Environmental Performance Assessment And Sustainable Development Planning In the Greater Mekong Subregion

Technical Working Paper I

IGES
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Making the Link:
Greater Mekong Subregion Environmental Performance Assessment And Sustainable Development Strategies

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Acronyms and abbreviations

ADB	Asian Development Bank
AECEN	Asian Environmental Compliance and Enforcement Network
ASEAN	Association of South East Asian Nations
BMA	Bangkok Metropolitan Administration
BOD	biochemical oxygen demand
CEP	core environment program
CO_2	carbon dioxide
D-P-S-I-R	driver-pressure-state-response-impact
ECE	environmental compliance and enforcement
EIA	environmental impact assessment
EMS	environmental management system
EOC	Environment Operations Center
EPA	environmental performance assessment
EPR	environmental performance review
GDP	gross domestic product
GHG	green house gas
GMS	Greater Mekong Subregion
GRI	global reporting initiative
ha	hectare
IGES	Institute for Global Environmental Strategies
ISO	International Standards Organisation
kg	kilogram
mcm	million cubic meters
MDG	millennium development goals
NCDC	national commission on sustainable development
NEAP	national environment action plan
NSDP	national strategic development plan
NSDS	national sustainable development strategy
NSSD	national strategy for sustainable development
OECD	Organisation for Economic Cooperation and Development
PRC	Peoples' Republic of China
PRSP	poverty reduction strategy paper
P-S-R	pressure-state-response
SDS	sustainable development strategy
SEF	strategic environment framework
SOE	state of environment
SOx	sulphur oxides
SSDS	subregional sustainable development strategy
TA	technical assistance
toe	tonnes of oil equivalent
UNCSD	United Nations Commission on Sustainable Development
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme

1. Introduction

Component 3 of the Core Environment Program (CEP) for the Greater Mekong Subregion (GMS) deals with environmental performance assessment (EPA) and sustainable development planning. The Institute for Global Environmental Strategies (IGES) is primarily responsible for the sustainable development planning, while the United Nations Environment Programme (UNEP) is responsible for the implementation of the EPA. The purpose of this review paper is to demonstrate the best practice worldwide in attempting to link sustainable development planning at all levels with environmental performance. It also reviews the progress to date in the GMS with both sustainable development planning and EPA and the need for increased linkage. From this review, it is intended that IGES and UNEP will be able to assist the GMS countries to continue to strengthen their EPAs by (i) drawing additional sustainability indicators from sustainable development planning, and (ii) making a stronger link between EPA and broader sectoral performance assessments within governments. This stronger linkage between EPA and sectoral performance assessment will assist the overall goal of mainstreaming environmental considerations into all aspects of subregional, national and sub-national development planning. Careful selection of a core set of indicators will help to link EPA, State of Environment (SOE) reports and National Sustainable Development Strategies (NSDS).

2. Environmental performance assessment

2.1 Environmental performance reviews in OECD countries

While almost all countries regularly review the performance of their environmental agencies, in recent years external peer reviews have been seen as a useful adjunct to self-evaluation. Peer reviews [1] of environmental conditions and progress are conducted periodically for each Organisation for Economic Cooperation and Development (OECD) member country. Termed environmental performance reviews (EPR), rather than EPA,[2] analyse efforts to meet domestic objectives and international commitments and provide recommendations to each country on how to improve their performance. The first cycle of 32 EPRs (all OECD countries and three non-OECD countries) has been completed (OECD 2000). A brief summary of the assessments is attached as an Appendix. A new cycle began in 2001, focusing on accountability, environmental effectiveness and economic efficiency. This cycle should be completed soon. Of the GMS countries, an OECD-mandated EPR has been completed recently in People's Republic of China (PRC) (OECD 2007).

The first cycle reviewed (i) effectiveness in implementing environmental policies; (ii) the extent to which environmental concerns were integrated into economic decision making; and (iii) commitment to international obligations. The intention is to help governments assess progress with respect to domestic objectives and international commitments; it is not intended to benchmark countries against each other. Of particular interest to this study is the assessment of how countries have been able to integrate environment and economic decision making, and whether through such integration more advanced countries have been able to decouple economic growth and environmental degradation.

[1] The OECD defines the peer review process as "the systematic examination and assessment of the performance of a State by other States, with the ultimate goal of helping the reviewed State improve its policy making, adopt best practices, and comply with established standards and principles" (Lehtonen 2006).

[2] The acronym EPA is often reserved for Environment Protection Agency.

It should not be automatically assumed that developed countries have more successfully integrated the three pillars of sustainable development than developing countries. Australia, a country that has drawn international opprobrium from its failure to sign the Kyoto protocol, is an example of an OECD country with good environmental laws, mostly well-enforced, and a National Strategy for Ecologically Sustainable Development dating from 1992, that is finding that increasing economic and population growth have lead to only a weak decoupling, with environmental pressures growing more slowly than GDP but still increasing (OECD 2000). The indisputable conclusion from the OECD review is that "better integration of environmental concerns into economic and sectoral policies and decisions is needed." The review notes that economic objectives in Australia too often take priority over environmental concerns, "with most decision makers believing that the wealth created by economic activities will overcome environmental effects." A specific recommendation is to "develop quantitative targets and timetables to further the implementation of the National Strategy for Ecologically Sustainable Development" (OECD ibid.).

Similar findings regarding the need for better integration were noted in the reviews of many OECD countries. If better integration of economic and environmental concerns is needed, then which countries are the exemplars? The OECD singles out at least 5 countries that have made the most progress: Canada, the Netherlands, Norway, Finland, and Switzerland.

Following broad consultation, Canada's Green Plan represented a government-wide commitment to translate sustainable development concepts into specific qualitative and quantitative national targets and policy measures. Evidence of effective integration is included in the legislated environmental assessment process, environmental analysis of policy proposals and legislation, roundtables at various levels on the environment and the economy, and sustainable development plans for agriculture, fisheries, forestry and industry sectors. Legislation was introduced to establish an independent Commissioner of the Environment and Sustainable Development and to require federal departments to prepare sustainable development strategies to be debated in Parliament (OECD ibid.).

As for most countries, more could be done to integrate environmental and economic issues in Canada and the OECD peer review recommended, *inter alia*, (i) strengthened economic analysis of environmental policies; (ii) greater use of economic instruments to prevent pollution and conserve natural resources; (iii) increasing environmental charges and taxes; (iv) improved inter-ministerial consultation and decision making; (v) harmonised national and provincial environmental objectives and clear distinction of responsibilities; (vi) incorporation of sustainable development objectives and improved environmental controls into municipal land use planning; and (vii) developing a reliable system of information on the SOE and related economic and social issues.

Since the late 1980's Finland's industries have successfully decoupled discharges of suspended solids and biochemical oxygen demand (BOD) and emissions of sulphur oxides (SOx) from production, partly through cleaner production processes and investment in pollution control equipment. Finland has also introduced environmental considerations into sectoral plans for transport, forestry, agriculture, energy and industry. For example, the Action Program for Reducing the Adverse Effects of Transport on the Environment includes specific environmental targets. Taxation has shifted from income and labour to be compensated by a new landfill tax and increased energy taxation. The Finnish National Commission on Sustainable Development (NCSD), created in 1993, is chaired by the Prime Minister. In addition Local Agenda 21 plans are being undertaken in many municipalities. The environmental impact assessment (EIA) Act

requires environmental assessment of policies and plans and several pilot projects have been conducted.

The main recommendations of the review were to (i) strengthen institutional mechanisms for integration of environmental concerns into sector policies; (ii) set quantitative environmental objectives and deadlines; (iii) continue to integrate environmental concerns into fiscal policies and remove environmentally harmful subsidies; (iv) use EIA procedures more widely; and (v) attempt to modify consumption and production patterns through consumer information and pricing, as well as "greening" government operations.

The Government of the Netherlands has resolved to reach sustainability by 2010. To achieve this, the Netherlands environmental planning system identifies 9 target groups and 8 priority themes, defines goals and ambitious quantitative targets and deadlines, describes in broad terms how to achieve these targets, and estimates the expected costs. Each target group is given flexibility to design its own implementation strategies to achieve the targets set, which are subsequently codified in the form of a contract or compact with the government. According to OECD, the planning system is "indicative, comprehensive, action-oriented and based on some of the most innovative and sophisticated analytical work in the world." There is a high degree of coordination among ministries and all levels of government, although integration of environmental policies with other national policies is mostly voluntary.

Strong determination will be needed to achieve the changes in production and consumption patterns being advocated. Of all target groups, consumers appear to be the hardest to influence. While there is wide support for shifting the tax base from labour to environmental "bads", the Netherlands also has to harmonise its tax system with its European neighbours. The main OECD recommendations are to (i) extend the use of land utilisation planning and regulation to serve pollution abatement, nature conservation, and risk prevention; and (ii) integrate environmental assessment earlier in decision making to influence plans, policies, and programs.

Norway has been a pioneer in promoting sustainable development in the international arena. They have (i) adopted specific sustainable development targets and the most cost-effective ways to achieve them; (ii) introduced environmental taxes and other economic instruments; (iii) explored fiscal reforms and shifting the taxation burden; (iv) updated regulatory instruments; (v) strengthened land use planning and other legislation; (vi) provided public information on sustainable development; and (vii) strengthened institutions, inter-ministerial coordination, and coordination with county and municipal administrations.

Recommended improvements included (i) preparation of a national plan for the environment; (ii) translation of sustainable development goals into sectoral targets, with new targets for environmental quality and stocks of key natural resources; (iii) strengthened coordination between the Ministry of Environment and other ministries; (iv) improved integration of environment, economic planning and budgets; and (v) a review of regulations relating to conservation and use of natural resources.

Switzerland has decoupled economic growth and air pollutant emissions, but decoupling is less obvious for water and waste management. The sustainable development strategy (SDS) adopted in 1997 identifies the actions that need to be taken. Switzerland has introduced policies to internalise the environmental externalities and to remove or reorganise environmentally harmful subsidies. Switzerland has a Committee on Sustainable Development but it still needs to set quantitative targets and deadlines. The Federal Council is promoting green tax reform, shifting from taxation of labour to environmental taxes, energy taxes, and new eco-taxes in the areas of agriculture, natural resources, and transport. The OECD also recommends

development of action plans to promote sustainable development at the cantonal level, strengthen environmental aspects of cantonal administrative structures, and assess environmental performance at canton level using inter-cantonal cooperative mechanisms.

Generally peer-reviewed EPRs, such as those conducted by the OECD, are seen as an opportunity to share learning and experience rather than any attempt at benchmarking. Lehtonen (2006) claims that the peer reviews empower weaker actors (typically environment ministries) within governments and improve the factual basis for decision making. They also create space in a non-threatening environment to discuss "hot" topics and how other jurisdictions have handled similar issues. Peer reviews enhance policy dialogue, foster transparency and accountability, build capacity and promote learning, and facilitate compliance with internationally agreed policies, standards and principles (Lehtonen op. cit.). Credibility of the reviews lies in the objective, fact-based, independent evaluations by a team of experts. The vadded value of the peer review process is its ability to push or persuade governments to establish clear reform targets, with implementation reports expected 2-3 years after the EPR is completed and a repeat round of reviews within 5-10 years.

2.2 Environmental performance reviews in other countries

Under the United Nations Economic Commission for Europe (UNECE) programme on EPR, countries reviewed (essentially using, or at times in combination with, the OECD procedure) include Estonia (1995, 2001), Bulgaria (1995, 2000), Slovenia (1997), Belarus (1997, 2005), Moldova (1998, 2005), Lithuania (1998), Latvia (1998), Ukraine (1999), Croatia (1999), Russia (1999), Kyrgyzstan (2000), Kazakhstan (2000), Armenia (2000), Uzbekistan (2001), Romania (2001), Albania (2002), Macedonia (2002), Serbia and Montenegro (2002), Azerbaijan (2003), Georgia (2003), Tajikistan (2004), and Bosnia and Herzegovina (2004).

The key lesson to be drawn from this set of countries is to assess how first round EPRs have led to significant improvements by the time of the second review, as this has particular importance for the second round EPAs in the GMS. Drawing from the latest report in this series, the second review of Ukraine (UNECE 2007), it is instructive to examine the lessons learned since the first review in 1999. One of the 98 recommendations in 1999 was to revise the National Environmental Action Plan and set clear priorities, targets and time frames for environmental protection in all sectors. The Government decided instead to first draft a Strategy of Sustainable Development of Ukraine, which sets out priority goals and objectives, and is now in the process of consideration and approval. It is expected that the national environmental policy will only be revised once the NSDS is approved.

Another key recommendation in 1999 was to strengthen the coordinating activities regarding environmental monitoring and provide environmental information to raise public awareness of environmental problems. The second review found that the Cabinet of Ministers had established an Inter-departmental Commission on Environmental Monitoring in 2001, followed by approved procedures for information exchange in 2002. The European Environment Agency was provided with comparable data sets for its 2003 Pan-European State of Environment Report. A Public Council, comprising various environmental NGOs, was established within the Ministry of Environmental Protection to consider regulatory documents and implementation of environmental policy. In 2003, the Aarhus Information and Training Center was opened in the Ministry of Environmental Protection and environmental information is routinely released to the media. Also, in 2003, the Government established a mechanism for public participation in environmental impact assessments.

On the negative side, a number of the 1999 recommendations have seen no change or (as in

the case of a draft law on a national environment fund) have been rejected. Other actions have been superficial and have not had any real impact. For example, the National Committee for Sustainable Development was removed from the purview of the Cabinet of Ministers and transformed into a National Council on Sustainable Development under the President of Ukraine in 2003, but no meetings of the Council have taken place since its inception. Following the Chernobyl disaster, one specific recommendation was to urgently develop a "realistic scenario for the role of nuclear energy". The Energy Strategy for Ukraine (2006-2030), however, proposes construction of 22 new nuclear reactors and only briefly mentions renewable energy resources.

The updated review concludes that environmental protection and sustainable development have been low on Ukraine's political agenda in recent years. Although there are now about 200 laws and by-laws, harmonising Ukraine's legislation with the European Union would cost about $1 billion. The strategic directions are still unclear and environmental institutions are not stable. Environmental monitoring still needs major improvement as there are significant gaps, inadequate treatment of the data, and access to data remains difficult. There has been a slight decoupling between economic growth, energy intensity and pollution but the environmental pressure from industry has barely changed since the first review. In short, the EPR process has effectively highlighted many of the priority issues that should be tackled by the Government of Ukraine and while some changes were triggered there has been an apparent lack of real commitment to the task.

Apart from France (Ministry of Ecology and Sustainable Development 2005), the Republic of Korea is the only country to date that has volunteered to have a "peer review" of its national strategy for sustainable development (NSSD) (Chung and Hwang 2006). Korea has had a national action plan to implement Agenda 21 since 1992, a Presidential Commission on Sustainable Development since 2000, and a national vision for sustainable development since 2005. To achieve this vision, the NSSD implementation plan (2006-2010) adopted by Parliament in October 2006 has five core themes, 48 implementation tasks and 224 detailed tasks, each matched with a performance indicator. The implementation plan is intended to undergo a continuous process of revision, supplementation and development through monitoring using a range of performance indicators.

The United Nations Commission on Sustainable Development (UNCSD) suggested that Korea would be a suitable country for shared learning and review of NSDS. Five northeast Asian countries organised workshops in 2002 and 2005 for shared learning on sustainable development experience and methodologies. In October 2006, these five countries, plus the Netherlands and the UN adopted a Seoul Declaration and the workshop reports were considered at the 14th UNCSD held in May 2006. A peer review workshop was held in March 2007.

Some of the quantitative and qualitative targets are given in Table 1. On the surface, these targets appear to be fairly conservative, perhaps reflecting a view that more ambitious targets will need to be deferred to subsequent versions of the NSSD. For example, announcing that nearly 2 million people will remain over-exposed to pollution by 2010 would seem hard to justify to those who are already suffering.

Table 1 Selected targets for the Korean National Strategy for Sustainable Development

Indicator	Baseline 2005	Target 2010
Secure (safe) water resources	7.737 million cu. m. (mcm)	8.368 million mcm (2011)
Natural protected area	9.7%	11.0%
Coastal and marine protected area	14.8%	20% (2020)
Park size per capita	8.2 sq. m.	9.8 sq. m.
Strategic environmental impact assessment	Investigating introduction	Settlement
Total amount system of green space	Investigating introduction	Enforcement and establishment
No-net-loss system for natural coast and habitats	Investigating introduction	Enforcement and establishment
Population over-exposed to pollution	3,515,000	1,760,000
Increasing market share of eco-friendly products	3.2 trillion won	16 trillion won
Increasing production of eco-friendly agricultural products	4.0%	10.0%
Decreasing quantity of chemical fertilizer usage	375 kg/ha (2003)	280 kg/ha
Re-using industrial wastes	77%	80%
Increasing energy efficiency	0.359 toe/$'000	0.294 toe/$'000
Product life cycle sustainability assessment	Introduction	Expansion of establishment
Carbon dioxide emissions per unit GDP	0.88 t/$'000 (2002)	0.77 t/$'000
Ratio of new to recycled energy supplies	2.3%	5.0%
Fund for combating desertification	$700,000	$2,000,000

Each target is matched by one or more detailed tasks, a timeline, and a cost estimate. For example, for the safe water resource target, there are four implementation tasks and 22 detailed tasks, as shown in Table 2. An estimated cost of 1,500 billion Won is indicated for the water sector for the period 2006-2010.

While the results of the "shared learning" for Korea are not yet available, it will be instructive to see if there is a qualitative difference in the recommendations for a peer review of a NSSD and a peer review of environmental performance. Given the multiple dimensions of sustainable development strategies (economic, social and environmental), it may be more difficult to identify specific experts as "peers" or it may require a larger number of experts to be involved.

Table 2 Implementation tasks for the water resources targets in Korea's NSSD

Implementation Task	An increased supply of drinking water	Integrated water resource management and the establishment of an efficient system of use	Building a water resources network and data base	A sustainable water management policy
Detailed tasks	Enhance the standard for drinking water quality Expand and reform waterworks facilities Streamline management system for operating waterworks Enhance the sanitation management system for drinking water in vulnerable areas Secure water supply sources and develop alternative water sources	Develop water resources and improve the supply system Integrate water resource management Enhance the system of water recycling Strengthen management policy concerning tap water demand Prepare a reasonable water price structure Construct a sustainable management system for under-ground water	Establish a national flux quantity monitoring network Expand the measuring of flux and water levels Automate water investigation, including remote automatic flux measurement Expand the sharing of information on water management, and improve the function	Anticipate water supplies and complement the long term master plan for water resources Establish a national master plan for water supply management Change policy for dam management Set up an advanced water management policy Enhance the quality of drinking water Introduce the public nature of underground water Introduce total load management for floods.

2.3 EPA in the GMS

Under TA 6069-REG: National Performance Assessment and Subregional Strategic Environment Framework for the GMS (SEF II) the first round of EPAs was completed for the GMS countries and the subregion (UNEP 2006). As agreed at the final workshop for SEF II, future approaches to EPA in the GMS should "remedy the shortcomings of the current EPA." Thus, it is instructive to examine the achievements and shortcomings of SEF II before embarking on the next round of EPAs.

Each GMS country ranked its priority environmental concerns, thus limiting the assessment to the top priority issues. Pressure-State-Response (P-S-R) indicators were identified for each of these issues. For example, in Cambodia for the "threat to biodiversity" concern the indicators chosen were (i) loss of critical habitats between 1993 and 1997 (P); (ii) percentage of globally threatened species 1996 to 2004 (S); and (iii) protected areas as a percent of total land area 1993 to 2002 (R). For "forest resources" the indicators were (i) forest concession areas 1994 to 2002 (P); (ii) forest cover as a percent of total land area 1965 to 2002 (S); (iii) reforested area 1985 to 2002 and protected forest as percent of total land area 1993 to 2002. Where data are available these indicators were graphed as trend lines and compared to a long term national "target" if one exists. All available data was collated in a set of fact-sheets, which provide a valuable assessment of not only the data but also the quality and reliability of the data.

Each of the P-S-R indicators was rated subjectively, with a justification given for each rating. An overall "star" rating (1 to 3) was then given for the environmental concern, based on the ratings for each indicator. For example, a 2-star rating was given for forest resources in Cambodia based on the evidence that the current responses will have the desired impact on improving the "state" indicator (forest cover) and meet the national target of 60% forest cover by 2005 and be

maintained through to 2015.

While no attempt was made to benchmark institutional performance in the GMS, and there may have been resistance to participating if that was set as an initial objective of the exercise, interesting comparisons were possible across countries. For example, in the area of forest cover, the variation between the S-indicators in GMS countries ranges from 33.2% in Thailand to 61.0% in Cambodia, while the long term targets range from 70% by 2020 in Lao PDR to no less than 35% in Myanmar. It was also found that some countries actually had more than one target for the same indicator, most notably in the forest sector, suggesting a need for rationalisation and harmonisation of targets between government agencies.

The TA 6069-REG: National Performance Assessment and Subregional Strategic Environment Framework for the GMS also prepared a subregional assessment (UNEP 2006). The subregional assessment found three environmental concerns of greatest common interest: (i) threats to the Mekong River's vital functions; (ii) illegal trade in wildlife resources; and (iii) degree of harmonisation of environmental policy and standards. In addition to assessing region-wide progress in relation to these issues, the subregional assessment was supplemented by work on biodiversity modelling and formulation of an environmental sustainability index.

In relation to the Mekong's vital functions, the subregional EPA concluded that lack of data (particularly longitudinal data) hampers any real assessment of the state of fisheries in the Mekong River, despite its obvious importance. There are also no quantified subregional environmental targets for fisheries and no institutional responsibility for developing goals and programmes to reach those goals.

In relation to the illegal trade in wildlife, the subregional assessment found that all six GMS countries are signatories to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the Convention on Biodiversity, although this is clearly insufficient to stop the illegal trade across national boundaries. Again, no specific sub-regional target exists in relation to illegal trade in wildlife (although it presumably should be zero) and there is no subregional institutional mechanism to control the trade across national borders (thus relying on under-resourced national wildlife agencies).

In relation to harmonisation of environmental policy and standards, with the exception of Lao PDR and Myanmar, GMS countries have water quality standards broadly aligned with the Association of South East Asian Nations (ASEAN) long term water quality goals. For air quality, the only regional standard is an ASEAN standard for ambient air quality to reach a Pollutant Standard Index of below 100 by 2010. No commonality was found in relation to forest cover standards.

2.4 Sectoral EPA

EPA at a sectoral level, whether in the public or private sector, generally relies on an evaluation of performance in implementing environmental management systems (EMS) and/or application of various environmental (or sustainability) reporting protocols. The International Standards Organisation (ISO) 14000 series has become the *de facto* indicator of an intention to implement an internationally acceptable EMS (http://www.iso.org), whereas the Global Reporting Initiative (GRI) is becoming the gold-plated standard for environmental performance reporting (http://www.globalreporting.org). According to the latest statistics, ISO 9000 and ISO 14000 standards are implemented by some 887,770 organisations in 161 countries. Since its inception in 1997, about 1,000 organisations have referenced the GRI guidelines in their sustainability reports and over 20,000 individuals and organisations are included in the GRI communication

network.

GRI has also developed sector supplements for financial services, logistics and transportation, mining and metals, public agencies, tour operators, telecommunications, and the automotive industry (GRI 2005).[3]

3. Sustainable development strategies

3.1 Sustainable development strategies – Worldwide

Despite consistent calls since the United Nations Commission on Environment and Development (UNCED) in 1992 and the World Summit on Sustainable Development (WSSD) in 2002 for all countries to prepare a NSDS and establish a national council on sustainable development before 2005, less than half have complied. According to a 2004 UN review, 12% of 191 countries had a NSDS under implementation, while another 24% had strategy documents which were approved by governments or were under development (OECD 2006).[4] Generally Asia-Pacific has performed slightly better than the global average, although implementation has been weak.

In part, the reluctance to prepare a NSDS stems from the existence of many similar plans that remain unimplemented. The Asia-Pacific region has a surfeit of national plans covering the environment (Figure 1), many of which have been funded by external agencies and conducted by consultants, ensuring rather weak national ownership of the plans (UNEP 2007). UNEP is currently assisting 17 countries in the region to develop NSDS, as well as contributing to three subregional sustainable development strategies.

The current view of sustainable development planning is that the three pillars of sustainable development (economic, environmental, and social) should be integrated, but not necessarily in a stand alone NSDS document. Agenda 21 actually stated that the objective was “to improve or restructure the decision-making process so that consideration of critical socio-economic and environmental issues is fully integrated and a broader range of public participation assured” (UNCED 1992) and did not propose establishment of a new stream of national planning.

The current view is that, to the extent possible, the sustainable development plan should act to bridge other existing plans such as a poverty reduction strategy paper (PRSP) or a national environment action plan (NEAP) and fill in any gaps. It should also provide the long term vision and framework within which specific sector plans and strategies fit seamlessly. Sustainable development planning should shift centralised and government controlled decision making towards sharing results and opportunities, transparent negotiation with stakeholders, and cooperation with key groups. Fixed plans should be replaced by more adaptive systems accommodating improved monitoring, social learning, and continuous improvement. The extent to which this emerging concept of sustainable development planning is being implemented in the GMS is analysed in the following sections.

[3] See http://www.globalreporting/org

[4] The World Summit in 2005 stated a new goal “to adopt, by 2006, and implement comprehensive national development strategies to achieve the internationally agreed development goals and objectives, including the MDGs.”

Agenda 21	National Action Plan	National Development Plan
o Philippines o China o Nepal o Indonesia o Viet Nam o Turkmenistan	o Mongolia o Japan	o India o Maldives o Thailand o Many others
Poverty Reduction Strategy Paper	**National Conservation Strategy**	**Vision 2020**
o Cambodia o Sri Lanka o Tajikistan o Viet Nam o Kyrgystan o Indonesia o Pakistan	o Pakistan o Nepal o Bangladesh o Malaysia	o Malaysia o India o Bhutan o Turkmenistan o Viet Nam

Figure 1 Existing sustainable development policy framework in Asia-Pacific (after UNEP 2007)

Experience from global assessments of the best practices for preparation and implementation of NSDS (OECD 2006) and peer review of the French NSDS (Ministry of Ecology and Sustainable Development 2005) offers insight into process and content improvements. The French peer review recommended the following process improvements:

(i) empower champions in the civil service to integrate sustainable development into their normal activities;
(ii) invest more time and resources into future iterations and implementation of the NSDS;
(iii) clarify the role of the National Council for Sustainable Development, especially in relation to other arms of government;
(iv) ensure that the NSDS is fully institutionalised so that it is not subject to the vagaries of political change; and
(v) establish a more participatory process, by adopting a dialogue model rather than consultation.

The OECD best practice guidelines stress that NSDS should be a process rather than a document (OECD 2006), leading to dynamic plans that are subject to periodic revision as circumstances change. The key elements of global best practice are as follows:

(i) policy integration – integrate economic, social and environmental objectives in a comprehensive and integrated strategy;
(ii) inter-generational timeframe – develop a consensus on a long term vision and provide vertical linkages from the long term (20-25 years) to the short term;
(iii) analysis and assessments – make sure the strategy is based on comprehensive and reliable social, technical and economic analysis, building on existing processes and strategies;
(iv) coordination and institutions – embed the sustainable development strategy in high-level government commitment and influential institutions;

(v) local and sub-national governance – link all levels of administration, e.g. through Local Agenda 21 plans;
(vi) stakeholder participation – ensure effective participation through a people-centered strategy;
(vii) indicators and targets – set realistic, flexible targets with clear budget priorities; and
(viii) monitoring and evaluation – incorporate monitoring, learning and continuous improvement.

From experience with the 23 out of 30 OECD countries that have produced some form of NSDS, the OECD found that most have focused on environmental objectives, with some treatment of economic objectives, but almost all foundered on adequate treatment of social issues (OECD 2006). Belgium, New Zealand and Sweden were cited as good exemplars of integrating social dimensions into their NSDS. The review found that "the integration of the three dimensions of sustainable development is one of the most difficult balances to achieve in formulating a national strategy." Few NSDSs have worked out a robust mechanism for making trade-offs between the three pillars of sustainable development.

Experience has shown that sustainable development strategies are often most effective at local levels, where implementation activities and Local Agenda 21 plans tend to have a closer relationship than at the national level. As an example, the City of Liverpool in the United Kingdom covers issues of (i) efficient use of resources, energy and waste; (ii) healthy and safe living environments; (iii) lifelong learning and community involvement; (iv) limiting pollution; (v) satisfying work in a sustainable economy; (vi) access and sustainable transport; (vii) local identity and the built environment; and (viii) enhancing the diversity of nature and leisure opportunities (City of Liverpool 2005). A clear link is made to the national Sustainable Development Strategy and the Regional Action for Sustainability. Priority environmental actions (waste reduction and recycling, energy conservation, renewable energy, water conservation, green transport planning, sustainable procurement, and staff training and awareness) are carried forward into the Council's Corporate Performance Plan. Sustainable Development Plan indicators are embedded in mainstream activities and reviewed every 3 years for a public report on progress. About 120 indicators are included in the plan and they tend to be very specific compared to indicators at national level. For example, one energy efficiency indicator is "percentage of new or major refurbished buildings commissioned by the Liverpool City Council attaining an energy efficiency "good rating" as set out in the council's energy guide."

3.2 Subregional sustainable development strategies – GMS

At the time of the World Summit on Sustainable Development (2002), progress towards sustainable development strategies in the ASEAN region was described as follows. "Unfortunately, although many excellent strategies and plans have been prepared, they are poorly linked to economic development plans, not adequately financed and to date have had little political support" (ADB/ESCAP/UNDP/UNEP 2001).

UNEP is currently attempting to develop a Subregional Sustainable Development Strategy (SSDS) for several subregions of Asia-Pacific, including the GMS. The Thailand Environment Institute (TEI) has been commissioned to prepare a draft version of the SSDS, to focus on trans-boundary issues of concern in the GMS (TEI 2007). Although still at a very preliminary stage of development, the draft SSDS refers to numerous statements by the subregion's leaders of a vision of the GMS as "an integrated, harmonious and prosperous subregion characterised by steady economic growth, social progress and environmental sustainability." At the Second GMS Summit in Kunming, PRC in 2005, the heads of government outlined a "road ahead

towards sustainable development" as well as their commitment to pursue the Millennium Development Goals (MDG). Priority action areas identified included (i) reinforcing infrastructure for development; (ii) improving trade and investment environment; (iii) strengthening social and environmental infrastructure; and (iv) mobilising resources and deepening partnership.

Unfortunately, like many other sustainable development strategies fostered by environmental agencies, the draft SSDS tends to over-emphasise the environmental aspects of sustainable development, repeating the approach that many other sustainable strategies have made in not adequately addressing social issues. The institutional challenges identified include (i) the lack of any regional coordinating body for sustainable development; (ii) the diversity of legislative frameworks for sustainable development; (iii) a congestion of donor-driven regional initiatives; (iv) a lack of coordination by civil society organisations; and (v) the lack of involvement by the subregional scientific community. However, no substantive solutions are offered to overcome these challenges.

The draft document outlines a vision for each of the three pillars of sustainable development, identifies some overall objectives and possible strategies and actions. However, it is not clear how a regional consensus will be reached on these strategies and actions, especially as the draft SSDS has not been built up from national sustainable development plans or their equivalents. The need for extensive consultation is noted but insufficient resources are available to carry out the public participation required. ASEAN is identified as a likely institution for taking the SSDS forward but as ASEAN may not be the best institution for this.

In summation, there is a clear need for a more integrated development plan for the GMS that will carefully balance environmental, social and economic objectives. However, greater country ownership and participation in the planning process is needed before the draft SSDS can be regarded as a useful contribution.

