable Development calls for the development of a "10-year framework of programmes in support of regional and national initiatives to accelerate the shift towards sustainable consumption and production

to promote social and economic development within the carrying capacity of ecosystems." The Marrakesh Process encompasses follow-up action to this important mandate. Two international expert meetings on the development of the proposed ten-year framework have been held since the World Summit: the first in June 2003 in Marrakech, Morocco, and the second in September 2005 in Costa Rica. The latter meeting resulted in four Marrakech Task Forces being established, each led by a different country. Other task forces are expected to be initiated during 2006 and 2007, and to include a focus on green growth.

Although international support is clearly required, the responsibility for action lies with all stakeholders, and governments in particular. Chapters 6 to 10 show that many developing countries of the region are at a crossroads, with accelerating environmental pressures due to rising production and consumption, growing populations and in some countries, high poverty levels. Economies in transition face perhaps the most arduous task in reforming both political and economic systems, some in the context of ongoing conflict. Small island developing states, while exerting the least environmental pressure in global terms, are the most susceptible to the global failure to pursue more environmentally sustainable growth patterns.

National action in support of green growth requires the highest levels of political commitment. China has taken several bold steps which policymakers, sustainability proponents and interested observers are watching carefully, and it will be able to share these experiences in a few years' time. It is telling that building a "Resource-Efficient and Environmentally Friendly" (REEF) society is seen as an important aspect of what has been termed China's "green" or "sustainable" rise. As concluded by the China Academy of Science:

"In history, the rise of any big power was always concomitant with the changes in the world political and economic landscapes and the re-allocation of resources and even with the outbreak of war. Since the 1990s, with the growth in the size of China's economy and international influence, China's

dependency on external resources (especially petroleum and iron ore) and the emission of greenhouse gases have increased steadily, thus arousing endless debate about “China’s threat”. It should be pointed out that, like other developing countries, China has the right of sharing the world’s resources even more fairly while making contributions to the world market and shouldering the costs of “made-in-China”. The real peaceful development must ensure that the rise is sustainable. As a responsible big power, China should, through the change of development mode, structural adjustments and technical innovation, make more rational utilization of the internal and external resources, minimize the impact of pollutants on the localities, regions and the globe and bear its responsibilities and obligations compatible with its national power. It is, therefore, necessary to approach the strategic position and its importance of building of a REEF Society from the global perspective.”³²

End notes

¹ See the website of the Ministerial Conference on Environment and Development in Asia and the Pacific, accessed on 15 March 2006 from <<http://www.unescap.org/mced/>>.

² See the website of the Seoul Initiative, accessed on 15 March 2006 from <<http://www.unescap.org/esd/environment/mced/singg/index.asp>>.

³ Daly, Herman (1994). "Operationalizing sustainable development by investing in natural capital" in Jansson, A.-M., M. Hammer, C. Folke, and R. Costanza, eds., *Investing in Natural Capital* (Washington DC, Island Press), cited in Hawken, Paul, Amory Lovins and L. Hunter Lovins (1999). *Natural Capitalism – Creating the next industrial revolution* (New York, Back Bay Books/Little, Brown and Company).

⁴ See Ministry of Environment, Japan (undated). "3R Portfolio – Good practices to Promote the 3Rs", accessed on 11 December 2005 from <http://www.env.go.jp/recycle/3r/en/info/05_08.pdf>.

⁵ Wenbin, Lu Department of Environment and Resource Conservation, National Development and Reform Commission, China (2005). "Resource-saving Society Development in China," presentation made at the ESCAP First Policy Dialogue on Green Growth in Asia and the Pacific, Seoul, Republic of Korea, 8 November 2005.

⁶ World Resources Institute (2000). *The Weight of Nations: Material Outflows from Industrial Economies* (Washington DC, World Resources Institute), accessed on 10 February 2006 from <<http://pubs.wri.org/weightofnations-pub-3023.html>>.

