SOPAC **UNEP**

Globalising the Environmental Vulnerability Index (EVI):

Proceedings of the EVI Globalisation Meeting,

27 – 29 August 2001, Geneva, Switzerland

September 2001

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ACRONYMS _____

AOSIS	Alliance of Small Island States
CCD	Convention to Combat Desertification
DEWA	Division of Early Warning and Assessment, UNEP
EU	European Union
EVI	Environmental Vulnerability Index and Profiles
FAO	UN Food and Agriculture Organisation
FIS	Foundation for International Studies
GEF	Global Environment Facility
GIS	Geographic Information Systems
GOOS	Global Ocean Observing System
GRID	Global Resource Information Database, DEWA, UNEP
ISDR	International Strategy for Disaster Reduction
IUCN	The World Conservation Union
LDC	Least Developed Country
NGOs	Non-Government Organisations
NZODA	New Zealand Overseas Development Assistance
OECD	Organisation for Economic Cooperation and Development
OPEC	Organisation of Petroleum Exporting Countries
SIDS	Small Island Developing States
SIS	Small Island States
SOE	State of the Environment
SOPAC	South Pacific Applied Geosciences Commission
SPREP	South Pacific Regional Environment Programme
UN	United Nations
UNEP	United Nations Environment Programme
WHO	World Health Organisation
WRI	World Resources Institute

ACKNOWLEDGMENTS _____

ABSTRACT _____

This report describes the proceedings of the Environmental Vulnerability Index (EVI) Globalisation Meeting held in Geneva 27 – 29 August 2001 at the United Nations Environment Programme's (UNEP) International Environment House. The EVI Globalisation Meeting was attended by South Pacific Applied Geoscience Commission (SOPAC), UNEP, University of Malta and participants from the countries of Bangladesh, Greece, Kyrgyz Republic, Nepal, Philippines and Thailand. Additional inputs were provided by International Strategy Disaster Reduction (ISDR) and submissions from Australia and New Zealand. Norway was also present as an observer.

Without exception, the environment is the life-support system for all human systems and is an integral part of the development and success of countries. Until now, it has not been possible to monitor the vulnerability of this life-support system at an appropriate scale to ensure human welfare. During the 1990's a call was made by the International Community through Agenda 21, the Barbados Programme of Action and the Alliance of Small Island States to develop vulnerability indices that might address these concerns. The EVI has been developed in response to these calls.

The purpose of the meeting was to begin the process of globalising the EVI previously focused on Small Island Developing States. One aim was to introduce and gain support for the index among a group of countries called collaborators on the project because they represent the global extremes needed for further developing the model. Another aim of the meeting was to obtain data from the collaborating countries for the purposes of testing the EVI.

In addition, topics relevant to the globalisation of the EVI were discussed, including the need for any new indicators to cover global conditions, problems with data collection, ways of creating a collaborative group to include SOPAC, UNEP, donors and participating countries, and mechanisms for permanent data collection. Emphasis was placed on mechanisms for introducing the EVI into the international community as much as on technical development. Participants gave statements regarding their experience with the EVI, providing additional insights for discussions.

During the discussions, the need for eight new indicators was proposed to ensure that global environmental vulnerability issues are covered by the EVI. These included indicators on shared borders, transboundary pollution and erosion, fragmentation of natural land cover, migratory species, ice bodies, landslides, over-hunting and lakes. Of these issues, draft indicators for five were suggested during the meeting.

A total of 13 recommendations was made by the meeting for further development of the EVI. These recommendations included mechanisms for improving global acceptance of the EVI model by highlighting its role in supporting human welfare. Recommendations were also given on future approaches to political and technical development of the index and sources of funding.

In order to complete the development of the EVI it will be necessary to focus on the following approaches: (1) There is an urgent need to ensure that the EVI is not perceived only as an islands issue. It is important that it is introduced into the international arena as a universal tool, relevant to all parts of the globe and useable at the scale of regions, countries and at the sub-country level. (2) The links between environmental security and human welfare need to be stressed as the central reasoning behind the index. The fact that the natural environment is the life-support system for all human systems, without exception, needs to be highlighted much more strongly. The EVI will occupy a new niche, allowing for environmental management at the same scales as those at which economic, social and cultural decisions are made – at the level of the country. Past management practices at either local or global scales, although necessary, could not operate in this way and did not allow for adapting policies. (3) There is a need to gain political acceptance for the EVI at the same time that it is undergoing its final stages of globalisation and testing. This includes introducing it at global and regional meetings, through governments and via publications. There is a long history of international documentation from meetings which called for the development of an EVI (Agenda 21, Barbados Programme of Action, AOSIS) and it is time to respond to these calls with the information that a functional EVI now exists. Rio +10 will be the most important meeting at which to present the index. (4) There was a call at this meeting for partners in developing the EVI among the countries invited. These collaborators were invited at this meeting to become part of the project in a very real sense. This will include the procurement of several sources of funding to assist in data collection, development and testing of the index. It also includes the establishment of links between all the collaborators on the project. (5) In addition to the excellent support given in the past, there is a need for UNEP to take a larger role in the development of the EVI. This includes political induction of the EVI into the world community, possible funding support and the use of existing mechanisms of data collection currently sponsored by UNEP.

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1   INTRODUCTION _____

1.1   *Background and Rationale*

Without exception, the environment is the life-support system for all human systems and is an integral part of the development and success of countries. But until now, it has not been possible to monitor the vulnerability of this life-support system at an appropriate scale to ensure human welfare. During the 1990's a call was made by the International community through Agenda 21, the Barbados Programme of Action and the Alliance of Small Island States to develop vulnerability indices that might address these concerns. The EVI has been developed in response to these calls.

A functioning Environmental Vulnerability Index (and profiles, collectively termed the EVI) was developed by SOPAC in the period 1998 – 2000. The EVI is the first tool to focus environmental management at the same meso-scales that decisions are made (economies and social systems), and focus them on outcomes. It is a method that uses 49 smart indicators to assess the vulnerability of the environment at the scale of entire countries. This is an appropriate scale because it is the one at which major decisions affecting the environment in terms of policies, economics and social and cultural behaviours are made. If environmental conditions are monitored at the same time as those concerning human systems, there is better opportunity for feedback between them.

To date, the EVI has focused on Small Island States because of an historic connection with the need to determine Least Developed Country (LDC) status on criteria other than purely economic ones. In 1999 at an Expert Think Tank in Suva, Fiji, the potential of the EVI was highlighted and the need to globalise the model stressed (Kaly*, et.al.* 1999b). During 2001, a minimum of 80%[1] of the EVI data requirements were collected for a total of 14 countries, (Table 1). Partial data are also held for 5 additional countries, and it is expected that collection will be completed during the next few months. In addition to the above, approaches were made to a further 22 countries of widely varying biogeographic, economic, environmental and hazardous conditions for the purposes of globalisation and testing of the model (Table 2). These countries were selected to represent some of the global extremes in terms of country characteristics, environmental conditions and hazards needed to generalise the EVI and scale its indicators. It is hoped that data will be available for at least 30 countries for testing the EVI during early 2002. Additional data are, at the same time, being collected for specific indicators for at least 100 countries for which published data sets are available.

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[1] 80% of the indicators need to be answered for a valid EVI

Table 1: **List of countries for which data are either in the process of being collected, or for which 80% of the EVI data are already held.**

Minimum of 80% of data held	Data in process of collection
Cook Islands, Fiji, Federated States of Micronesia, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Tonga, Tuvalu, Vanuatu, Trinidad & Tobago.	Australia, Malta, Mauritius, St. Lucia, New Zealand

Table 2: **List of the countries included in the globalisation of the EVI, with a justification for the inclusion of each.**

Country	Characteristics
Australia	Large, heterogeneous, island/continent, biogeographic range
Bangladesh	Medium, riverine, downstream effects from other countries, Asia
Bolivia	Small, landlocked, Americas
Botswana	Small, landlocked, tropical, Africa
Brazil	Large, rainforest, biogeographic range, downstream effects to other countries
Costa Rica	Small, biogeographic significance
Greenland (Denmark)	Large, ice habitats
Greece	Medium, mixture of fragmentation, Mediterranean
Ireland	Medium, biogeography
Israel	Small, desert
Italy	Medium, biogeography
Kenya	Medium, biogeography, Africa
Kyrgyz Republic	Small, biogeography, Eurasia
Maldives	Small, Indian Ocean islands
Malta	Small, Mediterranean, Developed Island State
Nepal	Small, plateau, biogeography, landlocked, downstream effects on other country
New Zealand	Medium, biogeography
Norway	Medium, biogeography
Philippines	Medium, extreme fragmentation, Asia
Singapore	Small, developed, Asia
Switzerland	Small, developed, Europe
Thailand	Medium, biogeography, Asia

1.2 Purpose and agenda of the Globalisation Meeting

This meeting was held from 27 – 29 August 2001 at United Nations Environment Programme's (UNEP) International Environment House, Geneva, Switzerland. The meeting was attended by representatives from the EVI Team of the South Pacific Applied Geoscience Commission (SOPAC), UNEP (Nairobi and Geneva), Foundation for International Studies (FIS) of the University of Malta, International Strategy for Disaster Reduction (ISDR), and representatives from Bangladesh, Greece, Kyrgyz Republic, Nepal, Norway, Philippines, and Thailand. The sessions were chaired by Mr Craig Pratt, Professor Lino Briguglio, Ms Elizabeth Khaka, and Dr Ursula Kaly.

The purpose of this meeting was to begin the process of globalising the EVI by assembling representatives of countries that cover some of the global environmental extremes found on the planet not specifically included during earlier development. This group was asked to familiarise themselves with the EVI, collect test data and provide inputs on any additional features or indicators that might be needed to cover global conditions. The overall aims of the Globalisation Meeting were therefore to:

1.   Introduce the concepts and gain support for the EVI in the first round of countries included for globalising the model;

2.   Obtain data from the cooperating countries (including those that could not attend the meeting in person);

3.   Obtain inputs on 5 topics relevant to this process:

Topic 1:   Extending the indicators of the EVI so that they cover global conditions. Are there any other indicators we should include?

Topic 2:   Perceived uses for the EVI in your country or generally

Topic 3:   Are there special problems associated with data collection in large and/or heterogeneous countries? How could they be addressed?

Topic 4:   Recommendations on how your country can be involved, together with the Pacific Region and other partners, in the process of further developing the EVI.

Topic 5:   Recommendations on how data collection mechanisms might be set up within your country. How might they be set up in general and/or in relation to global data-collection mechanisms? Include a time-line.

The agenda of the Global EVI meeting was as follows covered the topics and aims indicated above. A summary of the main agenda items is listed here, and the detailed programme reproduced in Appendix 1.

- Opening statements
- Statement on UNEP's support and involvement in the EVI
- Self introduction of participants
- Brief summary on history on vulnerability indices (VI's) and the need for an EVI
- Statement on SOPAC's development of the EVI to date
- Overview of the EVI model, results so far, and criteria for testing
- Country Statements
- Discussions on Topics 1 – 5
- General discussion and recommendations
- Closing statements

1.3   Opening and Closing Addresses

1.3.1   Welcome address by Mr Craig Pratt, EVI Project Coordinator, SOPAC

Mr Pratt welcomed each participant to the Global EVI meeting and extended SOPAC's appreciation to everyone. He acknowledged UNEP's assistance and their provision of excellent facilities for the Global EVI Meeting.

Mr Pratt then gave a brief summary of the agenda, aims of the meeting and topics for discussion. He also introduced the various presentations that would be given by the SOPAC EVI team and collaborators. Items of 'housekeeping' were also covered.

1.3.2 Address by Dr Arthur Dahl, Director of the Coral Reef Unit, Division of Environmental Conventions, UNEP Geneva

Dr Dahl addressed the Global EVI Meeting on behalf of UNEP. He gave a brief history of UNEP's involvement with SOPAC and the EVI, and stressed its importance as a tool for measuring the ecological vulnerability of a country. With these words, Dr Dahl officially launched the EVI idea to the participating countries.

1.3.3 Address by Ms Elizabeth Khaka, Programme Officer, UNEP Nairobi

Ms Khaka commended the efforts of SOPAC and Professor Lino Briguglio in taking up the EVI challenge. She assured the participants of UNEP's continuing support for the EVI project not only for small islands, but also for large countries. She stressed that the EVI is a useful tool, especially at the national level, for determining any country's vulnerability measures.

1.3.4 Address by Professor Lino Briguglio, Director, Islands and Small States Institute, Foundation for International Studies, University of Malta

Professor Briguglio gave a brief introduction to the concept of vulnerability indices and the background issues surrounding them in the context of Small Island Developing States (SIDS). He highlighted that the Commonwealth Secretariat had introduced the vulnerability concept, but had found very few workable indices to date. Some countries are cautious about vulnerability because they feared that the concept could be misleading.