3.3 National sustainable development strategies – GMS

3.3.1 Cambodia

The sequence of contributing plans to sustainable development strategies in Cambodia follows a typical pattern in developing countries of the Asia-Pacific region, which have been heavily influenced by external donors and/or UN organisations, as shown below:

- National Programme to Rehabilitate and Develop Cambodia 1994
- National Environmental Action Plan (NEAP) 1997
- National Biodiversity Strategy and Action Plan 2001
- Governance Action Plan (GAP I) 2001
- Cambodia Millennium Development Goals (CMDG) 2001
- National Poverty Reduction Strategy (NPRS) 2002
- Rectangular Strategy for growth, employment, equity and efficiency (2004)
- 3rd National Strategic Development Plan (NSDP) 2006-2010 incorporating the Rectangular Strategy philosophy
- Preceded by 1st (1996-2000) and 2nd (2001-2005) Socio-economic Development Plans (SEDP)
- Education Sector Strategic Plan (2006-2010)

The Cambodian Government has launched its third five-year plan, called National Strategic Development Plan (NSDP), for 2006-2010. The core focus of this five-year plan is to reduce poverty and to increase national economic growth, and to achieve other Cambodia Millennium

Development Goals (CMDG) and socio-economic development goals for the benefit of all Cambodians. It incorporates the national development philosophy referred to as the "Rectangular Strategy", emphasising the need to balance economic growth, employment, equitable distribution of wealth and access to services, and efficiency.

The Government considers the NSDP as the single, overarching development strategy for pursuing prioritised goals and actions for the period 2006-2010. The NSDP has been framed as the operationalisation of Cambodia's Rectangular Strategy, linking the long term vision in the Rectangular Strategy to concrete goals, targets and strategies. It synthesises goals and targets contained in the Second Five-Year Socio-Economic Development Plan for 2001-2005, the National Poverty Reduction Strategy for 2003-2005 and the CMDG. The NSDP highlights most essential strategies, targets and actions, but it leaves more details to be spelled out in sectoral and sub-national plans which will feed into the first annual review of the NSDP scheduled for March 2007. As an example, the Education Sector Strategic Plan (2006-2010) will be replicated by other sectors.

NSDP consists of seven chapters, including (i) future programme and action; (ii) progress and current situation; (iii) priority goals and targets; (iv) key strategies and actions; (v) costs, resources and programme; (vi) monitoring and evaluation; and (vii) conclusion. NSDP has 15 goals that are aligned to CMDG and the Rectangular Strategy. Moreover, in order to achieve these goals, 43 targets have been set up in the NSDP. The Cambodian government also set up a target on poverty reduction to 25% by 2010. Historic causes and decades of conflict have left a large proportion of people below the poverty line. However, there has been a rapid decline in poverty levels from 39% to 28% in both 1993 and 2004 surveys. In 2004, 90% of the poor were in rural areas.

NSDP preparation began in December 2004 and was led by the Ministry of Planning (MOP). In March 2005, the Government created an Inter-Agency Technical Working Group on NSDP Formulation – composed of 29 Ministries/agencies – whose day-to-day work was managed by a Secretariat chaired by the MOP. Government ministries and agencies, donors and civil society organisations were involved in the formulation of the NSDP. National-level consultations were held to elicit comments and to agree upon the overall goals and objectives of the NSDP. In mid-2005, a Technical Working Group on Planning and Poverty Reduction was established so that stakeholder inputs could be incorporated in the NSDP formulation process. Suggestions from stakeholders were incorporated in the draft NSDP, which was subsequently discussed at a national workshop held in November 2005. The NSDP was approved by the Council of Ministers in January 2006; by the National Assembly in May; by the Senate in June; and promulgated by the King in early July 2006. A NSDP monitoring framework was approved and announced in June 2006, with the first review expected in mid-2007.

Based on this information, is the Cambodian NSDP 2006-2010 equivalent to a NSDS? According to the UN and OECD recommendations on best practices for NSDS, the Cambodian NSDP brings together (but not necessarily integrates) economic, social and environmental objectives. As a five-year plan, it does not deal with the inter-generational time frame and longer term vision. However, it does build its analysis on existing processes and strategies, especially the Rectangular Strategy. It does coordinate national institutions in the planning process but does not link effectively with local and regional governance structures. There has been extensive participation in its formulation, indicators and targets have been set, and a monitoring and evaluation framework has been developed. Therefore, with some relatively minor amendment, the next revision of the NSDP could meet the criteria of an effective NSDS.

3.3.2 Lao PDR

In Lao PDR, a country dominated by Soviet era central planning, top-down five-year plans from the central government are the norm. Lao PDR's overarching development objective is to graduate from being a least developed country by 2020. Socio-economic development plans have been prepared for the 5, 10 and 20 year periods. As shown below, the sixth plan has been released for the period 2006-2010. In addition, Lao PDR has formulated a longer term socio-economic strategy to 2020.

- Strategic Vision for the Agriculture Sector (1999)
- State of Environment Report 2000: Lao PDR
- National Environmental Action Plan 2000
- Socio-economic Development Strategy (2001-2010) adopted by 7th Party Congress
- National Forestry Strategy 2020 (2002)
- National Growth and Poverty Eradication Strategy (NGPES) (2003)
- National Environment Strategy and National Biodiversity Action Plan 2004
- 6th National Socio-Economic Development Plan (NSEDP) 2006-2010
- Long Term Strategy of Socio-Economic Development to 2020

Lao PDR has numerous sectoral strategies and long- and medium-term socio-economic strategies at the national level. Economic and social issues are addressed comprehensively. However, the environmental dimension is still addressed mainly as a separate issue, rather than being fully mainstreamed into socio-economic development planning. In addition, increased linkage with local level planning and more effective integration of the three pillars of sustainable development are needed.

3.3.3 Myanmar

Myanmar remains one of the few countries in the Asia-Pacific region without a ministerial level environment agency and most environmental management is handled by line agencies. A National Commission for Environmental Affairs was established in 1990 and transferred to the Ministry of Forestry in 2005. Apart from Myanmar's Agenda 21, as shown below, there has been little attempt at integrating the economic, social and environmental pillars of sustainable development.

- National Environment Policy (1994)
- Myanmar Agenda 21 (1997)
- National development plans

A national environmental protection law has been drafted and there are plans for a new Ministry of Environment, but institutional change is relatively slow in Myanmar. A National Coordinating Committee for Environment was created in 2004, with a mandate to coordinate ministries and local authorities. Nevertheless, sustainable development planning and implementation must be regarded as an unfinished agenda in Myanmar.

3.3.4 People's Republic of China

The People's Republic of China (PRC) was one of the first countries in Asia to develop a national Agenda 21 following the 1992 Summit and agreement on the global Agenda 21. This was followed by a detailed action plan in 2003, as shown below.

- China's Agenda 21 (1994)

- Programme of Action for Sustainable Development in China in the Early 21st Century (2003)
- Tenth Five-Year Plan for Ecological Rehabilitation and Environmental Protection of Yunnan Province (2001-2005)

Over time, PRC has progressively increased the environmental content of its national five year plans. The 11th Five Year Plan proposes (i) a 20% decrease in energy intensity; (ii) maintenance of total population below 1.36 billion; (iii) protection of 120 million ha of cultivated land; (iv) a 10% decrease in total pollutant emissions; and (v) increased forest cover to 20% of the total land area (Xu 2007). The national five-year plan is quickly followed with provincial level (and lower) plans to implement the national plan. In 2007, Premier Wen Jiabao announced to the National People's Congress that environmental protection and economic development should be treated equally and that it was no longer acceptable to favour economic growth at the expense of the environment. It will be instructive to monitor how this policy announcement is incorporated into national and provincial plans over the next few years.

The OECD peer review of PRC's NSDS found that "the environmental pressures and demand for energy and other resources associated with China's rapid economic development dramatically underlines questions about the environmental sustainability of current production and consumption patterns globally" (OECD 2007). The EPR made 51 recommendations to strengthen PRC's environmental performance in the context of sustainable development. Recommendations in relation to sustainable development improvement include:

(i) Reviewing price levels for natural resources to better reflect their scarcity value and internalise externalities;
(ii) Establishing a inter-ministerial group to consider restructuring environment-related taxes;
(iii) Increasing and diversifying sources of environmental finance and more efficient allocation of public expenditure;
(iv) Strengthening institutional mechanisms for integrating environment into economic and sector policies;
(v) Continuing to establish national targets to achieve environmental objectives;
(vi) Reducing the share of people without access to sound environmental services (safe water, basic sanitation, electricity);
(vii) Developing a national health-environment plan of action;
(viii) Improving environmental information by developing and using indicators of environmental performance, environment-related economic information, and environmental accounting tools and providing public access to environmental information;
(ix) Further expanding environmental education and awareness, particularly among young people; and
(x) Continuing efforts to work with NGOs, the public and enterprises to achieve environmental policy goals.

3.3.5 Thailand

For many years, Thailand has accepted the need to mainstream environmental issues into the national economic and social development plans, as shown below.

- Policy and Prospective Plan for Enhancement and Conservation of National

Environmental Quality (1997-2016) completed in 1996
- 10th National Economic and Social Development Plan (NESDP) 2007-2011
- Environment Quality Management Plan (2007-2011)

The 10th National Social and Economic Development Plan (NESDP) is based upon H.M. King Bhumibhol's "sufficiency economy" philosophy (Isarangkun and Pootrakool u/d). It emphasises the improvement of knowledge and understanding of geographical environment, society, culture and value of existing resources, particularly linkages between human and natural resources and the environment. It supports the concept of sustainable development for the improvement of natural resources (e.g. soil, water, forest, coastal resource and biodiversity) as well as pollution control. Special attention is focused on biodiversity issues, which have a connection with livelihood, culture and local knowledge. Three key objectives are to (i) conserve and recover biodiversity and natural resources and environmental (NRE) conditions for fostering the quality of life; (ii) develop biodiversity and NRE capital as the foundation of national development toward stability, balance and sustainability; (iii) promote decentralisation and fair benefit sharing at all levels and protect the nation's interests that may be affected by bilateral and multilateral agreements.

Other environment-related concerns addressed in the 10th plan include: (i) free trade links with natural resources and environmental management; (ii) deforestation leading to natural disasters such as floods and drought; (iii) misuse of soil in agriculture; (iv) air pollution and health impacts; (v) import and production of hazardous substances; and (vi) domestic and hazardous wastes. Some specific environmental targets include (i) conserving forest land to be no less than 30% of the total land area; (ii) rehabilitating problem soils, such as saline/acid soils (1.6 million ha) or eroded soils (0.8 million ha); (iii) matching local demand for natural resources with supply, including issuing land title for 1.6 million ha for 700,000 underprivileged people; (iv) implementing integrated river basin management in 25 river basins; (v) recycling 30% of total household wastes and 80% of hazardous waste treated properly; (vi) reducing imported fertilizer and agricultural chemicals to less than 3.5 million t/yr; (vii) maintaining 85% of water quality in rivers and lakes at moderate to good condition; (viii) controlling air pollution to meet national standards; (ix) developing a national biodiversity database and a mechanism for accessibility, commercialisation and benefit sharing; and (x) developing at least 1,500 self-sufficiency networks for food and health security from management of local biodiversity (Koomsin 2007).

The key dilemma in Thailand is how to hold the line agencies accountable for implementation of the general thrust of the NESDP as well as the specific environmental dimensions. The current emphasis on "sufficiency economy" seems to be not well understood outside NESDB, except perhaps in relation to small scale agriculture (where the concept was initially developed). Thailand's "sufficiency economy" has its critics, too (Anonymous 2007).

In addition to the 10th Plan, Thailand is also preparing a NSDS with UNEP assistance, with a planned launch date of June 2007. The current draft consists of four strategic approaches (i) eliminate poverty through sustained and equitable economic growth; (ii) enhance environmental sustainability and security; (iii) create a knowledge-based society and social security; and (iv) ensure good governance at all levels of society. For each of these main headings there are 5-6 strategies with existing tools and policies, proposed actions and instruments, and indicators listed. The intention is to address long term issues and targets not currently covered by the 10th Plan, although that objective has not been reached in the current draft. The current draft also fails to adequately link upwardly to GMS and ASEAN development plans or downward to local level plans (for example in Thailand's 76 provinces). The authors are aware of these challenges but it is uncertain if they will be able to address them adequately by June 2007.

3.3.6 Viet Nam

Perhaps stemming from its long involvement in central government planning, Viet Nam has one of the most complete sets of planning documents making up its sustainable development planning framework, including the following plans:

- Socio-economic Development Strategy (2001-2010) adopted by the 9th National Congress;
- Comprehensive Poverty Reduction and Growth Strategy (CPRGS) prepared in 2002;
- National Strategy for Environmental Protection until 2010 and Vision Toward 2020, released in 2003;
- Strategic Orientation for Sustainable Development in Viet Nam, or Viet Nam Agenda 21 (VA21) issued in 2004;
  - Integrated into SEDP 2006-2010
- Socio-Economic Development Plan (SEDP) 2006-2010;
- Five Year Plan for Natural Resources and Environment Sector 2006-2010;

The National Strategy for Environmental Protection sets the following targets to be reached by 2010:

(i) 100% of newly-established units must apply clean technology or be equipped with pollution-reducing and waste-treatment facilities to meet environmental standards;
(ii) 50% of production units shall obtain ISO 14001 certificate or Certification of Environmental Standards Satisfaction;
(iii) 40% of urban areas, 70% of industrial zones and export processing zones must have standardised wastewater treatment facilities; 90% of residential, industrial and services waste will be collected; 60% of hazardous waste and 100% of hospital waste will be treated;
(iv) Seriously polluted production units will be thoroughly resolved by various measures (such as closure, upgraded technology, or investment in waste treatment systems);
(v) 50% of seriously polluted canals, lakes and ponds in urban areas will be improved;
(vi) 50% of mineral exploitation areas and 40% of seriously degraded ecological areas will be recovered; and
(vii) Increase forest covered land from 35.8% to 43% and recover 50% of degraded upstream forest areas.

Within the SEDP 2006-2010, environmental goals (covered by 8 environmental indicators) have been fully incorporated for the first time. In addition the 2004 Viet Nam Agenda 21 is being followed up with a Natural Resource and Environment Agenda 21, currently being formulated by the Viet Nam Poverty-Environment Initiative. The main deficiencies appear to be in the area of institutional coordination and linkage to local levels.

3.4 Sub-national sustainable development strategies – GMS

As noted in the OECD countries, often the most effective sustainable development strategies are found at the local level. The number of Local Agenda 21 plans around the world has been one of the most effective outcomes of the World Summit on Sustainable Development. The global website[5] listing Local Agenda 21 plans from a 2001 survey found that more than 6,400 local

[5] http://www.iclei.org

authorities in 113 countries had prepared a Local Agenda 21 or equivalent. This included 20 local authorities in Viet Nam, 21 in Thailand, and 25 in PRC. The current number is uncertain as local authorities have now entered a new phase, preparing Local Action 21 plans, moving from an "agenda" to concrete actions.

As an example, Bangkok's Agenda 21 was prepared in 1998 and identifies a 20 year programme for improvement of the city environment and quality of life (BMA 2003). Consisting of 10 chapters, the Agenda 21 covers (i) the strategy for a sustainable Bangkok; (ii) how to direct the urban economy towards sustainability; (iii) urban planning to improve the quality of life; (iv) reorganising traffic and transport systems to improve air quality; (v) investment in green urban areas; (vi) making Bangkok a clean city; (vii) good governance; (viii) access to information; (ix) human resources; and (x) citizen participation. The Bangkok Metropolitan Administration (BMA) has prepared a Sustainable Urban Management Handbook, which has been distributed to all its administrative units. Other actions include a Green Area Development Master Plan, the Bangkok Comprehensive Plan, the We Love Canals Project, the Mass Transit Project, and preparation of district inventories as a tool for budgeting city development.

With the assistance of UNEP, Bangkok has also prepared a series of SOE documents (BMA 2003). The SOE covers critical issues such as air pollution, water quality, solid and hazardous waste management, land subsidence, noise pollution, energy, historical places and architecture, green areas, environmental nuisance control, public participation, and important events.

4. Indicators

4.1 Indicators of sustainable development

The OECD best practice guidelines (OECD 2006) indicate wide variance in development of indicators of sustainable development. Some of the variants reported are as follows:

(i) New Zealand's Programme of Action is based on 40 indicators covering population change, environmental and ecosystem resilience, economic growth and innovation, skills and knowledge, living standards and health, consumption and resource use, and social cohesion;
(ii) Switzerland monitors sustainable development according to 115 indicators for 26 themes;
(iii) Norway's Action Plan for Sustainable Development has 16 indicators that are intended to reflect the value of financial, real, human, natural and environmental capital, as elements of national wealth;
(iv) Finland has 68 indicators in 8 categories;
(v) Germany has set indicators in fiscal, economic, education, research, housing, spatial planning, crime prevention, energy and environment areas as national targets;
(vi) The United Kingdom's Securing the Future strategy has 68 indicators linked to specific quantifiable goals, using a traffic light approach to report progress; and
(vii) The Czech Republic has one set of 116 indicators to monitor progress with another set of 24 indicators to communicate with policy makers and the public.

4.2 Indicators of environmental performance

The OECD programme on environmental indicators, initiated in 1989-1990, covers several sets of indicators, viz. (i) the OECD Core Set of Environmental Indicators to monitor environmental

progress and performance[6]; (ii) a small set of key environmental indicators, derived from the Core Set, to serve public communication purposes and to attract attention to key environmental issues; (iii) various sets of sectoral environmental indicators to monitor and promote the integration of environmental concerns into sectoral decision making and policies; and (iv) indicators derived from environmental accounting to monitor the integration of environmental concerns into economic policies and the sustainability of natural resource use and management (UN 2001). The work, carried out in close co-operation with OECD member countries, has resulted in (i) agreement on terminology and a conceptual framework common to OECD countries; (ii) identification and definition of indicators on the basis of three major selection criteria: policy relevance and usefulness for the user, analytical soundness and measurability; (iii) the systematic measurement of these indicators and their regular use in the OECD's analytical work and EPRs; and (iv) the provision of guidance on how to use and interpret the indicators.

The conceptual framework that underlies the work on environmental indicators uses the PSR model as a common structural basis, adjusted for varying purposes to account for greater details or for specific features. The framework includes a common terminology, criteria to be used for selecting environmental indicators and guidance for the use and interpretation of the indicators. The OECD Core Set of Environmental Indicators is directly based on the P-S-R model in combination with 13 core environmental issues.

P-indicators describe pressures from human activities exerted on the environment, including natural resources. “Pressures” here cover underlying or indirect pressures (i.e. the activity itself and trends and patterns of environmental significance) as well as proximate or direct pressures (i.e. the use of resources and the discharge of pollutants and waste materials). Indicators of environmental pressures are closely related to production and consumption patterns; they often reflect emission or resource use intensities, along with related trends. They can be used to show progress in decoupling economic activities from related environmental pressures, or in meeting national objectives and international commitments (e.g. emission reduction targets).

S-indicators relate to the quality of the environment and the quality and quantity of natural resources. As such they reflect the ultimate objective of environmental policies or legally defined standards. Indicators of environmental conditions are designed to give an overview of the situation (the state) and its development over time. Examples of indicators of environmental conditions are: concentration of pollutants in environmental media, exceeding critical loads, population exposure to certain levels of pollution or degraded environmental quality and related effects on health, the status of wildlife and of natural resource stocks. In practice, measuring changes in environmental conditions can be difficult or costly. Therefore, environmental pressures are often measured instead as an imperfect substitute.

R-indicators refer to individual and collective actions and reactions, intended to (i) mitigate, adapt to or prevent human-induced negative effects on the environment; (ii) halt or reverse environmental damage already inflicted; or (iii) preserve and conserve nature and natural resources. Examples include environmental expenditure, environment-related taxes and subsidies, price structures, market shares of environmentally friendly goods and services, pollution abatement rates, waste recycling rates. In practice, indicators mostly relate to abatement and control measures; those showing preventive and integrative measures and actions are more difficult to obtain.

[6] The third revision of the UNCSD core set in 2006 now covers 50 indicators, which are part of a larger set of 98 indicators of sustainable development.

Sectoral environmental indicators are based on an adjusted P-S-R model that better reflects the specificities of the various sectors. These distinguish (i) sectoral trends and patterns of environmental significance (i.e. indirect pressures and/or related driving forces); (ii) interactions between the sector and the environment, including positive and negative effects of sectoral activity on the environment as well as the effects of environmental changes on sectoral activity; and (iii) economic linkages between the sector and the environment, as well as policy responses.

The supplementary sectoral indicators help improve the integration of environmental concerns into sectoral policies and with indicators derived from environmental and natural resource accounting. These indicators also provide a building block for the environmental dimension of sustainable development indicators and contribute to the broader objective of sustainable development reporting. A few key environmental indicators have been selected from the OECD Core Set to serve public information and communication purposes.[7]

National governments that have adopted sectoral environmental reporting include Australia, which has both mandatory reporting under the Environment Protection and Biodiversity Conservation Act and voluntary reporting through Public Environment Reports (also referred to as triple bottom line reports).[8] The US Environment Protection Agency's Sector Strategies Performance Reports document the environmental performance of major manufacturing and service sectors. Performance trends over the past decade for sectors like cement, metal casting, iron and steel, paint and coatings, ports, shipbuilding, chemicals, construction, and forest products are provided.[9] The Canadian Government released environmental codes of practice for steel mills specifying minimum environmental performance standards and best environmental management practices. Compliance with these codes of practice was reviewed using a structured audit process consistent with ISO 14010 and 14011.[10]

Indicators of environmental performance are not limited to governments, however, as both the private sector and non-government organisations have also developed their own indicators. For example, the World Business Council for Sustainable Development has developed eco-efficiency indicators for measuring and reporting on company performance (Verfaillie and Bidwell 2000). Some good reviews of the progressive development of corporate indicators of environmental performance are given in Skillius and Wennberg 1998 and Global Environmental Management Initiative (1998).

The United States Environment Protection Agency maintains a National Environmental Performance Track programme which measures progress towards environmental performance goals, including air emissions, discharges to water, energy management, land use, material procurement, material use, noise, preservation, restoration and site cleanup, product performance, transportation management, vibration, waste management and water use. A life cycle approach is adopted for categorisation, divided into upstream stage, input stage, non-product output stage, and downstream stage. Implementation of an approved environmental management system is a prerequisite for entry into the Performance Track. Information on the best practices and innovations in environmental management is provided online through the National Center for Environmental Innovation. The Environmental Performance Track content and format were informed by the GRI Sustainability Reporting Guidelines.

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[7] Source: http://www.iisd.org/measure/compendium/DisplayInitiative.aspx?id=83

[8] Available at http://www.environment.gov.au/settlements/government/reporting.html

[9] See http://www.epa.gov/sectors/performance.html

[10] Results are summarized at http://www.ec.gc.ca/nopp/docs/rpt/ironSteel/en/summ.htm

4.3 Indicators of compliance and enforcement

Performance indicators are key tools for decision-makers in developing and implementing environmental compliance and enforcement (ECE) programmes. Indicators allow decision-makers to (i) monitor and control programme operations; (ii) ensure accountability to legislative bodies, budget authorities, constituent groups, and the public; and (iii) improve overall programme performance.

Increasingly, environmental agencies worldwide, even in developing and transitioning countries that generally face more serious implementation and enforcement challenges of their environmental laws, are developing and applying meaningful performance ECE indicators to measure and evaluate the effectiveness of their programmes. In so doing, they are looking at a mix of these different types of indicators.

To measure progress and ensure commitment to reform, the Asian Environmental Compliance and Enforcement Network (AECEN) is helping to develop indicators to track agency performance in environmental compliance and enforcement. These indicators are both tailored to country programmes and pilot activities, and can be aggregated regionally. Members also develop indicators as part of their participation in AECEN pilot projects in PRC, Thailand, Viet Nam and the Philippines.[11]

Based on the national indicators developed by members for their own ECE programmes, AECEN intends to draw out common indicators that can be used to compare the progress of members in implementing their programmes. The first assessment of Thailand was recently completed (AECEN 2004). This assessment found that "by not tracking outcome or impact indicators, Thailand does not adequately assess the overall effectiveness of its programmes, since there is no clear link between the number of inspections conducted and the level of compliance in the regulated community or the state of the environment. These indicators alone fail to reveal increased compliance levels achieved by agency programmes, as well as improved environmental conditions."

The Viet Nam assessment (AECEN 2005) found that "Vietnam currently does not have a comprehensive indicators system to evaluate the success of its environmental compliance and enforcement programme. Data is collected on an annual basis by provincial and municipal DoNREs and indicates an overall low compliance rate among regulated facilities. In Hanoi, for example, only 12% of all facilities comply with environmental regulatory requirements."

4.4 Indicators in the GMS

In SEF II, the selection of indicators was driven not only by statistical availability but also by the need to match the indicators to the environmental concern and the underlying policy target. The most suitable indicators were those that best relate to the policy target, thus defining the benchmark for performance assessment. From the outset of SEF II, 14 priority environmental concerns were identified (air pollution by stationary sources, climate change, fish resources, forest resources, inadequate waste management, inland water pollution, land degradation, mobile source pollution, natural disasters, ozone layer depletion, threats to biodiversity, threats to coastal zone, toxic contamination, water resources). Of these, no indicators were chosen for air pollution by stationary sources or ozone layer depletion, either because the concern was not ranked highly by any GMS country or because there are no data available.[12] For the remaining

[11] http://www.aecen.org

[12] Illustrating the need to constantly review and revise EPAs, air pollution in Chiang Mai from open air

12 concerns a variety of indicators was chosen as shown in table 3-14. Some brief observations on the indicators selected follow.

Table 3 Indicator selection in SEF II – Climate change

GMS Country	Pressure Indicator	Time Frame	State Indicator	Time Frame	Response Indicator	Time Frame
Cambodia	Greenhouse gas (GHG) emissions	1994-2020	n.a.	n.a.	n.a.	n.a.
Lao PDR	Volume of GHG emissions	1990	n.a.	n.a.	Expenditure on reducing the extent of slash and burn farming	2001-2005
Myanmar	GHG emissions in CO2 equiv.	1990-2005	n.a.	n.a.	GHG emission per unit of GDP	1990-2002
Thailand	Emission of GHG	1990-2020	n.a.	n.a.	Emissions of CO2 equiv. per unit of GDP	1990-2020
Viet Nam	National GHG emissions	1993-2002	n.a.	n.a.	n.a.	n.a.
Yunnan Province, PRC	Coal consumption for energy generation	1991-2003	n.a.	n.a.	Energy intensity	1991-2003

Five of the six countries chose GHG emissions as the P-indicator, but note the variation in approach. Thailand and Cambodia project GHG emissions from the early 1990s to 2020. Given the likelihood that developing countries will be required to participate in some form of post-Kyoto protocol after the first commitment period (2008-2012) and that EPA is meant to assess past performance, the longer-term projection appears to be not the most appropriate choice. If the projection is used, however, to indicate the likelihood of achieving a longer-term target, then it may be reasonable. Other countries, like Myanmar and Viet Nam opted for the Kyoto protocol reference year (1990) or the nearest available year with data (1993 for Viet Nam) as the baseline and the most recent estimate of GHG emissions (2005 and 2002 respectively). Given the global importance of the Kyoto protocol, a case could be made for using 1990 as the baseline for all countries.

Yunnan Province, on the other hand, opted for “coal consumption in energy generation” as the P-indicator, presumably in the belief that this is the major source of GHG emissions in the province and coal consumption is easier to convert into GHG data than most other sources.

Perhaps reflecting the difficulty in accurately measuring a change in state, given the normal wide variability in climates, none of the GMS countries used an S-indicator for climate change. Possible candidate indicators could include (i) average annual temperature increase compared to long term averages; (ii) maximum recorded temperature; or (iii) average decadal temperature. It would be instructive to see how this environmental dimension is handled in SOE reports. By not including an S-indicator, one must rely on an assumption that climate change is actually happening in these countries and that GHG emissions are the primary cause.

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burning and from thermal power plants on the Eastern Seaboard are major environmental issues in Thailand in 2007.

For responses, Cambodia and Viet Nam had no R-indicator, while most of the other countries used variations of GHG emissions per unit GDP, reflecting the need to decouple fossil fuel use and economic growth. This indicator would measure such decoupling from economic growth but it would not necessarily have any meaning in terms of climate change. If total GHG emissions drives climate change, then increased fossil fuel use would still result in climate change as the economy grew, although at a lower rate than if the energy intensity remained the same.

Table 4 Indicator selection in SEF II – Fish resources

GMS Country	Pressure Indicator	Time Frame	State Indicator	Time Frame	Response Indicator	Time Frame
Cambodia	n.a.	n.a.	Inland fish consumption	1981-2003	Number of community fisheries	1996-2005
Lao PDR	Volume of fisheries production	1995-2004	Retail price of fish at constant prices	1995-2002	Expenditure on fisheries management	1991-2000
Myanmar	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Thailand	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Viet Nam	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Yunnan Province, PRC	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

There can be little doubt that rapidly diminishing fish stocks (both freshwater and marine) are a major environmental issue in the region. Therefore, it is rather surprising that only Lao PDR and Cambodia identified this as a priority issue.

For Lao PDR, the volume of fisheries production is given as a P-indicator because increasing fish production is putting pressure on freshwater fish stocks. However, theoretically, increasing volume of fish production could also be a result of improved fish management and growing demand for fish, for domestic consumption and export. As an S-indicator, the retail price of fish is not necessarily a reflection of the state of fish stocks, but rather the balance between supply and demand. With static fish stocks, the retail price could increase merely because of increased demand or willingness/capacity to pay higher prices (e.g. relative to other meat prices). As an R-indicator, public expenditure on fisheries management is a proxy measure for improved management, although it could also reflect the increasing cost of public services in Lao PDR. It is also not clear why the data is only available up to the year 2000.

In Cambodia, note that inland fish consumption is given as an S-indicator, although it is equivalent to the volume of fisheries production given as a P-indicator for Lao PDR. The logic for this S-indicator is that decreasing fish consumption would be a sign of a fishery in serious trouble in Cambodia, where over 70% of the protein intake is from fish. Decreasing fish consumption, however, could also be due to changes in relative prices with other forms of meat, changing consumer preferences, or concern over the safety of consuming fish from increasingly polluted water. The number of community fisheries as the R-indicator is based on the assumption that fisheries management is more effective than community-based than fisheries managed by government bodies. An increasing number of community-based fisheries, without

any cap on fish harvesting, may lead to long term decline of the fishery rather than being an improvement.

One interesting observation is that countries not selecting fish resources as a priority issue are mostly those with long coastlines, perhaps reflecting a belief that coastal fisheries are under less pressure than inland fisheries.

Table 5 Indicator selection in SEF II – Forest resources

GMS Country	Pressure Indicator	Time Frame	State Indicator	Time Frame	Response Indicator	Time Frame
Cambodia	Forest concession area	1994-2002	Forest cover as % of total land area	1965-2002	Protected forest as % of total land area Reforested areas	1993-2002 1985-2002
Lao PDR	Area under shifting cultivation	1976-2004	Forest cover as % of total land area	1943-2002	Protected forest area as % of total land area	1993-2002
Myanmar	Ratio of wood removal over thousand hectares of forest cover	1975-2001	Percent of forest cover over total land area	1975-1998	Permanent forest estate as % of total land area Expenditure on forest conservation	1985-2002 1988-2001
Thailand	Available agricultural land per capita	1975-2002 (projection to 2030)	Forest cover as % of total land area	1961-2000	Protected areas as % of total land area Reforested area	1961-2004 1997-2002
Viet Nam	Ratio of round wood production over total forest area	1961-2000	Forest cover as percent of total land area	1942-2003	n.a.	n.a.
Yunnan Province, PRC	Ratio of wood consumption to forest standing stock increment	1960-2002	Percentage of forest cover	1960-2002	Area under forest conservation programmes Afforested area	2000-2004 1999-2004

There was unanimous agreement among the GMS countries that forest resource management is a major environmental issue in the subregion. The primary causes of forest loss, however, seem to vary considerably if judged by the variation in P-indicators. Cambodia attributes the main pressure coming from forest concessionaires, Lao PDR from shifting cultivators, and Thailand from agricultural development. Myanmar, Viet Nam and Yunnan, however, view forest harvesting and consumption of wood products as the major pressures. All countries used forest cover as a percentage of land cover as the S-indicator, regardless of initial forest endowments. This illustrates one of the main problems associated with benchmarking—different starting points.

Two main responses were identified—declaration of protected areas and forest plantations. Myanmar also identified expenditure on forest conservation as a proxy response. Viet Nam did not identify an R-indicator. Note that the responses often do not directly attack the pressures. Declaration of protected areas or creation of forest plantations might merely turn Lao shifting

cultivators or Thai landless farmers into criminals as the legal status of land they have used traditionally is changed by the State. As the responses do not address their need for land, then they may not be effective in reducing loss of forest cover. The problem of using expenditure data as a proxy R-indicator is that the more degraded the forests become the greater the expenditure needed. Government budgets are rarely sufficient to give 100% coverage of all forest management needs, so expenditure data may be more related to available funds than real forest protection needs.