⁷ World Resources Institute (2000), *ibid.* This study presents case studies of five developed countries which show that there are significant differences between the ratio of waste produced (indicated by the amount of material emitted on to land, air and water wastes, emissions, discharges, system losses, and dissipative flows) and the material that is retained in the economy in the form of long-lived durable goods and infrastructure.

⁸ World Resources Institute researchers found that even in today's relatively mature economies, the amount of durable wealth created every year did not seem to decline, as would be expected if the infrastructure were fully developed and the majority of material needs were met. See World Resources Institute (2000), *op. cit.*

⁹ UN General Assembly Resolution A/RES/S-19/2 states: "While there has been progress in material and energy efficiency, particularly with reference to non-renewable resources, overall trends remain unsustainable. As a result, increasing levels of pollution threaten to

exceed the capacity of the global environment to absorb them, increasing the potential obstacles to economic and social development in developing countries."

¹⁰ Offer, Ayner (2006). *The Challenge of Affluence: Self-Control and Well-Being in the United States and Britain since 1950* (Oxford/New York, Oxford University Press).

¹¹ Von Weizsäcker, Ernst, Amory Lovins and L. Hunter Lovins (1998). *Factor Four – Doubling Wealth, Halving Resource Use* (London, Earthscan Publications Ltd.).

¹² For similar case studies, see the website of the World Business Council for Sustainable Development, accessed on 28 February 2006 from <<http://www.wbcsd.ch/web/publications.htm>>.

¹³ Batista, Josefa Rizalina M. (1998). "Global Cooperation for Sustainable Development: the View from Philippines" in Carley, Michael and Philippe Spapens, eds. (1998). *Managing the Global Commons, Sharing the World: Sustainable Living and Global Equity in the 21st Century* (London, Earthscan Publications Ltd.).

¹⁴ See the environmental education webpage of the Government of Australia Department of Environment and Heritage, accessed on 14 February 2005 from <<http://www.deh.gov.au/education/programs/04-05-full.html>>.

¹⁵ For example, where the water efficiency of the production of a box of cereal will depend on the process and technology efficiency and can be maximized by eco-design principles, whether or not the box of cereal should be produced by a particular country could be determined based on the entire input of water needed to grow the cereal ingredients, in addition to the water needed to process them.

¹⁶ See the description of the Huangbaiyu project at the website of the China-U.S. Centre for Sustainable Development, accessed on 20 April 2006 from <<http://www.chinauscenter.org/VillageSlideshow/introduction.html>>.

¹⁷ Government of Singapore SEI Professional Sharing Series presentation (2005). "Green Mark for Buildings", accessed on 20 January 2006 from <<http://www.nea.gov.sg/cms/sei/PSS13slides.pdf>>.

¹⁸ ESCAP, UNDP and ADB (2005). *A Future Within Reach: Reshaping Institutions in a Region of Disparities to Meet the Millennium Development Goals in Asia and the Pacific*, United Nations publication, Sales No. E.05.II.F.27 (New York, United Nations).

¹⁹ International Fund for Agricultural Development (2002). *Assessment of Rural Poverty: Asia and the Pacific* (Rome, International Fund for Agricultural Development Asia and the Pacific Division).

²⁰ See Meinzen-Dick, Ruth and P.P. Appasamy (2002). "Urbanization and Intersectoral Competition for Water", in *Finding the Source: The Linkages between Population and Water* (Washington DC, Woodrow Wilson International Centre for Scholars) and Bruns, Bryan Claudia Ringler and Ruth Meinzen-Dick, eds. (2005). *Water Rights Reform: Lessons for Institutional Design* (Washington DC, International Food Policy Research Institute), accessed on 19 December 2005 from <<http://www.ifpri.org/pubs/books/oc49.asp#dl>>.

²¹ Curitiba, Brazil, a city transformed by people-centred urban planning, serves as an inspiration to urban planners worldwide. In this city, where major projects are decided by referendum, the economic and environmental benefits of a people-centred approach are manifested in lower transportation costs for those without cars, low pollution, high transport efficiency and decreased per capita fuel use.