Professor Briguglio stressed that the main concern for Small Island States (SIS) is their vulnerability. This means that they may be prone to damage even if they're doing well economically. Often this is perceived as being related to their small size. The importance of having an environmental vulnerability index in addition to an economic vulnerability index was stressed. It could be used not only for the purpose of receiving financial assistance for developing states, but more importantly for understanding it's environmental issues in comparison to other countries. Professor Briguglio outlined involvement in the initial stages of setting up the EVI methodology and his belief that the EVI could be refined in order to remove several indicators which he believes will turn out to be redundant. Examples include indicators such as population density and waste management.

1.3.5 Address by Dr D. Kaniaru, Director of Environmental Policy and Implementation, UNEP, Nairobi

Dr Kaniaru addressed participants on the second day of the meeting. He expressed his support for SOPAC in addressing the environmental vulnerability of SIDS and acknowledged their efforts in taking the lead in developing the EVI. Dr Kaniaru also acknowledged the existence of environmental vulnerability problems in countries throughout the globe, and highlighted a few issues in countries such as China, Bangladesh, and Mozambique. He stressed that the EVI project is a task of great magnitude that can influence donor countries. It is thus important that the project obtains the involvement of other countries in addition to those represented at the Global EVI Meeting.

Dr Kaniaru was pleased with the progress of the EVI project and encouraged the participants to take the lead in globalising the EVI model. Dr Kaniaru then stressed the need for simplicity that would enhance understanding of the EVI and requested that jargon be avoided and reports kept simple. He also suggested that the EVI be introduced as 'soft law', through negotiation and introduction to Action Plans. This could later be adopted as 'hard law', through international agreements or treaties.

1.3.6 Introduction to the EVI model, Dr Ursula Kaly, EVI Team Leader, SOPAC

Dr Kaly summarised the EVI concept and model to give participants the opportunity to raise any queries they may have on the structure and function of the index. She introduced possible uses for the EVI which take its usefulness far beyond the initial concept as a measure of vulnerability for SIDS concerned about LDC status. She described the approach taken by SOPAC and collaborators (including Prof. Briguglio and Think Tank participants - see Kaly et al 1999b) to build the model and select the smart indicators of environmental vulnerability. Outputs of the EVI were discussed and approaches to globalisation. Dr Kaly also presented the three agreed criteria for testing the EVI before it could be officially released for use.

1.3.7 Closing Statement, Dr Arthur Dahl, UNEP

Dr Dahl officially closed the Global EVI Meeting by acknowledging the efforts of each participant in their collaboration with the SOPAC EVI team. He reiterated the importance of the EVI at the national, regional and global levels. He agreed with Dr Bollin's remarks in which she expressed interest in the EVI work and the need to collaborate because some indicators may overlap with the ISDR index. Dr Dahl acknowledged SOPAC's efforts in creating the EVI on behalf of the world community.

2 MAIN OUTCOMES OF DISCUSSIONS _____

2.1 General responses to the EVI model and indicators

This discussion arose after Dr Kaly's presentation summarising the mechanics and work remaining on the EVI and continued as needed throughout the meeting. The following list covers the main points.

2.1.1 General comments and gaining support

1. The EVI needs to be kept simple. The key here is to try to obtain the best results for the least input.

2. The EVI has a political dimension and there is a need to obtain political consensus on its use. This will not be an easy process and will depend on support from participating countries. It was noted that the Forum Secretariat should be kept informed and will assist SOPAC in this regard. This applies to other Pacific Regional organisations.

3. In terms of global acceptance of the EVI: The World Summit 2002 was raised as a possibility for the Forum Secretariat to improve the EVI's global acceptability. Assistance should be sought from AOSIS to put the EVI on its agenda. SOPAC is currently writing a submission for the Rio+10 meeting to show that the EVI has greater significance than just LDC status. The foundation of political debate should be at the G77 (Group of 77 Developing Countries) meeting. It is important that not only small countries be involved, but also the larger ones.

4. A need to link environmental security or condition with poverty was identified. Poverty occurs where there has been an overloading or breakdown of the environment so that it can no longer properly support humans. The environmental issue is seen as lip service in African countries where their main concern is poverty. Thus, there is need to couch the EVI with poverty in order to gain acceptance from such countries. There is a need to look at correlations on poverty trends and the EVI and be able to demonstrate the link between the EVI and poverty before there can be any political investments.

5. The idea of environmental security was defined (loosely) as ensuring that the environment is intact and functioning sufficiently to support human activities. It would be considered similar to food security which is better understood.

6. A query was raised on whether the EVI should or could include human systems (as responders). Here it was confirmed that although the signal can vary according to the set of indicators included, the purpose of the EVI was to focus on natural systems.

7.   There was a request that the preliminary EVI results for the 3 Pacific Island Countries be used as examples for gaining support from participants' governments. This was considered useful as long as it was understood that the results were only preliminary and will change as the indicators are themselves refined. There was a need to demonstrate that the EVI had been tested before some of the governments (e.g. Bangladesh) would become involved, devoting time or funding to the collection of data. If the processed EVI data for Pacific countries were released, it should be done without identifying the countries involved. [Editor's note: There is a circular problem here because participants are being approached to provide data for testing so that a tested EVI may be presented to the world].

8.   A request for assistance in writing proposals to participants' governments was made and SOPAC agreed to help.

9.   A call for collaboration between SOPAC and UNDP was made for data collection from published sources.

10.   It was understood that the EVI helps each country in its own context. In Nepal, there are local scale phenomena occurring in each district. Using the EVI at these scales might be useful.

11.   The HDI (Human Development Index) and its usage were raised as a possible lesson for the EVI, but this was seen as unlikely to be helpful in the short term.

12.   One of the key features of the EVI is its ability to set baseline conditions so that improvements to the country's environment can be made and the success monitored. It could also be used to assign blame / claim compensation. Quantifying vulnerability can be a measure of good performance if improvements are made, and is an indicator of good environmental management.

2.1.2   Testing and scoring

13.   It was agreed that any indicators that turn out to be redundant will be removed during testing, choosing the simplest measure out of those found to be correlated. This process will require data from a reasonable number of countries.

14.   A query on the 80% of indicators answered as a cut off for a valid EVI was raised. It was suggested that this should not include indicators for which data are not applicable. [Editor's note: This would undermine the logic of the index as currently accepted and as defined during the Think Tank. Indicators not applicable to a country are currently scored at the lowest value of 1. This is intentional because it describes that country as relatively invulnerable to the indicator at hand. It follows logically that such an indicator is a real observation telling us that vulnerability to that hazard is low (or zero). Such an indicator cannot be excluded from the count of valid responses in the EVI and must therefore be within the minimum 80% requirement of answered indicators. The only indicators counted as unanswered are those for which no data exist or could be found. A full discussion of this issue can be found in Kaly et al. 1999b section on "gross" and "nett" vulnerability – this distinction was discarded from the EVI].

15. The criteria for testing the EVI were generally accepted. There was a request to change the name of Test 2 from "sensitivity" to "possibility" test. A concern was raised that the naïve experts used for Test 3 might give wildly differing results [Editor's note: this is expected and considered part of the test]. It was suggested that the naïve experts should be each sent to all of the test countries so that they could compare. There was also a comment that sending naïve experts without guidelines would be risky – in econometric studies the usual practice is to give 2 or more people certain tasks but to ensure that a standard method is followed. [Editor's note: The idea here in Criterion 3 is to give the EVI a reality check. Reality is that at present people do go out and do ad hoc assessments that are not comparable. If the EVI is going to be useful it has to be an improvement on doing these ad hoc assessments – it therefore has to be compared to them].

16. The question of using a 1 – 7 instead of a 1 – 10 scale was raised. It was explained that the scale was based on ease of use, having a central value for "medium" scores and was based on studies showing that too many divisions tend to be more confusing and difficult to use.

2.1.3   Data quality and collection

17. A query was raised on how we might deal with relative accuracy and other characteristics of the EVI data. A comment was made that this in part depended on the persons collating the data. The mechanisms already incorporated in the EVI for the purpose of identifying the quality of data were highlighted.

18. Data collection is time-consuming and often difficult with data not being available for some of the indicators, or data being available needing to be paid for. The possibility of SOPAC or another organisation raising funds for data collection was discussed.

19. Possible sources of public data to fill in gaps where data do not seem to be readily available from within the country were discussed. These include FAO, EU, GRID, and Internet pages belonging to government departments (e.g. Meteorology Department of Greece). There is a problem with using these because of differences among the sources. It was recommended that a list of acceptable sources be compiled.

20. A concern about the effect of accuracy of data was raised. It was pointed out that the EVI was likely to be robust to small inaccuracies in the data because of the large ranges and scoring involved. Small errors will have small effects on the final EVI scores.

21. Some countries have legislation for sharing data. This should be utilised and encouraged. There are clearly differences in how countries share their data, with those having a more open attitude finding it much easier to collect EVI data.

22. The issue of sensitive data was raised. Data on meteorology, water and forests were often considered sensitive because governments did not always want to acknowledge the extent of their problems. Clearly, permission needs to be sought from governments before data can be made public.

23. Creative means of collecting the data were discussed. An example was that of Trinidad & Tobago where EVI data collection was set up as a project for university students.

24. It was noted that many data were sub-optimal. This was considered good enough for initial calculations and testing. Data collection processes would have to be set in place and this will take some time. The EVI values for a country may be refined as data collection improves. Our focus at the moment is on refining the EVI itself so that the vulnerability concept can be captured.

2.1.4   Relevance of indicators

25. A comment was made that the EVI contained indicators irrelevant to some countries and that additional ones would be needed for some of those countries present at this meeting. Deforestation, soil erosion, diseases, transboundary pollution, other effects relating to boundaries and flooding were raised as some of the key issues. The remaining task is then, to add indicators that might be needed to make the EVI applicable globally – the crux of this meeting.

26. The absence of desert countries at this meeting was noted. Two African countries had been invited, but could not attend the meeting. Work with these countries will proceed so that they will be included in the testing.

27. The criteria for selecting countries was queried. A request was made for the criteria to be made explicit in this report.

2.2   Results of topic discussions

2.2.1   Topic 1: Extending the EVI Indicators to Cover Global Conditions

Part of the process of extending the indicators to cover global conditions included amendments to certain indicators to make them more general. For example, Dr Scott suggested the previously discussed amendments to indicator 40, on percentage of degraded land. It was recommended that any changes to the indicators be circulated among collaborators before being brought into effect.

The topics for several new indicators were proposed. This included an indicator for fragmentation of natural terrestrial habitats. The suggestion was made that the area of the 3 largest patches could be summed and divided by the total area of natural terrestrial land. This would be included as an EDI measure.

An indicator pertaining to transboundary issues was also proposed, including the problems of countries which receive waste generated in other countries, pollution, the migration of species and effects of erosion being carried by rivers. An example of transboundary pollution includes the case of smoke pollution experienced in Singapore as a result of forest fires in Indonesia.

Also highlighted was the issue of refugees crossing boundaries and using resources and bringing pests and disease. This was emphasised by Mr Adhikari who indicated the serious environmental and social problems being caused in Nepal by the influx of several hundred thousand refugees (at least 1% of the total population of Nepal) from Bhutan since 1990s. Due to the mountainous terrain and open borders of Nepal it has been difficult to control movement of people across the borders of Nepal. It is not clear whether the issue of refugees is covered by the civil strife indicator which may act as a good proxy. The need for good water management in middle-eastern countries was highlighted in this context. It was suggested that the number of borders being shared with other countries could be included as an additional indicator which would act as a proxy for these issues.

There was also a suggestion that over-hunting on land should be considered to complement overfishing in aquatic systems. This would be more applicable to landlocked countries.

By the end of this discussion, the need for 6 – 7 new indicators had been suggested for inclusion in the EVI in order for it to adequately cover global conditions. These were: (1) number of borders shared by a country; (2) transboundary pollution / erosion; (3) fragmentation of natural land vegetation cover; (4) migratory species; (5) glaciers, permafrost, and ice sheets; (6) avalanches, mudslides, and land slides; (7) overhunting of land animals; and (8) lakes.

2.2.2 Topic 2: Recommendations on Uses of the EVI in Each Country and Generally

Participants at the EVI Globalisation Meeting generally agreed that the EVI had a range of uses, many of which would be of immediate value within their countries. The uses listed here are largely in addition to those identified at the Think Tank and earlier meetings. They were:

1. A planning tool at the country level (Bangladesh) and a mechanism for organising the environmental data being collected

2. A planning tool at the sub-country level (Nepal, UNEP). The averaging of data at the national level (the main focus of the EVI at present) would tend to submerge differences among zones, but this is seen as a matter of the focus of the EVI: it can be used at either the national or sub-national level. If used sub-nationally, it would be useful for identifying provinces or zones with particular vulnerabilities and then be an aid to national planning.