Table 6 Indicator selection in SEF II – Inadequate waste management

GMS Country	Pressure Indicator	Time Frame	State Indicator	Time Frame	Response Indicator	Time Frame
Cambodia	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Lao PDR	Urban population	2005	Percentage of collected waste	2005	Expenditure on waste management	2005
Myanmar	Municipal solid waste generated in Yangon City	1983-2004	Percent solid waste collected in Yangon City	1983-2004	Expenditure on solid waste management in Yangon City	1994-2004
Thailand	Municipal solid waste generated	1993-2003	Percentage of collected municipal solid waste	1993-2003	Percentage of waste disposal and utilisation	1993-2003
Viet Nam	Volume of solid waste generated	2000-2003	Solid waste collected as a percentage of solid waste generated	2000-2003	Investment in solid waste management	1998-2003
Yunnan Province, PRC	Volume of municipal and industrial solid waste generated	1989-2004	Percent of non-recycled industrial waste	1989-2004	Municipal solid waste safely disposed of as a percent of total municipal solid waste generated Percent of industrial waste recycled	1989-2004 1989-2004

For the issue of waste management, most countries identified this as an urban environmental management issue, although Viet Nam did not distinguish between urban and rural sources. Yunnan distinguished between municipal and industrial solid waste at the pressure and response levels, but only referred to industrial waste in the S-indicator. Interestingly, Cambodia did not choose waste management as a priority issue, although the tourism sector has identified solid waste as major problem affecting the industry. Reflecting the difficulty in obtaining nationwide data, Myanmar restricted the waste management issue to the former capital Yangon City.

Most countries chose the percentage of solid waste collected as the S-indicator, although this could easily be turned into the percentage of solid waste that remains uncollected as a more accurate statement of the state of environmental quality. As a state indicator, this assumes that collected solid waste is properly disposed of, treated or recycled—an assumption that is not always true in these countries. In fact, poorly managed solid waste dumps may be as much of an environmental hazard as uncollected waste, especially if the waste dump is located close to a water source. Yunnan Province chose “percent of non-recycled industrial waste” as the

S-indicator, reflecting a preoccupation with the circular economy and the need to ensure adequate raw material for industrial production.

Three countries used expenditure on waste management as a proxy indicator for the response. As for forests, expenditure on solid waste management may not reflect the adequacy of the response. For example, in slum areas a relatively small expenditure on hand carts and a community-managed system of waste collection may be more effective than higher expenditure on large waste collection trucks that cannot enter the narrow streets. Thailand's choice of "percentage of waste disposal and utilisation" as an R-indicator relates to the observation that it is better to re-use waste rather than dispose of it. Capturing data on the amount of waste that is re-used rather than dumped, however, may be difficult in most developing countries, where the recycling of waste is mediated by informal rag-pickers or waste collectors. Yunnan Province used "percent of industrial waste recycled" as an R-indicator, while "percent of non-recycled industrial waste" was the S-indicator. As these two indicators are merely mirror images of each other, either version of the indicator may be better as an S-indicator than an R-indicator.

Table 7 Indicator selection in SEF II – Inland water pollution

GMS Country	Pressure Indicator	Time Frame	State Indicator	Time Frame	Response Indicator	Time Frame
Cambodia	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Lao PDR	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Myanmar	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Thailand	Discharge of untreated domestic wastewater	1994-2003; 2001, 2003	Water quality in designated water bodies	1993-2003	Amount of waste water treated	2003
Viet Nam	BOD discharges	1995-2003	BOD_5 concentration in selected rivers	1995-2002	Industrial waste water discharge fees	2003
Yunnan Province, PRC	Volume of municipal waste water discharge Volume of untreated industrial wastewater discharged	1989-2004 1993-2000	Percent of major rivers meeting Grade III water quality criteria	1990-2004	Percent of industrial waste water treated prior to discharge	1993-2000

Viet Nam appears to have adopted a very logical P-S-R sequence for inland water pollution. Total BOD loads clearly cause reduced BOD concentrations in rivers and a reasonable response is to impose a wastewater discharge fee. The problem with inland water pollution, however, is that it is very location and time specific. The massive accidental spill of molasses on the Chao Phraya River in Thailand in 2007 or benzine chemical discharge to the river upstream of Harbin in PRC in 2006 were short-term incidents that caused serious pollution but are almost impossible to include in a national environmental performance assessment system. Similarly, total BOD loads will have quite different impacts if they are more or less evenly spread across

the nation's rivers than if they are concentrated on a few key rivers.

For the S-indicators, Thailand's choice of water quality in designated water bodies and Viet Nam's BOD concentration in selected rivers demonstrate the problem of aggregation for location specific environmental quality. Yunnan's S-indicator takes the location differences into account and if the goal is to have all rivers meet at least Grade III standards, then it is a practical and useful indicator. The R-indicator, however, is less appealing as treatment levels may range from primary to tertiary. Primary treatment of highly toxic industrial wastewater may not remove the toxic elements and treatment at this level may be no better than no treatment at all. It is also not clear why only industrial wastewater is singled out, as domestic wastewater is a significant source of pollution in PRC.

Table 8 Indicator selection in SEF II – Land degradation

GMS Country	Pressure Indicator	Time Frame	State Indicator	Time Frame	Response Indicator	Time Frame
Cambodia	Agriculture land as a percent of total land/per capita	1961-2002	Average rice yield	1961-2003	Growth of agricultural irrigated area De-mined areas	1961-2002 1992-2004
Lao PDR	Number of upland households practicing shifting cultivation	1995-2004	Sediment load in selected rivers	1989-1995	Number of households under LUP/LA programmes	1995-2003
Myanmar	Growth in upland population	1980-2000	Vulnerable farm area as percent of total cultivated area	1998	Land rehabilitated as percent of area sown to crops	1974-2002
Thailand	Loss of forest area	1961-2000	Vulnerable farm land as a percent of total farm land Marginal lands as percent of total farmland area	2000, 2002 2000	Rehabilitation area of degraded land	1997-2003
Viet Nam	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Yunnan Province, PRC	Farm land per capita	1984-2004	Total area affected by soil erosion	1987-2000	Total soil erosion area rehabilitated Government expenditure on soil conservation	1989-2004 2001-2004

Five of the six countries chose land degradation as an important environmental issue, with only Viet Nam abstaining. As for forest loss, however, the causes seem to vary from country to country. The P-indicators for Yunnan and Cambodia are agricultural land area per capita, suggesting that land degradation increases as density of the farm population increases. A similar approach is adopted in Lao PDR and Myanmar, but specifically targeting upland population (Myanmar) or upland households practicing shifting cultivation (Lao PDR). This approach reflects the pressures that come from shifting cultivators having to return to previously cleared areas more frequently as population density increases, thus allowing the land less fallow time to recover. It may not capture, however, the pressure from lowland farmers and other land users

forcing shifting cultivators into a shrinking and more vulnerable area of uplands.

The S-indicators also vary widely including (i) average rice yields (Cambodia); (ii) sediment load in selected rivers (Lao PDR); (iii) various measures of vulnerable farm land as a percentage of total farm land (Myanmar and Thailand); and (iv) area affected by soil erosion (Yunnan). Of these, the area affected by soil erosion (assuming that this is the major form of land degradation) appears to be the most direct measure. Declining rice yields could be due to many other factors, such as reduced fertilizer use, increasing pest attacks, or reduced availability of irrigation water. Vulnerable farm land is land that is potentially affected by land degradation (due to excessive slope, or erodible soil types, for example) rather than land that has already been affected by land degradation.

For the R-indicator, most countries opted for slightly differing measures of area rehabilitated by government programmes. Cambodia has a rather unique measure of areas de-mined that can be used for agriculture again.

Table 9 Indicator selection in SEF II – Mobile source pollution

GMS Country	Pressure Indicator	Time Frame	State Indicator	Time Frame	Response Indicator	Time Frame
Cambodia	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Lao PDR	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Myanmar	Car equivalent unit per sq km in major cities	1999-2004	TSP concentrations in Yangon City	1998-2000	Percentage of vehicles inspected	1998-2004
Thailand	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Viet Nam	Number of vehicles in Hanoi and Ho Chi Minh City	1990-2001	Concentrations of SO2, NO2, PM and CO in Hanoi and Ho Chi Minh City	1997-2002	n.a.	n.a.
Yunnan Province, PRC	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Only Viet Nam and Myanmar chose mobile source pollution, and then only for selected cities where car densities are high. It is not clear why Viet Nam did not identify any response indicator.

Yunnan Province was the only one that chose natural disasters as a primary environmental issue. It is not clear, however, why provincial GDP should be seen as a P-indicator. Presumably GDP responds to rather than causes natural disasters. Perhaps this is one issue where there is no obvious cause but rather reflects the geological and climatological endowment of the province. The S-indicators (population affected and economic losses) are sensible choices, although financial loss may be clearer than economic loss (insurance companies, for example, are more interested in financial loss). Economic losses such as loss of income earning potential by injured or deceased inhabitants are more difficult to measure. The R-indicator combines preventative and reactive expenditure. If the expenditure on disaster preparedness is high enough, then the expenditure on disaster relief should shrink. Perhaps it would be better to separate these two indicators rather than combining them.

Table 10 Indicator selection in SEF II – Natural disasters

GMS Country	Pressure Indicator	Time Frame	State Indicator	Time Frame	Response Indicator	Time Frame
Cambodia	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Lao PDR	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Myanmar	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Thailand	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Viet Nam	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Yunnan Province, PRC	Provincial GDP at constant prices	1992-2003	Population affected by natural disasters Economic loss caused by natural disasters	1992-2003 1992-2003	Expenditure on disaster relief and preparedness	1992-2003

Table 11 Indicator selection in SEF II – Threats to biodiversity

GMS Country	Pressure Indicator	Time Frame	State Indicator	Time Frame	Response Indicator	Time Frame
Cambodia	Loss of critical habitat	1993-1997	Threatened species as percent of globally threatened species	1996-2004	Protected area as percent of total land area	1993-2002
Lao PDR	Ratio of natural forest to plantation forest	1976-2002	Threatened species as percent of globally threatened species	1996-2004	National protected area as percent of total land area	1993-2002
Myanmar	Loss of tropical rainforest in Tanintharyi Division Loss of mangroves in the delta forest reserves	1990-2000 1924-2001	Threatened species as percent of globally threatened species	1996-2004	Percent protected area over total land area	1918-2004
Thailand	n.a.	n.a.	Threatened species as a percent of globally threatened species	1996-2004	n.a.	n.a.
Viet Nam	Loss of natural forest habitat	1990-1998	Threatened species as percent of globally threatened species	1996-2004	Protected area as percent of total land area	1992-2002
Yunnan Province, PRC	Area of natural forests	1979-2002	Threatened species as percent of globally threatened species	1996-2004	Protected area as percent of total land area	1989-2004

All countries chose threats to biodiversity as a priority issue, predominantly in forested areas. Loss of natural forest was identified as the main P-indicator. All turned to the World Conservation Union (IUCN) Red Book list of endangered species as the S-indicator, notwithstanding the possibility that increases in species listed may be due to increased surveys and new discoveries rather than any real change in species loss. All countries also chose protected area as a percentage of total land area as the R-indicator, even though there is considerable variation in the extent to which each gazetted protected area is actively managed. So-called "paper parks" are ranked equally to well managed world heritage parks. Also, by focusing on terrestrial areas the loss of biodiversity in rivers, lakes, and coastal waters is not covered and may be more serious than loss of terrestrial biodiversity.

Table 12 Indicator selection in SEF II – Threats to coastal zone

GMS Country	Pressure Indicator	Time Frame	State Indicator	Time Frame	Response Indicator	Time Frame
Cambodia	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Lao PDR	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Myanmar	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Thailand	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Viet Nam	Growth of aquaculture area	1995-2003	Area of mangrove forest	1943-2001	n.a.	n.a.
Yunnan Province, PRC	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Perhaps reflecting this concern over threats to aquatic biodiversity, Viet Nam chose threats to its long coastal zone as a priority issue. The main pressure identified is from the rapid growth of aquaculture (particularly shrimp ponds) along the coastline. This growth is reflected in the S-indicator, area of mangrove forest, which has been declining precipitously. The reason for the absence of a response indicator is not clear. Mangrove forest rehabilitated is one obvious indicator.

Thailand and Lao PDR chose toxic contamination as a priority issue, although they obviously view it in different terms. Perhaps reflecting the more advanced industrial production capacity in Thailand, the P-indicator chosen was the total amount of hazardous substances utilised, while in Lao PDR it was the volume imported. While unexploded ordnance is a hazard, it is not clear why it was included under this topic. For Thailand, the S-indicator (number of health incidents) possibly pays inadequate attention to the severity of each incident. One Bhopal-type incident may be more serious than hundreds of small incidents involving few people. As the environmental damage from toxic and hazardous materials may stem from accidental release (in a train derailment, for example), the R-indicator relating to treatment of hazardous "waste" may not capture the necessary policy response.

Table 13 Indicator selection in SEF II – Toxic contamination

GMS Country	Pressure Indicator	Time Frame	State Indicator	Time Frame	Response Indicator	Time Frame
Cambodia	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Lao PDR	Volume of imported hazardous substances	2005	Number of UXO-related accidents	2005	n.a.	n.a.
Myanmar	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Thailand	Amount of hazardous substances utilised	1993-2003	Number of health incidents related to hazardous substances	1993-2003	Amount of treated hazardous waste	1994-2004
Viet Nam	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Yunnan Province, PRC	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Table 14 Indicator selection in SEF II – Water resources

GMS Country	Pressure Indicator	Time Frame	State Indicator	Time Frame	Response Indicator	Time Frame
Cambodia	Urban and rural population Agricultural population	1961-2003 1980-2003	Percent of population with access to safe potable water Area under rice cultivation	1998-2002 1980-2003	Urban and rural drinking water provision Expenditure on irrigation system construction and maintenance	1998-2003 1999-2003
Lao PDR	Rural population	1961-2004	Percent of population with access to safe potable water	1998-2004	Expenditure on improved water supply	2001-2005
Myanmar	Population growth Irrigated crop sown	1985-2015 1985-2002	Percent population with access to safe drinking water Irrigated area as percent of irrigable area	1995-2003 1997-2002	Expenditure on drinking water supply Expenditure on irrigation management	1997-2003 1992-2002
Thailand	Water consumption by agriculture	1993-2006	Area of under-irrigated land	1990-2004	Irrigation water storage capacity	2002
Viet Nam	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Yunnan Province, PRC	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

With the exception of Viet Nam and Yunnan, water resources were viewed as a priority environmental concern, in both rural and urban areas. This raises the question of whether natural resources management should be covered by an environmental performance assessment. Population growth was viewed as the P-indicator by most countries, although Thailand singled out water consumption by agriculture. Is this a tacit assumption that efficiency of water consumption is not a major variable? Access to safe drinking water (one of the MDGs) and area irrigated (or under-irrigated) were identified as S-indicators. Expenditure on water resource infrastructure was the most common R-indicator, with Thailand deviating slightly with "irrigation water storage capacity."

5. Bridging EPA and SDS

5.1 Common processes

The traditional way of thinking about sustainable development planning and performance assessment is as shown in Figure 2. The NSDS, based on extensive public consultation, provides a long term "vision" over a time frame of 15-20 years, which is then captured in a five-year socio-economic development plan, incorporating the objectives and medium-term targets of the longer term Vision document. The five-year plan also incorporates other strategic plans like NEAPs, TFAPs, PRSPs etc. The five-year plan is then broken down (or preferably built up from) medium-term sectoral strategies, which are in turn used to guide annual plans for each sector. The annual plans are broken into specific programmes and projects, submitted for budget approval, and approved or rejected in the annual budget process, which draws revenue from domestic resources like taxes and external resources like donor funds. Once funds have been allocated (often broken into recurrent expenditure and development funds) detailed implementation plans are prepared and the projects/programmes are then implemented. Implementation is monitored by the executing agency or some external party and the monitoring results are collected and stored in a database. National audit agencies conduct regular checks on expenditure of the funds and achievement of milestones.[13] At regular intervals, governments conduct performance assessments to feed back into the revision of the various plans.

Unfortunately few countries carry out this logical sequence rigorously and the entire chain of logic is only as strong as its weakest link, which too often rests with the monitoring and feedback loop. The following section attempts to tease out the importance of this step and its relevance to the GMS economic development programme.

The essential difference between EPA and the environmental pillar of SDS as applied in the GMS is that EPA examines past and present performance against the policy targets set for specific environmental concerns while SDS sets in place environmental management strategies for the future, based on achievements (or lack of them) to date. If trend lines are considered for specific indicators, EPA stops at the present, while SDS projects future trajectories, often using several scenarios to illustrate the consequences of following certain paths. EPA accepts given policy targets, while SDS attempts to set new (more ambitious) targets for some future date. The overlap between the two approaches is seen when EPA makes a judgement call on whether current performance levels will achieve the policy targets set and recommends future actions to ensure that the policy targets are met. A bridge is formed by the SOE report, which provides a 'snapshot' of the current situation.

[13] Both Canada and the United Kingdom have opted for independent audits of their sustainable development strategies as learning strategies (OECD 2006).

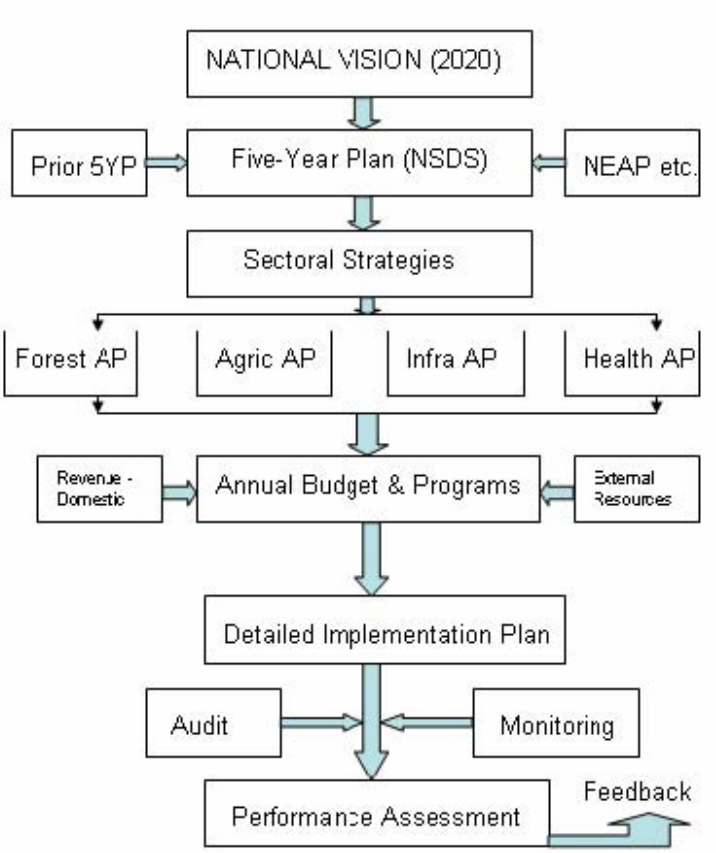

Figure 2 Sustainable development planning and performance assessment

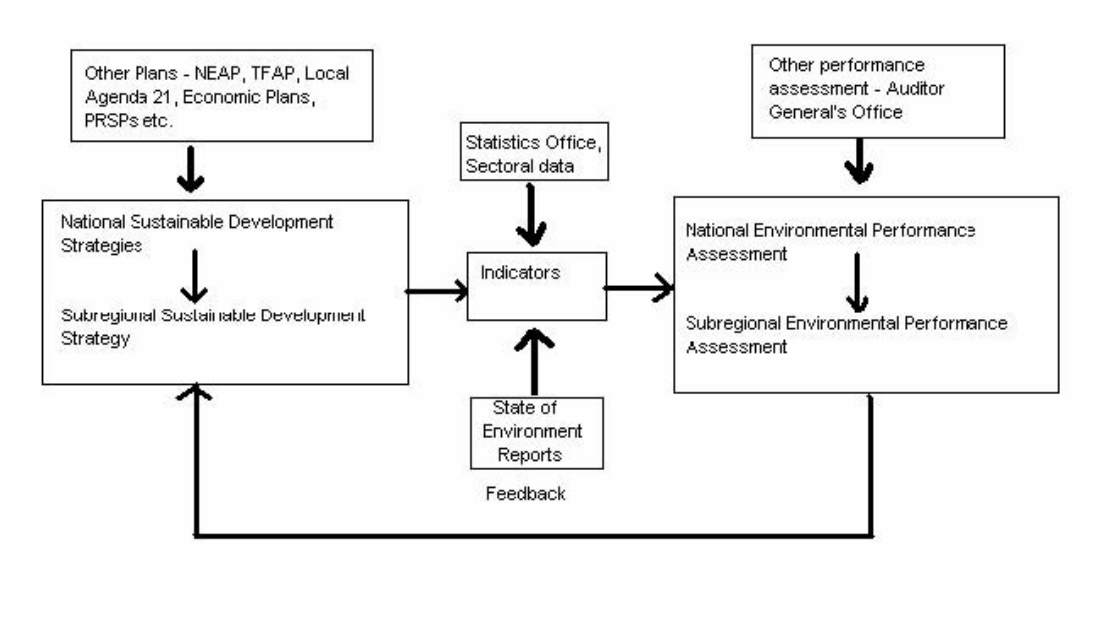

Figure 3 Link between NSDS/SSDS and NEPA/SEPA

Figure 3 illustrates the important connection between setting goals and targets under SDS, selection of the relevant indicators to "indicate" progress towards those targets, and using

performance assessment as part of a broader governance management to feed back into revisions and the updating of the national plans. Figure 3 also shows that SDS should merely fill in the gaps of other plans or consolidate them into a coherent synthesis. As sustainable development rests on the three pillars of economics, social dimensions and environment, but cannot be regarded as truly sustainable without integration, all plans that relate to these three areas should be integrated into a NSDS, so that there is no inherent contradiction or conflict between different plans.

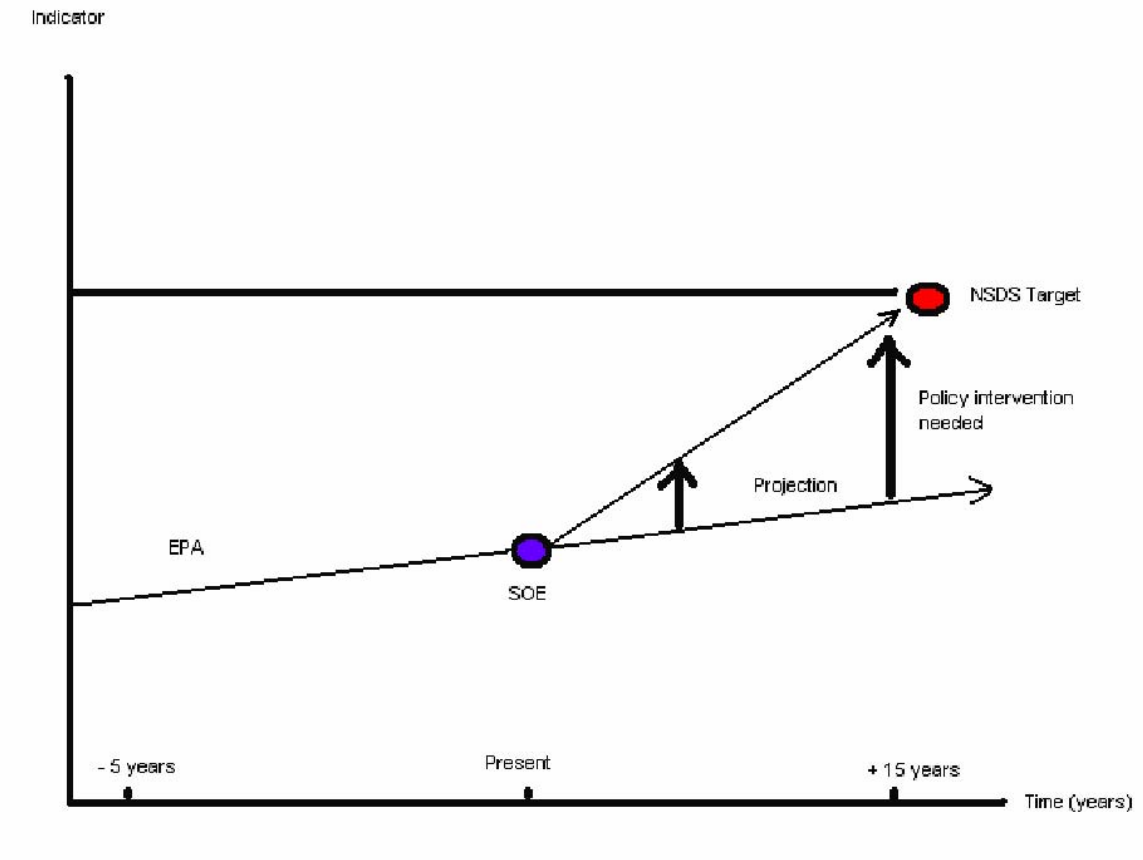

Figure 4 EPA, SOE, and NSDS tracking to identify management interventions

Thus EPA, SOE, and NSDS can be linked together as a management tool, as shown in Figure 4. If NSDS identifies a long term target, EPA measures past performance, and SOE measures the current situation, then projection of the trend line can indicate the likelihood of meeting the long term targets given no change in current policies. If the projection shows that the target is unlikely to be met, then one can identify policy or other interventions that would move the trend line upwards to meet the target. Note that policy interventions may be sequenced in such a way that less draconian policy measures can be tried first and their impacts monitored and reviewed by a subsequent SOE +/or EPA, before applying more drastic measures. This highlights the dynamic nature of SDS planning and the importance of feedback loops and periodic revision of the SDS, usually no longer than 5 year intervals.

The fact-sheets collated in SEF II provide the underpinning data for this approach. To select one example from the very valuable data set collected by SEF II, Cambodia has set a target of maintaining forest cover at 60% by 2015. As shown in Figure 5, since 1965 forest cover has

consistently declined from the starting point of 73%. The very rapid deforestation rate from 1965 to 1993 appears to have been halted but the prospect of maintaining forest cover at 60% by 2015 may be difficult without further policy intervention. In addition, there is some doubt over the latest survey data as they were collected during the dry season when it may have been difficult to separate forest and scrub cover, leading to an over-estimation of forest cover.

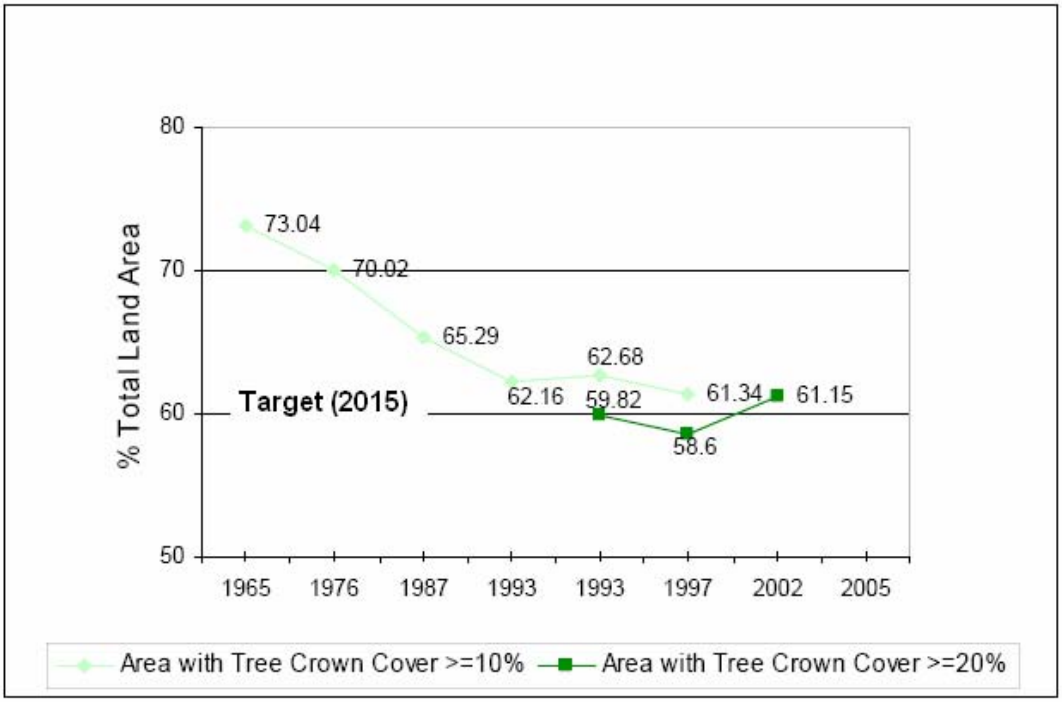

Figure 5 Trends in forest cover in Cambodia 1965-2002

Policies implemented to date in the forest sector include:

(i) Replanting degraded forests in Svay Rieng and Takeo provinces from 1985-2002;
(ii) Royal decree in 1993 establishing 15% of the land area as protected forest areas;
(iii) Declaration of Tonle Sap as a Biosphere Reserve in 2001;
(iv) Added protected forests in 2002, bringing total protected area to 23.5% of the total land area;
(v) Some forest concession areas cancelled; and
(vi) Ministry of Agriculture, Forestry and Fisheries attempts to control illegal logging.

Based on the slowing deforestation trajectory and policy interventions to date, it may be possible to achieve the 2015 target. However, careful monitoring is suggested and additional policy measures and institutional strengthening may be needed prior to 2015. As noted in SEF II, many of the protected areas are former concession areas and improved management of cancelled concession areas may be the most effective measure for increasing forest cover.

5.2 Institutional connections

Typically a NSDS (or other form of SDS) is the product of a National Council on Sustainable Development or similar form of multi-stakeholder forum. SOE and EPA remain embedded in the national environment agency, often with some external donor providing financial and/or technical support. This would not matter if the environmental component of the NSDS was built on and

equivalent to the environmental implementation plan of the national environment agency, which in turn is represented on the multi-stakeholder forum.

Unfortunately, environmental agencies are not responsible for all aspects of environmental management and many of the policies and other interventions that will result in environmentally sustainable development are the province of other government departments (e.g. Ministry of Energy or Ministry of Transport). Unless these agencies have an environmental strategy that is endorsed by the national environment agency, then as a typically weak government entity, the environment agency may have inadequate ability or intention to influence sectoral policies. Indeed, many countries do not even have inter-agency coordination processes that would provide institutional "space" for such coordination. In this situation, environment agencies compiling an EPA often find that they do not have access to the relevant data and may even be unaware of some key targets.

To illustrate the difficulties of inter-departmental coordination, in formulating the Korean NSSD, several NGOs proposed that "green job creation" should be included. The Ministry of Environment initially felt that this should be the province of the Ministry of Labour or the Ministry of Finance and Economy. Nevertheless, the Ministry of Environment did conduct some research on the matter and announced clean job creation plans, only to find that they were rejected by the Presidential Committee on Job Strategy (Chung and Hwang 2006). Due to an over-emphasis on the environmental pillar, key ministries (like Education and Human Resources Development and Government Administration and Home Affairs) did not fully participate in the development of the implementation plans for the Korean NSSD and important avenues for sustainable development such as education and local administration may not be fully committed.

As shown in Figure 2, the logical chain connecting NSDS and annual implementation plans through normal budget processes is highly dependent on effective institutional coordination. While a national council for sustainable development may be able to coordinate preparation of the long term vision, they are almost never adequately resourced to control coordination at the level of sectoral plans or annual implementation plans. Two approaches are possible (i) extension of the powers of the national council using the mandate of the office of the President, or other chief executive; or (ii) mandating inter-sectoral coordination through legislation. Possibly a combination of both approaches may be most effective.

5.3 Indicator selection

From the above description of common processes, it can be seen that indicators (whether environmental or sustainability indicators) link EPA, SOE and SDS. Therefore, common processes of indicator selection are called for. The evidence suggests that in the past indicator selection has not been a process held in common by EPA, SOE and SDS.

