

Progress Report

Environmental Vulnerability Index (EVI) Project Progress Towards a Global EVI



SOPAC

South Pacific Applied Geoscience Commission

March 2001

SOPAC Miscellaneous Report 405

Progress Report:

Environmental Vulnerability Index (EVI) Project

Progress Towards a Global EVI

By:

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The logo for SOPAC, consisting of the letters 'SOPAC' in a bold, italicized, sans-serif font.

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This project has been funded with support from New Zealand, Ireland, Norway and Italy.

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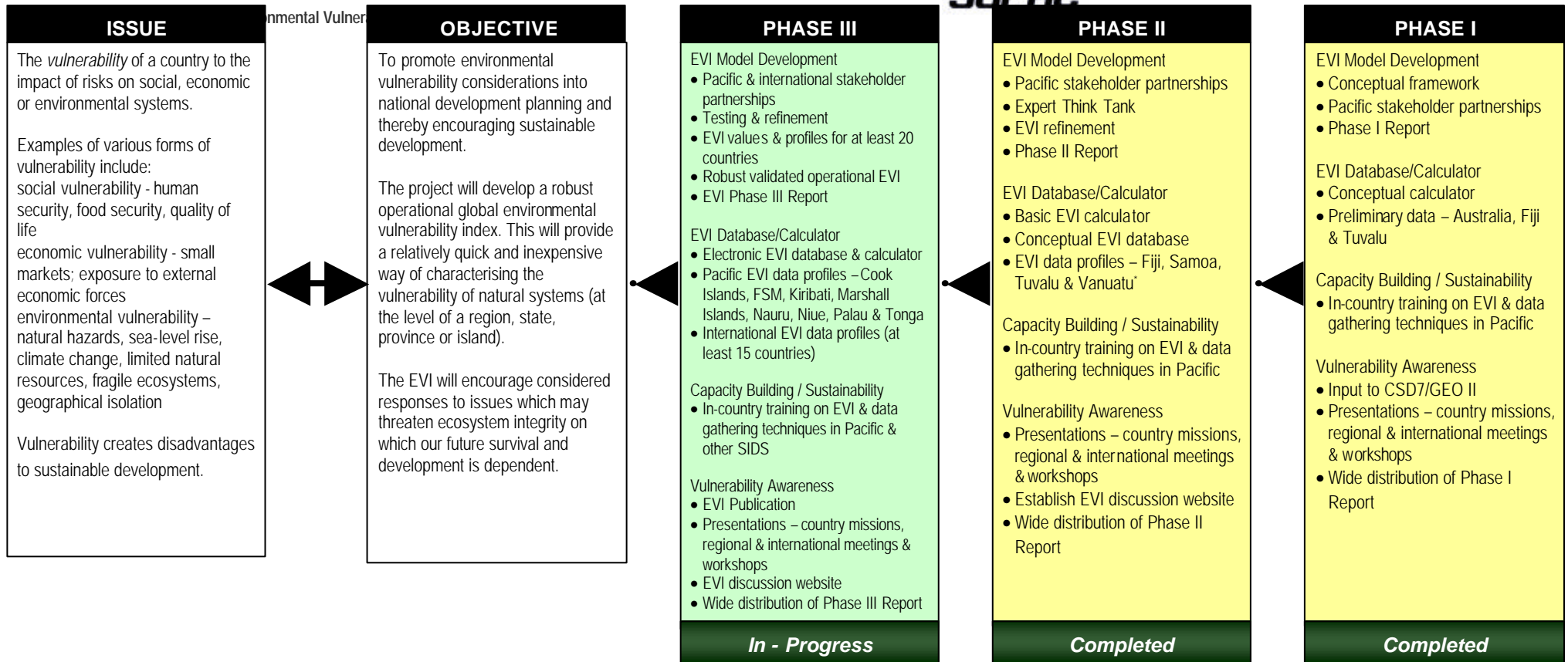
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Project Summary