3. Useful for prioritising environmental actions (Kyrgyzstan)

4. Provides guidelines to help governments establish limits and targets and how to best use environmental data (Nepal)

5. The data collection process and questionnaires are useful for collaboration with other departments, for development projects and for international agencies (Nepal)

6. Can be used to process compensation claims on transboundary pollution problems (Nepal, Bangladesh)

7. With the EVI providing environmental information in simple figures, its use will allow for better use of environmental information in decision making by policy-makers (UNEP)

8. Can be used to identify problems so that further investigations may be undertaken to understand their causes, particularly if coming from other countries (Nepal, Thailand, Bangladesh)

9. Could be used by governments and NGOs for improving public awareness

10. The indicators on anthropogenic influences could be used for stimulating government action, particularly because they provide guidance on how policies could be changed to effect improvements. Geological and other indicators could also function in this way because policies can be put in place to minimise the risk of disasters

11. A planning tool at the Regional level (agglomerations of countries) (UNEP)

12. A signal of where assistance is required to be used by regional organisations (e.g. SPREP)

13. The EVI could be recalculated for different ecoregions to identify the actions of different environmental processes as a way of understanding some of the issues that the index will identify within countries.

2.2.3 Topic 3: Special Problems with Data Collection and Solutions

A range of problems was identified by participants in relation to the collection of EVI data within the country.

1. Data are available in provinces of the country but are not collated at the national level. This problem was highlighted by Greece where data varied in the different ecological zones or provinces found in the country. The need to set up reliable data collection and collation mechanisms was highlighted by this problem.

2. Data are available in different units to those required by the EVI. This problem was highlighted by Nepal and Thailand and it was resolved that raw data could be supplied to the EVI Team who would convert them to the correct units. Where units cannot be converted, the issue will be addressed as part of the establishment of suitable data collection mechanisms.

3. The effort required to calculate the EVI's indicator values from the raw data being collected in some cases is very large.

4. There is an unwillingness among some departments to provide the data. This was seen as a problem in some cases because of a lack of authority to access the data (needing an official letter of authority) (e.g. Nepal), because there is an unwillingness to 'vouch' for the data as official (e.g. Thailand), or because departments now require payment for releasing data. There was an agreement that for the purposes of the EVI's development, 'unofficial' data would be accepted from participants. The need for identifying the provider of data is largely so that inconsistencies or errors could be directed back to the correct person.

5. Data from different sources can differ in value and quality. Thailand and Nepal considered government data to be more reliable than from NGOs who normally collect data only for selected sites or their own purposes and which are often not on-going. A request for priority listing of acceptable data sources was made. It was also suggested that links be added to the SOPAC EVI website. There was some concern that data could be of poor quality because it was collected by untrained personnel. The quality of the data for a country will be largely dependent on its own efforts and quality assurance. Although there is no absolute way of determining whether data are wrong, large deviations might be visible by comparison among countries, much like an inter-laboratory comparison.

6. Data for some indicators could be obtained from external sources and that the burden does not necessarily have to be entirely on the country itself. The WHO website updates data on safe sanitation every 6 months. [Editor's note: web sites to try are www.wri.org/ehi/water.html, www.cnie.org/pop/pai/image4.html, www.igc.apc.org/wri/wri/ehi/dev-water.html].

7. Data are often not available in electronic format, making collation for the EVI's indicators difficult.

8. Some of the indicators were difficult to understand and required more explanation on the data collection sheets. Clarifications were specifically requested for Indicators 13, 14, 15 and 17, and all of those depending on IUCN, WHO or FAO definitions which should be reproduced on the sheets. The English and terminology should also be simplified.

2.2.4 Topic 4: Recommendations on How Each Country can be Involved Together with the Pacific Region and other Partners, in the Process of Further Developing the EVI

The participants were given an opportunity to air their views on how their country could be involved in the process of further developing the EVI as partners with SOPAC, UNEP, donor countries, the Think Tank, Pacific Region and other involved countries.

Many of the participants were interested in extending their involvement past the data collection stage and into the planning and programming of the EVI. For many of the countries, however, this has been on a personal level rather than at the government level. The importance of involving governments in the development of the EVI was stressed – without it, the index would not carry enough weight to become accepted politically. Most of the EVI data collected to date has come through government sources. It is therefore expected that government is aware of the EVI work, although it is important that governments be officially informed of the EVI work. As the need to validate data becomes more important and to ensure government authentication of data at all levels the EVI indicators questionnaires also include a section requiring government stamp and signatures.

To enhance the coordination of EVI data compilation at national levels it was suggested that SOPAC request nominations for government officials to be contact points in each country, but as SOPAC is a Pacific regional organisation this cannot be done officially by SOPAC. However, the UN mechanism provides an ideal opportunity to extend invitations to countries to become involved in such projects, and encouraging countries to identify appropriate focal points. This focal point will be of great importance particularly as global discussions on the EVI reports continue.

In Thailand the EVI project is at Thailand's government level, so it is possible to ask for official release of the data, requiring the approval of the respective Ministers. It will be important to identify the next few steps of the EVI project before the participant from Thailand can liase with her government. With this in mind, it was recommended that participants wishing to be involved further should approach their own governments for approval and support of global EVI work. UNEP could provide further back up by writing to each Environment Ministry in order to facilitate this process.

Some participants saw themselves as focal points and volunteers for the project, with SOPAC essentially as the data collector, not having enough capacity in the country to carry out the work alone. In the case of Bangladesh, Mr Haider's involvement was approved by the Ministry of Forests and Environment, but there was a need for more technical assistance. Technical assistance and consultants were sought for data compilation and to present the results to senior government officials. For these countries, funding assistance is required to facilitate EVI data collection. In the case of Bangladesh, this could amount to around 1 million taka (USD $20,000).

It was suggested that UNDP and GEF provide financial assistance for such purposes, depending on priorities. Bangladesh could assist in the development of the EVI by submitting a proposal to the UNDP and, if successful, set the stage for other countries to do likewise. Because of the EVI's value as a tool for assisting existing projects, such as disaster reduction, it should gain the support of UNDP. It was suggested that each of the participating countries in the project would need the support of UNEP to access funding from UNDP. This approach is much more likely to be successful once initial data have been collected from the countries, scoring for the indicators set and draft EVI scores calculated. To facilitate this approach, SOPAC requested that participants at the meeting return their EVI data by November 2001. After this, a letter could be written by UNEP on behalf of all the participating countries in request for UNDP funding. It was agreed that all participating countries, apart from Bangladesh (Mr Haider would still attempt to provide the required data for his country personally), continue with the EVI data collection and receive reimbursement from UNDP later when/if a proposal is approved. A reminder was given that each government's authorisation is needed for GEF funding.

2.2.5 Topic 5: Recommendations on Setting up Data Collection Mechanisms within Each Country and in Relation to Global Data Collection Mechanisms – Including a Timeline

Several important suggestions were made concerning continued data collection, development and communication among participants once the meeting was over. These included:

- Each participant holding consultations with their respective agencies on indicators needing refinement, such as Indicator 22 on remaining natural vegetation;
- There should be a monthly or bimonthly update sent out to each participant on each country's data collection status.

The importance of collecting data on an on-going basis was stressed. The outcomes of many projects lose their value because data are only collected on a limited basis, and/or for only a short period of time. The Statistics office in each country is a data-collection library and includes environmental statistics. Although in some countries, departments may not share data among them, most do give them to the Statistics Department and international agencies. This presents an opportunity for setting up data mechanisms for the EVI.

Another issue raised was that although reporting obligations may exist in countries, this does not necessarily guarantee their storage. This has lead to the existence of gaps in institutional structures, with some governments not having foreseen the importance of collecting data continuously. This is an area in which the EVI will play an important role.

2.2.6 Political steps for gaining global acceptance of the EVI

Although not specifically one of the discussion topics suggested for the meeting, participants felt that gaining acceptance of the EVI in the international community was of equal importance to technical development. As such, this topic came up for discussion several times during the meeting, and a multi-pronged approach evolved. This approach included political introduction of the now functional EVI in addition to more direct methods.

Global Meetings

1. For both political and direct approaches, it was suggested that the EVI's political origins be stressed. It is a direct product of Agenda 21 (Chapter 17) and received global support during the Global Summit on Small Island States held in Barbados, 1994 (the Barbados Programme of Action).
2. It was suggested that the EVI should be introduced at the Rio+10 meeting in Johannesburg and the G77 and EU in order to gain world-wide support. Other opportunities for introducing the EVI at meetings should not be missed, including an opportunity for Dr Dahl to introduce it during his trip to Brunei.
3. Tuvalu's maiden speech in the UN could include EVI and will carry a lot of weight. Tuvalu has been a strong supporter of the EVI throughout its development.

Regional Processes.

4.   The presiding government speaks for the EU. This changes every 6 months. It is recommended that SOPAC finds out who will be chairing and put the EVI through this channel.

5.   The Forum Secretariat should be given the results of this meeting to put the EVI's progress in the Forum Discussion.

6.   Regional organisations, such as SPREP should be encouraged to mention results of the EVI in their SOE (State of the Environment) Reporting.

7.   Individual donor or collaborating countries in a region could gain the support of their neighbouring countries. For example, Ireland and Norway are major donors to the EVI and Greece is a collaborator.

8.   Strategic countries, such as Bahrain could be interested in the EVI because they are SIDS. In the case of Bahrain this could lead to interest from other OPEC countries.

UNEP

9.   UNEP is called upon to take more of a role in the development of the EVI, particularly on the political aspects. Malta could support this process – even if exits AOSIS

10. In any case, UNEP's involvement should be on-going, and its support of the development of the index is seen as critical to success. To obtain further assistance, it will be necessary to write a 1-2 page discussion document, in layman's language. Bangladesh supported this approach, saying that with UNEP's encouragement the EVI might be more easily adopted by developing countries.

11. UNEP will assist with finding out which countries previously supported the EVI in UN General Assembly and report back to the collaborators.

AOSIS.

12. AOSIS in the G77 are important supporters and may bargain for support of the EVI. An approach needs to be made to Mr Slade (AOSIS) by SOPAC Programme Manager, Dr Russell Howorth. Malta offered to assist with the support of the EVI through AOSIS.

Agreements and International Data Reporting

13. The International Conventions Group could be shown how the EVI could fit in to their goals, as it involves aspects of biodiversity and could therefore be adopted to simplify reporting in their conventions. Dr Dahl encouraged that the EVI concept be introduced into the major international program as a means of supporting a country's ecosystem.

14. The EVI could be presented to the Millennium Assessment Project UN Foundation / WRI / Earthwatch / UNEP.NET that all require ecosystem assessment. These groups could adopt EVI as part of the assessment process.

15. The possibility of introducing data collection for the EVI as 'soft law' was raised. This would depend on the political context of the EVI. If it were integrated into one of UNEP's processes, there would be a collective momentum for countries to participate in globalising and eventually using the EVI. It was suggested that this process could be initiated during the Pacific Multi-Stakeholder Consultation for World Summit on Sustainable Development scheduled for 5 - 7 September 2001.

Promoting in-country support in Collaborating Governments.

16. Participants' own governments need to be aware of their involvement with the EVI, and should not find out about it at an international meeting.

17. Participants could approach their own governments on the fact that the EVI exists, how it would be a valuable tool, and ask for government support at international meetings (e.g. Kyrgyzstan suggested this approach before the Rio+10 Meeting)

18. Re-circulating the EVI results within a country, back to those departments that contributed data would be a useful mechanism for gaining support. Nepal has already decided to do this and reports will be sent to the Environment Department, Meteorology Department, and the Ministry of Local Development.

Other approaches and issues

19. With their permission, those countries that have used the EVI for internal purposes could be used as examples for gaining acceptance (e.g. Tuvalu & Nepal).

20. The need to move the EVI out of a perceived role as an 'islands' concern is of paramount concern in the process of gaining world-wide acceptance. Its uses as a sustainable development tool for all countries needs to be stressed.

21. Caution was suggested for sensitive data for OPEC countries – support for the EVI might be limited in these countries.

22. It is important that the EVI is not just seen as a tool for islands. It is proving its usefulness for all countries. It is appropriate for Johannesburg to adopt the EVI for all nations as part of sustainable development now that the index has been tested globally.

23. In 1994 all island states made reference to the issue of vulnerability, but by 1999 only 6 or 7 did. This means the potential exists to regain their interest. Four UNEP Governing Council Documents need to be accessed for this purpose.

Publications and newsletters

24. Two types of papers to be written by SOPAC and reviewed by participants are needed to facilitate all of these processes. Thailand suggested that a document on the EVI should be prepared for presentation at its Regional Forum (and for Rio+10) before formally introducing it to the country, and other uses were suggested. The two resulting types of papers required were:
    - 2-page paper in simple language for political uses; and
    - Paper in more technical depth for technical review

25. Acceptance and knowledge of the EVI could be spread through the use of newsletters such as Earthwatch and GOOS, though there are many more opportunities in this area.