For example, the Korean NSSD drew its inspiration for 77 sustainable development indicators from the core set of 57 UNCSD indicators (Chung and Hwang 2006), modified as necessary to suit Korean conditions.[14] The indicators were divided into 14 themes (social – 6, environment – 5, and economic – 3), 34 sub-themes (12, 11, and 11 respectively) and 77 indicators (25, 27, and 27 respectively).

[14] Chung and Hwang (2006) note that "SDIs for Korea follow UNCSD work for the further development and technical improvement of indicators…..Indicator selection was based as much as possible on the availability of indicators that complement the present UNCSD core list by relating it to important areas in Korea not well covered by Agenda 21."

For monitoring purposes, the Korean NSSD proposes a three-tiered approach (i) voluntary monitoring at a departmental level; (ii) performance evaluation by the Office for Government Policy Coordination; and (iii) the national sustainable development indicator system. Monitoring results will be disseminated through white papers, reported to Cabinet and then open to the public. This multi-level monitoring system is seen as necessary to overcome the short-term horizons of government departments and to force them to begin thinking about longer term strategies. However, the rationale for allowing monitoring by government departments to be voluntary rather than mandatory is rather questionable.

If a common process of indicator selection is undertaken then there will be a greater likelihood of monitoring programmes consistently collecting data for these indicators, as there will be multiple uses of the same data.

6. Conclusions and recommendations

Across the globe, the mainstreaming of environmental concerns into development decision making remains a patchy endeavour. Nevertheless, there is adequate experience to provide guidance to those countries willing to attempt the task. In the GMS, experience shows that linking EPA, SOE and sustainable development planning is an achievable goal for developing countries, as the basic building blocks exist. Such linkages can become an important environmental management tool, indicating where current trajectories are likely to fall short of sustainable development targets and where strategic policy interventions may be needed. To date, however, no country in Asia-Pacific has systematically used such linkages to identify strategic policy entry points.

Recommendation: Component 3 of the CEP should attempt to link EPA, SOE, and NSDS in a systematic fashion, so that strategic policy interventions can be identified.

The apparent success of peer reviewed EPRs in the OECD countries raises the question of whether a similar approach should be adopted in the GMS. If Lehtonen (2006) is correct and peer reviews empower weaker actors (like environment ministries) and improve the factual basis of decision making, then there is a strong argument for trialing peer reviews in at least one of the GMS countries, if a willing volunteer can be found.

Recommendation: The OECD should be approached to see if it would help raise awareness on the benefits of peer reviews of EPAs in the GMS. Even without OECD assistance, peer review by the GMS countries working together may be possible in the medium term.

The UNECE experience of the second round of EPRs suggests that there is value in referring back to the first round reviews and assessing progress over the intervening period. However, circumstances change and there is frequently a need to adjust the original objectives and targets. Hence, slavish adherence to the EPR recommendations that applied at the time they were formulated should be avoided and a more flexible approach adopted, provided that the overall movement is towards sustainability.

Recommendation: The second round of EPAs in the GMS should document how circumstances have changed since the first round of assessments as well as reviewing progress in implementing the SEF II recommendations.

The review of SEF II achievements and shortcomings demonstrates that despite some early misgivings, it was possible to identify the priority environmental issues in each GMS country, some existing targets, suitable indicators, some trend data, and make an informed assessment of progress. Some of the indicators selected were too removed from the issue of concern,

meaning that changes in the indicator could have been due to other factors. In addition, the sequence of indicators in accordance with the P-S-R model was not always logical. For example, the P-indicator may have no relationship to the selected S-indicator, meaning that it is not possible to judge if the response would make any changes to the underlying pressure.

Recommendation: The SEF II indicators should be re-examined by the GMS countries during implementation of Component 3 with a view to introducing a more logical and internally consistent set of indicators. Reference should be made to the UNCSD core set of indicators to make sure that international reporting obligations can also be facilitated by the EPA work. The feasibility of expanding the P-S-R model to the broader D-P-S-I-R (Driver-Pressure-State-Response-Impact) model used by the UNEP global environmental outlook series should be carefully assessed before introduction, as it potentially increases the number and complexity of the indicators used.

The review found that EPA has potential application well beyond assessment of national level environmental performance of public environment agencies. Sectoral agencies whose activities impinge on the environment (such as forestry, agriculture, public works etc.) may also benefit from sectoral performance assessments, possibly using the public agencies sector supplements developed by GRI. The private sector environmental performance can be tracked by application of the ISO 14000 series standards. As several local government levels in the GMS have developed Local Agenda 21 plans and some (like Bangkok) already report on progress through SOE reports, more systematic approaches to EPA are possible at sub-national level.

Recommendation: In addition to making sure that routine EPAs are embedded at the national level in the GMS, Component 3 should begin the process of raising awareness of the advantages of EPA and suitable tools at the sectoral agency, private sector, and sub-national levels, possibly through pilot projects and workshops.

The review found that most GMS countries have the elements of a NSDS even if there is no formal document prepared to date. UNEP is assisting several GMS countries to document their NSDS and is preparing a draft SSDS. The best practices globally suggest that the real advantage of sustainable development planning comes from the process rather than preparation of the document. In this respect, the current efforts by UNEP and their selected consultants fall short. Insufficient time and resources have been devoted to public participation in the process and many sectoral agencies have not been involved despite their potential contribution to sustainable development. This is a particular problem for the SSDS which is yet to find an institutional "home" that will take ownership of the process and be responsible for stimulating and monitoring implementation.

Recommendation: Rather than submitting a partially prepared SSDS to the next GMS Summit, Component 3 should consider preparing a decision document that would propose the Environment Operations Center (EOC) to evolve into the institutional home for a SSDS and a clearing-house for information on sustainable development plans at all levels throughout the GMS. Once the institutional arrangements are agreed and endorsed by the GMS heads of government, the EOC could then take steps to ensure that future efforts in relation to sustainable development planning are adequately resourced and financed.[15] The draft SSDS could be submitted for information purposes rather than endorsement at this stage.

[15] Among other things the EOC could keep a watching brief on national socio-economic development plans and sectoral strategies to make sure that the environmental concerns are adequately mainstreamed.

The peer review of the French NSDS recommended that a key element of success is to empower champions in the civil service to integrate sustainable development into their normal activities.

Recommendation: In considering staff to be seconded to the EOC from GMS governments, "champions" from sectoral agencies other than the national environment agency should be included. By exposing such staff to current environmental concepts and performance assessments, they will be more effective in mainstreaming environmental concerns in their sectoral agencies on return.

The OECD best practice guidelines matched against experience in the GMS suggests that several areas of improvement are needed especially in relation to integration of the three pillars of sustainable development, underlying scientific data and analysis, coordination and governance arrangements, and stakeholder participation. As in the OECD countries, the over-emphasis on environmental issues needs to be balanced out with increased attention to social aspects. Of particular relevance to Component 3, there is a need to set more realistic, flexible targets with clear budget priorities and to make sure that sustainable development strategies are continuously monitored and progressively improved.

Recommendation: Use ongoing processes leading to NSDS or their equivalent to set more realistic, flexible targets (tied to annual budget priorities and consistently funded monitoring programmes) as the basis of modifying the indicators for second round EPAs in the GMS.

At least 60 local government areas in the GMS have prepared a Local Agenda 21 or equivalent. Currently these local government areas are being encouraged to convert from an "agenda" for action into more concrete action plans, termed Local Action 21. As many environmental issues are best addressed at the local level, such action plans should be encouraged.

Recommendation: Component 3 should consider conducting a review of existing Local Agenda 21 plans and assist other local government areas to learn from this experience and prepare their own plans. A selected group of municipalities should be assisted to prepare model Local Action 21 plans.

The review of NSDS and associated economic, social and environmental plans in the GMS suggests that there are adequate numbers of existing plans and ongoing planning processes to generate meaningful sustainable development targets for the second round of EPAs, with some exceptions (such as Myanmar). The primary functions of any new NSDS should be to update existing plans, fill in any remaining gaps, and formulate a longer-term vision of where the country is headed.

Recommendation: Ongoing external support for NSDS processes in the GMS should assist countries to move away from a stand-alone NSDS to a continuous process of setting the longer term targets within which five-year socio-economic development plans and sector strategies are fully embedded. These medium term plans, in turn, should be fully linked to annual action plans and budget allocations.

The OECD has spent considerable effort in drawing up a core set of environmental indicators, covering 13 environmental themes, and has extensive experience in their application. The third revision of the UNCSD core set of sustainable development indicators in 2006 now covers 50 indicators, which are part of a larger set of 98 indicators of sustainable development.

Recommendation: In the second round EPAs for the GMS, the UNCSD and OECD core set of indicators should be examined and at least some of these indicators adopted so that GMS

countries can be compared with more advanced economies.

The Asian Environmental Compliance and Enforcement Network (AECEN) is helping to develop indicators to track agency performance in environmental compliance and enforcement, with pilot assessments in PRC, Thailand and Viet Nam among GMS countries. The draft assessments to date indicate that compliance monitoring tends to be restricted to process indicators (like number of inspections and prosecutions) rather than outcome indicators.

Recommendation: Component 3 should work closely with AECEN to ensure that robust compliance and enforcement indicators focused on outcomes are included in the second round of EPAs for the GMS.

In SEF II, the selection of indicators was determined not only by statistical availability but also by the need to match the indicators to the environmental concern and the underlying policy target. A patchwork of indicators based on the PSR model has now been developed from the first round of EPAs. These indicators could be expanded to the broader D-P-S-I-R model although a more complete effort using the existing approach may be a higher priority. The brief review of the GMS indicators in this report will provide some guidance to country teams.

Recommendation: As indicators are the point of commonality between EPA, SOE and NSDS, considerable care should be taken in revising the indicators for the second round of EPAs under Component 3. The gaps in coverage should be filled and the logical sequence connecting pressure, state, and response indicators should be re-examined.

This report has shown that EPA, SOE, and NSDS can be linked together as an effective environmental management tool, helping to identify where and when new policy initiatives may be needed.

Recommendation: Component 3 should address the linkages between these formerly separate exercises and demonstrate to GMS countries how they fit together to offer a clear indication of policy interventions needed to attain long term targets.

The connection between NSDS and EPA (as well as SOE) needs greater attention at the institutional level in the GMS. SOE and EPA remain embedded in the national environment agency, often with some external donor providing financial and/or technical support, while NSDS is either under a national council for sustainable development or some other form of multi-stakeholder forum. If the environmental component of a NSDS was under control of the national environment agency and that agency had sufficient powers to coordinate the environmental activities of all other sectoral agencies, then this separation of responsibilities would be of little concern. However, in practice, most environmental agencies are relatively weak and do not have these coordinating powers.

Recommendation: If the linkages between NSDS, EPA and SOE are to operate seamlessly, the current institutional arrangements in the GMS need to be re-examined. Changes in institutional mandates may be needed to give national environmental agencies greater coordinating powers over the environmental plans and actions of other sectoral agencies.

Appendix

Summary of First Cycle Reviews of Environmental Performance by OECD (1993-2000)

Country	Economy-wide Integration of Environmental Concerns	Integration of Environmental Concerns into Key Sectors
Australia	Weak decoupling with environmental pressures growing slower than GDP but still increasing.	Progress has been made in promoting sound environmental practices within the mining industry.
Austria	Current approaches largely based on regulations and the best technology may have to be streamlined and supplemented by efforts to integrate environmental and economic decisions.	Energy policies have achieved good environmental results, with energy intensity per unit of GDP decreasing for 20 years. Continuous improvement in making the tourism sector more environmentally friendly.
Belgium	Concept of sustainable development (SD) incorporated into legislation and a federal plan for SD. Economic development not yet sustainable in practice.	Sectoral integration is still weak and priorities seem to be given to economic growth, with significant negative effects on the environment. Inter-ministerial integration is making progress.
Canada	Green Plan represents commitment to translated SD concept into qualitative and quantitative national objectives and policy measures. Legislation establishing Commissioner of the Environment and Sustainable Development.	Notable achievements made in integrating environmental considerations into economic and sectoral policies, including environmental analysis of policy proposals and legislation. SD plans for agriculture, fisheries, forestry and industry.
Czech Republic	In recent years, integration of environmental consideration in economic policies was not sufficient and the words “sustainable development” were not used. This is now changing.	Centrally planned economy resulted in pollution black spots. In the transition period, structural changes led to industrial decline, closing of some plants, environmental investment in others, and substantial environmental improvement.
Denmark	Significant strengthening of integration of environmental concerns in economic and social decision making is needed.	Progress has been made in sectoral integration at planning, budget and project levels. Sectoral plans such as Energy 21 and Traffic 2005 are steps towards integration.
Finland	Promoting SD has been a key goal since the late 1980s. Government policy aims at full cost pricing of goods and services.	Industry has been successful in decoupling pollutants from production. Environment built into sector plans for transport, forestry, agriculture, energy and industry.
France	National Environment Plan in 1990 provided an integrated approach but needs to be updated, with quantitative and qualitative targets.	Integration has been approached in different ways according to sectors – extensive for industry, but insufficient for transport and agriculture.
Germany	Some progress but incorporation of East Germany has added to environmental pressures. Structural changes in industry have led to environmental improvements.	Energy intensity has improved and supply structure has diversified. Environmental benefits in transport sector offset by growth of road transport. Chemical industry improving environmental performance.
Greece	Progress has been uneven. Council of State has played a positive role in practical interpretation of SD in case law. EU directives and funding seem to dominate over national objectives.	Good integration of decisions in the energy sector and adequate in physical planning and housing policy. Ad hoc integration in other sectors. Horizontal coordination among departments could be improved.

Hungary	GDP rebound after 1993 not accompanied by former levels of pollution, due to industry modernisation and environmental legislation. Inter-ministerial commission on SD and Local Agenda 21 activities with support of NGOs.	Efforts have been made to integrate environmental concerns into sectoral policies, but need to be strengthened. Environmental sustainability is an objective of the 1996 Transport Policy, but air pollution increases. Emphasis on renewables in energy policy.
Iceland	New Ministry of Environment (MOE) and government White Paper, needs to be followed up with a Strategic National Environment Plan. Increased expenditure on environment is inevitable.	Policy coordination by MOE through ad hoc committees. Central highlands and waste management need better coordination. Structural adjustment in agriculture is an opportunity to mainstream environment.
Ireland	1997 National Strategy for Sustainable Development implemented by high level inter-ministerial committee and National Sustainable Development Partnership. Local Agenda 21 and Environmental Partnership Fund supporting local efforts.	SEA systematically assessing potential impacts of sectoral policies, implemented in context of 2000-2006 National Development Plan. New Planning and Development Bill to strengthen spatial planning.
Italy	Need to implement national plan in response to Agenda 21 and assess results of first 3-year Environmental Management Programme.	Success in integrating environmental and energy policies, with very low energy intensity, energy efficient technology, high energy taxes and prices, as part of National Energy Plan. Initial progress in transport sector has been undermined by growth in transport volume.
Japan	Some decoupling of economic growth and traditional pollutants, but more needed. A comprehensive national environment plan could better integrate key agencies.	Transport sector relatively clean, but traffic is growing. A comprehensive transport development plan is needed. In energy, Japan has successfully decoupled GDP, energy use and CO2 emissions. Energy conservation and efficiency programmes have slowed, however.
Korea	Some progress but no broad improvement of environmental quality. Rapid economic and institutional transformations add to environmental challenges.	Green Vision 21 sets quantitative objectives but vertical structure of public administration makes it difficult to formulate and implement integrated environmental policies. Pollution and congestion in the transport sector are worsening.
Luxembourg	Shift to a service economy has reduced pressure on the environment, but rising affluence is generating new challenges. National Plan for Sustainable Development finalised in 2000.	With few exceptions, environmental concerns are not integrated into sectoral policies. Emphasis is placed on economic and social development, protection of agriculture, road transport and consumption.
Mexico	Sound SD strategies with national development plan and environment programme (1995-2000), National Consultative Council for SD, and new partnerships with industry.	Inter-ministerial cooperation has improved with Ministry of Environment, Natural Resources and Fisheries (SEMARNAP). A formal body deals with energy and environmental issues. Further integration of environmental concerns into fiscal policies, transport sector, and coastal area management is needed, however.
Netherlands	Dutch environmental planning since the 1980s has been highly successful, with quantitative targets with deadlines and nine target groups identified for achieving these targets. Probably global best practice aimed at achieving sustainability by 2010.	Environment is thoroughly integrated into transport planning, with quantitative targets, high share of public transport and bicycles, and clean cars and fuel. Although sustainable agriculture is the goal, emissions remain above sustainable levels and structural changes are needed.

New Zealand	A coherent approach to natural resources management is given in the Environment 2010 Strategy and the comprehensive Resource Management Act.	Agriculture, energy and industry underwent structural reforms since the 1980s, but environmental concerns had little role to play. Devolution to local level has not been matched with local level planning capacities.
Norway	Norway has been a pioneer in support of SD and has made good progress in integrating environmental and economic policies. Specific targets have been set for SD and there are many environmental taxes and other economic instruments.	Norway has attempted to integrate environmental considerations into its extensive, export oriented energy sector, with caps on carbon emissions, carbon taxation, and a Climate Change Action Plan. Cost effective sectoral plans should be coordinated with the Ministry of Environment.
Poland	Pollution, energy and resource intensity of the economy are higher than other OECD countries despite a National Environment Policy built around SD principles. Environment is still seen as an expensive "add-on" and a responsibility of the environment agency.	Major ministries have not internalised a commitment to the environment and existing arrangements are not sufficient to hold them accountable. The Energy Policy incorporates the objectives of the Environment Policy, but major environmental problems remain. Major investment is needed in the industry sector.
Portugal	Portugal's environmental expenditure has generated some improvements but it needs better integration to pursue SD and environmental convergence with the EU.	The legislative framework is in place but additional economic instruments are needed, such as taxes or charges on air pollution. All economic aspects of water resources and waste management need attention.
Spain	Spain's environmental management has improved since the 1980s, but it needs greater use of economic instruments to support its environmental policies. There is progress on waste disposal and recycling but not on waste prevention.	Despite a National Hydrological Plan, balance between ecology and economy in the crucial water sector has yet to be achieved. Some steps were taken to integrate energy and environment in the 1991 National Energy Plan but further effort is needed.
Sweden	Despite some progress in decoupling environmental pressures from GDP, Sweden sees the need for increased integration as the key to improving environmental performance and SD.	Environmental considerations are taken into account in development strategies for the transport and energy sectors, but consumption is still trending upwards. Environmental integration in agriculture has been fairly successful.
Switzerland	Good progress in green tax reform, sustainable consumption, and a new Committee on SD. Cantonal plans for SD and Local Agenda 21s are needed.	Integration of environmental and transport policies is a good example for other countries. Reforms towards sustainable agriculture are underway. Greater effort is needed in land use planning and tourism.
Turkey	Turkey benefits from integrated planning by the State Planning Organisation and incorporation of environmental planning into Five Year Development Plans. Considering legislation for a Sustainable Development Council.	There is limited coordination between sectoral ministries and different levels of government. Attention needs to be paid to integrating environmental concerns into energy, transport, tourism, industry, and agricultural policies.
United Kingdom	Much remains to be done to integrate environmental, economic and sectoral policies, as recognised in the 1994 Strategy for Sustainable Development.	A coherent Climate Change Programme, but greater internalisation of environmental costs is needed in the energy sector. Responsible Care Programme is a good model for voluntary approaches by industry.
United States	Environmental policies focus on separate issues and remedying environmental deterioration rather than prevention. President's Council on SD and EPA's Five-Year Strategic Plan are setting environmental goals.	Cooperation among federal agencies is growing, despite the scattered structure of environmental law. There is a National Environmental Performance Partnership with the states. Pollution per vehicle has declined but there has been no success in reducing the growth in vehicle traffic. The Toxic Release Inventory is a good tool in the chemical industry, although clear targets are needed.

Belarus	Environmental pressures have decreased since 1990 due to reduced economic output, energy supply changes and environmental action. There is excessive reliance on end-of-pipe solutions.	Environmental concerns need to be integrated into policies for industry, agriculture and energy. Economic reform should lead to a less resource- and pollution-intensive economy. An integrated response was provided to the Chernobyl incident.
Bulgaria	The pollution and resource intensity of the economy remain high, despite the fall in GDP and industrial output. Progress has been made in the environmental policy framework.	Pollution from industry remains high and energy intensity of industrial production has increased. Industrial policies largely ignore environmental concerns. Good housekeeping and environmental audits are cost effective means to improve environmental performance.
Russian Federation	Economic reform has not been matched by institutional reform. A Concept of the Transition to SD was approved in 1996. There is also a National Environmental Action Plan.	Little decoupling has been achieved and the pollution intensity of the economy has increased. The priority attached to environment within public policy has declined with most environmental programmes too ambitious and seriously under-funded. Liabilities for past environmental damage impede new investment.

Source: OECD (2000)

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Greater Mekong Subregion Environmental Performance Assessment and Sustainable Development Planning - Performance Indicators

Discussion paper prepared by
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Abbreviations and Acronyms

ADB	Asian Development Bank
BOD	biochemical oxygen demand
Cd	cadmium
CEP	core environment program
COD	chemical oxygen demand
Cr	chromium
Cu	copper
DEQP	Department of Environmental Quality Promotion
EEA	European Environment Agency
EIA	environmental impact assessment
EPA	environmental performance assessment
EPI	environmental performance indicator
EPR	environmental performance review
GDP	gross domestic product
GMO	genetically modified organism
GMS	Greater Mekong Subregion
GNA	green national accounting
Hg	mercury
ISO	International Standards Organisation
IUCN	World Conservation Union
JICA	Japan International Cooperation Agency
MDG	millennium development goals
MoNRE	Ministry of Natural Resources and Environment
MRC	Mekong River Commission
NBS	National Bureau of Statistics
NDP	net domestic product
NESDB	National Economic and Social Development Board
Ni	nickel
NO_x	nitrogen oxides
ODS	ozone depleting substances
OECD	Organisation for Economic Cooperation and Development
ONEP	Office of Natural Resources and Environmental Policy and Planning
Pb	lead
PM	particulate matter
POP	persistent organic pollutant
PRC	People's Republic of China
RMB	yuan renminbi (currency of PRC)
SEEA	system of integrated environmental and economic accounting
SEF	strategic environment framework
SEPA	State Environmental Protection Administration
SNA	system of national accounts
SO_2	sulphur dioxide
SO_x	sulphur oxides
SOE	state of environment
UN	United Nations
UNEP	United Nations Environment Programme
VOC	volatile organic compounds

1. Background

From the outset of the **National Performance Assessment and a Strategic Environmental Framework for the Greater Mekong Subregion (SEF II)** in 2003 the selection of the right set of indicators was seen as the key step in the conduct of an environmental performance assessment (EPA) as shown in Box 1.

Box 1 SEF II Framework
Step One: Selecting policy concerns
Step Two: Adapting priority concerns to GMS conditions and quantifying policy targets
Step Three: Selecting indicators and matching them to priorities
Step Four: Selection of core and headline indicators
Step Five: Preparation of indicator "fact sheets"
Step Six: The conduct of EPA

In providing guidance to the national teams, SEF II reviewed global experience in developing environmental indicators and that overview is repeated here (with some light editing) as Appendix 1. Four broad categories of environmental performance were identified (i) evaluation of environmental performance by enterprises built around the ISO 14000 series; (ii) assessments of the performance of governments and public bodies in general (i.e. not primarily environment-related); (iii) environmental performance assessment (EPA) by (or of) individual countries; and (iv) environmental performance by (or of) supra-national entities. SEF II focused on environmental performance of Greater Mekong Subregion (GMS) countries at the national level and, to a lesser extent, environmental performance at the subregional level.

In starting this work for Component 3 of the Core Environment Programme (CEP) several key decisions need to be made in relation to the choice of indicators. First, a decision will need to be made on whether the set or priority concerns remains as in SEF II or whether new priority concerns have emerged over the past few years. Second, will each country be able to stick with their existing indicators (bearing in mind some of the points made in Discussion Paper No. 1) or will they change them? Third, for those countries which did not select certain priority concerns but wish to do so this time around, which indicators will be chosen? Fourth, where there were missing concerns in SEF II will the GMS countries be able to fill them and if so, what indicators will be chosen? Fifth, for the sub-national level are the priority concerns the same as at the national level and if not, what are the appropriate indicators? Sixth, is there any appetite among the GMS countries to extend the EPA methodology to the sectoral level? Seventh, is there any need to extend the aggregate index approach that was tentatively explored in SEF II? Eighth, is there a need to go beyond the environmental indicators and extend the analysis to sustainability assessment, covering social and economic indicators? Finally, is the Pressure-State-Response (PSR) model still regarded as adequate or should it be extended to the more comprehensive Drivers-Pressure-State-Impact-Response model used in the Global Environmental Outlook (GEO)?

The purpose of this discussion paper is to explore how others have dealt with the choice of environmental indicators, to draw out the lessons learned, and to provide guidance to GMS countries as they grapple with the answers to the difficult questions outlined above.

2. Approach to Indicators in SEF II

In SEF II, the project team spent considerable time and effort in trying to select indicators that would not only reflect progress towards achievement of national objectives and targets but would also contribute to a harmonised set of indicators which could be used across the subregion. Table 1 illustrates the kind of debate that was undertaken in the process of deciding on which indicators to choose.

Table 1 Debate over selection of indicators in SEF II

Priority	Type	Possible shared indicators	Remarks	Comments
Land degradation - *what is the target – zero land degradation, reduced rate of land degradation, or reversal of the rate of land degradation?*	P	Rate of deforestation Population density in the uplands	Feasible everywhere, but low score given by Yunnan Feasible everywhere, but Thailand mentioned statistical problems caused by shifting population (Vietnam and Lao PDR did not but they could have)	*Land degradation may be due to conversion from one use to another, or may be due to inappropriate use beyond the inherent land capability. Land degradation can be just as common and often more important in lowland areas than in upland areas. Deforestation is not equivalent to land degradation – perennial pasture cover may be just as stable as forest cover.*
	S	Average rice yields	Feasible everywhere. Attention needed to definition (upland yields? country-wide yields?)	*Rice is grown in rain-fed upland areas as well as irrigated lowland areas. Yield changes are due to variety selection, fertiliser inputs, pest and weed control, and rainfall/irrigation, as well as on-farm practices. What proportion of degraded lands is used for growing rice?*
	R	Rehabilitated areas	Feasible except for Lao PDR. Ensuring same definitions bound to be difficult	*The area of land rehabilitated would be an outcome of the response. Responses could be reforestation, soil erosion control programmes, restoration of soil fertility, manipulation of the carbon/nitrogen balance in the soil, conversion to organic agriculture practices, or other forms of soil remediation.*

A rather theoretical framework was proposed to guide selection of indicators as shown in Figure 1.

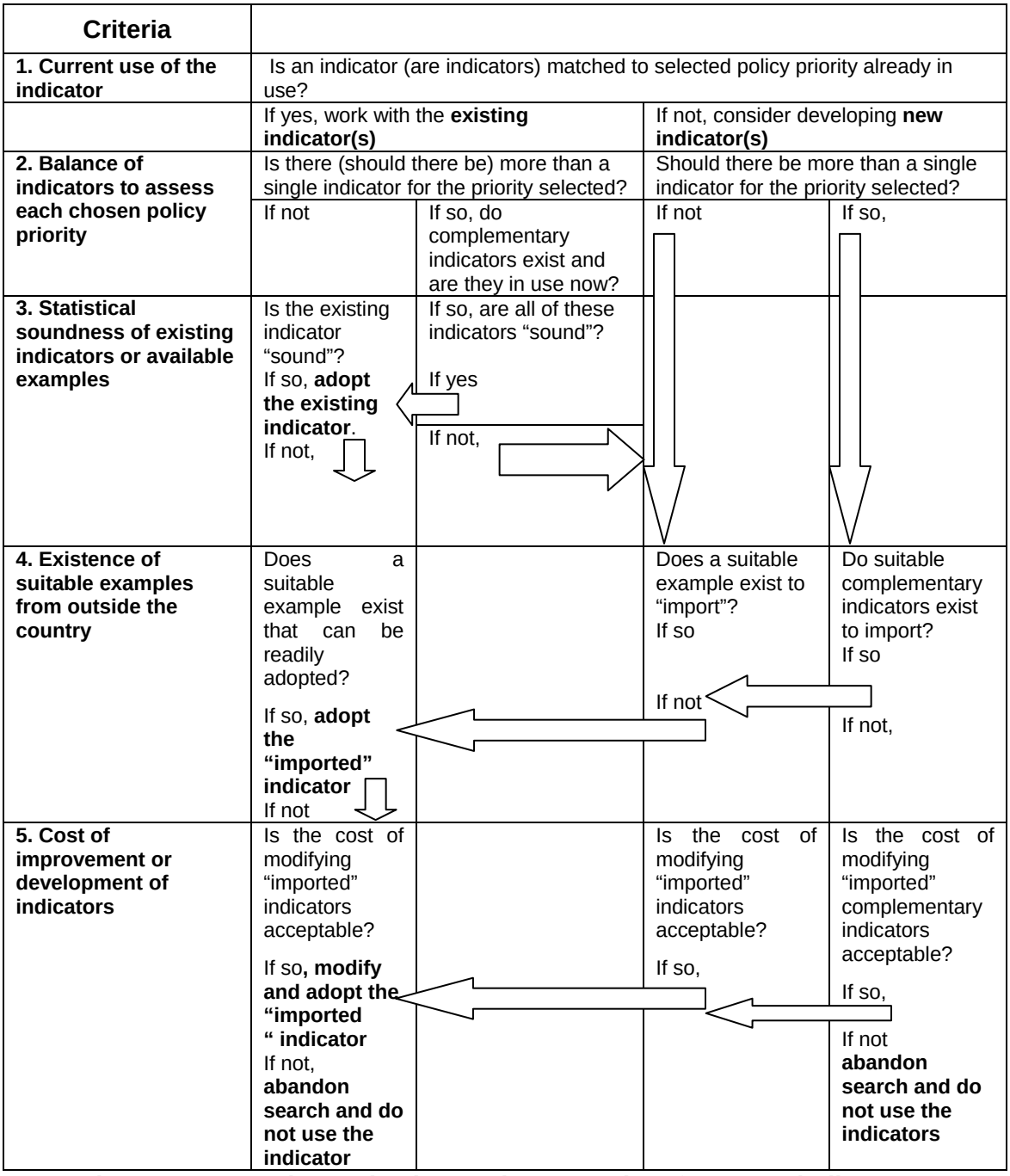

Figure 1 Approach to selecting environmental performance indicators
Source: TP 2 in SEF II

The indicators, selected using this process, are shown in Table 2. The recommended structure for GMS thus consisted of 48 principal indicators (of which 9 were transboundary ones), 25 core indicators (of which one was transboundary) and 11

headline indicators. Headline indicators are intended "*to provide a broad overview of trends in the country's environment in areas that are important to the citizens. The indicators do not represent a comprehensive report on the state of our environment, but rather are a series of snapshots that can raise public awareness and act as signposts for our path towards environmental sustainability.*"

Table 2 Environmental performance indicators recommended for EPA in GMS

	Type of indicator recommended			Amendments adopted during SEF II
Policy concern/theme	**Pressure**	**State**	**Response**	
Country-level indicators				
Land degradation	**Population density in the uplands**	Percentage of vulnerable farmed areas	Expenditure on promoting sustainable farming and sedentarisation programmes	Most GMS countries adopted this as a priority concern. Pressure indicators included agriculture, upland population, shifting cultivation, and loss of forest area. State indicators also varied widely from direct measures of sediment load to indirect measures like rice yield. Most response indicators relate to area rehabilitated.
	Land use changes; Ratio of land exploitation; Rate of deforestation; Human-induced soil degradation	Value of non-irrigated agricultural output per ha Average rice yield; Degree of top soil losses; Real prices of rainfed farmland	Rehabilitated areas	
Threats to biodiversity	Rate of loss of designated ecosystems	Threatened species	**Per capita public expenditure on protected areas**	Most GMS countries (except Thailand) adopted this concern. Loss of forests was seen as the main pressure. Most used the IUCN Red Book threatened species list for the State indicator. Protected areas were viewed as the best Response indicator.
	Clearance of native and semi-native forest; Land use changes		Protected areas as % of total area by ecosystem type; Protected species as % of threatened species	
Inland water pollution	BOD5 in designated water bodies	**Incidence of waterborne diseases**	Expenditure on secondary and/or tertiary water treatment	Only 3 GMS countries adopted this concern. Discharge indicators included untreated domestic wastewater, BOD, and municipal wastewater. Various ambient quality measures were used as State indicators. Only one country used fees as a Response indicator.
	Other pollutants on designated water bodies	% of municipal wastewater undergoing secondary or tertiary water treatment; Access to safe drinking water	User charges for wastewater treatment	
Inadequate waste management	Population density in principal urban areas	**Burden of uncollected waste**	Charges for waste disposal	Most GMS countries adopted this concern. Most used urban waste generated as the