²² For other examples, see the website of the Centre for Sustainable Design, accessed on 22 April 2006 from <www.cfsd.org.uk>.

²³ See, for example, Jansson, A-M, M. Hammer, C.Folke, and R. Costanza, eds. (1994), op. cit.

²⁴ Speers, Andrew (2004). "Water and Industry: challenges and opportunities", *Industry and environment*, Vol. 27, No. 1, pp.13-16 (Paris, UNEP Division of Technology, Industry and Economics).

²⁵ See Dongol, Chandra M., Kenneth Hughey, and Hugh Bigsby (2002). "Capital Formation and Sustainable Community Forestry in Nepal", *Mountain Research and Development*, Vol. 22, No. 1, pp. 70-77 (Berne, International Mountain Society and United Nations University). In Thailand in 2005, a community forest bill was amended to exclude the establishment of community forests in protected forest areas. Supporters of the bill marched on Bangkok and protested against the decision, citing the loss of livelihoods, the discouragement of local forest protection initiatives and the limitation of the participation of forest-dependent communities in using, protecting and managing forests.

²⁶ As described by Van Dieren, Wouter, ed. (1995). *Taking Nature Into Account: A Report to the Club of Rome* (New York, Springer-Verlag), this index "begins with personal consumption as the basis of economic welfare. Personal consumption is then adjusted by an index of income distribution that gives greater weight to consumption when incomes are more equally distributed and less weight when incomes are less equal, relative to a given base year From this base, additions are made to reflect economic welfare derived from non-market labour production ..., government welfare inducing expenditures and stocks of private goods and public infrastructure. Then the costs of current economic activity are subtracted

... unemployment, commuting... water, air, soil and noise pollution... Sustainability in an environmental context is then accounted for by subtracting the long-term costs of [resource use and environmental degradation]."

²⁷ Similar to GDP and GNP, this indicator is expressed in monetary terms, but is adjusted for such issues as 1) the social cost of crime and natural disaster, 2) the non-monetary benefits of household and community work, 3) the environmental cost of depleting natural resources, 4) the costs of pollution and clean-up efforts, and 5) adjustments for income distribution and the drawbacks of living on foreign assets. See Anielski, M. and J. Rowe (1999). *The Genuine Progress Indicator – 1998 update* (San Francisco, Redefining Progress).

²⁸ See Faris, Christopher B. (2004). "Information and Communications Technology and Gross National Happiness – Who serves Whom?", in Karma Ura and Karma Galay, eds. (2004). *Proceedings of the First International Seminar on Operationalization of Gross National Happiness* (Thimphu, Centre of Bhutan Studies), accessed on 21 March 2006 from <<http://www.bhutanstudies.org.bt/publications/gnh-dvlpmt/GNH-I-1.pdf>>.

²⁹ United Nations, European Commission, International Monetary Fund, OECD and World Bank (2003). *Handbook of National Accounting: Integrated Environmental and Economic Accounting 2003*. Final draft circulated for information prior to official editing.

³⁰ See Hamilton, K. and E. Lutz (1996). "Green National Accounts: Policy uses and empirical experience," Environment Department Papers, Paper 039, Environmental Economics Series (Washington DC, the World Bank); Hecht, J. E. (2000). *Lessons learned from Environmental Accounting: Findings from Case studies* (Washington DC, World Conservation Union); ESCAP (2004). *Integrating economic and environmental policies: the case of the Pacific Islands*, Development Papers 25, ST/ESCAP/2273 (New York, United Nations).

³¹ See the website of the Ministry of Environment, Japan, "Japan's Action for a World-Wide Sound Material-Cycle Society through the 3R Initiative: Japan's Action Plan to Promote Global Zero-Waste Societies", accessed on 21 March 2006 from <<http://www.env.go.jp/earth/3r/en/approach/01.pdf>>.

³² China Academy of Science (2006). *2006 China Sustainable Development Strategy Report: Building a Resource-Efficient and Environment-Friendly Society* (Beijing, Science Publishing House).