Project Title	Environmental Vulnerability Index (EVI) Study
Project Type	Development of a global environmental vulnerability index
Lead Implementing Agency	South Pacific Applied Geoscience Commission [SOPAC]
Key Stakeholders	<p>SOPAC Pacific member and non-member countries</p> <ul style="list-style-type: none"> • Australia • Cook Islands • Federated States of Micronesia • Fiji • French Polynesia • Guam • Kiribati • Marshall Islands • Nauru • New Caledonia • New Zealand • Niue • Papua New Guinea • Palau • Samoa • Solomon Islands • Tonga • Tuvalu • Vanuatu <p>Small Island Developing States (SIDS) – Barbados, Jamaica, Maldives, Malta, St Lucia, Mauritius, Trinidad & Tobago</p> <p>Supporting Countries - Ireland, Italy, Norway</p>
Project Goal	To develop a robust operational global environmental vulnerability index which provides a relatively quick and inexpensive way of characterising the vulnerability of natural systems (at the level of a region, state, province or island). The common basis on which the index is developed will therefore allow comparisons among countries and through time
Project Purpose	To enhance national capacity, technical skills and knowledge in environmental vulnerability and management
Project Benefits	<ul style="list-style-type: none"> • Development of a robust internationally recognised and acceptable EVI. • Promotion tool for sustainable development through identification of key environmental vulnerability issues and examining the relative vulnerabilities of states. • Empower countries through strengthened capacity across all project components.
Project Components	<ol style="list-style-type: none"> 1. Refinement & Comprehensive Testing of the EVI 2. Pacific Country EVI Capacity -Building 3. Sustainable Data Collection Process for the EVI (through in-country and international agencies) 4. Computer EVI Interface 5. EVI Validation Exercise
Project Duration	The project is expected to have a duration of 2 years
Location	The project office will be located at the SOPAC Secretariat in Suva. Project staff will be required to travel within the Region and elsewhere as necessary, for the duration of the project
Donor Inputs	Donor inputs are primarily directed toward funding project activities, which include the resources required to carry out project activities, enhance national capacity within participating countries and, costs for two full-time equivalent positions to coordinate and implement key project activities
SOPAC Inputs	The Secretariat will provide: a framework for administrative, financial and other reporting for the project; accommodation and access to facilities and services such as logistics support, library and publications, computer networks and databases; and representation to the Pacific Island Forum and CROP meetings
Achievements to Date	Sufficient data for a valid EVI (minimum 80% data requirements) have been collected for 6 out of 13 countries included so far. Palau is a model example, having provided 100% of its EVI data, showing that the EVI is achievable



Project Summary

Environmental Vulnerability Index (EVI) Study

PROJECT BENEFITS	
<p>EVI Tool</p> <ul style="list-style-type: none"> • Operational globally robust EVI which provides a comprehensive measure of environmental vulnerability of a country • Established Pacific & International partnerships in EVI development • Can be used as a measure of change in environmental vulnerability if repeated assessments are made (every 5 years) • Tool for monitoring sustainable development • Strengthen ability to prioritise environmental vulnerability issues of concern; useful for environmental management and planning • Useful for state of environment reporting by identifying mechanisms that would tend to degrade the environment 	<p>Capacity Building/Sustainability</p> <ul style="list-style-type: none"> • Strengthened country capacity in compiling environmental data • Improved data collection & handling • Improved understanding of the EVI, its uses, mechanics and application as a management tool <p>Vulnerability Awareness</p> <ul style="list-style-type: none"> • Increased awareness/debate on the importance of environmental vulnerability and implications for sustainable development • Raise awareness about the actions that increase or decrease environmental vulnerability • Increased awareness of the important development work being carried out by SOPAC

Background: Phase I & II

The issue of vulnerability has received growing international recognition as a major disadvantage facing sustainable development of small island developing states (SIDS), arising from an interplay of such factors as remoteness, geographical dispersion, vulnerability to natural disasters, high degree of economic openness, and small internal markets and limited natural resource endowment.