	Generation of municipal solid waste; Generation of industrial solid wastes	Percentage of municipal solid waste collected	Expenditure on landfill development; Waste re-cycling and recovery rates; Cost recovery in municipal waste handling	Pressure indicator. Waste collected was used in preference to waste uncollected. Expenditure on waste management was the most common Response indicator.
Toxic contamination	Generation of hazardous wastes	Concentration of Pb, Cr, Cu and Cd in rivers and coastal areas	Completeness of toxic material inventory	Two countries selected toxic contamination, although Lao PDR included unexploded ordnance in this category. Thailand included health incidents related to toxic chemicals as a State indicator. The Response indicator was the amount of treated hazardous wastes.
	Consumption of Pb, Hg, Cd, Ni; Imports and exports of hazardous wastes; Apparent consumption of pesticides; Emissions of organic compounds	Area of land contaminated by hazardous wastes	Rehabilitated sites as percent of contaminated; Market share of unleaded petrol; Share of car battery recycling	
Air pollution by stationary sources	Volume of SO_2 and PM emissions	SO_2 and PM concentrations above international ambient standards	Total outstanding volume of SO_2 and PM emissions in industrial permits	None of the GMS countries adopted this concern or indicators.
	Index of acidifying substances Emissions of NO_x and SO_x Emissions of particulate matter	Excess over critical loads of pH in water and soil; Per cent of industrial facilities found in violation of permit conditions	Capacity of SO_x & NO_x abatement equipment of stationary sources Per cent of industrial pollution permit holders inspected Expenditure on air pollution abatement equipment	
Mobile source pollution	**Per capita volume of automotive fuels sold in urban areas**	Excess of PM and NO_x over international ambient standards in the capital city	Per cent of registered cars undergoing pollution inspection	Only 2 GMS countries adopted this concern. Car density is used as proxy Pressure indicator. Ambient concentrations are used as State indicators rather than excess over standards. Only Myanmar had a Response indicator – number of vehicles inspected.
	Mobile source emissions Urban air emissions SO_x, NO_x, VOC Emissions of NO_x Car-equivalent-units per head of population	Incidence of respiratory diseases	Expenditure for noise abatement; Per cent of car fleet equipped with catalytic converters; Emission and noise regulatory levels for vehicles	

Threats to coastal zones	**Population density along the coast**	Relative real prices of dwellings in the coastal zone	Zoning regulations	Only Viet Nam chose this as a priority concern, with an emphasis on mangrove loss for aquaculture.
	Area of coastal aquaculture per km of coast; Oil pollution; Heavy metals discharges; Shore build-up	Quality of coastal water		
Climate change	**Emissions of CO_2 per unit of GDP**	Excess of CO_2 over international ambient standards	Fossil and wood energy intensity	Most GMS countries used emissions per unit of GDP as a Response indicator. No GMS country adopted a State indicator. Baseline years were mostly 1990 in accordance with the Kyoto Protocol. No GMS country used average consumption of fuel wood or slash-and-burn area.
	Emissions of GHGs per unit of GDP; Average consumption of fuel wood; Average area of slash-and-burn		Ratio of current GHG emissions to a 1995 benchmark	
Ozone layer depletion	Apparent consumption of CFC	Atmospheric concentrations of ozone-depleting substances	CFC recovery rate	No GMS country adopted this concern, although most have in place ODS elimination programmes under the Montreal Protocol.
	Apparent consumption of ozone-depleting substances	Ground-level UV-B radiation		
Water resources	Agricultural water; consumption per capita	**Access to safe potable water**	Water and wastewater charges as percentage of full production cost	Four of the six GMS countries chose water resources. Population was chosen as a proxy for the Pressure indicator. Thailand used agricultural consumption of water as its indicator set, rather than potable water. Response indicators were based on public expenditure.
	Groundwater abstraction; Urban water consumption per capita; Ratio of water withdrawals to flows	Frequency, duration and extent of water shortages; Long-term marginal cost of urban water supply		
Fish resources	Volume of fish catches	**Real domestic prices of fish**	Expenditure on fish stock and catch monitoring	Only 2 GMS countries adopted this concern. Cambodia used number of community fisheries as a response indicator.
	Value of inshore fisheries output; Value of offshore fisheries output	Overfished areas; Size of spawning stock		
Forest resources	Ratio of actual to sustainable harvest	**Real domestic prices of fuel wood**	Budgets on forest protection	All the GMS countries chose forest resources as a priority concern. A

	Per capita fuel wood production; Rate of deforestation	Real prices of timber; Forest cover Timber balance	Per cent of protected forest area in total forest area; Per cent of production forest inventoried; Per cent of harvested area successfully regenerated or afforested	wide range of Pressure indicators was chosen. Forest cover was the main State indicator for all countries. Protected areas and reforested areas were chosen as Response indicators.
Transboundary concerns				
Threats to the Mekong's vital functions	Total water withdrawals by GMS members	Deviations from long-term flow average in lower reaches	GMS countries contributions to MRC budget	
		Maintenance of environmental flow target		
Illegal trade in resources, wildlife	Price index of illegal items outside GMS	Threatened species in GMS	Local budgets to fight illegal trade	
	Local prices of illegal items			
Absence of harmonisation of policy targets and evaluation tools	Deviations of country pollution norms from GMS average	Percentage of land that is classified using GMS-wide criteria	Budgets allocated to environmental harmonising initiatives	
		Percentage of common air and water pollution Standards		

Legend: core indicator **bold** = headline (or key) indicators

For each concern selected the SEF II team identified the most suitable principal indicator(s), based on (a) "proven track record" internationally, (b) use or partial use of the indicator in at least one GMS country, (c) the cost of developing proposed indicators where none exist now; (d) the degree of "statistical" fit between the indicator and the identified concern and (e) reporting demands placed on GMS country by global environmental conventions. As indicated in Discussion Paper 1, at least 92 indicators were ultimately chosen for 12 different environmental "concerns" compared to the 48 initially recommended.

The SEF II consultant team also proposed several environmental indicators for the key economic sectors in the GMS (Table 3). No attempt was made in SEF II, however, to develop a sectoral performance assessment.

Table 3 Recommended environmental indicators for sector assessment

Sector	Type of indicator			Notes
	Pressure	**State**	**Response**	
Agriculture	Use of fertilisers per ha of arable land	Arable land per capita	Expenditure on introduction of improved farm practices	
	Apparent consumption of pesticides; Agricultural water consumption per capita; Emissions by intensive livestock sector	Degree of top soil loss; Share of intensive livestock subsector in total organic pollution	Expenditure on wastewater treatment in intensive livestock sector	References: Dumanski and Pieri (1995); Parris (2002)
Transport	Consumption of petrol and diesel by road transport	Structure of energy use by the transport sector	Fuel prices and taxes	References: EEA (see Appendix B)
	Road traffic by mode; Mobile source emissions	Road traffic fatalities	Relatives taxes on vehicles and vehicle use	ADB (2002), Blue Skies for Metro Manila
Energy	Energy intensity	Energy sector air emissions per GDP and per capita	Share of consumption of renewable energy	References: OECD (1993),Indicators for the Integration of Environmental Concerns into Energy Policy Environment Canada (1997), Energy Consumption. National Environmental Indicator Series
	Energy balance		Real energy end-use prices by fuel type; Relative taxation by different fuel types; Implicit and explicit tax on energy/CO_2; Expenditure on energy efficiency, alternative energy, climate change research	
Tourism	Number of tourist nights per domestic population	Share of tourism receipts in exports	Public expenditure on conservation of heritage sites	References: MCSD (2000), Plan Bleu

Legend: principal indicators

3. Experience in Thailand

Thailand has made several additional forays into the world of environmental and sustainability indicators beyond its involvement in SEF II. These indicate that there is neither national consensus on which indicators should be routinely collected nor on how various indicators might be aggregated into indexes.

In 2003, the National Economic and Social Development Board (NESDB) computed an economic strength and level of development index (Social Research Institute 2005). This index combined indicators of economic self-reliance, economic immunity, adaptability to global changes, stability growth, and development decentralisation. The results showed that prior to the financial crisis in 1997, the overall economic strength was at 69.5%, dropping to 66.9% in 1997-1998, and recovering to 71.1% in 2002.

Also in 2003, to comply with Agenda 21, NESDB commissioned Thailand Environment Institute and Kenan Institute of Asia to develop appropriate sustainable development indicators. They assembled 23 indicators (economic – 9; social – 7; and environmental – 7). The indicators are shown in Table 4. The combined sustainable development index increased from 57.7% in 1999 to 64.3% in 2003. Environmental quality is consistently ranked lower than progress in economic and social indicators. Through expert brainstorming in 2007, these indicators were reviewed and revised, with one new environmental indicator (chemicals used in the agriculture sector) added.

Table 4 Thailand's Sustainable Development Index

Economic Indicators	**Social Indicators**	**Environmental Indicators**
Total factor productivity Ratio of energy use/GDP Renewable energy Waste recycling Total employment Public debt/GDP Current account/GDP Gini coefficient Poverty reduction	Average years of education Achievement in education Life expectancy at birth Human health Life security Participation index Corruption index	Percent forest area Mangrove area/1961 area Marine fauna within 3 km Groundwater use % Good water quality Air quality Treated hazardous wastes *Chemicals used in agricultural sector**
1999 – 70.2%	1999 – 61.9%	1999 – 40.8%
2003 – 79.1%	2003 – 65.4%	2003 – 48.6%

* added in 2007
Source: Social Research Institute 2005

Along with most other countries Thailand is a signatory to the millennium development goals (MDG) and is committed to submitting regular reports on progress. As Thailand will meet most of the MDGs by 2015, it has gone further than many other countries and adopted the MDG+ targets. The environmental measures for MDG 7 included in this set of indicators include (i) % of land covered by forests; (ii) % protected areas; (iii) energy use per Baht 1,000 of GDP at 1998 prices; (iv) carbon dioxide emissions per capita; (v) ozone depleting substances (ODS) consumption; and (vi) proportion of the population using solid fuels.

Progress in relation to the MDG 7 targets is given in Table 5. These indicators show some progress on the environmental front but point to the difficulty of decoupling energy consumption and economic growth.

Table 5 Thailand's MDG 7 indicators

Indicators	1990	1995	2000	2002
Land area covered by forest (%)	28	25.6	25.3 (1998)	33 (2000)
Protected area as percent of total area (%)	12.4	15	17.6	n.a.
Energy use per Baht 1,000 of GDP (kg of oil equivalent – kgoe)	15.7	15.5	15.7	15.9
Carbon dioxide emissions (tonnes/capita)	2.4	3.6	2.3	n.a.
Consumption of ODS (tonnes)	7,262	8,314	3,586	n.a.
Proportion of population using solid fuel (%)	65.5	47.2	36.3	30.5

Source: Government of Thailand 2004

In 2004, NESDB commissioned consultants to establish indicators that would help monitor environmental trends (Social Research Institute 2005). Three sets of indicators were proposed (i) an aggregate indicator for environment and natural resources together; (ii) an index for natural resources; and (iii) an index for environment. Each of the two latter indices consisted of 6 underlying indicators, weighted by expert judgement of a project steering committee. The indicators chosen were (i) proclaimed protected areas; (ii) soil rehabilitation; (iii) surface water per capita; (iv) mangrove area; (v) catch per unit effort; (vi) budget share for natural resources and environment; (vii) ratio of water sources of acceptable quality to water of very low quality; (viii) proportion of treated municipal wastewater; (ix) reuse or recycling of solid wastes; (x) proportion of treated industrial hazardous wastes; (xi) air quality; and (xii) number of protected areas and cultural heritage sites.

In its 2005 monitoring report for the 9th social and economic development plan, NESDB reported assessment results after 3 years (2002-2004) of experience in implementation of three sets of indicators, including sustainable development indicators, economic strength and level of development index, and national well-being indices.[1] The results are depicted in Figure 2. Sustainable development as a whole in that period has improved continuously due to economic and social development progress. However adverse impacts on environment were detected which could be interpreted from the low score (Level 2 or <70%).[2] The following trends on environmental quality were reported as:

[1] National well-being indices consist of 7 components (health, knowledge, working life, income and its distribution, environment, families, and good governance) with 25 indicators.

[2] Assessment score was categorized into 5 levels. The interpretation of each level could be explained as follows:
Level 5 = the trend has been improved at a high level (90-100%)
Level 4 = the trend has been improved at a moderate level (80-89.9%)
Level 3 = there is no improvement (70-79.9%)
Level 2 = the trend has regressed (<70%)
Level 1 = undefined

(i) Continued deforestation and annual reforestation not keeping up with annual losses;
(ii) Reduced biodiversity in both quantity and species numbers;
(iii) Lack of knowledge of genetically modified organisms (GMO) and lack of clarity on GMO policy;
(iv) Increased severity of water shortages;
(v) Continued land degradation and inappropriate land use;
(vi) Deterioration of marine and fisheries resources;
(vii) Increasing energy use and associated pollution;
(viii) Increased urban solid waste and weak capacity of local governments to deal with it;
(ix) Water quality from major sources below the standards required for use;
(x) Continued air quality deterioration in major cities;
(xi) Increased amount of hazardous wastes and inability to cope with the problem; and
(xii) Increased import of hazardous substances for use in agriculture and manufacturing industries.

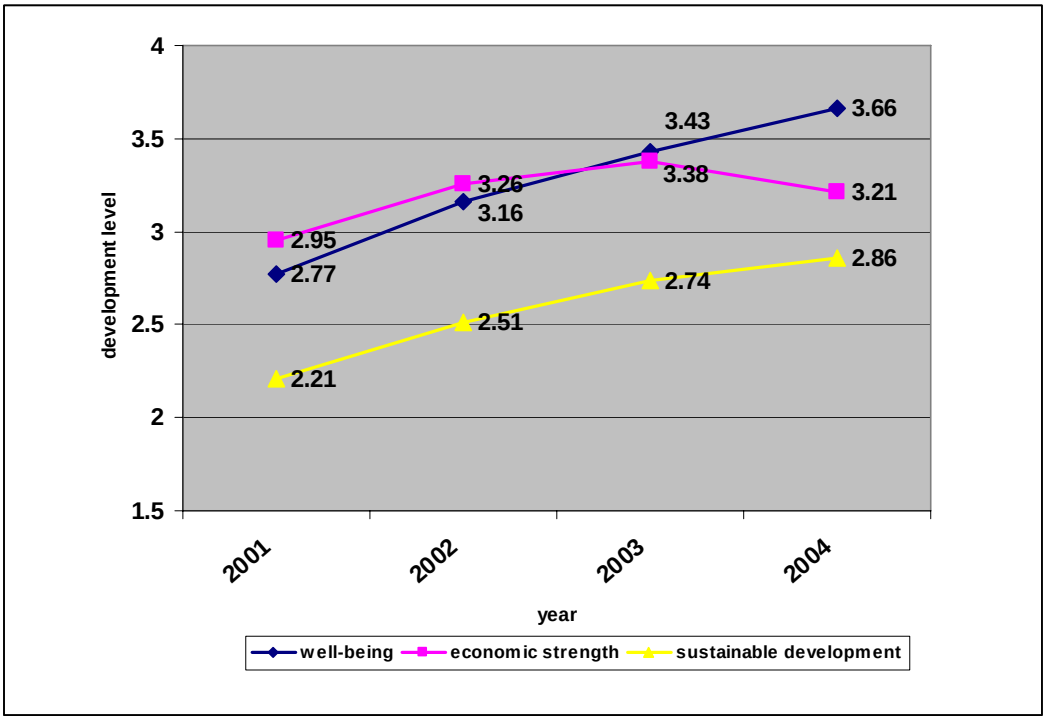

Figure 2 Assessment results on development in Thailand from 2001-2004
Source: NESDB (2005)

The Office of Natural Resources and Environmental Policy and Planning (ONEP) State of Environment Report 2005 reiterates many of these problems and adds some emerging issues including (i) recovery from the 2004 tsunami; (ii) drought; (iii) declining watershed conditions in the Ta Chin watershed; (iv) contribution of open burning to climate change and reduced air quality; (v) sea level rise and subsidence in the Chao Phraya River basin; (vi) coastal erosion; (vii) contamination from mining; (viii) coastal

zone deterioration; (ix) open dumping and burning of municipal solid wastes; (x) a 50% reduction in good water quality; (xi) high levels of fine particulates in air quality of urban areas; (xii) excessive roadside noise levels in urban areas and at the new airport; (xiii) slums and other urban planning problems; and (xiv) degradation of the cultural environment (ONEP 2005).

ONEP has evaluated the effectiveness of long term environmental policy and plans, such as the Policy and Prospective Plan for Enhancement and Conservation of National Environmental Quality: 1997-2016, and the previous five-year environmental plan, the Environmental Quality and Management Plan 2002-2006. ONEP conducted a study on environmental policy implementation as well as established a monitoring and appraisal system. In the monitoring and appraisal system, environmental indicators which were developed by ONEP in 2004 under the Pressure-State-Response Framework have been reviewed and examined. Out of 182 indicators, consisting of 75 status indicators, 39 pressure indicators, 56 response indicators, and 12 process indicators, ultimately 58 indicators were considered as proper indicators to be utilised in the monitoring and appraisal system, although only 43 indicators are ready to use. The results of applying these 43 indicators were classified into three groups (i) the result was in the same direction as the target; (ii) the result was in the opposite direction as the target; and (iii) the result was unable to draw a clear conclusion from current information. Major obstacles identified for the use of indicators were (i) unclear relationships between indicators and specified targets, (ii) inappropriate indicators, (iii) inadequate data support for the assessment at the national level, and (iv) lack of a database system at the provincial level (ONEP 2007).

In the 2007-2011 Environment Quality Management Plan, indicators have been selected for each of the 6 strategies of the plan in different environmental sectors[3] and used as key performance indicators of all levels of government. The 6 strategies include (i) promoting participation in natural resources and environmental management; (ii) enhancing management efficiency; (iii) creating driving forces for local governments to more aggressively manage the environment; (iv) providing better access and utilisation of resources for alleviating poverty; (v) encouraging balanced and sustainable utilisation of natural resources; and (vi) monitoring, maintaining and rehabilitating environmental quality. Indicators for Strategy 1 are shown as examples in Table 6. The plan will be evaluated annually through the selected indicators. Likewise assessment of the plan to indicate target achievement will take place in the second half of the plan period. The Ministry of Natural Resources and Environment advocates creating a broad-based monitoring and evaluation committee for the plan, using SOE reports and media releases to disseminate the findings.

[3] The “sectors” include (i) forests, (ii) biodiversity, (iii) soil and land, (iv) mineral resources and energy, (v) aquatic and coastal resources, (vi) water resources, (vii) pollution, (viii) urban environment and community, (ix) natural environment and historic sites, (x) and multilateral environmental agreements.

Table 6 Indicators for Strategy 1 in Environment Quality Management Plan 2007-2011

Strategy 1: Promoting participation in natural resources and environmental management	
Indicator	Environmental sector
1. Keeping the current forest area (including mangrove) and creating new area not less than 0.5% within 5 years	Forests
2. Managing biodiversity through participatory process in 80% of important ecosystems	Biodiversity
3. Approving the land right in 80% of target households	Soil and land
4. Managing mineral resources through participatory process in every province and preventing target villages in disaster prone areas	Mineral resources and energy
5. Managing aquatic and coastal resources through participatory process in every province 6. Successful level of participation in aquatic and coastal resources management	Aquatic and coastal resources
7. Managing through participatory process in 50% of target water basins	Water resources
8.Manaing environmental quality through participatory process in every province	Pollution
9. Increasing 50% of urban community outputs from activities relating to environmental management	Urban environment and communities
10. Creating networks of natural and historical site conservation not less than 5 agencies per years	Natural environment and historic sites
11. Increasing public participation in multilateral environmental agreements	Multilateral environmental agreements

NESDB is now examining international experience with development of a happiness index (following Bhutan's lead) as the 10th Plan (2006-2011) focuses on achieving a "green and happy" society in Thailand. According to the definition of happiness, six components have been elaborated to cover all aspects of happiness. Each component consists of various sub-components as shown in Table 7. There are 35 core indicators which could reflect objectives for each component and be measured quantitatively, together with 44 supplementary indicators which could be used to explain the reasons underlying change of assessment results measured by the core indicators.

Table 7 Components, sub-components and indicators of happiness in Thailand

Component	Sub-component	Core Indicator	Supplementary indicator
1. Well- being			
	Physical health		
	-Healthy body	Ratio of population with no illnesses	-Ratio of newborns with birth weight ≥ 2,500 grams -Population with unhealthy behavior (%) -Population exercising (%) -Population with over nutrition (%)
	-Longevity	Life expectancy at birth (year)	
	Mental health		
	-Healthy mind	Ratio of mental disorder patients	
	-Sense of moral	Criminal cases per 1,000 population	Population with religious activities (%)
	Knowledge		
	-Educational attainment	Functional literacy rate	Mean years of schooling for people aged 15 years and over (years)
	-Quality of education	Test scores on class subjects	Ratio of people enrolled in education to those who are not
	-Information acknowledgement		-Population with reading -Population access to internet
2. Economic strength and equality			
	Honest livelihood		
	-Employment	Unemployment rate	-Ratio of low income labour -Working hours per month or year
	-Sufficient income	Ratio of households with incomes exceeding expenses over 10%	-Households saving money (%) -Average debt per household
	-Job security and occupational safety	Ratio of employees covered by social welfare	-Disabled employees caused by occupation (%) -Ratio of employees with chemical injuries
	Income distribution	-Ratio of poor in economic terms	-Gap of income distribution

		-Gini coefficient	
	Economic strength	-Economic growth -Total factor productivity -Inflation rate -Current account/GDP	-Ratio of international reserves to short-term external debt
3. Family life			
	Proper roles of family	-Ratio of abandoned elders (per 100,000 elders) -Ratio of abandoned children (per 100,000 children)	-Ratio of domestic violence cases -Ratio of family and child cases -Ratio of families where all members stay together
	Healthy family	Divorce rate	Rate of registration of marriage
4. Strong community			
	Self-reliance		
	-Economic aspect	-Ratio of strong co-operatives	-Working capital of community groups -Ratio of community capital utilisation over 50%
	-Problem solution		-Number of group activities -Ratio of communities with development plans
	Community with integrity	Ratio of communities with social security	Ratio of communities/ villages with domestic social welfare
	Community participation	-Ratio of households with members of community groups -Ratio of communities/villages with self-learning system	-Ratio of households participating in public activities
5. Good living environment with balanced ecosystem			
	Basic needs for living		
	-Habitat	Ratio of households with home ownership	
	-Infrastructures and services	Ratio of households with access to tap water	Ratio of households with electricity
	Safety in life and property	-Ratio of criminal cases -Ratio of drug trafficking cases	Loss of life and property from accident/fire
	Good environment	-Ratio of water bodies	-Ratio of main rivers

		with moderate quality -Volume of properly treated wastes	with DO, BOD and TCB parameters below standard -Dust with particle size ≤ 10 µm -Greenhouse gases emission -Solid waste production -Leftover solid waste -Ratio of domestic per hazardous wastes -Volume of chemical products in agricultural sector
	Balanced ecosystem	-Volume of captured economic aquatic animals per hour -Forest cover	-Number of endangered species -Ratio of conserved forest per total land area
6.Democratic society with good governance			
	Pubic awareness	-Traffic rules violation statistics -Ratio of voters participating in elections	-Number of networks for environment and natural resources conservation -Number of organisations at community level per 100,000 population -Number of households with members of community group or local administrative organisation
	Good governance	-Transparency index -Number of cases considered by the Administrative Court and the National Counter Corruption per 100,000 population	-Enterprise governance -Number of complaints submitted to independent organisations
	Solidarity society	Ratio of human rights violation cases and complaints per 100,000 population	Ratio of cases in 3 provinces of the deep south

Source: NESDB (2007)

The set of happiness indicators has been gradually amended to be appropriate to the Thai context through consultation with the government, but also from civil society particularly at the grass root level. Opinion surveys underpinning development of the

happiness index show that Thai people value (i) sufficient earnings without debt; (ii) good health; (iii) a good environment; and (iv) a chance to send their children to school. In the troubled Southern regions, residents included peace and security as priorities.

Due to differences of urban and rural societies, variations in the composition of the happiness indices are needed. Therefore NESDB has developed different sets of happiness indices to correspond to actual conditions of urban and rural areas. There may be some indicators which could be applied in both rural and urban situations, while other indicators have been adjusted as shown in the example in Table 8.

Table 8 Happiness indicators for Component 1 in urban and rural societies

Component	Sub-component	Urban indicator	Rural Indicator
1. Well- being			
	Physical health		
	-Healthy body	Ratio of population with diseases caused by stress and urban pollution i.e. cancer, heart failure, allergy	Ratio of population with diseases caused by poverty and poor sanitation i.e. parasitic infection, malnutrition
	-Longevity	Life expectancy at birth (years)	
	Mental health		
	-Healthy mind	Ratio of mental disorder patients	*No indicator*
	-Sense of moral	Criminal cases per 1,000 population	-Population with religious activities (%) -Participation in the community group activities (%)
	Knowledge		
	-Educational attainment	Ratio of secondary school enrollment	Mean years of schooling outside municipal area
	-Quality of education	Test scores on class subjects in secondary school	Test scores on class subjects in primary school
	-Information acknowledgement	-Population access to internet	- Population reading newspapers

Source: NESDB (2007)

Even though the happiness index is not yet completed (scheduled to be completed by July 2007), preliminary assessment of the happiness of Thai society has been conducted based on available data from 2001-2005. Currently the 6 components were given equal weight for the composite index.

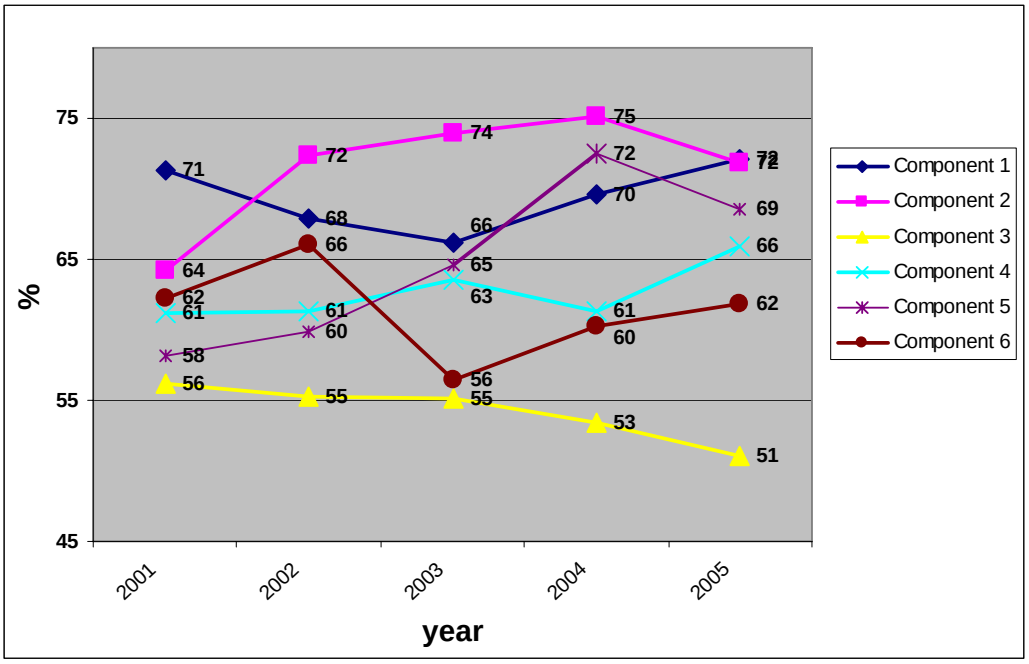

Figure 3 Thailand's happiness index assessment 2001-2005

Component 1 = well-being, component 2 = economic strength and equality, component 3 = family life, component 4 = strong community, component 5 = good living environment with balanced ecosystem, component 6 = democratic society with good governance
Source: NESDB (2007)

The assessment results showed that the overall trend of happiness level of Thailand increased from 62.2% in 2001 to 66.0% in 2005. The components which showed greatest change were well-being, economic strength and equality, good living environment with a balanced ecosystem, and strong community. The components which had worsened were family life and democratic society with good governance. The details of assessment results for each component are shown in Figure 3.

4. Experience in PRC

Two efforts contributing to mainstreaming EPA in PRC are (i) environmentally extended national accounting based on an aggregate indicator, the so-called green GDP, and (ii) recognising excellence of urban development based on an integrated assessment of quantitative and qualitative indicators. The former functions like a thermometer to indicate where the nation is now and how far it can go on the track towards sustainability, while the latter if adopted on a voluntary basis can serve as an incentive to stimulate good performance. A third aspect of EPA on which little public information is available is the recently completed OECD peer review of PRC's environmental performance. Further details on this will be included in this paper as details are made available.

4.1 Aggregate Indicator: Green GDP

To promote integrated environment and development decision making the State Environmental Protection Administration (SEPA) and the National Bureau of Statistics

(NBS) jointly initiated a study on PRC's Green National Accounting (GNA) in March 2004. Technically supported by the Chinese Academy for Environmental Planning, SEPA and Renmin University, the system of environmental and economical accounting is now established and pilot projects on GNA and on the valuation of environmental damages have been conducted at the national level and for ten selected provinces/municipalities[4] since 2005.

Accounting method and components of GNA - Based on the *Systems of National Accounts 1993* (United Nations et al. 1993), the United Nations (UN), the Commission of the European Communities, the International Monetary Fund, the Organisation for Economic Co-operation and Development (OECD), and the World Bank, published a system of integrated environmental and economic accounting (SEEA) (United Nations 1993). In 2000, the UN prepared an operational manual on SEEA (United Nations 2000) and a final version of the handbook of national accounting for SEEA (United Nations et al. 2003) was published in 2003.

A satellite system of the System of National Accounts (SNA), SEEA brings together economic and environmental information in a common framework to measure the contribution of the environment to the economy and the impact of the economy on the environment. It provides policy makers with indicators and descriptive statistics to monitor these interactions as well as a database for strategic planning and policy analysis to identify more sustainable paths of development.

A simplified expression of green GDP = GDP - Consumption of Fixed Capital – (depletion + defensive expenditure + degradation), or in other words, net domestic product (NDP) less costs for natural resources and for the environment. PRC's GNA adopts a similar accounting method but substitutes GDP for NDP as GDP is more familiar to policy makers and the public. GNA thus consists of three components (i) physical accounting of environmental pollution; (ii) valuation of imputed environmental degradation cost; and (iii) environmental adjusted national accounting.

The physical accounting of environmental pollution is divided into three sub-accounting tasks, water pollution, air pollution and solid wastes, accounting for physical amounts of generation, disposal and discharge/emission. The survey to generate input data for each item is conducted for 42 sectors at national level, regional level[5] and in 10 selected provinces/municipalities led by SEPA and NBS in collaboration with other departments including Ministry of Health, Ministry of Agriculture, Ministry of Water Resources, Ministry

[4] The 10 provinces/municipalities selected for conducting the pilot projects include Beijing Municipality, Tianjin Municipality, Chongqing Municipality, Hebei Province, Liaoning Province, Anhui Province, Zhejiang Province, Sichuan Province, Guangdong Province and Hainan Province.