26. The need to keep publishing in international peer-reviewed journals throughout development of the EVI was promoted.

2.3 Responses to Country Statements

2.3.1 General comments

- It was recommended that the EVI team highlight ISDR who are taking the lead in developing an index for parallel human risk dimensions. This would better respond to current thinking of policy makers and would complement the EVI.

- It was noted that the Anthropogenic sub-index might be of greatest interest in Bangladesh, at least to begin with. It will be important to make the connection with human systems in clear terms in order to attract participation from many of the countries.

- Dr Christine Bollin, a short-term consultant with the UNDP/ERD in collaboration with the ISDR, mentioned briefly her work, which is involved in compiling the World Vulnerability report that has a lot of aspects of disaster risk including an index for disaster risk at the national level. This would help find the indicators for risk reduction and mitigation of different countries and would assist in government decision as to what it could do to help reduce risks to disaster.

- It was suggested that Craig Pratt initiate dialogue about each indicator on the environment and human systems with ISDR.

- The importance of highlighting human impacts was stressed. Rich countries generate wastes that affect the environment, which poor people rely on for their natural resources.

- The point was made that that there is not anything done that does not arise from the environment. This means that the EVI becomes very important as a tool for management of human systems. This point should be emphasised in the EVI to give it a high priority. It was agreed that the EVI should stress the human link.

- Thailand: Requested letters of support to gain access to data. This was echoed by other participants.

2.3.2 Comments pertaining to specific indicators and the need for new ones

- Bangladesh: A key indicator for air pollution was queried. SO2 is included for this purpose, but the possibility of using arsenic was raised, either separately or in water. Arsenic is natural in waters of Bangladesh, though it appears to arise due to deeper tapping of groundwaters. This may lead to problems also with salinisation, possibly requiring an indicator.

- Bangladesh: The liquefaction of alluvial sediments during earthquakes may not be captured in the EVI and is an issue for Bangladesh in terms of buildings [Editor's note: This would only be considered if it were an environmental one].

- If the EVI results are to be finalised by each country, policy makers may treat the issue of arsenic contamination differently. This may be the case at the national level, but the scoring gives a yardstick. At the global scale, this will not occur.

- It was suggested that very specific indicators such as arsenic not be included because they would lead to non-applicable responses in many other countries.

- Bangladesh: Of the 49 indicators, some were seen as important to Bangladesh while some such as volcanic eruption did not apply.

- Kyrgyzstan: There is a problem collecting meteorological data from 60 stations.

- Kyrgyzstan: Lake ecosystems in Kyrgyz are damaged by the tourism industry.

- The possibility of having an adapted coastal settlements indicator (25) or a new one (EDI) to cover lakes was suggested to capture their sensitivity to tourism, high nutrient levels and other forms of disturbance. Note that lakes are also included in land reserves.

- The indicator on safe sanitation needed better definition. It was pointed out that this indicator comes from WHO and exists as an external, public data source. The SOPAC team agreed to clarify this.

- There was a request for clarification on the wording and meaning of indicator 43. It was also suggested that this indicator may be redundant, though testing will identify this.

- Information on land degradation might be difficult to obtain for countries with a long history and profound changes to their natural habitat. This would certainly be the case in Greece. In that case, it would be best to refer to the current existing environment as natural conditions because this is what the environment will now revert back to if humans do not disturb it further. A request was made for a specific time frame in making these distinctions.

- The question was raised of whether degraded land area included city areas, city parks and industrial areas. The response was that degraded land includes all land that cannot revert back to a natural habitat, even if we define that natural habitat in terms of irreversible changes which occurred hundreds of years ago. The key to a natural habitat will have to be a pragmatic one and focus on habitats which can exist without human maintenance. It is acknowledged that this is not ideal. Agricultural land is excluded from the category of degraded land, being included in its own indicator. If agricultural land is overgrazed and damaged, it will then change category to degraded.

- A question was raised on whether there was an indicator of fragmentation of forest etc. This had not been included in the EVI to date. Field size was not considered an appropriate proxy because this depends on soil type and local economics. The use of GIS was suggested. Focus should be on wildlife, and particularly migratory species which are important in Africa and have not been included in the EVI.

- The importance of picking out the missing information in particular questions was stressed.

- IUCN definitions are to be provided from the 2001 version of the Red List to all participants.

- Definitions used in indicators on fisheries relied on FAO. FAO should have information relating to indicator 24 but it is not clear whether indicator 39 has an FAO definition.

- Loss of environmental quality refers to the fragmentation of land through the use of roads and includes degradation. Indicator 35 on the number of cars is used as a proxy for air pollution and fragmentation.

- The indicator on terrestrial reserves should specifically state that it includes lakes.

- The indicator on degraded land (#40) requires a better definition, with the period for recovery being limited to 100 years. The Convention to Combat Desertification (CCD) definition on degraded land needs to be included in the text of the indicator. There might be 3 different types of land: natural land, land being managed by man, and that which is damaged and cannot be used by man and cannot regenerate.

- Indicator 11 should include the wording 'and/or'.

2.3.3   Issues on the process of data collection

- Bangladesh: More time is needed for collecting data and capacity needs to be improved.

- Greece: It was suggested that some of the failure to respond to requests for data might be remedied by approaching the right person. This was done, but they needed constant reminders, making data collection very slow and difficult.

- Information on degradation may be found at http://www.nhq.nrsc.usda.gov/WSR/Scrolls?scroll1.html; and http://www.grida.no/db/maps/prod/level3/id_1234.html .

- Nepal: Has data on ores, but the form is different to that required for the EVI.

- Data on Indicator 41B on renewable water resources should be available from the World Resources Institute (WRI). This could be compared with internal data.

3   NEW INDICATORS PROPOSED TO COVER GLOBAL CONDITIONS _____

In the discussion on possible new indicators (Section 2.2.1), and at other points throughout the discussions, up to eight possible new indicators were identified for inclusion. The purpose of these was to ensure that the EVI did cover global conditions, despite the obvious need to keep the index simple. The issues identified were:

- Number of shared land borders;
- Transboundary pollution and erosion;
- Fragmentation of land cover;
- Migratory species;
- Ice bodies;
- Landslides;
- Over-hunting of land animals; and
- Lakes

Not all of these lead to a new indicator in the context of the meeting, and there is a need to look at these issues again later. The five new draft indicators suggested and discussed were as follows. No indicator was suggested for transboundary problems associated with pollution and erosion.

3.1   Indicator 50: Shared borders

Number of different land borders shared with other countries.

IRI, Anthropogenic

This indicator attracted little controversy. Most of the participants agreed that it would act as a valuable proxy for problems associated with wars and refugees which may result in uncontrollable damage to a country and its environment. It would also be a valuable indicator for problems of pests, disease and uncontrollable movements of gene technology. Transboundary impacts will be partially represented in this signal, as would problems associated with migratory species. The focus of this indicator is the lack of self-determination of the country. That is, events occurring in neighbouring countries could lead to adverse effects on the environment, with the possibility of very little control. This is certainly a vulnerability issue.

3.2   Indicator 51: Fragmentation of natural land cover

This indicator was more difficult to define. Its basis is in the ecological literature where biodiversity correlates with the size of fragments (species-area curves and landscape ecology). It is based on the assertion that natural vegetation cover, regardless of the form it might have taken, was by definition 100% before humans started to change the landscape. It is worth pointing out here that there are two concepts involved. Patches are natural features of a landscape presenting as variability of species assemblages and physical features of the habitat. That is, a forest might have within it patches of grasses, shrubs and tree areas. These are all natural options of cover within the overall forest ecosystem and from time to time patches may change from one type to another. This pattern is seen in all kinds of ecosystems throughout the world. In contrast, fragments are man-made. They are isolated areas of natural cover formed when parts of the landscape are converted to human uses (agriculture, cities etc). A single fragment of natural forest may contain several different patch types, so it is important that the two concepts are not confused.

Clearly fragmentation of terrestrial landscapes is an important vulnerability issue. As fragmentation increases, overall biodiversity will tend to decrease and localised extinctions become common. For many of the larger species, such as mammals with large home ranges or which migrate, fragmentation can mean complete extinction.

This indicator was drafted in several different forms, each of which will require additional research before a final indicator will be found.

Option 1:

Total area of the three largest fragments as a proportion of the total area of natural land cover.

EDI, Anthropogenic

This form of the indicator may be inappropriate because it focuses on the largest fragments and does not give us much insight into the smaller ones (those which would present the most problem). A situation in which there are 3 very large fragments, and the remaining natural cover is present in very small pockets would attract the same vulnerability score as a situation in which the remaining fragments were fewer, but also of a large size. This would lead to an inaccurate vulnerability assessment.

Option 2:

Percent of natural vegetation cover in fragments of less than or equal to 200ha, excluding those that occupy entire islands.

EDI, Anthropogenic

The size of the fragments has arbitrarily been set at 200ha here. It will be necessary to refer to the landscape ecology literature to determine the best fragments size for the indicator. This form of the indicator focuses on the smaller patches, and will be based on ecologically relevant measures.

3.3   Indicator 52: Migratory species

Number of known species which migrate outside the territorial area at any time during their life spans (including marine species).

REI, Biological

This indicator is included because the welfare of the species is for at least part of their lifecycle not under the control of the country. For example, there have been major problems associated with migratory fish stocks, such as tuna, where one country may try to implement sustainable fishing practices while another may mine the stock without controls. Further, some of the species may be important from a biodiversity perspective (whales, turtles) or may be keystone species. Keystone species are those that by their actions define ecosystems – without them the whole ecosystem can breakdown (such as large African herbivores).

3.4   Indicator 53: Glaciers, permafrost and icesheets

Mean annual change of area of ice as a proportion of total land area (average over last 5 years)

EDI, Geological

This indicator focuses on the loss of glaciers, permafrost and icesheets as ecosystems. The form of the indicator is similar to the loss of land cover question. (A negative value indicates loss and a positive value indicates an increase in ice cover).

3.5   Indicator 54: Avalanches, mudslides and landslides

There was some question of whether this issue was widespread enough to lead to major environmental damage. Though certainly it is of concern to humans, it is not yet clear whether this indicator belongs in the EVI. The occurrence of slides depends on many variables which may not be well understood in a country. These include slope, type of materials, starting events and fluidisation. The indicator was discussed in two forms during the meeting and additional work is needed before a workable draft will be available.

Option 1:

Number of slides lasting more than 30 seconds recorded over the past 5 years, divided by area of mountainous land.

REI, Geological

This form of the indicator would be easiest to measure if slides appear and can be recognised on seismic equipment. It is expected that slide will have vastly different signatures, and although not collected at present, the data may be present simply as background noise in the recording of earthquakes. Additional research is needed on this question.

Option 2:

Average slope of the 10 highest mountains

IRI, Geological

This form of the indicator is not well-defined. The definition of a single mountain is in question. Mountains can be defined by their highest peaks, but the foot of any one mountain may be very hard to define in order to ascertain slope. It is unlikely that this form of the indicator will be useful.

4 FUTURE DIRECTIONS AND RECOMMENDATIONS _____

4.1 *Recommendations*

1. The connection between the EVI, the environment and humans needs to be stressed to more accurately illustrate the EVI's importance in terms of human security. This will improve global acceptability of the index.

2. The international documentation supporting the need for an EVI exists (AOSIS, Barbados, Agenda 21-Chapter 17). In 1999 the governing council of UNEP committed themselves to supporting the development of vulnerability indices. This international documentation should be referred to heavily and the point needs to be made that the EVI needs to go to Johannesburg in response to these calls for action.

3. A multi-pronged approach is recommended for introducing the EVI at all scales throughout the world. This includes the level of global summit meetings, regional meetings and individual governments. Some of the suggestions for doing this are listed in Section 2.2.6.

4. The EVI should be paired-up with the Human Vulnerability Index (HVI) and/or ISDR, as complementary aspects to the overall issues of sustainability and human security. The EVI must be seen as a way of addressing human vulnerability issues.

5. During the next months it will be necessary to introduce the EVI to as many international meetings, soft-law agreements, and action plans as possible. This includes the Johannesburg Summit September 2001, UN Council, CSD. Technical development of the EVI will only be worthwhile if the political induction of the model occurs simultaneously to ensure the model will be used. The ideas have to be seeded into the process by the end of 2001 and will need to be finalised in Indonesia in May 2002. A good start will be the Pacific meeting next week.

6. The UN could assist with obtaining government approval and support of the EVI by writing to the Environment Minister in each collaborating country.

7. Governments of the partners involved in developing the EVI need to be informed officially of involvement to ensure political backing and eventual acceptance of the index. This step could partly be taken by the participants at the meeting who could inform their own governments.