Concern regarding the issue of vulnerability of Small Island Developing States (SIDS) was first brought to international attention during the Global Summit on Small Island States held in Barbados in 1994. At this conference SIDS, with the support of the United Nations, expressed the desire in the Barbados Programme of Action (BPoA) for the development of a vulnerability index that reflects the status of SIDS and integrates ecological fragility and economic vulnerability.

Although efforts to develop vulnerability indices for countries are not new, popular focus has been on economic and social vulnerabilities, these give only a limited understanding of the overall problem. The Environmental Vulnerability Index (EVI), a project being undertaken by SOPAC looks specifically and for the first time into the issue of environmental vulnerability.

In 1998 with funding from the New Zealand government, a SOPAC study team was put together to undertake development of a methodology for determining environmental vulnerability. In February 1999 the team produced its first report entitled Environmental Vulnerability Index (EVI) to summarise national environmental vulnerability profiles¹.

This report was extensively peer reviewed in Phase II of the project and critically discussed at an Expert Group Meeting held in Fiji in September 1999. SOPAC in association with the Islands and Small States Institute, Foundation for International Studies, University of Malta with the support of the United Nations Environment Programme also organised a meeting of experts in Malta to review the EVI. The outcome of this meeting was documented in a Report of the Meeting of Experts on the Environmental Vulnerability Index, Valletta, Malta, 29 November - 3 December 1999 (See Annex 1 & 2).

This process of development and refinement has been accompanied by the accumulation of environmental vulnerability data profiles on several Pacific countries including Fiji, Samoa, Tuvalu and Vanuatu. This data provided the basis for preliminary testing of the model which was completed in February 2000 and presented in the Phase II report – Environmental Vulnerability Index: Development and provisional indices and profiles for Fiji, Samoa, Tuvalu and Vanuatu².

The focus of this report is to provide an up-to-date progress report on the project and to examine the Pacific experience in compiling environmental vulnerability information for use in the EVI project.

¹ SOPAC Technical Report 275

² SOPAC Technical Report 306

Support for EVI Development

The Pacific Island countries have repeatedly expressed their support for the EVI development work being carried out by SOPAC through the Pacific Island Forum Communiqués. The SOPAC Governing Council has also consistently supported the work since 1998. On-going development and involvement of all Pacific countries has been a feature of the project. Environmental vulnerability profiles are being compiled for all SOPAC member countries and significant progress has been made in this activity.

The New Zealand government has generously provided on-going support to the development of the EVI. Several other countries including Ireland and Norway have committed their support to the further global development and refinement of the EVI being carried out by SOPAC. Italy has also pledged their support for Phase III of the project.

International interest in the work being carried out by SOPAC has grown with increasing interest from SIDS throughout the world. Several countries including Barbados, Jamaica, Malta, Mauritius, St Lucia and Trinidad and Tobago have committed their support to provide country environmental vulnerability data for future refinement and testing of the EVI. Expressions of interest in participating in the EVI have also been received from Kyrgyz Republic, Maldives and Seychelles. Other countries beyond SIDS have also expressed interest in the EVI work and in particular in its possible use as a tool for highlighting specific issues of concern of environmental vulnerability within a country. Other important potential uses in environmental planning and management have received increasing attention as well.

SOPAC Welcomes Tonga's Support for the Environmental Vulnerability Index

SOPAC welcomes the support expressed by Tonga's Prime Minister, Prince Ulukalala Lavaka Ata at the UN Summit in New York and their call upon the UN to recognise SOPAC's work on the environmental vulnerability index. This was highlighted in a PACNEWS Bulletin 08 September 2000 New York.

"Tonga has spoken of its satisfaction with the United Nations (UN) decision to promote the inclusion of economic vulnerability as a factor for determining the criteria of Least Developed Countries (LDC).

But suggested the UN and other international agencies ought to do more.