[5] PRC's mainland is grouped into three main regions, representing the east, the central and the west. (i) Eastern region includes Beijing Municipality, Tianjin Municipality, Hebei Province, Liaoning Province, Shanghai Municipality, Jiangsu Province, Zhejiang Province, Fujian Province, Shandong Province and Hainan Province. (ii) Central region includes Shanxi Province, Jilin Province, Heilongjiang Province, Anhui Province, Jiangxi Province, Henan Province, Hubei Province and Hunan province. (iii) Western region includes Inner Mongolia Autonomous Region, Guangxi Zhuang Autonomous Region, Chongqing Municipality, Sichuan Province, Guizhou Province, Yunnan Province, Tibet Autonomous Region, Shannxi Province, Gansu Province, Qinghai Province, Ningxia Hui Autonomous Region and Xinjiang Uigur Autonomous Region.

of Construction and Ministry of Communications. Nearly 30% of major industrial polluters, all sewerage plants, municipal solid waste disposal plants, large-scale livestock and poultry farms and 30,000 households were included in the provincial/municipal survey.

The valuation of imputed environmental degradation cost is conducted by two alternative methods based on the former physical environmental accounting. One alternative is estimating maintenance costs. Maintenance costs are the additional imputed costs that would have been incurred if the domestic economic activities of an accounting period had been modified or their impacts mitigated in such a way as not to have impaired the long-term quantitative and qualitative levels of the domestic and worldwide natural environment. In PRC's GNA, maintenance costs are based on domestically available and prevailing abatement/mitigation technology to avoid any environmental degradation in the accounting period. The aggregate of maintenance costs can represent the lower bound of the value of environmental degradation. The second alternative is estimating the imputed environmental damage costs, including loss of agricultural productivity, health damage cost and cost of damage to the ecological functions. Compared with the former alternative, this is regarded as a more appropriate way to reflect the imputed environmental degradation cost.

The national accounts adjusted by the environmental satellite account, or the green GDP, is then obtained by deducting the cost of environmental degradation from the conventional GDP.

Limitations - Compared with other estimates of SEEA, which cover broad categories of natural resource depletion including land, minerals, forests, water and fishery resources, and two categories of environmental degradation (environmental pollution cost and ecological damage cost), PRC's GNA 2004 only accounted for environmental pollution costs, while natural resource depletion and ecological damage are not yet embedded due to limitations in data and valuation techniques. In addition, environmental pollution costs in SEEA includes more than 20 items, while PRC's 2004 estimate only covers 10 items such as (i) health damage, loss of agricultural productivity and material loss caused by air pollution; (ii) health damage, loss of industrial and agricultural productivity, and shortage in water supply caused by water pollution; and (iii) cost caused by land appropriation by solid wastes. Groundwater and soil contamination among other key items are not yet taken into account. Accordingly this accounting version reflects only partial environmental satellite account comparing with a more complete SEEA.

Preliminary accounting results - The preliminary results show that environmental degradation caused by pollution costs about RMB ¥511.8 billion, while imputed maintenance cost is RMB ¥287.4 billion, accounting for 3.05% and 1.8% of national GDP in 2004, respectively. Of the environmental degradation costs, water pollution, air pollution, and solid wastes account for 55.9%, 42.9% and 1.2%, respectively. Though incomplete and underestimated for some items, the striking results indicate the severe situation that PRC is facing to combat environmental damage. It also highlights that published economic growth rates are largely illusory. Regional accounts of environmental damage caused by pollution are shown in Figure 3.

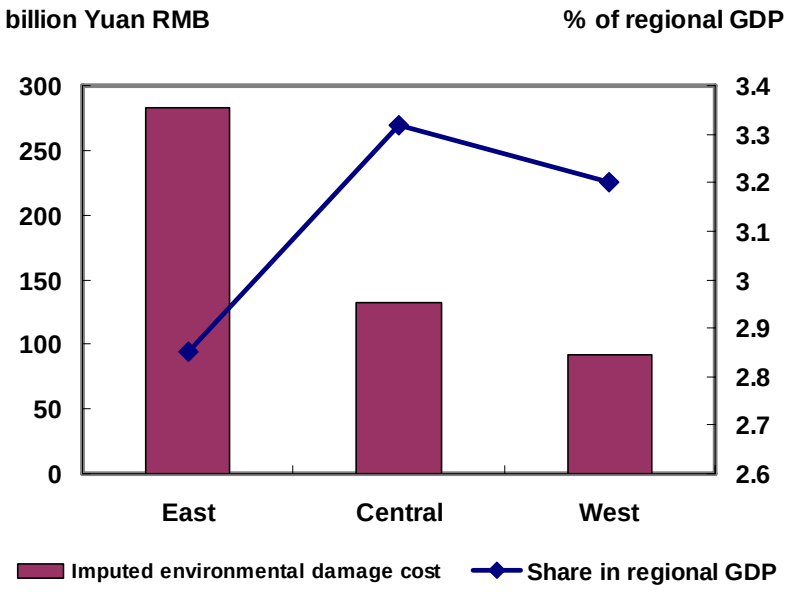

Figure 4 Regional account of environmental damage caused by pollution in 2004

The share of environmental degradation cost in regional GDP ranges from 2.85% in eastern PRC to over 3.2% in both western and central regions. As the biggest contributor to the national total environmental degradation and the biggest contributor to national economic growth, the eastern region, which is the most developed region in PRC, has less pollution offset to regional development compared with the less developed central and west regions, possibly reflecting the relative size of the economy in the east.

Future perspectives - PRC's effort to develop an integrated economic and environmental national accounting system is one of the first among developing nations. SEPA and NBS plan to extend the accounting scope, improve valuation techniques and gradually establish a routine accounting and reporting system instead of a one-off exercise. SEPA will conduct three successive surveys on (i) nationwide pollution sources; (ii) nationwide groundwater pollution; and (iii) nationwide soil contamination, in collaboration with other governmental sectors concerned.

Moreover, a nationwide survey on economic loss caused by ecological damages will be launched in order to lay the foundation for accounting for the total cost of environmental degradation. In parallel, SEPA will initiate research on integrated environmental and economical policies related to effective pollution control, raising revenue for environmental protection, establishing ecological compensation mechanisms, and linking existing EPA of government offices with the green national accounting work.

Based on the 2004 accounting exercise 2004, SEPA will set region-specific priorities for industrial pollution control and demarcate functional zones to facilitate industrial pollution control by integrating regional development plans to promote regional sustainable development.

4.2 Performance Incentives: Environmental Model City Programme

One of the blueprints described in PRC's 9th Five-year Master Plan (1996-2000) for Environmental Protection and Perspective Objectives for 2010 aimed at sustainable urban development through construction of environmental model cities. In 1997, to realise this target, SEPA initiated a programme to award the title of Environmental Model City to cities with a civilised and prosperous society, rapid and sound economic development, good environmental quality, appropriate resource utilisation, sound ecological cycle, clean and beautiful urban environment, adequate infrastructure and convenient living conditions (China Environmental Statistics Editing Committee, 1998, 1999, 2000, 2001 and 2002).

Indicators, criteria, procedures and stakeholders - Aimed at setting a good example to promote sustainable urban development, this award programme, although on a voluntary participation basis, involves an official assessment by SEPA against criteria set for 28 indicators covering social, economic and environmental aspects and environmental concerns such as resource consumption, environmental investment, environmental quality, pollution control, ecological conservation and environmental management, among others. In the 11th Five-year Master Plan period (2006-2010), the scope of assessment will extend to 36 indicators and some of the criteria will be upgraded (see Table 10).

The procedure followed in making the awards includes (i) formal application by the municipal government together with nomination by the provincial environmental protection bureau; (ii) preparation of an action plan towards a qualified Environmental Model City based on the criteria set by SEPA (see Table 10); (iii) implementation of the action plan with proven improvement; (iv) on-site investigation by SEPA; (v) official assessment by SEPA; (vi) public reporting of the assessment results; (vii) decision on the city's eligibility made by SEPA; (viii) annual award ceremony; and (ix) periodic re-examination by SEPA to ensure maintenance and encourage continuous improvement.

Stakeholders involved in the whole process include SEPA, municipal government, municipal environmental protection bureau, provincial environmental protection bureau, related sectors, and the public.

Table 9 Indicators for official assessment of an Environmental Model City

Category	No.	Indicator	Criteria
Basic requirement	1	Quantitative assessment of integrated urban environmental management	keep top 3 record in province / municipality ranking for the last 3 years
	2	Occurrence of major pollution accident or ecological disaster	None
	3	Environmental investment	> 1.5% of GDP
Social and economic indicator	4	GDP per capita	> RMB 20,000
	5	Annual economic growth rate	> national average level
	6	Birthrate	< national planned quota
	7	Energy consumption per unit GDP	< level of an average city
	8	Water consumption per unit GDP	< level of an average city
Environmental quality	9	Days with air pollution index (API) < 100 (or the annual average daily level of major air pollutants)	> 85 % of total days in a year (or attains national air quality criteria grade II)
	10	Quality of water resources providing concentrated drinking water	compliance rate > 96%
	11	Quality of inland water (including near-shore seawater)	compliance rate 100%, no occurrence of Grade V (including blackness, odor, total phosphorus, total nitrogen, and active phosphate)
	12	Ambient noise	average level < 60dB (A)
	13	Noise of the trunk of transportation system	average level < 70dB (A)
	14	Construction of conservation area for drinking water resources	qualified rate > 90%
	15	Share of natural reserve area	> 5% of urban land area
	16	Share of vegetation area (area of gardens and parks per capita for western region)	> 35% of urban build-up area (> national average level)
	17	Rate of urban sewage treatment	> 70% (> 60% for western region)
	18	Compliance rate of major industrial polluters	> 95%
	19	Rate of access to gas utility	> 90%
	20	Rate of central heating in north PRC	> 65%
	21	Compliance rate of vehicle emissions	> 90%
	22	Rate of safety disposal of municipal solid wastes	> 85%

	23	Rate of disposal and utilisation of industrial solid wastes; rate of disposal of hazardous industrial solid wastes (including hazardous chemical wastes)	>90%; >90% and no release of hazardous wastes (including medical hazardous wastes)
	24	Rate of disposal of remnant hazardous wastes	> 90%
	25	Share of urban area implemented particulate control measures	> 90%
	26	Share of urban area complying with ambient noise criteria	> 60%
Environmental management	27	Environmental performance assessment of government officers; accountability system for achieving urban environmental management target; plan to ensure improvement against the benchmarks set for Environmental Model City	Environmental indicators included in performance assessment of government officers; environmental accountability system should be implemented; targets should be broken down into pragmatic action plans.
	28	Environmental protection institution and environmental capacity building	Independent environmental protection institution should be established and normalised
	29	Public satisfaction with urban environmental quality; proper response to public denouncement of environmental pollution	> 85%; 100%
	30	Environmental education in primary and elementary schools	> 80% and the minimum hours for environmental curriculum should be 12.
	31	Share of green community	> 20% of total number of community and should improve continuously
	32	Action plan for achieving total emission control goal	Properly designed action plan and major polluters should achieve specific abatement target based on the total emission control goal
	33	Sanitary condition	Pragmatic action plan to improve sanitary condition should be drafted and should be ranked as a provincial level Sanitary City; and satisfies the requirements for the nomination by the National Sanitary Committee to enter the screening process of national level Sanitary City.
	34	Environmental management on the outskirts of the city	Complies with state requirements and prepares governmental documents, drafts relevant rules and makes progress report

	35	Environmental information disclosure system; and emergency response scheme for environmental accidents	Environmental information disclosure system should be established; and an emergency response scheme should be drafted; special budget should be appropriated; and staff should be in place with skills enhanced by regular emergency drills.
	36	Rate of enforcement of key environmental projects (ratified by the State Council and/or by the Provincial Government)	> 80%

Source: http://www.zhb.gov.cn/cont/mhcity/

Success factors – With increasing public environmental awareness, many municipal governments have recognised that a better urban environment is not only important to sustain sound social and economic development but also to open up opportunities for expanding domestic and foreign direct investment. The Environmental Model City award programme functions as a platform to recognise, award, and publicise municipal efforts towards sustainable urban development by providing concrete criteria of performance. Obvious progress has been observed during the last decade since the scheme's debut in 1997. From 1997 to April 2007, 72 cities were recognised as Environmental Model City by SEPA (Figure 4) and twice as many have submitted their applications or are in the process of evaluation.

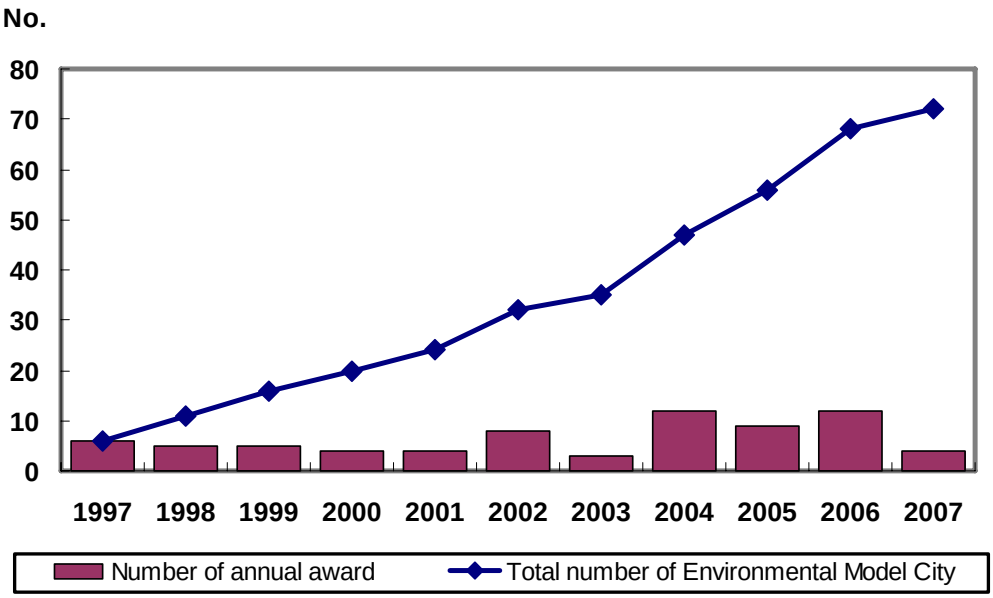

Figure 5 Progress of Environmental Model City award programme (1997-2007)
Source: http://www.zhb.gov.cn/cont/mhcity/

Cities that have already been awarded the title of Environmental Model City and those in the process show tangible improvement in urban environmental quality and have

established positive cooperation mechanisms among different sectors towards a common goal.

Though SEPA plays important role in defining the indicators, setting up criteria, conducting on-site investigation and coordinating assessment and implementing monitoring, one of the keys to success of this programme is that local government takes the initiative on a voluntary basis. In the process, both SEPA and municipal governments have learned how to achieve sustainable urban development. Some aspects of success include:

- Environmental awareness of local governments and the public has increased;
- Environmental Model Cities have also been rewarded with more rapid economic growth through expanding foreign trade and attracting more domestic and/or foreign direct investment;
- The programme saves substantial transaction costs for its implementation and has financial sustainability for its continuous implementation;
- Economic structural adjustment has been accelerated;
- The indicators set for performance assessment stimulate municipal governments to integrate environmental considerations into economy-wide decision-making and establish effective cooperation mechanisms among different sectors;
- The 10-day public reporting in the media before a final decision makes the process more transparent and encourages public participation;
- Voluntary approaches rather than command and control measures encourage innovations of environmental governance and a mixture of various policy measures according to each city's own specific conditions; and
- There is continuous improvement encouraged by periodic re-examination.

Limitations and future perspectives - The effectiveness of this programme in promoting sustainable urban development depends on well designed indicators and selection of criteria/benchmarks. Both the scope of indicators and the level of criteria/benchmarks need further research.

So far, Environmental Model Cities are geographically concentrated along the eastern coastal region of PRC, where the economy is more developed (Figure 5). As PRC is a big country with evident regional discrepancies, indicators and criteria/benchmarks tailored for different regions are needed but have not yet been addressed in the current programme. Another concern is that there is no effective mechanism to ensure sustained improvement after the award is granted.

Figure 6 Spatial distribution of Environmental Model Cities

5. Lessons Learned

From the above review and experience in SEF II, several key lessons have been learned. In SEF II, from the outset of the project, there was a healthy debate over the choice of priority concerns and indicators. While some observers might claim that the eventual indicators chosen were not always the best, the process of examining a range of possible indicators and evaluating their advantages and disadvantages helped to define the nature and magnitude of the performance measurement issue. It will be advantageous to re-examine the priority concerns and indicators chosen in SEF II, if only to reinforce the central place that indicator choice takes in EPA.

Most countries seem to have chosen too many indicators for different purposes, leading to inadequate focus on achieving measurable results for priority environmental concerns. All of the international experience suggests that a limited number of indicators should be chosen, usually with a core set of indicators identified for public communication. If too many indicators are selected then the burden of monitoring will become unsustainable and trend analysis over the medium-term to long-term will fall by the wayside. In SEF II

over 90 indicators were chosen and there is clearly a need to reduce that to a more manageable number.

Where institutional arrangements for sustainable development planning are different from the national environment agency, there is a danger that multiple sets of environmental indicators may be selected. In Thailand, NESDB is experimenting with a wide range of indicators, which include various environmental indicators. Some of these tend to be difference from the indicators that the national environment agencies use. As ONEP has identified 182 indicators, the need for rationalisation of the multiple approaches in Thailand is clear. One way for this to be done is to more consistently involve NESDB in Component 3.

In PRC, the aggregation of indicators for the green GDP demonstrates some of the advantages and disadvantages of using an aggregate index. The main advantage is that GDP is an index with which most people are already familiar. Therefore, a significant reduction in GDP by incorporating environmental costs is intuitively accepted by the public. However, green GDP is less useful as an environmental management tool, except in the broadest sense that more effort is needed. As the partial approach adopted by PRC leaves out significant elements, such as natural resource depletion, it could even be misleading if the omitted aspects are significant contributors to overall environmental damage. The good news is that SEPA plans major data collection efforts on groundwater pollution, soil contamination, other forms of pollution, and ecological damage that will all contribute to enhanced EPA reporting.

The main advantage of using an aggregate index is that it can indicate what environmental costs are incurred in achieving economic growth, by integrating or internalising environmental costs into the conventional economic accounting system. This can highlight optional growth paths based upon a society's preference for more economic growth but more environmental degradation, or less economic growth compensated by better environmental quality. However, one caution in using an aggregate index is that there may be a misleading in the message conveyed by the green GDP, i.e. environmental degradation and economic growth can be perfectly substitutable for each other. Man-made capital and natural capital are not necessarily substitutable and some environmental degradation or ecological damage is irreversible.

The Environmental Model City programme in PRC is a good example of shifting responsibility for environmental management to lower levels of government, where stakeholders are closer to the real environmental conditions. The voluntary nature of the programme and the public reporting are also interesting approaches, although how to spread the programme to the often highly polluted western region cities without any mandatory regime is not clear. While there is periodic re-examination of the award, a useful addition to the approach would be to raise the hurdle progressively so that there is continuous improvement across all cities and leading cities would be appropriately recognised and rewarded. As there are more than 500 cities spread across PRC, one possibility would be to use a star rating system, similar to the Programme for Pollution Control Evaluation and Rating (PROPER) programme in Indonesia that ranked individual enterprises on their environmental performance (Garcia Lopez 2004). In Indonesia, even the threat of being awarded a "black star" was often enough to trigger change.

A similar rating system to PROPER for rating enterprises is being implemented at a pilot stage in some PRC cities in collaboration with the World Bank. This is operated on a voluntary basis, but mixed with a mandatory requirement for major polluting enterprises. As most of the major polluters are marked by a brown or black color star, few of them are willing to join this programme on a voluntary basis. However, considering the effectiveness of this kind of programme, not only as an incentive to improve corporate environmental behavior, but also contributing to emission reduction, the inclusion of these lagging enterprises is crucial. While voluntary based environmental performance assessment programmes have shown their effectiveness in recognising excellent performance or good governance, for rating purposes or assessment against benchmarks, a voluntary regime tends to be weak and either mandatory or a mixture of mandatory and regulatory regimes might be more effective.

6. Possible Alternatives to Current Set of GMS Indicators

6.1 Land Degradation

Land degradation is one of the major concerns observed in many developing countries and most GMS countries also agree on its importance. FAO (2003) reports that in South Asia 30-40% of the agricultural land is degraded to some degree from water erosion (25%), wind erosion (18%), soil fertility decline (13%), salinisation (9%), lowering of the water table (6%), and waterlogging (2%).

However, selection of appropriate environmental indicators for land degradation is not an easy matter. FAO (2003) states that there are no internationally agreed criteria for estimating the severity of degradation and most surveys do not make reliable assessment. Given this situation, selection and collection of appropriate environmental indicators should consider various factors including (i) types of indicators, (ii) implementability of collection, and (iii) consistency among *pressure, state, and response* indicators.

Regarding the *state* indicator, there are broadly two types of indicators: physical measurement (both direct and indirect) and non-physical measurement, e.g. those expressed in monetary terms. The former indicates the state of land productivity directly while the latter indicates it indirectly by the value attached to land productivity. As recognised during SEF II, physical measurement of the degree of degradation at the national scale would be difficult, and would inevitably involve some sampling regime. Direct physical measurement would involve biophysical evaluation of soil conditions that need to be carried out in laboratories or on-site measurement of soil erosion with land use held constant. Neither would be very suitable because of the large variation among samples and the lack of implementation capacity in GMS countries. In addition, erosion itself is not necessarily representative of all forms of land degradation.

Indirect physical measurement such as crop yield is not perfect either due to its dependency on biological conditions such as varieties of crops and weather conditions as well as capital, labour and technological inputs (e.g., level of mechanisation/irrigation, application of fertilisers and pesticides, crop rotation cycles). For instance, a decline of yield can be observed if labour availability decreases (e.g., from out-migration), land availability increases, rotation is more frequent, or agricultural inputs decrease.

In spite of the various drawbacks of crop yield as an indicator, efforts to collect crop yield data such as that of rice, which is a commonly grown staple food in the region, may be of some use as a latent aggregate indicator that represents the *state* of soil conditions. Yield is a common term used among farmers, the primary stakeholder. A challenge would be how to screen out the aforementioned biological and human-induced "noise." For this reason, it is preferable to have the attainable yield under field conditions or similar benchmark/baseline yield as a parallel indicator, which can be derived from simulation of actual agro-climatic factors with scenarios of mixes of farming technology and management options. Such efforts may need to be sought region-wide. Actual yield as a ratio of "attainable" yield may then provide a more robust indicator.

Since human-induced agricultural activities are closely related to crop yield as mentioned above, some of these factors can be used as *pressure* indicators and potential *response* indicators that represent rehabilitation countermeasures. This way, the linkage between human activities and environmental impacts is clear and consistency among the three types of indicators will be maintained (i.e., consistent linkage of *pressure*, *state*, and *response*). Human-induced soil degradation includes mechanisation, irrigation, application of fertilisers and pesticides. However, it should be noted that farming technology and management can influence land productivity both positively and negatively in a nonexclusive and simultaneous way. For example, increasing the level of mechanisation can contribute to an upgrade of land productivity while at the same time causing compaction of soil which results in land degradation. Application of fertilisers and pesticides contribute to an increase in land productivity and yields, while excessive application could cause soil degradation. For this purpose, some benchmark (or ideal input level) would be necessary to determine the excessiveness of human activities.

Alternatively, a set of indicators can be expressed in monetary terms. Crop market prices can be used as both *pressure* and *state* indicators. For instance, if domestic prices of export-oriented crops are above international levels, there would be considerable pressure to produce a large amount of them at lower costs. Also, levels of subsidies on fertilisers may imply a certain level of *pressure*. In this regard, other factors such as population, rates of inflation/deflation are also factors that influence the value of agricultural output which in turn affect land productivity and land degradation. An advantage of using monetary indicators is that they can be integrated into an aggregate indicator scheme such as the GNA system (or green GDP) outlined for PRC. Some of the disadvantages are that cause-effect relations with land degradation remain somewhat indirect and comparison among countries would be affected by exchange rates and inflation rates.

Finally, as is the case of most indicators, efforts to collect time series data are vital to analyse changes over time. It is also possible to express indicators in terms of a ratio compared to the previous year or a base year. This may be useful for a *state* indicator so that it can indicate the dynamic nature of indicators rather than a static snapshot.

6.2 Water Issues

Inland water pollution is treated as separate priority area from water resources in Table 2. The former is more closely related to quality of the water resource after use (selected by only three GMS countries) while the latter relates to quantity of water resources before

use (selected as a priority by six GMS countries). However, both are equally important and related each other. Polluted water can imply poorer water availability.

Inland water pollution - As *state* indicators for inland water, BOD_5 and COD are commonly used standard measures across the world. As a *pressure* indicator, the volume of end-of-pipe wastewater discharge can be used as a measurement of one direct cause of pollution (the other main source is diffuse polluted runoff from agriculture and urban areas). Sources of wastewater are usually categorised as industrial (point-source), agricultural (non-point source), and household (non-point source in nature but can be regarded as point-source if a sewage collection system is in place). Information that reflects industrialisation (such as the number of water-use intensive factories), agriculture (such as the number of livestock or amount of fertiliser applied) or urbanisation (such as the number of households) may be used as *pressure* indicators. The agricultural sector will be responsible for a large portion of water pollution caused by inappropriate fertiliser use and increasing organic waste generation from livestock and food processing industries. Shindo et al. (2006) simulate and project, for example, that nitrogen loads from the agricultural industry in 2020 would become 1.4-1.7 times that of the present load in the ASEAN+3 countries.

Regarding the implementability of data collection, non-point source pollution data would require an independent monitoring group since this data is usually not voluntarily monitored by polluters. Point-source data could be collected at the discharge sites of potential polluters and this can be done by making such monitoring a mandatory condition of an operating license, especially for enterprises of commercial scale.

For *response* indicators, except for expenditure on wastewater treatment, figures associated with capacity building such as the improvement of the monitoring system, inspection frequency and institutional measures such as policy/standards/regulations or legislation are also important in assessing the performance of effective responses to reduce inland water pollution.

Consistency among *pressure, state,* and *response* indicators would be enhanced if data collection efforts are increased for the three source categories (industrial, agricultural, and municipal). For example, volumes of wastewater discharge, measurement of water pollution, and expenditure on pollution control for each of these categories may be useful. Also, this set of data would be beneficial to water resource issues (quantity issues).

Water resources - Water resources is one of three priority indicators that deal with quantity issues listed in Table 2 (fish and forest resources being the other two). Quantity issues often require (i) assessing the size or stock of resources, (ii) planning and management the extent of allowable use prior to resource allocation, and (iii) making efforts to conserve (water resources) or expand the stock of resources to the maximum possible extent (fish and forestry resources). OECD (2001) predicts that the overall increase in water use in non-OECD countries between 1995 and 2020 is likely to be approximately 25%. Agriculture being the largest water user, FAO (2003) predicts about one-third of the harvested area in developing countries in 2030 is projected to be irrigated land, up from 29% in 1997/1999 (about 14% increase). However, *pressure* on water use is from multiple users (agricultural, industrial, and municipal use), depending on the country's economic profile. It may be preferable to have *pressure*, *state,* and *response* indicators such as volume of water demand, volume of water use/shortage,

and expenditure spent to secure water resources for each of these categories, similar to the set of indicators for inland water pollution. Grasping the overall demand for water use at the national level is particularly important in the watershed of the Mekong River where the main water source is shared by many countries for various uses. As fishery resources are considered important in the Mekong basin not only for economic activities but also nutrition, water use for fishery purposes (in lakes, rivers, or fish farms) may need to be differentiated from agricultural uses.

6.3 Forest Resources

All the GMS countries agreed on the importance of forest resources. In recent years there has been a growing recognition of the importance of forestry in providing environmental goods and services such as protection of watersheds, conservation of biodiversity, recreation, and mitigating climate change (FAO, 2003). FAO also states that nearly all forest loss is occurring in the tropics. Population growth coupled with agricultural expansion (especially in Africa and Asia) and agricultural development programs (in Latin America and Asia) are major causes of forestry cover changes (ibid.). Since wood production is usually categorised into fuel and non-fuel purposes, as *pressure* indicators it may be preferable to have domestic prices for fuel and non-fuel wood as well as their associated volumes demanded. To select *state* and *response* indicators, different types of forest (commercial use or conservation) need to be considered. A ratio of these types of forest as a composite *state* indicator may be indicative, however, the severity of changes in composition may not be shown clearly if one denominator (conserved forest) is extremely large. In the case of *state* indicators for forestry resources, one expressed in terms of changing rates of forest cover can be meaningful since one of the global concerns is the speed of deforestation.

6.4 Waste Issues

Inadequate waste management is one of the few concerns on which many GMS countries agreed and are collecting associated data. Dealing with the total quantity of wastes seems to be an appropriate step to start with, however, as separation and recycling of wastes progress in GMS countries, issues related to quality of wastes (toxic contamination) may soon become important, although only two GMS countries rated this as a current priority.

As *pressure* indicators of general waste generation, population and economic growth may be useful. As *state* indicators, the volume of municipal solid waste would represent the general situation of the nation's waste generation, although this could be used as direct *pressure* indicator and the percentage of municipal solid waste collected (identified in Table 2) as the *state* indicator of waste management. Among other possible indicators, expenditure on municipal solid wastes would make all three *pressure*, *state*, and *response* indicators consistent. It should be noted that industrial wastes would need to be paid increased attention as economies develop.

Regarding toxic contamination, except where raw toxic materials are extracted from mines in GMS countries, many of the complex chemical compounds originate in foreign countries. These are already accumulating as trade flows increase in the subregion. In this sense, an increased volume of material flow can be a *pressure* indicator and the current levels of toxic contamination from materials such as persistent organic pollutants

(POP) and banned pesticides which are not properly disposed in GMS countries can be *state* indicators. Since hazardous wastes and materials, such as medical wastes and industrial wastes (batteries and electronic parts) which pose larger risks to human health in small quantities, may increasingly penetrate GMS countries, data collection may be soon required. In this context, an inventory of toxic materials would be a suitable *response* indicator.

6.5 Biodiversity

As Mike Comeau pointed out in SEF II the top five threats based on citations of major threats to endemic species are habitat loss (ranked highest), harvesting, intrinsic factors, pollution, and human disturbance. The loss of forests was seen as the main pressure in the GMS in terms of natural habitat, followed by wetlands, shrubland, grassland, and artificial terrestrial (ADB, 2006).[6] Most GMS countries, except for Thailand, considered this as a significant concern.

There are still technical difficulties in the measurement of biodiversity. A consensus on the definition of "threatened" and how it is measured needs to be reached among GMS countries. The OECD Key Environmental Indicators for 2004 noted that "threatened" refers to species in danger of extinction and species likely to be in danger of extinction soon." In measuring the *state* of biodiversity, the number of threatened or extinct species is compared to the number of known or assessed species—a problematic measure when the number of known species is known to be wildly underestimated in the GMS. OECD and IUCN stated that trends in protected area should be provided as a complement, although this looks more like a *response* indicator.

OECD identifies habitat alteration and land conversion from the natural state as its core set of indicators for *pressures*, area of key ecosystems as a *state* indicator, and protected areas as a *response* indicator. A challenge in assessing the effectiveness of protected areas as a *response* indicator is the number of "paper parks", the varying and actual protection levels, management effectiveness and related trends where new areas are designated, or where boundaries are revised, and/or some sites destroyed or changed by pressures from economic development or natural processes.

6.6 Fish resources

The volume of fish catch was identified as the principal *pressure* indicator by GMS countries. OECD (2004) suggests that fish catch expressed as a percentage of world captures and changes in total catches since 1980, excluding fish production from aquaculture, may be a more effective measure. However, given the importance of fishery resources in GMS in freshwater capture and increasing aquaculture, GMS countries need to address how to incorporate both aspects into their data collecting. Fish catch in rivers, coastal zones and lakes are quite different, so total catch may not point to environmental deterioration in specific fisheries.

As OECD (2004) points out that this *pressure* indicator should be complemented with information on the status of fish stocks and the proportion of fish resources under

[6] Presentation on "Sub-Regional Wildlife Biodiversity Assessment" at the SEF II Final Workshop in Bangkok, 26 April 2006.

various phases of fishery development. Estimation of stock size, though it is often accompanied by technical difficulties, could be used as *state* indicator, while management of the resource or efforts to expand the stock of resources could be used as a *response* indicator.

Alternatively, the real domestic prices of fish could be used as *state* indicator, as identified during SEF II, reflecting scarcity. Over-fished areas and size of spawning stock could also be used as *state* indicators and expenditure on fish stock and catch monitoring as a *response* indicator, as suggested by OECD (2004).