8. The next steps in the development of the EVI need to be clearly defined by SOPAC for involvement by participants of this meeting.

9.   As a way forward, three types of funding were recommended for developing the EVI. Writing proposals for all of these are to be assisted by SOPAC:

- Initial funding assistance to be sought from UNEP for collecting test data;

- GEF medium level funding to be sought for technical development and testing of the EVI with participating countries as collaborators; and

- Bilateral funding to be sought from UNDP for longer term capacity-building and setting up permanent data mechanisms.

10.   Many of the problems with the data collection process could be addressed by obtaining funding and setting up permanent, organised collection mechanisms. The UN funds such data collections and could be approached for assistance and/or EVI data could be included in existing reporting obligations.

11.   Up to 8 new indicators might need to be developed to cover some of the vulnerability issues found in the countries participating in this meeting. These are to be examined by SOPAC and circulated to collaborators.

12.   The text of indicators should explicitly state where governments could make improvements to the EVI value by policy changes.

13.   The text of indicators should show how each indicator relates to human welfare.

4.2 Conclusions

In order to complete the development of the EVI it will be necessary to focus on the following approaches:

First, there is an urgent need to ensure that the EVI is not perceived only as an islands issue. It is important that it is introduced into the international arena as a universal tool, relevant to all parts of the globe and useable at the scale of regions, countries and at the sub-country level.

Second, the links between environmental security and human welfare need to be stressed as the central reasoning behind the index. The fact that the natural environment is the life-support system for all human systems, without exception, needs to be highlighted much more strongly. The EVI will occupy a new niche, allowing for environmental management at the same scales as those at which economic, social and cultural decisions are made; the country. Past management practices at either local or global scales, although necessary, could not operate in this way and did not allow for adapting policies.

Third, there is a need to gain political acceptance for the EVI at the same time that it is undergoing its final stages of globalisation and testing. This includes introducing it at global and regional meetings, through governments and via publications. There is a long history of international documentation from meetings which called for the development of an EVI (Agenda 21, Barbados Programme of Action, AOSIS) and it is time to respond to these calls with the information that a functional EVI now exists. Rio +10 will be the most important meeting at which to present the index.

Fourth, there was a call at this meeting for partners in developing the EVI among the countries invited. These collaborators were invited at this meeting to become part of the project in a very real sense. This will include the procurement of several sources of funding to assist in data collection, development and testing of the index. It also includes the establishment of links between all the collaborators on the project.

Finally, in addition to the excellent support given in the past, there is a need for UNEP to take a larger role in the development of the EVI. This includes political induction of the EVI into the world community, possible funding support and the use of existing mechanisms of data collection currently sponsored by UNEP.

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APPENDICES _____

Appendix 1   Programme for the meeting

Monday 27th August (9:30-17:00)

09:30 – 12:30	(Chair Craig Pratt)
	Welcome & housekeeping – Mr Craig Pratt
	UNEP's support and involvement in the EVI – Ms Elizabeth Khaka
	Self-Introduction of all participants
	What is a vulnerability index? History of VIs and need for EVI – Prof. Lino Briguglio
	How the EVI came about, SOPAC and LDCs – Mr Craig Pratt
13:30	(Chair Prof Lino Briguglio)
	Overview of the EVI and results so far – Dr Ursula Kaly
	Criteria for testing – Dr Ursula Kaly
	Open forum: Understanding the EVI, comments and concerns
1700	Reception

Tuesday 28th August (9:00-17:00)

09:30 – 12:30	(Chair Ms Elizabeth Khaka)
	Country Statement – Bangladesh – Mr Mohammed Haider
	Country Statement – Greece – Dr Paula Scott
	Country Statement – Kyrgyz Republic – Mr Maksim Surkov
	Questions and discussion
	Topic 1 (Working Groups)
	Report from working groups on recommendations for Topic 1
13:30	(Chair Dr Ursula Kaly)
	Topic 2 (Working Groups
	Report from Working Groups on Topic 2
	Topic 3 (Working Groups)
	Report from Working Groups on Topic 3
	General discussion on Topics 1-3
17:00	Finish

Wednesday 29th August (9:00-16:00)

09:30 – 12:30	(Chair Dr Arthur Dahl)
	Country Statement – Nepal – Mr Damodar Adhikari
	Country Statement – Philippines – Mr Percival Guiuan
	Country Statement – Thailand – Dr Pornsook Chongprasith
	Questions and discussion
	Topic 4 (Working Groups)
	Report from working groups on recommendations for Topic 4
13:30	(Chair Prof. Lino Briguglio)
	Topic 5 (Working Groups)
	Report from Working Groups on Topic 5
	General discussion
16:00	Close

Appendix 2   Country Submissions

A2.1 Australia – P. Burgess[2], B. Curran[3] and T. Maddon[4]

Please find following input for the above meeting. Previous comments submitted i.e. for the Think Tank, are also still relevant.

Environment Australia is currently coordinating collation of Australia's data for the Environmental Vulnerability Index. Unfortunately, completed information will not be available in time for the meeting in Geneva. However, the following information relating to Australia's experiences, in particular difficulties, with data collection is provided to assist with the development of the EVI.

Australia reinforces its support of the EVI project. As a developed economy, with a wide range of climatic variability, habitat, biodiversity, resource development and federal system of government Australia has found collating data for the EVI to be a complicated and resource consuming exercise. Issues that re being encountered include:

1.   Collation of information for many of the indicators requires substantial resources (time and money). For example, the Bureau of Meteorology have indicated that it will not be possible, or at least very difficult, to compile the required information (indicators 1-6); please refer to the attached advice for details.

2.   Information for a number of indicators is either not readily available or in the format required, for example:
   - Locating information, which has been collated to give national figures or State/Territory, sourced information (to collate) requires substantial staff time resources (to coordinate and compile information). Background - State/Territory (and local) governments have primary responsibility for land management and development issues in Australia; a number of agencies are responsible for the range of issues addressed by the EVI.
   - Where national data is available it may not be readily applied to the relevant indicator. For example, Indicator 36 on SO2 levels. Information on emissions is readily available but data required for this indicator will be difficult to collate on a national basis.

One of our concerns would be if less developed countries are facing the same sorts of issues, particularly given their generally lesser capacity to undertake tasks of this nature.

We would also note again, the issues of comparability of data in regard. Questions have been raised regarding the applicability of the EVI to Australia. Most of these have related to what the indicators mean when data on a continental scale is aggregated and reduced to one figure. Australia has, and is continuing to develop a range of tools providing a scientific basis to measure, monitor and address the impacts on the environment. These include initiatives such as the State of the Environment Report, National Pollutant Inventory and the National Land and Water Resources Audit.

I look forward to the outcomes of the Geneva meeting and in particular progress and future direction in developing the EVI.

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[2] Mr Philip Burgess - Director, Marine and International Section, Australia

[3] Ms Beth Curran - Executive and International Affairs, Bureau of Meteorology, Australia

[4] Ms Trixi Maddon - International Marine Section, Department of Environment and Heritage, Australia

Purpose

To respond to your e-mail of 19 July requesting preliminary information regarding the Bureau of Meteorology's capacity to provide data for the SOPAC project to test the Environmental Vulnerability Index (EVI) Indicators.

Response

With respect to the meteorology related EVI indicators, these as presented, do not appear well suited to assessing the environmental vulnerability of a country like Australia. This is partly because of the real extent and partly because of the large inter-annual variability that can occur in continental climates. It is also unclear how each EVI indicator will be interpreted in relation to the other indicators.

Bounded by four distinct oceanic areas, and with a area of 7.69 million square kilometres, Australia has more than 20 climate zones (Koeppen Classification) ranging from equatorial savannah through tropical monsoon regions, persistently dry deserts and temperate regions. While the Bureau of Meteorology maintains more than 100 Reference Climate Stations (specified for use with Indicators 2-6), and has a wider climate network, we believe that aggregation of data from these sites to gain a single EVI indicator for each parameter to represent Australia would be misleading and of very dubious value.

It may be appropriate to provide indicators for individual climate stations (a small sample), or for each climate zone, or on a gridded basis. However, the usefulness of these approaches is untested. Short-term variations that may be critical in some environments (climate zones) may be part of the natural variation in other regions.

Availability of information and costs

With respect to availability of data, preliminary responses by the National Climate Centre (NCC) are provided below.

EVI #1- Sea-surface temperatures (SST)

While the Bureau could provide gridded analyses for this indicator it would be reasonably expensive, due to the preliminary work involved in obtaining a 30-year average of SST. As the SOPAC project is a global test of the EVI we would strongly recommend that EVI Indicator #1 is derived globally at a central analysis centre such as the UK Meteorological Office or the US National Meteorological centre.

Some consideration should be given to SST anomalies in regions beyond the Economic Exclusion Zone) of countries where SST in geographically removed regions are known to have a significant impact on local wind patterns and rainfall. Also, in some regions of the globe relatively large fluctuations in SST from year to year are common. By using absolute deviations, EVI Indicator #1 may highlight normal events as extreme departures in these regions, when compared with less variable oceanic areas.

EVI #2 - High winds

There are around 30 stations across Australia that have a suitable length of record for analysis of wind speed variations. However, the average monthly maximum wind data required for EVI Indicator #2 is not currently available from the National Climate Centre.

We would suggest as a substitute for this indicator using the number of days each month in the last five years when the average wind speed at any observation time exceeded the 80 percentile. While these data are available, quality checking (several months work which, dependent on funding from other sources, may occur in the next 18 months or so) would be required before the data could be used to determine the indicators. It should be noted the data are insufficient to provide a representative continental scale analysis. Also, it would not be appropriate to aggregate station data to obtain a single vulnerability indicator for Australia (as this would involve e.g. combining tropical cyclone data with data from mid-latitude storms).

EVI #3, #4 - Dry and Wet periods

NCC can provide gridded monthly rainfall analyses (0.25°lat by 0.25°long), across Australia. We would recommend using these analyses in preference to the 'raw' Reference Climate Station data because the grids take into account the spatial variation between stations.

It would not be appropriate to aggregate this data into a single vulnerability indicator for each of EVI #3 and E'L'I #4 to represent Australia.

EVI #5, #6 Heat Waves and Cold Snaps

In Australia, the terms 'heat waves' and 'cold snaps' imply consecutive days above or below a given threshold - but that does not appear to be the requirement for these EVI indicators. A high quality daily maximum and minimum temperature data set derived from the reference climate station network is available (about 100 stations in all) from which the data required for these EVI's could be extracted.

It would not be appropriate for the Australian environment to aggregate these data to obtain a single vulnerability indicator for each of EVI#5 and EVI#6.

If data on 'heat waves' and 'cold snaps' is being sought, a more appropriate indicator for Australia can be found in Collins et al, (2000, Aus Met Mag, 49, 2777-92), as described below.

- Relatively warm day events: Frequency of 3 to 5 consecutive relatively warm days >= 90th percentile
- Relatively warm night events: Frequency of 3 to ,5 consecutive relatively warm nights >= 90th percentile
- Relatively cool day events: Frequency of 3 to 5 consecutively relatively cool days <= 10th percentile
- Relatively cool night events: Frequency of 3 to 5 consecutively relatively cool nights <= 10th percentile
- Hot day events: Frequency of 3 to 5 consecutive days >= 35°C
- Hot night events: Frequency of 3 to 5 consecutive nights >= 20°C
- Cold day events: Frequency of 3 to 5 consecutive days <= 15°C
- Cold night events: Frequency of 3 to 5 consecutive nights <= 5°C

Summary

In the case of the meteorological parameters, we do not believe that the Australian region can be represented by a single Environmental Vulnerability Index indicator, aggregated across the region. This is not to suggest that broad-scale indices have no value. The Bureau sees benefits from using broad indicators of this type to e.g. compare trends in climate extremes across different parts of the globe.

The Bureau has suitable data sets to derive the rainfall indicator (EVI #3 and #4) on a gridded basis, or for individual reference stations, and it has data to obtain the temperature indicators (EVI #5 and #6) for individual stations. Wind data records of suitable length, which are held in the national climate archive, are insufficient to provide a representative continental analysis of trends in high winds. And, it is not possible at this stage to provide the data required EVI #2, although a substitute indicator based on average wind speed (as opposed maximum wind gusts) could be derived. To do this, the current data would require quality checking first, and once again, the data could not be aggregated to give a single Australian value. SST data could be made available as gridded analyses, but we believe it would be more cost effective for SOPAC to obtain these data on a global basis in UK Met Office or US National Met Office.

Under the Bureau's cost recovery policy, we would normally charge for accessing this climate data. The estimated charge for the rainfall and temperature data required for the indices and the existing wind data would be of the order of several thousand dollars. Quality checking of the wind data, essential to provide a reliable record for this type of research, is time consuming and if funding to undertake this is not secured from other sources, would add considerably to the charge.