6.7 Coastal Zones

The relative real prices of dwellings in the coastal zone were identified by some GMS countries as one *state* indicator. However, use of prices of dwellings may be criticised because property prices in GMS countries are imperfect and may not be directly related to environmental conditions. Distance from a major city, for example, may be more important in determining price than environmental quality. Measurement of quality of coastal water as a *state* indicator could be dealt with as an extension of the inland water quality assessment. Saline and brackish waters, however, may have different environmental parameters of concern. For example, the presence of red tides due to algal blooms may be more important than measures of salinity or turbidity. Mangrove removal is the main *pressure* indicator identified in the GMS countries, but this fails to capture the environmental degradation associated with hotels and other tourism developments along sandy beaches. The existence, compliance and enforcement with coastal zoning plans may be a suitable *response* indicator.

7. Recommendations

Section 1 of this paper outlined some critical choices that need to be made at the commencement of this project. Some recommendations for each of these choices are as follows.

Question 1: A decision will need to be made on whether the set or priority concerns remains as in SEF II or whether new priority concerns have emerged over the past few years.

For the priority concerns, it is unlikely that much has changed since the completion of SEF II, but it is worthwhile examining recent SOE and other reports to see if there are any priority concerns that need to be addressed now.

Recommendation 1: It should not be automatically assumed that the priority concerns adopted at the outset of SEF II remain the top priority concerns today. If new concerns need to be added or a re-ordering of priorities is needed, then adequate time and space needs to be devoted to this question.

Question 2: Will each country be able to stick with their existing indicators (bearing in mind some of the points made in Discussion Paper No. 1) or will they change them?

In the process of indicator selection the importance of *state* indicators is re-emphasised. Ruzicka and Mohit pointed out in SEF II that the best policy targets are generally those that are related to *state* indicators (although see the discussion on *state* and *impact* indicators below). As identifying *pressure* indicators tends to be more difficult due to their divergent nature (i.e., multiple factors can affect one environment *state*), initial efforts could focus on selecting and agreeing on a common set of *state* indicators.

Recommendation 2: To the extent that there is agreement on the need to develop a core set of common indicators at the subregional level, then the emphasis should be on *state* or *impact* indicators. Some possible alternative indicators are suggested in Section 6.

Question 3: For those countries which did not select certain priority concerns but wish to do so this time around, which indicators will be chosen?

The three discussion papers presented to the Inception Workshop reflect in different ways on the applicability and relevance of the indicators chosen in SEF II. As an input to the choice of indicators, it is suggested that GMS country teams review these observations, discuss them with other GMS teams, and conduct their own brainstorming to come up with a suitable set of indicators.

Recommendation 3: The experience of SEF II plus additional information provided at the Inception Workshop should guide GMS country teams in adopting new indicators for priority concerns that they did not choose in SEF II.

Question 4: Where there were missing concerns in SEF II will the GMS countries be able to fill them and if so, what indicators will be chosen?

The review of Thailand and PRC outside the SEF II process suggests that there is a wide range of concerns that were not addressed. A complete review of other indicators based performance assessment is needed to identify a new long list of possible priority concerns. This long list can then be reduced to a workable set of priority concerns through national workshops involving a wide range of stakeholders.

Recommendation 4: The list of priority concerns should be revisited by all GMS countries as it is clear that other planning processes have identified a wider range of environmental issues. A long list of additional concerns should be reduced to a workable set through national consultation with a wide group of stakeholders.

Question 5: For the sub-national level are the priority concerns the same as at the national level and if not, what are the appropriate indicators?

As indicated by the Environmental Model City programme in PRC, the sub-national level priority concerns are not always the same as at the national level.

Recommendation 5: For the conduct of EPA at sub-national level, a separate process of identifying priority concerns should be undertaken, preferably retaining a core set that is common to both national and sub-national levels.

Question 6: Is there any appetite among the GMS countries to extend the EPA methodology to the sectoral level?

In SEF II, there was understandable emphasis on building capacity within the national environment agencies. Now there is a need to extend this approach to all sectoral agencies that impinge on environmental quality. The importance of developing institutional capacity for conducting EPA in a wide range of agencies in each GMS country is stressed, keeping in mind the longer term goal of developing a harmonised set of environmental indicators that will promote sustainable development in the subregion. One of the conclusions and recommendations made in the SEF II report states:

> "Environmental standards and policies are not uniform in a developing region like GMS, where most of the member countries are still at relatively early stages of their economic development and where different development priorities affect the way in which available resources are allocated towards environmental management. Policy and environmental standards harmonisation is desirable but will best be achieved through a sustained process of institutional strengthening and capacity building of environmental institutions in the GMS and appropriate stakeholder participation (ADB, 2006)."

Recommendation 6: It would be beneficial for the GMS countries not to focus on comparing national performance at this stage, nor to benchmark performance, but to build capacity in the key government agencies and focus on reducing environmental impacts of the sectors. Sectoral agencies should also share the experience and lessons gained from their development of institutional capacity and conduct of national and provincial level EPAs, through a process of continuous self-improvement, with their counterparts in other GMS countries.

Question 7: Is there any need to extend the aggregate index approach that was tentatively explored in SEF II?

The PRC experience with the green GDP, global systems like the ecological footprint or the wealth of nations, Thailand's happiness index and others demonstrate that there is a fascination with trying to come up with an environmental index that will achieve global acceptance in the same way as GDP or the Human Development Index. An aggregate index might grab political attention and help raise general awareness, and in this sense it can be useful addition to separate indicators for each environmental concern.

Recommendation 7: There have been so many attempts at drawing up new "sustainability" indexes, there should be no attempt made under Component 3 to develop any new aggregate index. Experimentation with existing schemes, such as green GDP, however, may be encouraged as such aggregate indexes will help to raise public awareness and political attention.

Question 8: Is there a need to go beyond the environmental indicators and extend the analysis to sustainability assessment, covering social and economic indicators?

In SEF II, there was a view expressed that EPR should extend to sustainability assessment. In practice, most GMS countries wisely stuck to environmental concerns. There are ongoing assessments of economic and social performance in most countries and the MDGs are perhaps the best example of a global effort in this regard. Integration of economic, social, and environmental assessments into a common assessment has

generally failed, not only in developing countries. As such an extension would significantly expand the workload of the project, care must be taken before going down this road.

Recommendation 8: Component 3 should stick to assessment of environmental performance, while recognising its importance in contributing to broader sustainability assessments.

Question 9: Is the Pressure-State-Response (PSR) model still regarded as adequate or should it be extended to the more comprehensive Drivers-Pressure-State-Impact-Response (DPSIR) model used in the Global Environmental Outlook (GEO)?

Continued effort is needed to identify the cause-effect relationships between *pressure* and *state* indicators, as well as the efficiency and effectiveness of *responses* in changing the *state* conditions in the desired direction. Improved knowledge of these linkages would be beneficial to link EPA, NSDS and subregional development strategies. By expanding the PSR model to DPSIR some of these linkages will become clearer.

Recommendation 9: Even though some DPSIR indicators may be rejected at this stage because of inadequate data, research into cause-effect relationships should continue. As the relationships become clearer, then indirect or proxy indicators should be replaced with more direct indicators.

As the GMS countries begin to realise that environmental *response* measures are not always best directed at the proximate causes, the need to distinguish between “ultimate *drivers*” and “proximate *pressures*” will become clearer. Similarly, it will become clearer that countries are only concerned with the *state* of the environment because of the *impact* that a changed state has on a group of people or some ecosystem function, on which we depend.

Recommendation 10: Mechanical adoption of the DPSIR approach to replace the PSR approach would result in almost doubling the number of indicators needed. Therefore, it is recommended that a more selective approach is adopted. If the chosen *response* indicator is aimed at an underlying *driver*, then an indicator at the level of *driver* should be chosen, in preference to a *pressure* indicator. If the environmental goal or target is directed at minimising the *impact* on a group of people or some ecosystem function, then an indicator at the level of *impact* should be chosen in preference to a more indirect or remote *state* indicator. The key decision criterion should be that there is always a logical connection between the indicators chosen and they, in turn, should have a logical connection to an acknowledged environmental goal or target. There is no need to have an indicator for every element of the DPSIR framework.

Appendix 1

Review of Environmental Indicator Development
(an abridged version of Technical Paper 1 Appendix B from SEF II)

Introduction

Interest in monitoring environmental conditions and assessing performance against stated policies has followed on the heels of growing public interest in environmental matters and concerns over unsustainable development. “Delivering concise, scientifically credible information in a manner that is readily understood and communicated to decision-makers and other audiences” (WRI)—the purpose of indicators—has claimed a big share of attention in these efforts.

In the process, at least four broad categories of work on—or related to—environmental performance have emerged, namely (1) evaluation of environmental performance by enterprises built around ISO 14000; (2) assessments of the performance of governments and public bodies in general (i.e. not primarily environment-related); (3) environmental performance assessment by (or of) individual countries and (4) environmental performance by (or of) supra-national entities.

Below, the first two are reviewed very briefly reserving most attention to categories (3) and (4).

(1) Environmental performance by enterprises

> "if only governments were run like businesses" …, policy-type objectives arising from UN Conventions could be used as guidelines for establishing continuous improvement programmes at lower level "functions" - as in ISO 14001 systems. Unfortunately, these UN sanctioned goals, boldly agreed to by our governments during UN forums, seem to fade into the background once the party is over. Governments need a lesson from ISO management systems. Executing global initiatives, assuming that they are reasonable to begin with, is really no different from implementing any continuous improvement programme
> (From a review of M. Strong’s Where on Earth Are We Going?” Alfred A. Knopf, Canada)

Business managers have been drawn to assessment systems supported by environmental performance indicators (EPI) by the rising interest in environmental management systems (EMS) particularly as these systems relate to the new international standards of ISO 14000 and ISO 14031, and Europe's Eco-Management and Audit Scheme (EMAS). Some communities and environmentalists approach EPIs from the standpoint of their "right to know," emphasising public disclosure at the facility level. Skillius and Wennberg (1998) note the proliferation of different types of environmental assessment conducted by the corporate sector (environmental auditing, environmental accounting, life-cycle assessment, environmental reporting, development of EPIs and environmental benchmarking to mention only the most common) often

conducted without much thought given to the interrelationships among them and the potential synergetic or counteractive effects they could have on each other.

Among numerous EPA initiatives by the corporate sector, worth listing are WRI's Corporate Sustainability State-of-Play initiative developing sustainable development indicators for business, extensive ISO 14031 documentation, OECD-developed guidelines on pollutant release and transfer registers, the SustainAbility approach developed in collaboration with UNEP, the eco-efficiency metrics project by WBCSD, The European Chemical Industry Council (CEFIC) guidelines, and WRI- and INECE-developed approaches. WRI (1998) notes "notable efforts to standardise corporate environmental reporting" but also finds that most corporate environmental managers continue to rely mainly on compliance-oriented EPIs and mandatory reporting of pollutant releases. However, a majority of respondents "regularly used" other unregulated metrics, including greenhouse gas emissions, water and energy use, and chemical inputs.

It is important to recognise the methodological similarities: the quest for a small number of environmental scores that would capture the underlying complexity (in this case, complexity at a facility or company level), search for agreement on the fundamentals of measuring performance that allows meaningful comparisons across facilities and industries, and a hierarchy of assessments that exists both in the corporate and public policy domains. (see the diagram below, reproduced from WRI).

(2) Assessment of the performance of governments and public bodies

This work ranges from tasks as varied as measurement of the efficiency of public expenditure (with a large numbers of examples furnished by, e.g. World Bank and IMF websites) to performance of local governments [see, e.g. the work sponsored by the Sloan Foundation]. Interesting dissenting opinions also emerge from this work, such as doubts about the merits of overly aggregated indicators. [see, e.g. Hatry (1999)]

Differences in labeling apart, the approach to performance assessment by the Government of New South Wales is fairly typical of the situation in OECD countries. The NSW Government has an advisory body, the Council on the Cost and Quality of Government, that periodically prepares State of Effort and Accomplishment Reports, assisted in this task by the Government's own Review and Reform Division. Four types of indicators are used for this purpose, i.e.

Resource indicators that quantify levels of expenditure (and where possible unit costs) on the delivery of services, the number of staff employed and the value of assets owned;

Service indicators measure the type and amount of outputs produced (service efforts) and the outcomes that have been achieved in terms of broad government goals for the policy area (service accomplishments);

Satisfaction indicators measure the personal assessment of services by clients and/or community stakeholders based on their own expectations; and

Community indicators measure broad social, economic and environmental trends relevant to the Government's goals in each policy area. They reflect the influence of a range of factors and often require a long time to show significant change.

Source: http://www.occg.nsw.gov.au/performance

(3) Country-level environmental performance assessment

Asian Development Bank

Though somewhat overshadowed by recent ascendancy of poverty alleviation as an area demanding methodological and practical attention, ADB mid-1990s efforts to develop approaches to facilitating comparisons of environmental performance [*Measuring Environmental Quality in Asia*, ADB and HUP (1997)] deserve to be revisited. Its greatest appeal (and possibly weakness, too) lies in the derivation of single measures of national environmental performance, to some the ultimate prize in EPA work. Since then, much work on aggregate score of environmental (and sustainable development) performance has gathered pace [see UN (2001)].

Three ADB environmental technical assistance projects in GMS (SEMIS, SETIS and SEF I), well-known to GMS environmental authorities, each in their own way dealt with environment-related information, its prioritisation and comparability. More recently, the completion of the *GMS Environmental Atlas* was preceded by extensive review of available indicators for inclusion into the Atlas, both in Manila and in GMS capitals. Whether prompted by ADB or by UNEP under its own indicator compiling activities, national environmental authorities in GMS countries have been made well aware of the state of their environment-related data.

Organisation for Economic Cooperation and Development and its member governments

Development of the methods and practical applications of environmental performance assessments by OECD member countries has nearly a twenty-year history and continues unabated. It is also OECD that has institutionalised the process of country environmental performance assessments based on a peer review. The work by most OECD national governments in this domain is extensive and backed by formidable scientific and institutional capacity. Several semi-government institutions supplement the work of specialised government agencies (e.g. RIVM, the National Institute of Public Health and the Environment in the Netherlands).

OECD has also been in the forefront of efforts to formulate indicators measuring the success of integrating environmental concerns into various economic sectors (transport, agriculture, energy) (http://www.oecd.org/env/soe/indicators.htm)

A number of initiatives by individual OECD countries or groups of these countries have added to the body of work dealing with EPIs and their role in EPA. Swedish Indicators of Sustainable Development (http://www.hallbarasverige.gov.se/eng/index.htm) are fairly typical of these efforts.

Perhaps best known are OECD *environmental performance reviews* of individual member countries that draw on the work done by national governments (including development of indicators and their values) and through a peer review process offers an independent evaluation of progress.

UNEP

In 1973, UNEP introduced *Earthwatch*, as a means of coordinating and acting as a catalyst for all environmental monitoring and assessment activities throughout the entire UN system. The raison d'être was and remains to provide information gathered from across the UN system relevant for policymaking by building essential partnerships across the UN system with the scientific community, governments and NGOs. At the global level, UNEP prepares regular Global Environment Outlooks (GEO), taking information from all regions. Recently UNEP has started to prepare GEO Yearbooks to address emerging environmental issues.

Through its *State-of-the-Environment* reporting, UNEP has assisted a large number of countries in generating and systematically presenting environment-related information, and has contributed significantly to the development and use of environmental indicators. UNEP has been involved in a number of influential collaborative projects aimed at improved EPA such as *Plan Bleu* (see below) and development of rural sustainability indicators in Central America (with CIAT and World Bank).

UNEP CEROI (Cities' Environment Reports on Internet) initiative. It is based on Urban State-of-the-Environment reports[7] and is accompanied by indicators ("Encyclopedia of Urban Environmental Indicators", a matrix of 29 core indicators and other 61 indicators) grouped into 6 categories (DPSIR, external impacts, economic sector, physical environment, social environment, instruments). A related effort to facilitate cross-urban comparisons has been supported by the EU Directorate General Environment ("European common indicators", tested by 100+ local and regional authorities).

UNCSD

UNCSD Indicators on Sustainable Development. Chapter 40 of *Agenda 21* calls for the development of indicators of sustainable development realising that commonly used economic performance indicators such as gross national product and measures of resources and pollution flows, do not provide adequate indications of sustainability. Through its Work Programme on Indicators, UNCSD intends to measure the full spectrum of sustainable development issues. The CSD uses indicators to translate physical and social science knowledge into manageable units of information that can facilitate the decision-making process; measure and calibrate progress towards sustainable development goals; provide an early warning, and sound the alarm in time to prevent economic, social and environmental damage. 134 indicators were initially

[7] Of all GMS cities, only Bangkok has so far prepared such a report

developed for testing in over twenty developing countries. Of these, 55 were environmental indicators. In testing, about 50 out of the initial 134 indicators were found relevant and applicable, and perhaps another 50 not in the original list were considered worthy of consideration.

UNHSP (Habitat)

UNHSP's Global Urban Indicators (GUONET) uses 23 key urban indicators and 9 qualitative data sub-sets plus an extended set of indicators. The indicators respond to six categories of Habitat's commitments (shelter, social development eradiation of poverty, economic development, governance, environmental management and international cooperation)

UNSD

UN Statistics Division (UNSD) compiles *Millennium Indicators Database.* A framework of 8 goals, 18 targets and 48 indicators to measure progress towards the Millennium Development goals was adopted by a consensus of experts from the United Nations Secretariat and IMF, OECD and the World Bank. In 1996, UNSD also developed a list of environmental indicators in collaboration with the Inter-governmental Working Group on the Advancement of Environment Statistics.

WHO

Since late 1990s, *WHO* has been using up to 48 environmental health indicators using an expanded DPSEEA framework. [see Briggs (1999) and von Shirnding (2002)]

FAO

FAO, too*,* has contributed to the indicator development, especially in areas of sustainable agriculture and rural development as well as in more specialised fields such as marine capture fisheries

The World Bank

The World Development Indicators (WDI) is the World Bank's annual compilation of data about development. WDI 2003 includes approx. 800 indicators in 87 tables, organised in six sections: World View, People, Environment, Economy, States and Markets, and Global Links. The tables cover 152 economies and 14 country groups-with basic indicators for a further 55 economies.

The Environmental Economics and Indicators Unit (EEI) was formed in 1995 as a response to the increasing demand in this area. EEI is involved in various indicator projects, both within and outside the World Bank.

In some cases, World Bank-supported activities include environmental indicators as part of a broader set of indicators used to monitor project performance and impact. To respond to this need, the EEI prepared a *manual on environmental performance indicators* (EPIs). First issued in 1996, and updated in 1999, the note discusses indicator frameworks, selection criteria for environmental project indicators, and issues to consider for various environmental areas. [see Segnestam (1999) (2002)]. This work uses a project-based framework (modified input-output-outcome-impact approach) in

contrast to the PSR model adopted by most other indicator work. Several other indicator-related initiatives are on-going within such as work on Land Quality Indicators (see www.ciesin.org/lw-kmn) and the Africa Live Database.

Rural sustainability indicators. This project, which is a collaboration between CIAT, UNEP and the World Bank, has as its objective to develop, test and refine environmental, land quality and other related indicators and information tools in a geographic information system (GIS) interface, for integrating rural sustainability considerations into policy-making and planning and improve environmental management at different scales in Central America countries. [www.ciat.cgiar.org/indicators/index.htm].

Wealth estimates and genuine saving. This is World Bank's attempt to derive "synthetic" indicators that measure environment and economic factors in one indicator. The *wealth measure* is a stock measure and is a new way of estimating a country's total resources, including both produced assets, natural capital, and human resources (both human and social capital). *Genuine saving*, a flow measure, adjusts gross savings numbers by deducting the value of depletion of the underlying resource asset and pollution damages, and considers current educational spending as an increase in saving, since this spending may be considered to be an investment in human capital (rather than consumption, as in the traditional national accounts).

European Union

European Environment Agency (EEA) and the *European Information and Observation Network (EIONET)* uniting the networks of individual EU countries. EEA environmental indicators, accessible on EIONET are at present being evaluated by clients to determine the final core set. Short-term indicators identified within the core set with high policy relevance, well developed methodology, capable of illustrating temporal trend and comparability between countries became operational in 2003/2004.

EC Joint Research Centre (JRC) consists of 8 scientific institutes including the Ispra-Based Environment Institute and Space Application Institute.

European System of Environmental Pressure Indicators, effort by *Eurostat.* The Project aims at a comprehensive description of environmental, economic and social "policy performance". Under the first-mentioned group, ten "policy fields" are defined and for each, six pressure indicators are defined. Research on further aggregation and extension of the system to CSD-style sustainable development indicators (SDI) is done at the European Commission's Joint Research Centre (JRC).

In addition to the work already mentioned, EEA and Eurostat have developed specialised sets of indicators such as coastal zone development indicators.

Other organisations

A large number of national and international non-government and research organisations are involved in the work on environment and sustainable development measurement. Some of these are cross-referenced throughout this document. To mention only a few, they include:

World Resources Institute (http://www.wri.org). "*In any country, people know their fate is tied to such economic indices as GNP or inflation rates. People believe that these numbers are a good indication of whether we are moving toward greater prosperity or hard times -- something they care about. Yet, no such significant indicators exist to tell us how the environment is faring, so WRI is striving to establish clear, understandable indicators for the environment that effectively represent whether we are moving toward sustainability or not".*' WRI biennial *World Resources Report* is something of a classic in the field.

Worldwatch Institute and its *State of the World Report* and *Vital Signs.* As in the case of World resource Report, a large number of environment and sustainable development parameters and indicators are used, their values tracked in time and an assessment is offered of selected underlying trends.

World Wide Fund for Nature (WWF) (and its "Living Planet Index"; http://www.panda.org/livingplanet/home.shtml),

International Institute for Sustainable Development (IISD) and its "dashboard of sustainability"; www.iisd.ca/cgsdi/dashboard.htm),

International Union for the Conservation of Nature (IUCN) and its "barometer of sustainability";www.iucn.org/themes/ssp/baromsum.htm and "well-being assessment."

Redefining Progress and its "index of sustainable economic welfare."

Columbia University International Earth Science Information Network (CIESIN), and *Yale Center for Environmental Law and Policy* (YCELP) and their work on "environmental sustainability index" [Esty (2002)]

The South Pacific Applied Geoscience Commission *(SOPAC)* and its work to develop an Environmental Vulnerability Index (EVI).

International Network for Environmental Compliance and Enforcement *(INECE)* and its work on compliance indicators.

(4) Environmental performance assessment in a transboundary context

Here we look at activities conducted in support of transboundary management tasks rather than aimed at simply assembling environment-related parameters from different parts of the world as is the case with much of the comparative and statistical work of U.N. agencies including their regional programmes (e.g. Baltic State of the Environment Report (http://www.bef.lv/baltic/default.htm), to give an example form outside Asia).

Great Lakes Water Quality Agreement (GLWQA)

Through this 1972 agreement, the governments of the U.S. and Canada have committed themselves "to restoring and maintaining the chemical, physical, and biological integrity of the waters of the Great Lakes Basin Ecosystem." For more than two decades, numerous programmes and measures have been undertaken towards this purpose including the analysis of data on ambient conditions and pollutant loadings leading to state-of-the-lakes reports. Among other things, the two governments (at both the federal

and provincial/state levels) have been seeking to identify the core needs of their data collection and the indicators to evaluate the Agreement's progress. An Indicators-for-Evaluation Task Force was formed in 1993 to develop a framework within which to conduct this evaluation. The initial focus on state-of-the-lakes reporting has been gradually giving way to the consideration of indicators of ecosystem integrity as well as social cost, equity and other considerations. This was in line with the evolution of the objectives of the governments and other interest groups from narrow regulatory and remedial targets to preventive programmes and sustainable development of the entire Great Lakes area.

The ecosystem and sustainable development approaches introduce considerable complexity that threatens to overwhelm policymakers. Paradoxically, this enhances the appeal of clear, easily understood indicators of progress that capture a broad spectrum of issues in a few key and even dramatic figures.

Worth noting is the ordering of policy objectives (concerns) formulated for the Great Lakes. They include

1. *Fishability.* There shall be no restrictions on the human consumption of fish in the waters of the Great Lakes basin ecosystem as a result of anthropogenic (human) inputs of persistent toxic substances.
2. *Swimmability.* No public bathing beaches closed as a result of human activities or, conversely, all beaches are open and available for public swimming.
3. *Drinkability.* Treated drinking water is safe for human consumption; human activities do not result in application of consumption restrictions.
4. *Healthy Human Populations.* Human populations in the Great Lakes basin are healthy and free from acute illness associated with locally high levels of contaminants, or chronic illness associated with long-term exposure to low levels of contaminants.
5. *Economic Viability.* A regional economy that is viable, sustainable and provides adequate sustenance and dignity for the human population of the basin.
6. *Biological Community Integrity and Diversity.* Maintenance of the ability of biological communities to function normally in the absence of severe environmental stress (ecosystem health) and to cope with changes in environmental conditions which impose stress, *i.e.* to be able to maintain their processes of self-organisation on an ongoing basis (ecological integrity). Maintenance of the diversity of biological communities, species and genetic variation within species.
7. *Virtual Elimination of Inputs of Persistent Toxic Substances.* Virtual elimination of inputs of persistent toxic substances to the Great Lakes system.
8. *Absence of Excess Phosphorus.* Absence of excess phosphorus entering the water as a result of human activity.
9. *Physical Environment Integrity.* Land development and use compatible with maintaining aquatic habitat of a quantity and quality necessary and sufficient to sustain an endemic assemblage of fish and wildlife populations.

The State of the Lakes Ecosystem Conference report [SOLEC (2002)] provides an excellent illustration of the huge advances made in the quality of performance assessment and reporting systems in those circumstances where political commitment is strong (and where formidable technical expertise exists, as it does in the Great Lakes region).

Environmental Plan for the Mediterranean ("Plan Bleu")

To facilitate the understanding of the links between development and the environment in the Mediterranean region, and to support policy objectives, the "Blue Plan" has undertaken several projects relating to indicators with the support of METAP, EU, Agencies for Environment Monitoring and Development in various Mediterranean countries and the Mediterranean Commission on Sustainable Development.

The EPI Project aims at promoting the use of selected indicators as a means of assessing the success of environmental goals in 13 Mediterranean countries or territories. The project has focused on 4 topics (waste, air quality, water quality and water resources). The exercise took place successively on three geographical levels: the Mediterranean region, 1996–1998, sub-regional, 1998, and, more recently, national. Four priority topics have been explored in depth: (i) air pollution, (ii) solid waste, (iii) quantitative management of water resources and demand, and (iv) water pollution. A minimum set of EPIs were selected in common (5 EPIs/topic). A need was confirmed for a uniform definition of the EPIs to facilitate cross-country and longitudinal comparisons. Mediterranean thematic networks on air, water and waste have been created.

The Indicators-for-Sustainable-Development Project aims at developing indicators of progress towards sustainable development in the 20 Mediterranean-rim countries, the Contracting Parties to the Barcelona Convention. Here, the goals are broader than under EPI Project: it is not just a matter of measuring environmental performance but of integrating the more complex concepts of sustainable development. The Mediterranean Commission on Sustainable Development has served as a preferred forum for this work, which is also enriched by national tests (Morocco, Slovenia and Tunisia). A "joint set" of 130 indicators of sustainable development in the Mediterranean was adopted in 1999 from a list of some 250 indicators, 134 of which came from the UNCSD. Only 40 indicators of these 134 were retained for the Mediterranean countries. National tests for relevance and availability were carried out.

The North American Commission for Environmental Cooperation (NACEC)

NACEC, created in support of NAFTA (including U.S., Mexico and Canada), placed emphasis on the development of indicators capable of reflecting the environmental impacts of NAFTA, including the impacts in the border areas of the three NAFTA signatories. Unlike the traditional focus of environmental indicators on the status of environmental media like air and water, waste management and land use, NACEC targeted implementation, enforcement and compliance.

In 1997, NACEC initiated a project to develop indicators and criteria for evaluating the performance of the Parties in implementing policies and programmes for effective environmental enforcement. The Project has documented work in the area of enforcement indicators, provided a forum for dialogue, and established a baseline. NACEC went on to develop indicators for use by the three parties.

Environmental Indicators for Central America

During the period 1995-1997, The International Center for Tropical Agriculture (CIAT), and UNEP, working with 6 regional and 50 national institutions, developed *Central American Environmental and Sustainability Indicators.* With additional support by the

World Bank, this effort was extended to the development of *Rural Sustainability Indicators for Central America* The indicators tool kit for Central America includes 11 indices that help analyse development and environmental problems; 68 "core" indicators for determining the causes and effects of these problems; and 114 "complementary" indicators that help apply the analysis to decision making. With a "spatial land-use model" developed at Wageningen University in The Netherlands, users can explore the potential impact of specific policies, strategies, and actions under different scenarios, such as "business as usual," "natural disasters," or "sustainable rural development". (http://www.ciat.cgiar.org/indicators/.) The project has also produced a computerised *Atlas of Environmental Indicators and Sustainable Development for Central America and the Caribbean.* In addition, and based on the work described above, an Environmental Indicators Toolkit to Help Prepare for Natural Disasters in Central America was launched.

Appendix 2

Cities awarded the title “Environmental Model City” (1997-2007)

Year	No. of Cities awarded	City
1997	6	Zhang-jiagang city, Shenzhen city, Dalian city, Zhuhai city, Xiamen city, Weihai city
1998	5	Kunshan city, Yantai city, Laizhou city, Rongcheng city, Zhongshan city
1999	5	Haikou city, Shantou city, Suzhou city, Dagang district of Tianjin Municipality, Wenxing district of Shanghai Municipality
2000	4	Qingdao city, Jiangyin city, Daqing city, Wendeng city
2001	4	Hangzhou city, Ningbo city, Changshu city, Taicang city
2002	8	Huizhou city, Zhaoyuan city, Shaoxing city, Rushan city, Haimen city, Changchun city, Yangzhou city, Jiaozhou city
2003	3	Wujiang city, Nanjing city, Dongying city
2004	12	Mianyang city, Wuxi city, Jintan city, Suyang city, Fuzhou city, Zhenjiang city, Changzhou city, Shenyang city, Kelamayi city, Kuerle city, Jiangmen city, Yubei district of Chongqing Municipality
2005	9	Chengdu city, Fuyang city, Baoji city, Guilin city, Jiaonan city, Laixi city, Rizhao city, Penglai city, Weifang city
2006	12	Tianjin Municipality, Ma-anshan city, Langfang city, Pudong new district of Shanghai municipality, Beipei district of Chongqing Municipality, Nantong city, Huzhou city, Shaoqing city, Quanzhou city, Yixing city, Jimo city, Pingdu city
2007*	4	Taizhou city, Guangzhou city, Yiwu city, Shouguang city

Number of awards in 2007 is to April 2007.
Source: http://www.zhb.gov.cn/cont/mhcity/

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Subregional Environmental Performance Assessment – Greater Mekong Subregion

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1. Introduction

Under ADB's TA 6069-REG: National Performance Assessment and Subregional Strategic Environment Framework for the Greater Mekong Subregion (GMS), a first attempt at a subregional environmental assessment was prepared towards the end of the project (ADB 2006). Under this project (referred to as SEF II), the emphasis was on national environmental performance assessment (EPA) and there was a reluctance to even attempt the same sort of assessment at the subregional level, mainly because there was no subregional environmental entity that could be held responsible for environmental performance at a supra-national level.

While up to 13 priority environmental issues were identified at the national levels, only three issues (threats to the Mekong River's vital functions, illegal trade in wildlife resources (and by extension, biodiversity conservation), and harmonisation of environmental policy and standards) were examined at the subregional level. To supplement analysis of these issues at the subregional level, SEF II also conducted biodiversity modelling to estimate the impacts of human activities on biodiversity and formulated a GMS-wide environmental sustainability index (ESI) (ADB 2006). As noted in the final report, the objective of the exercise was relatively modest: "to explore and illustrate the scope for a structured assessment of environmental performance of GMS or other subregional groupings within GMS such as the Mekong River Commission (MRC) group of countries."

UNEP RRCAP is implementing a project to support preparation of a series of national sustainable development strategies (funded by the Norwegian Agency for Development Cooperation (NORAD) and ADB[1]) for each GMS country and a subregional sustainable development strategy (SSDS) (TEI 2007). As stated in the draft report "SSDS is expected to provide a long term vision, goals and targets for the GMS". Hence, even without a specific institution identified as the responsible entity, it should be possible to record progress towards these subregional goals and targets, provided they are formally accepted.

The lack of a plausible subregional institution to implement a SSDS and to be held accountable for environmental performance at the subregional level has been addressed in a separate assessment report prepared by the NSDS Project Secretariat under RETA 6198 (Habito and Antonio 2007). Having examined possible existing alternatives, the NSDS consultants conclude that "an appropriate institutional mechanism at the subregional level has yet to be found to ensure coordination, promote integration and expand participation and cooperation of stakeholders. There is thus a need to identify and designate a mechanism, preferably built on one of the existing ones, to assume the overall coordinating role."

Under Component 3 of the Core Environment Programme (CEP), the need for a subregional environmental assessment is identified as part of the work programme. This discussion paper revisits the question of a subregional EPA in the light of this subsequent work and attempts to answer the following questions:

[1] TA 6198-REG: Capacity Building on Promoting Sustainable Development in the GMS.

(i) Does it make sense to attempt a revision of the 2006 version of the subregional EPA report as part of Component 3?
(ii) If not, what steps need to be taken to make this a sensible priority work item in Phase 2 of the CEP?
(iii) What should be the respective roles of different actors in implementing these steps?

The minimal requirements for attempting a revision of the subregional EPA report are (i) a set of targets against which progress might be measured; and (ii) a subregional agency that could be held accountable for that progress. A final criterion is that despite the absence of these two factors, there is a separate educative or capacity building value to undertaking a subregional EPA, so that valuable experience can be gained. In the absence of these factors, emphasis should turn to creating the enabling conditions rather than wasting time and resources attempting another subregional EPA.

2. Subregional Sustainable Development Strategy

Previous planning initiatives at the subregional level have been undertaken by ADB and the MRC (Habito and Antonio 2007). A ten-year GMS Strategic Framework (2002-2012) guides the GMS Economic Cooperation Programme and is implemented through the GMS Plan of Action and a comprehensive development matrix. ADB's specific lending and technical assistance to the GMS is guided by a three-year rolling Regional Cooperation Strategy and Programme (2007-2009). MRC formulated a Strategic Plan for 2006-2010, which is reflected in the Mekong Basin Development Plan (BDP), for the four lower riparian countries.

At the regional level, ASEAN countries have agreed on the ASEAN Vision 2020 strategy, with more detailed programmes of action (Hanoi Plan of Action 1998 and Vientiane Action Programme 2004). ASEAN environment ministers adopted Strategic Plans of Action for the Environment for 1994-1998 and 1999-2004. According to Habito and Antonio (2007) none of these plans, however, "fully captures the essential elements of a SSDS" although the TEI (2007) "initiative promises to fill this gap."

The latest draft of the SSDS, while stressing that it focuses only on issues that have a trans-boundary or regional character, identifies the main issues as (i) watershed management; (ii) hydropower development and regional power trading; (iii) sustainable management of shared resources; (iv) trade in timber and wildlife resources; (v) sustainable management of biodiversity and trans-boundary forests; (vi) trans-boundary air pollution (especially forest fires and smoke haze) and wastes; (vii) early warning systems for environmental health and disasters; and (viii) sustainable poverty reduction. Later in the document climate change, hazardous wastes, and alien or invasive species are discussed too.

It should be noted that this draft SSDS repeats a mistake made by many similar sustainable development strategies and focuses too heavily on the environmental and natural resource management consequences of unsustainable development.[2] As will be seen later, the key social and economic drivers of unsustainable development need to

[2] As this paper is focused on environmental performance assessment, this issues surrounding the draft SSDS will not be addressed here but will be raised in a subsequent workshop to finalise the document.

be tackled too If these drivers are approached from the outset to make them sustainable then (and only then) long term sustainable development may be possible. In the context of the GMS these subregional issues include (i) free trade agreements; (ii) navigation along the Mekong River; (iii) road and rail connections; (iv) airport development and air travel; (v) cooperative tourism packages and cross-border facilitation; (vi) energy grids and the ASEAN gas pipeline; (vii) joint development of offshore oil and gas; (viii) intra-regional labour markets and migration (both legal and illegal); (ix) rural-urban slum formation; and (x) border economic zones.

In the draft SSDS, the overall vision for the GMS remains in line with the statement at the first GMS summit of leaders in 2002 – a "vision of an integrated, harmonious and prosperous GMS characterised by steady economic growth, social progress and environmental sustainability." This was reconfirmed in the second GMS summit in 2005 as "the people of GMS envision their region with the standard of living of its peoples at par with the developed economies and the quality of life the best in the world."

A guiding principle for environmental aspects of the draft SSDS focuses on avoiding harm from rapid economic development.

> *"While pursuing rapid and robust economic development for poverty alleviation and wealth creation for the GMS, it is essential to minimise and mitigate the negative impacts on the ecosystem and environment. Especially, it is essential to ensure that the current economic activities do not incur any irreversible damage to the shared environmental resources of the GMS and the natural capital is conserved, recovered and increased for the benefit of the future generations."*

The draft SSDS then proposes that the short-term to medium-term goals (up to 2015) should be those of the Millennium Development Goals (MDG). Subsequent goals should be based on progress towards the MDGs around 2015. This immediately poses a dilemma because the environmental goals (under MDG 7) are the weakest and least defined of the MDG targets.[3] In a sense this approach is also tautological in setting a goal for environmental sustainability (which is by definition one of the three pillars of sustainable development). In addition, the MDG targets are not sufficiently specific (except for water supply and sanitation) to deal with the trans-boundary and regional issues identified above as being the most important for the SSDS. Some of the indicators used for the first subregional EPA could usefully be included in the SSDS.

Some additional targets are suggested later in the draft SSDS document, including (i) "regulating and stopping the rampant forest and biodiversity loss by 2015; (ii) stopping all illegal trans-boundary movement of illicit forest products, rare species, animals, pets and hazardous substances and waste by 2015; and (iii) developing at least 12 model sustainable tourism projects in the region by 2015 where the local communities will be the key stakeholders and beneficiaries." However, the draft SSDS generally provides a series of strategies rather than targets, making any assessment of progress difficult to measure, while acknowledging that "what gets measured, gets managed."

[3] For example MDG Target 9: Integrate the principles of sustainable development into country policies and programs and reverse the losses of environmental resources.

Based on this assessment, the first criterion for revisiting the subregional EPA is not satisfied.

3. Subregional Environmental Institutions

The draft SSDS states that “ensuring close and active cooperation by all six GMS countries in a well-structured and clearly mandated development programme presents a serious challenge. The GMS lacks a truly regional body with the legal mandate to develop and monitor implementation of such a programme” (TEI 2007). Further it recommends that “ASEAN could be the most appropriate platform to drive the sustainable development in the GMS”.

The “Assessment Report on NSDS Preparedness” by NSDS project consultants Mr. Habito and Ms. Antonio (2007) a
ssessed the options as follows. “Four existing mechanisms are logical candidates to be the basis for a SSDS coordination mechanism. **ASEAN** covers all but one (i.e. China) of the GMS countries, although China has been a dialogue partner for years. The **MRC** covers only the Lower Mekong countries of Cambodia, Lao PDR, Thailand and Vietnam, but has dialogue arrangements with Myanmar and China. It is a mechanism for effecting coordinated and cooperative utilisation, management and conservation of the water and related resources of the Mekong River Basin. The **GMS Economic Cooperation Programme** was established by the GMS governments and the ADB in 1992 as a mechanism for cooperation and coordination among the GMS countries on a broad set of development concerns including trade and tourism, infrastructure, human resource development, investment and environment. **GMSARN** is a network of academic institutions within the GMS countries that have agreed to address development concerns in the sub-region through academic and research cooperation.”

Unlike TEI (2007) no strong preference for any particular option was expressed in this report, although it does claim that the “mechanism most responsive to the institutional requirements of sustainable development appears to be the Ministerial-level Forum of the GMS programme” (see Figure 1) (Habito and Antonio 2007).

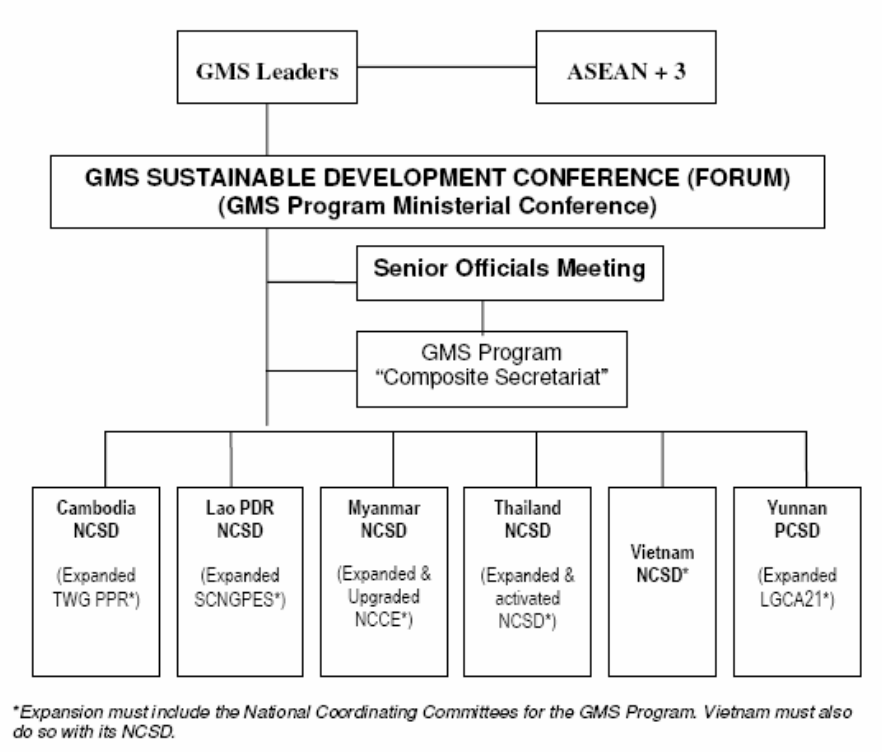

Figure 1 Proposed Institutional Arrangement for Sustainable Development
Source: Habito and Antonio, 2007

When the Environment Operations Center (EOC) was first envisaged, an Options Paper presented to the GMS countries stated that "a proactive mechanism needs to be established to ensure that the massive investment in infrastructure and the economic development stimulated by this investment are managed in an environmentally sound and sustainable manner." It was recognised, however, that the GMS countries were unlikely to adopt a fully operational sub-regional environment agency from the outset.

Hence a phased development was proposed: "These options were set out as escalating steps, implying increasing levels of capacity and institutional autonomy as technical demands and responsibilities increase. The corresponding institutional levels envisage that the WGE could gradually shift from a programme review forum to a proactive permanent body responsible for shaping development of the subregion from the earliest stages of planning, through implementation, monitoring and reporting on performance, and ultimately take on a role in enforcement."

After adopting the second step, i.e., the EOC (described as "a small permanent group of professional staff, possibly attached as a unit to an existing regional institution", reporting to a standing GMS Environment Committee, made up of the environment ministers or their delegated heads of environmental agencies), the proposed third step was a subregional **Environment Commission** with seconded staff from national environment agencies. The ultimate step was an **independent GMS Subregional Environmental Agency** acting under a legal agreement between the GMS countries, established with powers to enforce compliance when trans-boundary problems arise.

At the last Working Group on Environment (WGE) meeting in June 2007, a discussion paper was provided that considers the future governance arrangements in the GMS. Based on extensive discussion, it is believed that the EOC should "set itself the task of becoming an example of an effective and efficient environment and development institution that could be favorably considered by the global environment and development community as worthy of duplication." It was recommended that its primary focus should be capacity building in the GMS countries, bringing in expertise from other countries when needed. While it may become a legal entity at some stage in the future (25-30 years), for the time being it was regarded as "too early to consider any international treaty, protocol or convention." In the meantime, it should have a distributed structure, more like an environment operations network.

Based on this assessment and the lack of consensus (and the apparent reluctance of the GMS countries to move towards a more permanent subregional institution), the second criterion for revisiting the subregional EPA is not satisfied.

4. Subregional Environmental Performance Assessment

Turning to the educative or capacity building aspect of conducting a subregional EPA, lessons can be drawn from the earlier version. The argument for proceeding with the first subregional EPA was expressed as follows.

> *"While the absence of a trans-boundary management mandate and the nonbinding nature of subregional environmental targets put in doubt the appropriateness of a performance-based approach in today's institutional circumstances of the subregion it is possible to take a more generous view of the scope for a meaningful environmental assessment at a subregional level. First it is possible to anticipate the emergence, over time, of shared trans-boundary targets that would go a long way towards making performance assessment possible….. Second, it may be useful to view the performance assessment on a scale that begins with the least sophisticated (where subregional performance is no more than a simple sum of national environmental indicator values) and ends with the more intellectually satisfying ("true performance assessment")."*

Based on this understanding of the limitations of the subregional EPA, three issues were addressed as follows.

4.1 Threats to the Mekong's Vital Functions

No quantified objectives exist. The nearest to quantified objectives are found in the 1995 Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin signed by the four lower riparian countries. There is a general statement to optimise multiple use and mutual benefits and protect the basin from pollution and other harmful effects from development. There are two more specific hydrological goals to ensure (i) acceptable minimum monthly natural flow in the Mekong during each month of the dry season; and (ii) a wet season flow in the Mekong at Kratie that allows the reverse flow of Tonle Sap to an agreed upon optimum level of the Great Lake (ADB 2006). Quantified values for these latter two targets have yet to be formulated or negotiated (Table 1).

Table 1 Proposed Indicators for Threats to Mekong's Vital Functions

Function	Pressure Indicators	State Indicators	Response Indicators
Hydrological	1. Area of irrigated crops in GMS countries.	1. Minimum monthly natural flow in the Mekong each month of the dry season. 2. Wet season flow in the Mekong at Kratie. 3. Total suspended solids concentrations in selected locations.	1. Irrigation water storage capacity in the Basin. 2. Budget contributions to the National Mekong Committees.
Irrigation	1. Area of irrigated land per capita.	1. Area under irrigated crops in the Basin. 2. Area under irrigated paddy in the Basin.	1. Irrigation water storage capacity in the Basin. 2. Expenditure on improved irrigation efficiency.
Hydropower	1. Energy consumption per capita. 2. Ratio of highest to lowest average energy consumption per capita among GMS countries.	1. Hydroelectricity output. 2. Percent of hydropower in total energy consumption.	1. Installed and approved hydropower generating capacity.
Navigation	1. Ratio of road to river cargo volume (excluding Viet Nam).	1. Total volume of cargo and passenger traffic on the Mekong. 2. Volume of cargo traffic in selected locations.	1. Installed cargo handling capacity on the Mekong. 2. Length of river navigable to vessels of "x" tons. 3. Expenditure on improving the navigability of the Mekong
Fisheries	1. Quality of Mekong water. 2. Irrigation water storage capacity in the Basin. 3. Total basin population. 4. Forest cover. 5. Agrochemicals consumption.	1. Total output of capture fisheries. 2. Total output of capture fisheries in Cambodia and Mekong delta. 3. Percentage of large fish in the total capture fisheries output in selected locations.	1. Total output of culture fisheries. 2. Total area of protected wetlands in the Basin. 3. Combined size of MRC and other donor funding of fisheries conservation in the Basin.
Tourism		1. Number of foreign tourist visitors. 2. Share of first two leading foreign tourist arrival countries in GMS tourist arrivals total.	1. Protected areas as percent of total area. 2. Expenditure on forest protection.

Source: ADB, 2006

The authors conclude that "a closer look at the statistical foundations of a structured assessment of the Mekong's vital functions shows that major gaps and inaccuracies exist in several vital areas. This suggests that before such an assessment is formalised, the quality of the underlying information needs to be improved. Depending on the environmental concern under study, this improvement is either a matter of developing a benchmark where none exists or taking a hard look at the reliability of existing data" (ADB 2006).

4.2 Illegal Trade in Wildlife Resources

As the basis of this threat is its illegal nature, the lack of reliable information on the extent of the problem is inevitable. Nevertheless, several indicators were proposed to assess the overall threat levels to GMS wildlife (of which illegal trade is a minor contributor) as shown in Table 2.

Table 2 Proposed assessment of the overall threat levels to GMS wildlife

	Proposed Indicators	Assessment	Rating
Pressure	Major threat citations against GMS-endemic and threatened wildlife species.	167 citations of major threat types in the IUCN 2004 Red List of Threatened Species, for 109 GMS species under review.	High for all GMS countries for loss of habitat, Medium for all GMS countries for hunting and gathering.
	Major habitat citations against GMS-endemic and threatened wildlife species.	113 citations, with forest habitats under threat in more than 50% of cases.	
State	Weighted distribution of threatened and endemic species as a percentage of globally threatened species.	For gross numbers: Range 1.23-3.05% Average 2.13% For weighted numbers: Range 7-33%	Cambodia – relatively good Viet Nam – relatively poor Others - average
Response	GMS-endemic threatened wildlife species protected by local laws.	Fully protected – 24.8% Partially protected – 11.1% Not protected – 63.3%	Birds – moderate Mammals – moderate Reptiles – relatively poor Amphibians and fish - poor
	GMS-endemic threatened species protected by CITES convention	Fully or partially protected and included in CITES – 20.2% of threatened species	Thailand – significant Cambodia – low Others - average

Source: ADB, 2006

The GMS provides sanctuary for about 5.4% of the globally threatened species of wildlife, but a smaller portion of these (109 species or 0.9% of the global total) are endemic to the GMS. Continued loss of forests and wetland habitats are the dominant threats, but crucial to survival of the threatened species is to make sure that protected areas encompass the range and habitat requirements of those species.

4.3 Harmonisation of Policies and Standards

The topic of harmonising environmental policies and standards does not lend itself to the Pressure-State-Response model for other environmental issues. The analysis concluded that:

(i) There are still gaps in environmental legislation and/or environmental standards in the GMS countries;
(ii) Institutional arrangements need to be improved to better harmonise and coordinate environmental management;
(iii) No projects or programmes are underway (or seem practical at this stage) to standardise water and air quality standards, or a common forest cover target; and
(iv) GMS is not ready for a subregion wide EPA analysis, as neither the necessary institutions nor common policies/standards exist that would make such an analysis meaningful.

4.4 Other Possible Topics for a Future Subregional EPA

For some subregional topics, it may be possible to simply add together the results of national EPAs. For example, halting the loss of mangroves could be addressed by combining the national results of all GMS countries with a coastline. However, if there is no subregional agreement on whether mangrove loss (i) should be completely stopped

(bearing in mind that port and other infrastructure development may require some loss of mangrove areas); or (ii) that mangrove replanting should aim for some percentage increase in mangrove area over a defined time period; or (iii) that the current rate of loss should be reduced to a certain percentage, then it is difficult to assess performance. If country A has a policy target related to stopping mangrove loss and country B has a target related to increasing the national mangrove area, how should the subregional performance be rated if mangrove loss is reduced to a minimal level?

A similar situation applies to subregional forest cover. It is possible to add together the forest cover in each GMS country and arrive at a total forest cover number for differing periods of time. If the definition of forest cover varies between countries, however, then the straight additive approach will be inherently flawed. To get around this, it is feasible to measure national forest loss as a percentage of some baseline forest cover (however measured) and then average the percentages across the 6 GMS countries, possibly weighted by total forest area in each country. Does a reduced weighted average percentage of forest loss in time period B compared to an earlier time period A, mean that the subregional performance in relation to forest management is improving? It may, but equally really good performance in one large country could mask equally poor performance in several smaller countries, or forest plantations (possibly including oil palm plantations) could be replacing highly valued old growth forests. On average forest management performance could be slipping, while total forest cover in the GMS was increasing.

Another possibility, to overcome the problem of common definitions or harmonised standards, is to treat transboundary issues on a bilateral basis, as has been attempted between the USA and Mexico (Border 2012, 2006). Six goals were signed between the two countries in 2003 to improve the border environment over a ten year period (reduce water contamination, reduce air pollution, reduce land contamination, improve environmental health, reduce exposure to chemicals, and improve environmental performance). Results oriented goals and objectives guide specific actions which are monitored by environmental and performance indicators. Specific standards appear to be those from the US EPA. A unique approach adopted in this border region is to pair up cities adjacent to each on either side of the border and compare environmental performance in these “twin” cities (see Figure 2).

Finally, there may be transboundary issues which can only be addressed by concerted subregional effort. A good example is haze management, for which ASEAN countries have signed a regional agreement, following disastrous bushfires in Indonesia and Malaysia in the late 1990s. Haze management is the classic “free rider” problem. If smoke and haze concentrations are slightly above the regionally agreed trigger point for national action, country A has an incentive to wait and see if country B is going to take some action to control the fire hotspots, which would mean that country A is then able to save expenditure on fire control. If both countries wait, however, the situation may get out of control and the haze problem would be much worse than if they had both taken early and commensurate action. In the case of the ASEAN haze agreement, specific countries have been allocated responsibilities for certain actions to help overcome the free rider problem.

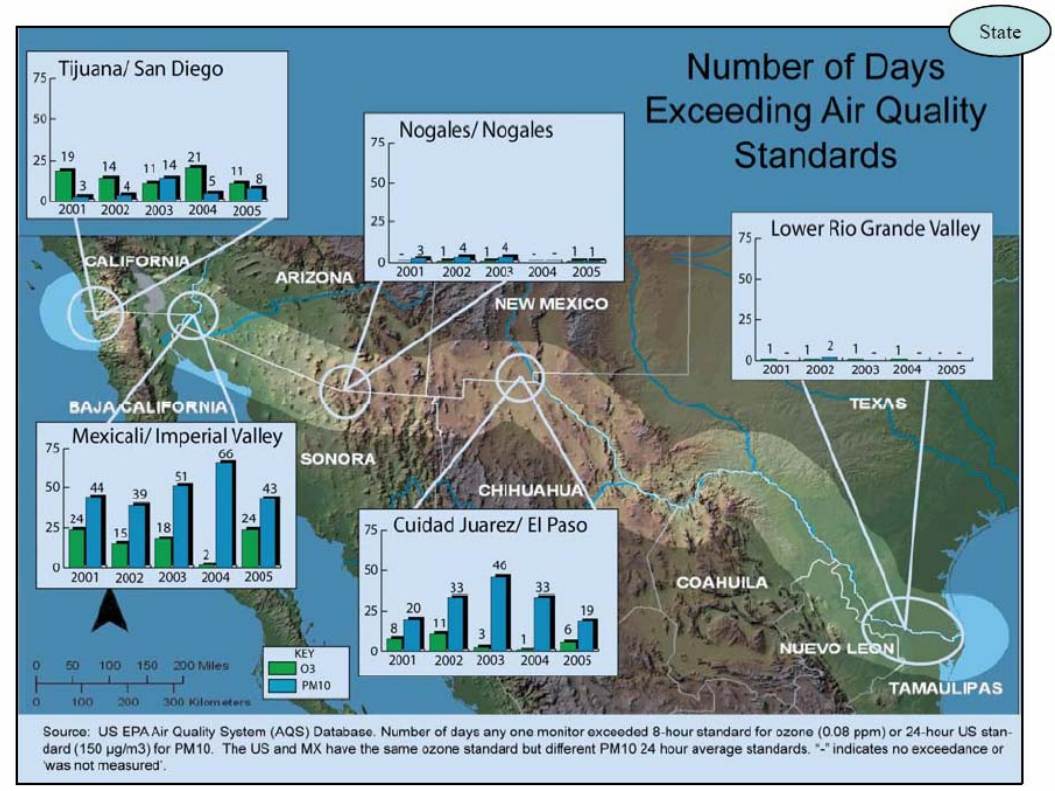

Figure 2 Air quality comparison in sister cities along the US-Mexico border
Source: Border 2012, 2006

5. The Way Forward

The subregional EPA (ADB 2006) recommended a large number of follow up actions, of which the most critical were:

(i) Study the reasons for the inadequate factual basis for formulating and monitoring policies on the optimum use of the Mekong and the growing gap between policies and strategic statements and their factual underpinnings;
(ii) Formulate a basin monitoring plan and agree on priority areas for database development, reconciliation and improvement and assigned responsibilities;
(iii) Develop a subregional biodiversity model from scratch rather than using a global model with subregional inputs;
(iv) Initiate a process for harmonisation of policy and environmental standards across the GMS;
(v) Draft a GMS environmental policy and targets against which future subregional EPAs can be conducted; and
(vi) Develop a coordinated set of indicators that could be used to promote sustainable development in the GMS.

The draft SSDS report (TEI 2007) recommended continued capacity building and sustainable development education, public-private partnerships, and reduced duplication of effort. To implement the SSDS, it recommended appointing "a focal point with a clear mandate and authority to coordinate the sustainable development efforts in the GMS."

Furthermore, it recommended that ASEAN could be the "most appropriate platform to drive the sustainable development in the GMS."

Although part of the same NSDS project Habito and Antonio (2007) recommended slightly different institutional improvements:

(i) Designate the GMS Ministerial conference as the sustainable development coordinating and integrating mechanism;
(ii) Designate the senior officials meeting as the technical-level sustainable development support mechanism;
(iii) National councils for sustainable development should serve as the coordinators of sustainable development efforts in each country;
(iv) Establish a strong oversight secretariat for the GMS Ministerial conference, linked to all working groups and stakeholders;
(v) Consider a transition phase (with sustainable development still within the ambit of the WGE and serviced by the EOC) where an annual forum involving all GMS working groups;
(vi) Establish a definite programme to phase up country ownership and control, while phasing down the domination by ADB and other donors.

The NSDS Assessment Report by Habito and Antonio (2007) also recommended capacity building improvements that will enable GMS countries and the subregion to move towards effective sustainable development strategies:

(i) Continue the process of capacity building for sustainable development, especially through national councils for sustainable development;
(ii) Strengthen capacities to integrate the three dimensions of sustainable development, using appropriate tools for problem and policy analysis;
(iii) Use peer reviews of NSDS among the GMS countries as a mutual learning process and to facilitate complementary and synergistic initiatives;
(iv) Promote joint projects among two or more GMS countries to facilitate a subregional approach to sustainable development;
(v) Encourage peer-to-peer mentoring between GMS countries to assist in capacity strengthening; and
(vi) Organise periodic gatherings of national council for sustainable development (or equivalent) members both from within GMS countries and from other parts of Asia.

Returning to the original criteria that would need to be satisfied before recommending a second round of subregional EPA, the following steps would need to be undertaken before that could proceed.

(i) **A set of targets against which progress might be measured** – There are two approaches to meeting this criterion. First, the final SSDS which sets out specific targets is agreed by the GMS countries, possibly at a GMS summit. Second, a more harmonised approach to targets and indicators is adopted in the next round of national EPAs and in the national strategies and plans that underpin those EPAs. At the subregional level, a subsequent EPA would add (or average or compare) country level indicators.

Note that the current draft SSDS would not meet the first option because it does not have quantified targets yet and it is unlikely to be in a sufficient stage of development

that would allow GMS leaders to endorse it at the summit level. If the second option was adopted, GMS countries may be concerned about benchmarking against neighbouring countries. Also national level targets and indicators are unlikely to adequately address the priority trans-boundary or subregional issues. A third alternative, like the US-Mexico case, could see harmonised approaches to some transboundary issues on a bilateral basis, but there is not much evidence for a move in this direction.

(ii) **A subregional agency that could be held accountable for that progress** – There is currently no consensus on the institutional form that a subregional agency responsible for sustainable development across the whole GMS should take. To reach such agreement, will require considerable effort to convince GMS countries that trans-boundary and subregional issues cannot be adequately dealt with by national agencies alone, merely collaborating and cooperating on an *ad hoc* basis, whenever necessary. In addition, unclear institutional ambitions by the MRC, ASEAN, and ADB to control the sustainable development agenda in the GMS will need to be reconciled. Elevating the issue to the ministerial and senior official level (as recommended by Habito and Antonio (2007)) for debate and possible resolution appears to be a good first step. A transition phase (if needed), however, needs to be carefully designed so that it does not add one more layer and another round of meetings to an already crowded agenda.

(iii) **Educative or capacity building value to undertaking a subregional EPA** – Since the first RETA on subregional environmental management information systems, more than a decade ago, ADB has pursued a capacity building and education programme that has slowly but surely strengthened institutional capacities in the GMS. The creation of the EOC was intended to be the next step in this process, where seconded staff from the GMS countries would work alongside international experts and gradually take over implementation responsibilities. While that objective now seems rather ambitious, the capacity building gains of undertaking another (flawed) subregional EPA are uncertain, unless a simultaneous, concerted effort is made to move towards a permanent subregional institution and agreed targets for sustainable development. Certainly, there is little capacity building to be gained if the consultant driven process of TA 6069-REG was to be repeated.

6. Conclusions and Recommendations

Therefore, returning to the original questions to be addressed by this paper:

(i) Does it make sense to attempt a revision of the 2006 version of the subregional EPA report as part of Component 3?

Within the time frame of Phase 1 of Component 3, it does not make sense to revise the 2006 version of the subregional EPA report. There is no responsible subregional agency, there are no agreed GMS-wide targets or indicators, and capacity building efforts regarding EPA are best addressed at the national level at this stage. There is no new data and the country situations have not changed much since 2006.

(ii) If not, what steps need to be taken to make this a sensible priority work item in Phase 2 of the CEP?

Step 1: At the next GMS summit, explore if the GMS countries are prepared, over the next 5 years, to undertake a substantial revision of the current draft SSDS that explicitly

addresses the need for public input and country ownership and sets quantitative sustainable development targets. A commitment from the countries that they see the need for a GMS-wide sustainable development plan, are prepared to commit national resources to this effort, and are prepared to negotiate binding targets would provide the necessary underpinning to proceed.

Step 2: Along with funding currently available from NORAD, ADB should consider co-funding a substantially revised SSDS in Phase 2 of the CEP, which would build on the UNEP work to date, the GMS economic cooperation strategy and development matrix, and the MRC's basin development plan, to provide the overall sustainable development plan for the GMS. This should not be seen as a responsibility of the WGE alone but a shared responsibility of all the GMS working groups. It would provide the strategic underpinning for the RCSP and the GMS development matrix, which are both heavily oriented towards infrastructure development at present.

Step 3: ADB, MRC and ASEAN should have high level discussions on the evolution of institutional arrangements in the GMS, with the view to forming a consensus view on ultimate development of a subregional sustainable development agency and the steps needed to reach that goal. Then a concerted round of discussions with the GMS countries should lead to an agreed approach. In the meantime, a combined meeting of all the GMS working groups should be convened to agree on a "temporary" designation of the WGE (and the EOC as its secretariat) as having the responsibility to guide preparation of the SSDS.

(iii) What should be the respective roles of different actors in implementing these steps?

As indicated above, the GMS countries (senior officials and ministers) should be engaged in (i) agreeing on the need for a comprehensive, quantitative SSDS to replace the draft prepared by TEI; (ii) negotiating the content of the SSDS and specific targets; (iii) discussing with ADB, MRC, and ASEAN the institutional arrangements to implement the SSDS; and (iv) seconding staff to the institution given that responsibility.

ADB, MRC, and ASEAN should agree on (i) their respective roles in ultimate development of a subregional sustainable development agency; (ii) the interim steps along that evolutionary path and their resource contributions; and (iii) the assignment of staff to work collectively towards that end.

The GMS working groups should convene to agree on (i) the role of each working group in contributing to the comprehensive SSDS; (ii) interim institutional arrangements; and (iii) the ultimate exit strategy as the subregional sustainable development agency takes over the current roles of the working groups.

The UN system (especially UNEP, UNESCAP, and UNDP) should come to an arrangement with the GMS countries to (i) assist in drafting and negotiations towards a protocol or convention among the GMS countries on sustainable development at the subregional level, in accordance with Agenda 21 and the Johannesburg Plan of Implementation; (ii) act as an information repository and clearinghouse for sustainable development information system until a subregional agency is capable of taking over this role; and (iii) take the primary role in capacity building at the national and subregional levels.

Other stakeholders, including NGOs, academic institutions, and the private sector should become involved in preparing and commenting on the draft SSDS and the participatory processes required for its implementation.

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