Table 3:   Status of EVI data for Australia

No.	Indicator	Completeness	May be available	Unavailable
1	Sea surface temperature			Referred to central analysis centre e.g. UK Met Office or US National Met Centre due to financial costs
2	High winds			Currently unavailable
3	Dry periods		Data available but in different form (gridded monthly rainfall analyses)	
4	Wet periods		Data available but in different form (gridded monthly rainfall analyses)	
5	Heat waves		Data available but in different form (consecutive days above or below given threshold)	
6	Cold spells		Data available but in different form (consecutive days above or below given threshold)	
7	Volcanic eruptions	Not answered		
8	Earthquakes	Not answered		
9	Tsunamis	Not answered		
10	Land area	Not answered		
11	Fragmentation	Not answered		
12	Isolation	Not answered		
13	Vertical relief	Not answered		

14	Lowlands	Not answered		
15	Coastal vulnerability	Not answered		
16	Endemic species	Not answered		
17	Pathogens and plagues	Not answered		
18	Potential for introductions	Not answered		
19	Introductions	Not answered		
20	Endangered species	Not answered		
21	Extinctions	Not answered		
22	Natural vegetation	Not answered		
23	Intensive farming	Not answered		
24	Fisheries	Not answered		
25	Coastal settlements	Not answered		
26	Population density	Not answered		
27	Population growth rate	Not answered		
28	Rate of loss of natural cover	Not answered		
29	Tourists	Not answered		
30	Wastewater	Not answered		
31	Production of hazardous and municipal wastes	Not answered		
32	Waste treatment	Not answered		
33	Oil spills	Not answered		
34	Toxic industries	Not answered		
35	Vehicles	Not answered		
36	SO_2 concentration		Readily available, but difficult to collate on a national basis	
37	Fertilisers	Not answered		
38	Pesticides	Not answered		
39	Fisheries stocks	Not answered		
40	Degradation	Not answered		
41	Water resources	Not answered		
42	Deep mining	Not answered		
43	Sub-surface mining	Not answered		
44	Terrestrial Reserves	Not answered		
45	Marine Reserves	Not answered		
46	War / Civil Strife	Not answered		
47	Environmental related legislation and regulations	Not answered		
48	Sanitation	Not answered		
49	GMOs	Not answered		

A2.2 Bangladesh - M.S. Haider

Introduction

Bangladesh lies in the northeastern part of South Asia between 20°34' and 26°38'-north latitude and 88°O1' and 92°41'-east longitude. The country is bounded by India on the west, the north, and the northeast and Burma on the southeast and the Bay of Bengal on the south.

Bangladesh, with a land area of 147,500sq km and an estimated population of 126.5 million (1998), is one of the most crowded countries on earth. The country, a vast floodplain with some mountains in the south-east, is a few feet above the sea level and is located on the top of the world's largest river deltas, created by the Ganges, the Jamuna, the Meghna and their tributaries.

About 80 percent population of the country lives in the rural area. An estimated 2.45 million ha (17 percent) of the total land of the country is under forest or potential forest cover. The Sundarbans, is the largest single expanse of mangrove forest in the World.

The tropic of Cancer passes through the centre of Bangladesh and the climate can be described as tropical monsoon type- warm and humid in the summer, dry and cool in the winter. Maximum temperature in the summer exceeds 38 degree Celsius and is characterised by thunderstorms as well as high evaporation rates. The monsoon or the rainy season experiences more than 80 per cent of the total annual rain fall. Temperature in Bangladesh varies between 10-40°C. It peaks during April and minimum is recorded in January.

Floods, tropical cyclones and storms often cause catastrophes. There are other natural hazards and man made disasters which cause tremendous sufferings to people particularly the poor who are landless (60%) or possess little land. The socio-economic conditions engage most people in daily struggle for means of livelihood. Natural calamities and poverty often define Bangladesh to the outside world, But what is least known to the outside world about the country is the secret of survival of its people and their struggle for retaining resource bases which are threatened by global changes and consumption habits of the so called first world.

Bangladesh is a country richly endowed with water resources. The water ecosystem comprises the tributaries and distributaries of the three major river systems the Ganges-Padma, the Brahmaputra-Jamuna and the Meghna and numerous perennial and seasonal wetlands like haors, baors and beels. Water resources are vital because the economy of the country depends on agriculture and fisheries. Water contamination and depletion in the availability of water due to excessive use of ground water, pollution of agro-chemicals and arsenic poisoning is increasingly becoming a major problem for Bangladesh.

Flooding and river bank erosion - two very related phenomena - are common in Bangladesh. Rivers erode parts of their banks during floods and post - flood periods due to current and wave action.

A significant trait of Bangladesh's water ecosystem is the seasonality of water availability, i.e., excessive water during the monsoon causing floods, and water shortages in the dry season often causing a drought like situation.

The wetlands of Bangladesh (haors, baors and beels as well parts of the floodplains that remain inundated for parts of the year) cover about 16,000 sq. km or 11 per cent of the country's area. However, the wetland area has often been estimated to account for nearly 50 per cent of the territorial land including estuaries and mangrove swamps along the coastal belt. Wetlands in Bangladesh have great ecological and economic significance. They are a hotbed of biodiversity and contain flora and fauna of local, national and regional significance.

Environmental Vulnerability and Bangladesh

In recent years, as a direct consequence of population increase and agricultural expansion causing water regime modification, many wetlands have shrunk or disappeared. Such degradation has brought about a biodiversity loss, reduction in fish habitat, and an increase in the flood-proneness of certain floodplains.

Bangladesh has 3 broad types of landscapes: floodplains, terraces and hills. Heavy rainfall, steep slopes of hills and terraces and year round tillage contribute to continuous erosion of the topsoil. Lack of comprehensive soil conservation practices and increasing pressure of population on land are major constraints in combating the land degradation process.

Bangladesh has many environmental problems, natural or man-made. These factors accompanied by depletion in the stock of resources are posing danger to the sustainability of the country. Since the bio-geographical location of Bangladesh makes its resources manifold vulnerable to adverse impacts of climate change as well as those of gradual extinction of various species due to natural calamities and human intervention. In Bangladesh, deforestation is a major environmental concern.

Now, whether it is the socio-economic life of common masses, whether it is agricultural bases or power of cyclones, whether it is global warming or terror of tornadoes, whether it is air and noise pollution in the major urban areas, whether it is water pollution causing hazardous and toxic effluents of the industries, Bangladesh is environmentally a vulnerable country and the nation should take a defensive action plan to offset the upcoming catastrophe in every sectors.

Vulnerable to any degree of sea-level rise, the major parts of Bangladesh will go under water because the terrain is largely flat and the relief is low. Nearly 50 per cent of the country has an elevation of less than 10 meters above sea level. Only in the southwestern parts of the country have the altitude exceed 300 meters. Large areas within the country have been uplifted geologically in recent times while some areas are still subsiding.

The major issues vulnerable to the Existence and sustainable development of Bangladesh can be classified as:
- Population Pressure;
- Poverty;
- Lack of proper planning;
- Political will;
- Natural Disaster;
- Global warming;
- Deforestation;
- Desertification;
- Intrusion of Salinity,
- Depletion of mangrove forest;

- Loss of Biodiversity and Genetic Resources;

- Different sources of pollution posing direct threat to human health, wildlife and biodiversity;

- Increasing dependence on chemical fertilisers and insecticides;

- Continued usage of unsafe pesticides, most of which have long been banned in the countries of their production and exports;

- Elimination of stockpiles of obsolete chemicals and pesticides;

- Sustainable disposal of hazardous wastes and their clean-up;

- Illegal dumping of wastes, particularly tanker sludge, and chemicals in the Bay of Bengal;

- Lack of skilled human resources,

- Technological backwardness

Conclusion

Bangladesh has many environmental problems, natural or man-made. These factors accompanied by depletion in the stock of resources are posing danger to the sustainability of the country.

The above list of vulnerability may exceed the number if proper survey and research is conducted on specific issues. Updated survey and inadequacy of actual data is a major problem to identify and quantifying the vulnerability indexes. In this regard, I would like to offer my all out cooperation to the organizer, to come forward to develop such indexes for my country. My heartiest thanks to the SOPAC EVI project personnel for the effort they have made so far to develop such a useful tools for determining the EVI of a country.

In order to achieve the cherished goal of sustainable development, the new century calls for us to develop our Governance Capacity addressing adequately the issues of Environmental Vulnerability along with other concerns. Scientific and technological capacity also needs to be strengthened to determine environmental carrying capacities and indicators/Indexes, to set baselines and suggest precautionary limits and mitigation measures, to monitor environmental changes, to deepen understanding of environmental processes both at local and global levels and to develop as well as adapt technologies to ensure development is taking place within the limits and constraints set by the environmental carrying capacities.

A2.3 Greece – P. Scott

Of the 49 indicators, 61% have been answered, 10% have been collected but are yet to be obtained from the various government departments, 16% are yet to be located, and the data for 4 indicators do not exist. Her general comment was that since most of Greece's population was concentrated in Athens, a lot of data, such as sulfur dioxide levels, were located there, thus data that were obtained and recorded are partial. Dr Scott also commented on the ancient civilisation in Greece where introduced species, virgin forests, and deforestation occurred more than 100 years ago and therefore did not fit within the concept. She mentioned that as a non-government official who lived far from Athens, which is main data collection centre in Greece, difficulties were faced with obtaining data from the various departments.

Some of the difficulties faced in Greece were the inefficiency in respective government departments in providing data. Dr Scott said that her phone calls were often passed around within the department. She commented on the units used for sulphur dioxide levels in Athens as recorded in tonnes and added that there were a lot of information on groundwater but none on extracted water as required by indicators 36 and 41B respectively. In Dr Scott's experience, data was easily accessible through other non-governmental organisations and through the internet (the original source being the government), and other researchers such as the ones involved in tsunami projects. Dr Scott mentioned that the least successful of data source was the government, which could only provide about 10% of the data. Dr Scott also reported that there were not many gaps in the EVI data for Greece and that their environmental concerns were well covered by the indicators. She also mentioned that Greece is relatively rich in international standards but poor in the EU context. It was difficult to access data, which are not usually analysed, and that EU collected most of the data for OECD purposes.

Table 4:   Status of EVI data for Greece

No.	Indicator	Rank	Comments
1	Sea surface temperature	0	Data not found yet
2	High winds	1	Data collected but not available
3	Dry periods	1	Data collected but not available
4	Wet periods	1	Data collected but not available
5	Heat waves	1	Data collected but not available
6	Cold spells	1	Data collected but not available
7	Volcanic eruptions	2	External source
8	Earthquakes	2	
9	Tsunamis	2	External source
10	Land area	2	
11	Fragmentation	2	
12	Isolation	2	
13	Vertical relief	2	
14	Lowlands	0	Data not found yet
15	Coastal vulnerability	0	Data not found yet
16	Endemic species	2	
17	Pathogens and plagues	0	Data collected but won't respond
18	Potential for introductions	0	Data not found yet
19	Introductions	0	Data not found yet
20	Endangered species	2	

21	Extinctions	1	
22	Natural vegetation	1	
23	Intensive farming	1	
24	Fisheries	0	Data not found yet
25	Coastal settlements	2	All land near the sea
26	Population density	2	
27	Population growth rate	2	
28	Rate of loss of natural cover	0	Data not found yet, probably does not exist
29	Tourists	2	
30	Wastewater	0	Data collected but won't respond
31	Production of hazardous and municipal wastes	0	Data collected but won't respond
32	Waste treatment	0	Data collected but won't respond
33	Oil spills	0	Data collected but won't respond
34	Toxic industries	1	
35	Vehicles	2	
36	SO_2 concentration	0	Data on total tonnes emissions only
37	Fertilisers	2	
38	Pesticides	2	
39	Fisheries stocks	2	
40	Degradation	0	Don't know how to answer this – ancient degradation
41	Water resources	0	Cannot find extraction data- none exists
42	Deep mining	0	Ministry won't respond
43	Sub-surface mining	0	Ministry won't respond
44	Terrestrial Reserves	2	
45	Marine Reserves	2	
46	War / Civil Strife	2	
47	Environmental related legislation and regulations	2	
48	Sanitation	0	May be unanswerable, waiting for information
49	GMOs	0	Ministry won't respond

Key (rank): 0 – no data, 1 – answered imperfect data, 2 – answered satisfactory data

Table 5:   Summary of EVI Data Status for Greece

Key	Number of Data	Percentage of Data (%)
0	19	39
1	21	43
2	9	18

A2.4 Kyrgyz Republic – M. Surkov

Eighty percent of the Kyrgyz Republic is mountainous and thus has several critical environmental issues. Kyrgyz has a diverse geological relief with its highest altitude in the range of 7000m above sea level. Although, Kyrgyz has abundant water resources, these are predicted to decrease by 20% by the year 2015. Land degradation is a major problem, this is due to a high slope gradient and precipitation that causes removal of topsoil and landslides. Transboundary impacts of water, erosion and pollution are also important issues in Kyrgyzstan. Radioactive waste dumping is another major environmental issue with dumping concentrated in an area located 400km from the capital to the south. This area has a population of about 20,000 people and has 20 disposal sites from internal mining, which are commonly washed out during landslides.

So far around 6 or 7 indicators have been completed (12 or 14%). An assurance was given that data collection will be followed up on return to the country. There is a need for consultants to assist with the EVI data collection in Kyrgyz. Mr Maksim also said that there were some indicators such as sea surface temperature and cyclones that did not apply to his country. He also mentioned that there was a project being initiated to address environmental issues in Kyrgyz and, being a government official, did not find any difficulties in collecting data. However, Mr Maksim said that since Kyrgyz has 60 meteorology stations, there were difficulties in compiling the relevant data. Mr Surkov also mentioned that Kyrgyz has approximately 1,900 lakes, of which the second largest has a diameter of 700sq km, and is surrounded by small settlements and cities. Therefore, he suggested that data on this could be used as an alternative to the indicator pertaining to indicator 25 on population along coastal settlements.

Table 6:   Status of EVI Data for Kyrgyzstan

No.	Indicator	Progress			
		Complete	Partial	Pending	Blank
1	Sea surface temperature			✓	
2	High winds			✓	
3	Dry periods			✓	
4	Wet periods			✓	
5	Heat waves			✓	
6	Cold spells			✓	
7	Volcanic eruptions			✓	
8	Earthquakes			✓	
9	Tsunamis			✓	
10	Land area			✓	
11	Fragmentation			✓	
12	Isolation			✓	
13	Vertical relief			✓	
14	Lowlands			✓	
15	Coastal vulnerability	✓			
16	Endemic species	✓			
17	Pathogens and plagues			✓	
18	Potential for introductions			✓	
19	Introductions	✓			
20	Endangered species	✓			

21	Extinctions			✓	
22	Natural vegetation			✓	
23	Intensive farming			✓	
24	Fisheries			✓	
25	Coastal settlements			✓	
26	Population density	✓			
27	Population growth rate			✓	
28	Rate of loss of natural cover			✓	
29	Tourists			✓	
30	Wastewater			✓	
31	Production of hazardous and municipal wastes	✓			
32	Waste treatment			✓	
33	Oil spills			✓	
34	Toxic industries			✓	
35	Vehicles			✓	
36	SO$_2$ concentration	✓			
37	Fertilisers	✓			
38	Pesticides	✓			
39	Fisheries stocks			✓	
40	Degradation	✓			
41	Water resources	✓			
41B	Water resources		✓		
42	Sub-surface mining			✓	
43	Percentage of land, rivers and coastal zone affected by mining and quarrying			✓	
44	Terrestrial Reserves			✓	
45	Marine Reserves			✓	
46	War / Civil Strife			✓	
47	Environmental related legislation and regulations	✓			
48	Sanitation			✓	
49	GMOs			✓	

Table 7:   Summary of EVI Data Status for Kyrgyzstan

Progress	Number of Data	Percentage of Data (%)
Complete	12	24
Partial	1	2
Pending	37	76

A2.5 Nepal – D. Adhikari

Nepal at a glance

Capital: Kathmandu

People: Nepal has more than 40 ethnic groups and 70 spoken languages

Language: Nepali is the national language. Most of the people speak English in urban areas.

Area: 147,181 sq. km.

- Extending about 885km. in length and varying width from 145 to 240km (Figure 1).
- It is situated along the southern slopes of the Himalayas and contains the highest peak in the world.
- Eight peaks more that 8,000m. out of 14 in the world.

Geography and Topography

- Situated between China in the north and India in the south

Ecological Regions

- The Himalayan Region: 27 percent of total area ranging from 3,000 meters above sea level up to 8,848 meters
- Hilly Region: 50 percent of total area, ranging from 600 m. to 3,000 m in elevation.
- Terai Region: Southern part of Nepal with extremely low elevation of 60m to 3000m.
- 77 percent of the total area is mountainous and it contains a huge number of high peaks, steep hills, elevated flattish uplands punctuated by river valley of varying extent and width.

Climate

- Nepal lies within the subtropical monsoon climatic system.
- Four seasons - Winter (December-February) Spring (March-May) Summer (June-August) Autumn (Sept. -November)
- The climatic characteristics of Nepal are marked by extremes in seasonal variations and regional differentiation.
- Nepal is 2nd richest in water resources, it has more than a thousand number of major watersheds.

Major Environmental Problems and Issues

1.   **Human Dimension**
   - Population growth and urbanization
   - Health and sanitation
   - Poverty implications

- Poor access to basic social services

2. Atmospheric and Climate Issues
- Greenhouse gases
- Chloroflurocarbon (CFC)

3. Inland Waters
- Water
- Water quality
- Wetlands

4. Land Degradation, Deforestation and Natural Disasters
- Land use
- Soil Erosion
- Desertification
- Natural Hazards

5. Forests and Bio-diversity
- Forests
- Community forests
- Biological diversity

6. Energy

7. Solid and Liquid Wastes

8. Air and Water Pollution
- Air quality
- Water pollution
- Noise level

9. Agriculture

10. Legislative and Institutional Issues

In a nutshell, environmental problems have emanated from:

1   Ecological vulnerability;

2   Excessive dependence on natural resource base;

3   Inadequate integration of the environmental aspects in development planning and implementation;

4   Ad-hoc implementation response on major environmental issues.

Uses of Environmental Vulnerability Index
- Excellent Tool for Operationalising the slogan 'THINK GLOBALLY, ACT LOCALLY'.
- EVI can be a 'Useful Global Inventory';
- Common Understanding on Basic Environmental Indicators;

- It Identifies the Major Gaps in National and Global Environmental Information System (N/GEIS).

Areas of Improvements

1. Some of the indicators still can be added based on the global ecological diversity and socio-cultural factors for its wider future use (like socio-cultural aspects, energy consumption, human dependency on natural resources etc.)

2. Developing some indicators relating to national level environmental problems (country specific indicators).

3. Validity and authenticity of personally data have to be ensured.

4. Regular updating mechanism for the long run.

Problems Faced During Data Gathering

- Most of the environmental data are scattered, highly unorganised and incomplete.

- Rights to Information are guaranteed by Nepalese Constitution, however, officials do not provide even available data very willingly. Personal contact is one of the useful tool in assembling the data.

- Most of the data are in file, they are not updated and published properly.

- Use of data in planning is not very systematic.

- Most of the data are in raw form; most of the officials are not ready to process these.

- The status of verification and updating is very poor.

- The data collection process took more than a month for 2 persons on a full-time basis

Summary of Data Collection Status in Nepal

Table 8:   Summary of EVI Data Status for Nepal

Status	Number of Data	Percentage of Data (%)
Completed (fully/satisfactory)	28	58
Partially completed	8	16
Not Available	6	12
Not Applicable	7	14

A2.6 New Zealand – H. Loose[5]

Table 9:   Status of EVI Data for New Zealand

No.	Indicator	Progress			
		Complete	Partial	Pending	Blank
1	Sea surface temperature	✓			
2	High winds	✓			
3	Dry periods	✓			
4	Wet periods	✓			
5	Heat waves	✓			
6	Cold spells	✓			
7	Volcanic eruptions	✓			
8	Earthquakes	✓			
9	Tsunamis	✓			
10	Land area	✓			
11	Fragmentation	✓			
12	Isolation	✓			
13	Vertical relief	✓			
14	Lowlands	✓			
15	Coastal vulnerability	✓			
16	Endemic species			✓	
17	Pathogens and plagues			✓	
18	Potential for introductions	✓			
19	Introductions			✓	
20	Endangered species			✓	
21	Extinctions			✓	
22	Natural vegetation			✓	
23	Intensive farming			✓	
24	Fisheries	✓			
25	Coastal settlements			✓	
26	Population density	✓			
27	Population growth rate	✓			
28	Rate of loss of natural cover			✓	
29	Tourists	✓			
30	Wastewater			✓	
31	Production of hazardous and municipal wastes			✓	
32	Waste treatment			✓	
33	Oil spills			✓	
34	Toxic industries			✓	
35	Vehicles			✓	
36	SO_2 concentration			✓	

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[5] Ms Hine-Wai Loose - Environment Division, Ministry of Foreign Affairs and Trade, Wellington, New Zealand

37	Fertilisers			✓	
38	Pesticides			✓	
39	Fisheries stocks	✓			
40	Degradation			✓	
41	Water resources			✓	
41B	Water resources			✓	
42	Sub-surface mining			✓	
43	Percentage of land, rivers and coastal zone affected by mining and quarrying			✓	
44	Terrestrial Reserves			✓	
45	Marine Reserves			✓	
46	War / Civil Strife	✓			
47	Environmental related legislation and regulations	✓			
48	Sanitation	✓			
49	GMOs			✓	

Table 10:   Summary of EVI Data Status for New Zealand

Status	Number of Data	Percentage of Data (%)
Complete	23	47
Partial	-	-
Pending	26	53

A2.7 Philippines – P. Guiuan

I. Introduction

The Philippine Statistical System

The Philippine Statistical System (PSS) is a decentralized system where many agencies gather, compile, process, aggregate and disseminate data in accordance with their respective mandates. The system is comprised of all government agencies that produce statistics either as a primary function or as a by-product of their administrative or regulatory functions. It also includes training and research institutions, the academe and research organisations, non-government organisations and the private sector.

The National Statistical Coordination Board (NSCB), as the highest policymaking body on statistics, coordinates the activities of the PSS through the setting of statistical standards, the delineation of responsibilities of the PSS agencies and the setting of priorities among the PSS agencies.

In the gathering and compilation of environment statistics, agencies such as the Environmental Management Bureau (EMB), Forest Management Bureau (FMB), Land Management Bureau (LMB) and the Protected Areas and Wildlife Bureau (PAWB) of the Department of the Environment and Natural Resources (DENR), National Mapping and Resource Information Authority (NAMRIA), Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), the Philippine Institute of Volcanology (PHILVOCS), Environmental Health Services (EHS) of the Department of Health (DOH), the Bureau of Fisheries and Aquatic Resources (BFAR) of the Department of Agriculture (DA) and the NSCB are involved.

II Results

2a. Out of the 49 EVI indicators, 29 or 59.2 percent were compiled based on the key and proxy indicators required by the EVI. A lot of man-hours were utilised in the processing of the raw data for the indicators and 3 personnel were involved in the activity.

2b. Of the 29 indicators, three (3) proxy indicators were generated based on the suggested proxy indicators of the EVI. These include, 1) the depletion rate or rate of resources depletion instead of the number of new fisheries stocks/expanded fisheries efforts, 2) tidal waves/monsoon waves, instead of tsunamis or storm surges, and 3) outbreaks of toxic red tide and paralytic shellfish poisoning, instead of reported organism outbreaks.

2c. Out of the 20 indicators, which have not yet been compiled, seven (7) of the EVI indicators could be generated but will need more man-hours for the processing of the raw data. Most of the EVI indicators required certain parameters to follow and this resulted in the re-computation of the data. The remaining thirteen (13) EVI indicators could not be generated because of the unavailability of data. No system (such as surveys, administrative reports) exists in the gathering and compiling of the data required to generate the EVI indicators/proxy indicators.

III.   Issues

3a.   Unclear definition/parameters on the EVI indicator "Safe Sanitation": Do we have to come up with a composite index for the three indicators comprising safe sanitation (garbage disposal, safe water supply, sanitary toilet) as what the WHO has done?

3b.   Is the use of the "Depletion Rate" sufficient enough as proxy indicator for the indicator "Number of new fisheries stocks/Expanded fisheries efforts? We have estimated depletion rate as depletion (in metric tons) over sustainable catch (also in metric tons multiplied by 100. Is this right?

3c.   Some of the raw data used in compiling the indicators (i.e. mostly weather-related data) are not available for free so the office has to pay for these particular dataset, and yet further processing was necessary.

Table 11:   Status of EVI Data for the Philippines

No.	Indicator	Progress			
		Complete	Partial	Pending	Blank
1	Sea surface temperature	✓			
2	High winds	✓			
3	Dry periods	✓			
4	Wet periods	✓			
5	Heat waves	✓			
6	Cold spells	✓			
7	Volcanic eruptions	✓			
8	Earthquakes	✓			
9	Tsunamis	✓			
10	Land area	✓			
11	Fragmentation				No data
12	Isolation	✓			
13	Vertical relief	✓			
14	Lowlands				No data
15	Coastal vulnerability				No data
16	Endemic species				No data
17	Pathogens and plagues	✓			
18	Potential for introductions	✓			
19	Introductions				No data
20	Endangered species	✓			
21	Extinctions				No data
22	Natural vegetation	✓			
23	Intensive farming	✓			
24	Fisheries			✓	
25	Coastal settlements				No data
26	Population density	✓			
27	Population growth rate	✓			
28	Rate of loss of natural cover	✓			
29	Tourists	✓			
30	Wastewater				No data

31	Production of hazardous and municipal wastes	✓			
32	Waste treatment				No data
33	Oil spills			✓	
34	Toxic industries				No data
35	Vehicles	✓			
36	SO$_2$ concentration			✓	
37	Fertilisers	✓			
38	Pesticides			✓	
39	Fisheries stocks	✓			
40	Degradation	✓			
41	Water resources			✓	
42	Sub-surface mining	✓			
43	Percentage of land, rivers and coastal zone affected by mining and quarrying				No data
44	Terrestrial Reserves				No data
45	Marine Reserves				No data
46	War / Civil Strife			✓	
47	Environmental related legislation and regulations	✓			
48	Sanitation	✓			
49	GMOs			✓	

Table 12:   Summary of EVI Data Status for the Philippines

Data Progress	Number of Data	Percentage of Data (%)
Complete	29	59
Pending	7	14
Blank (No Data)	13	27

A2.8 Thailand – P. Chongprasith

Introduction

The Kingdom of Thailand, covering an area of 514,000 sq km and accommodating approximately 61 million people, lies in the heart of Southeast Asia. It shares borders with Myanmar to the west and north, Lao P.D.R. to the north and northeast, Cambodia to the east and Malaysia to the south (Figure 1a). The country is geographically divided into four distinct areas: the mountainous North, the fertile Central Plains, the semi-arid plateau of the Northeast, and the peninsula South. As Thailand lies within the humid tropics and remains hot throughout the year. Average temperatures are about 29oC, ranging in Bangkok from 35oC in April to 17oC in December.

Thailand has approximately 2800 km of coastline (Figure 1b), which are richly endowed with natural resources such as fertile soil, minerals, beautiful scenery, and mangrove and hardwood forest (Figure 1c). Coastal seas support coral reefs, seagrass beds and diverse fish stocks that are indisputably important to us as a whole (Figure 1c,d).

Due to this diverse range of ecological, geographical, geological, political, social and cultural conditions, Thailand is invited to participate in globalising and testing the Environmental Vulnerability Index and Profiles. During the Environmental Vulnerability Data Profile development stage, country's data has been gathered with great effort.

Of all 47 indicators, despite lack of some data of specified years, questionnaires of 21 indicators were completed so far (Table 13). Most of data obtained is from Web Page of related agencies. While inquiries for data of to indicators had been passed on to the responsible private and governmental agencies, and the information for 4 indicators was received in return. On the other hand, the questionnaires of 15 indicators can only be partially completed and the rest, 5 indicators, are still in blank.

Table 13:   Status of EVI Data for Thailand

No.	Indicator	Progress			
		Complete	Partial	Pending	Blank
1	Sea surface temperature		✓		
2	High winds			✓	
3	Dry periods			✓	
4	Wet periods			✓	
5	Heat waves			✓	
6	Cold spells			✓	
7	Volcanic eruptions	✓			
8	Earthquakes	✓			
9	Tsunamis		✓		
10	Land area	✓			
11	Fragmentation	✓			
12	Isolation	✓			
13	Vertical relief		✓		
14	Lowlands				✓
15	Coastal vulnerability				✓
16	Endemic species	✓			

17	Pathogens and plagues		✓		
18	Potential for introductions		✓		
19	Introductions	✓			
20	Endangered species	✓			
21	Extinctions				
22	Natural vegetation	✓			
23	Intensive farming		✓		
24	Fisheries	✓			
25	Coastal settlements				✓
26	Population density	✓			
27	Population growth rate	✓			
28	Rate of loss of natural cover	✓			
29	Tourists		✓		
30	Wastewater	✓			
31	Production of hazardous and municipal wastes		✓		
32	Waste treatment	✓			
33	Oil spills	✓			
34	Toxic industries		✓		
35	Vehicles	✓			
36	SO_2 concentration	✓			
37	Fertilisers		✓		
38	Pesticides		✓		
39	Fisheries stocks			✓	
40	Degradation				✓
41	Water resources	✓			
41B	Water resources				✓
42	Sub-surface mining		✓		
43	Percentage of land, rivers and coastal zone affected by mining and quarrying				✓
44	Terrestrial Reserves	✓			
45	Marine Reserves		✓		
46	War / Civil Strife	✓			
47	Environmental related legislation and regulations	✓			
48	Sanitation		✓		
49	GMOs				✓

Table 14:   Summary of Data Status for Thailand

Data Progress	Number of Data	Percentage of Data (%)
Complete	22	45
Partial	14	29
Pending	6	12
Blank (No Data)	7	14

Difficulties and Problems in collecting data can be categorised into 4 groups as follows:

1.   Unclear information

Indicator 13: Altitude range (highest point subtract the lowest point in country). For the country like Thailand of which her territory composes of land and marine zone, the lowest point in the country expected to be filled in the questionnaire can either be that on-shore or off-shore. Hence, it should be put in more specific that the lowest point of what is expected.

Indicator 15: Percent of land area below 10 metres in elevation within 2 kilometres to coast composed of unconsolidated sediments (excluding coral reefs). There is GIS database showing landuse of which physical and biological resource such as bush land, mud flat, mangroves forest and peat swamp are designated. However, criteria to identify unconsolidated sediments are unclear. Therefore land area cannot be calculated accordingly.

Indicator 40: Percent of land area degraded. In order to identify degraded area, this recently generated land use map   must be compared with the one produced in the past. Hence, time span over which degradation can be significantly identified should be indicated. For example: percent of land area degraded after a decade or so.

Indicator 43: Percentage of land, rivers and coastal zone affected by mining and quarrying. There are the figures indicate mining and quarrying area in Thailand whereas the effects of mining and quarrying have not been studied before. Hence, if the degree of effects or scope of interest is specifically defined, experts may possible to designate the affected area, as well as calculate the percentage.

2.   Inapplicable data

Data for such issues are recorded but not directly applicable to answer SOPAC's questionnaire. There are 3 indicators in this group.

Indicator 14: Percent of land area less than 10 meters above sea level. Topographic mapping format in Thailand is having minimum contour interval of 20 m elevation. Therefore, it is unlikely to calculate land area with less than l0 meters of elevation from the existing map.

Indicator 17: Number of reported (and verified) organism outbreaks (pathogens, blooms, plaques, etc.) over the last five years per land area. Since severity of pathogens outbreaks and plaques is recorded as number of patients, hence, it is unlikely to identify frequency of occurrence of such outbreaks.

Indicator 25: Density of people living in coastal settlements (i.e. with a city centre within "'km. of the coast). There is no survey done in such a way that density of people living in coastal settlements is identified. On the other hand, there is a list of provinces within 20 km. of the coast and the population living there. Hence, a number of people residing within 20 km. away from the coast can be calculated in proportion with the percentage of land fall in that range, if valid.

3.   Data collected locally

Indicator 41B: Annual internal renewable water resources. There is no representative value for the whole country.

4. Lack of data

Indicator 42: Tonnes of mining material (ore + tailings) extracted per square kilometre per land area per year average last five years. There is no such information recorded in Thailand. However, mining experts can speculate the amount of tailing mining material in accordance with mining method known.

Further comments

Due to the fact that the EVI has been originally developed for island countries in the Pacific and Caribbean Regions, questionnaires using to collect data are made to be suitable for the countries, which have relatively homogenous condition over their territories. Thence, when the same set of questionnaire is employed to collect data of the country with more complex environment such as Thailand, question arises. The problem is how the questionnaire is expected to be filled for some certain indicators such as high winds, dry periods, wet periods, number of endemic species and sulphur dioxide concentration since the figures vary greatly from location to location over the country.

After elaboration, Thailand's working team decided to use average values to represent the condition of the whole country. However, this may not be the best solution. To make the Index be more realistic for the country like Thailand, the country should be zoned and index should be calculated separately within these zones, then incorporate the indices of sub-region to get the country index.

Moreover, some indicators require to input information in term of per square area which may appropriate only for the countries with certain land area and relatively homogeneous condition but not for large countries. For example, endemic species per square kilometre land area (Indicator 16), the figure can be obtained by divided the number of endemic species exist in the country by total land area. As mention earlier that this would not represent actual identity of certain area and may not serve the purpose of the project.

It is necessary for SOPAC to set forth a concrete data collection strategy to ensure that the data obtained from each country is comparable and serve the purpose of the SOPAC, as well as a new set of questionnaire, which suits the countries with variety of local condition more.

Recommendations

It is necessary for SOPAC to set forth a concrete data collection strategy to ensure that the data obtained from each country is comparable and serve the purpose of the SOPAC, as well as a new set of questionnaire, which suits the countries with a variety of local condition more.

Figure 1:   Maps of Thailand showing (a) position, (b) distribution of shoreline types, (c) rare and endangered species and habitats and (d) aquaculture.
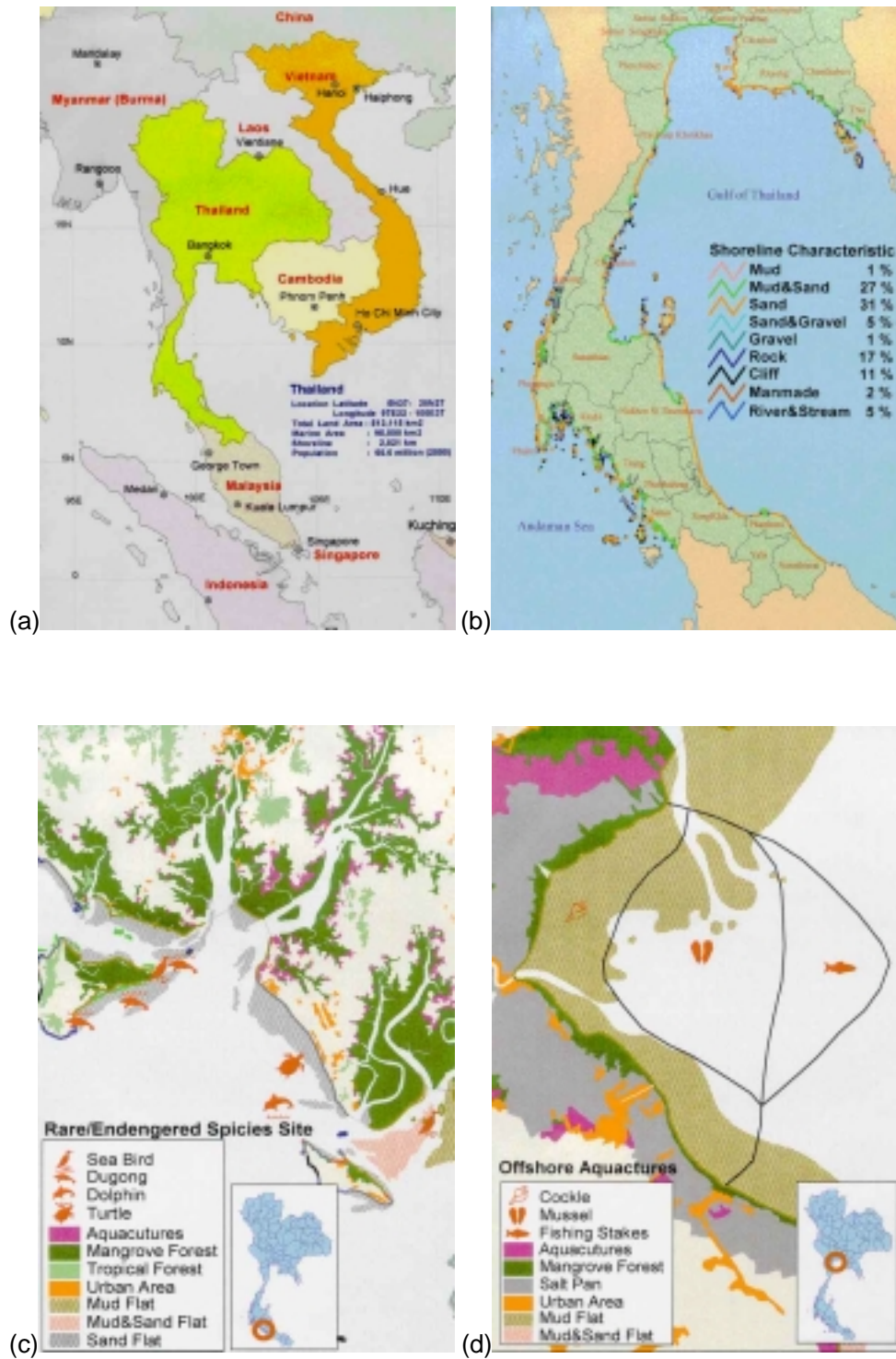
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