He proposed the adoption of an environmental vulnerability index being worked out by the Fiji-based South Pacific Applied Geoscience Commission (SOPAC).

"I welcome the inclusion of economic vulnerability as a factor for determining the LDC criteria but also recognize that small island developing States are vulnerable to environmental changes," Prince Ulukalala told the UN sponsored Millennium Summit in New York.

"I, therefore, commend to you the work on the environmental vulnerability index currently carried out by the South Pacific Applied Geoscience Commission and register my appreciation to those member States who have made available the resources for the completion of this study," the Prince added."

Regional and International EVI Exposure

During the course of the project, the EVI team has attended meetings to introduce the EVI methodology to its potential users and to encourage involvement in the development of the EVI. A range of SIDS, SOPAC member countries and potential donors have been briefed on the EVI and progress of its development. Phase III of the EVI project involved the attendance at the following meetings to raise awareness about the EVI (a complete list of all meetings attended for the entire project is in Annex 2):

RECENT MEETINGS ATTENDED	DATE
• Bermuda Workshop on Vulnerability and Risk, International Ocean Institute, Bermuda	February 2000
• Global Conference on Development Agenda for Small States (Commonwealth Secretariat/World Bank Joint Task Force on Small States), London	February 2000
• Committee on Development Policy (UNCDP/UNDESA) Expert Group Meeting on Testing and Simulations of the Economic Vulnerability Index	February 2000
• Kiribati Country Visit	April 2000
• Nauru Country Visit	April 2000
• Leaders Summit, Tokyo, Japan	April 2000
• CSD 8, New York	April 1999
• UNEP/AIMS: Workshop on Information Management and Decision Support for Marine Biodiversity Protection and Human Welfare, Townsville, Australia.	December 1999
• Presentation on Ongoing Work on the Environmental Vulnerability Index (EVI) to SIDS, New York	June 2000
• Tonga Country Visit	June 2000
• Pacific Islands News Association Millennium International Media Conference on the Environment, Nadi, Fiji	July 2000
• Forum Economic Ministers Meeting, Niue	July 2000
• Cook Islands Country Visit	August 2000
• SOPAC Annual Session, Kiribati	September 2000
• Marshall Islands Country Visit	November 2000
• Niue Country Visit	November 2000
• Jamaica Country Visit	November 2000
• Barbados Country Visit	November 2000
• St Lucia Country Visit	November 2000
• Trinidad Country Visit	December 2000
• UNEP Mission, Nairobi	December 2000
• FSM Country Visit	January 2001
• Palau Country Visit	January 2001
• PNG Country Visit	February 2001

Progress: EVI Study Phase III

At the end of Phase II, the EVI was developed to a working draft stage. It now must undergo extensive mathematical testing and globalisation. The Expert Think Tank in 1999 in its deliberations recommended that to effectively test and refine the EVI, at least 15 countries that characterise all possible extremes for environmental systems should be represented. Also suggested was that the compilation of at least 80% environmental vulnerability data be accepted as a prerequisite for each country to qualify for use in this testing process.

The selection criteria for countries inclusion into the EVI are based upon ecosystem factors to ensure that all aspects of various environmental extremes, types of ecosystems and major biogeographic regions have been included in the selection of countries for the next phase.

At least ten countries out of the “Primary Targets” shown in Figure 1 will be included in the next phase of EVI development. This list of primary target countries include Alaska, Bolivia, Botswana, Brazil, Costa Rica, Greece, Greenland, Ireland, Israel, Italy, Kenya, Kyrgyzstan, Nepal, Norway, Singapore, Switzerland and Thailand. Their participation will involve provision of environmental vulnerability data for use in the testing and refinement of the EVI. Other additional countries are welcome to participate. Funding constraints will limit the number of countries that can be effectively supported in this global third phase. Participation of several countries are listed as secured including SOPAC member countries for which environmental vulnerability data profiles are currently being compiled, or which will be included later.

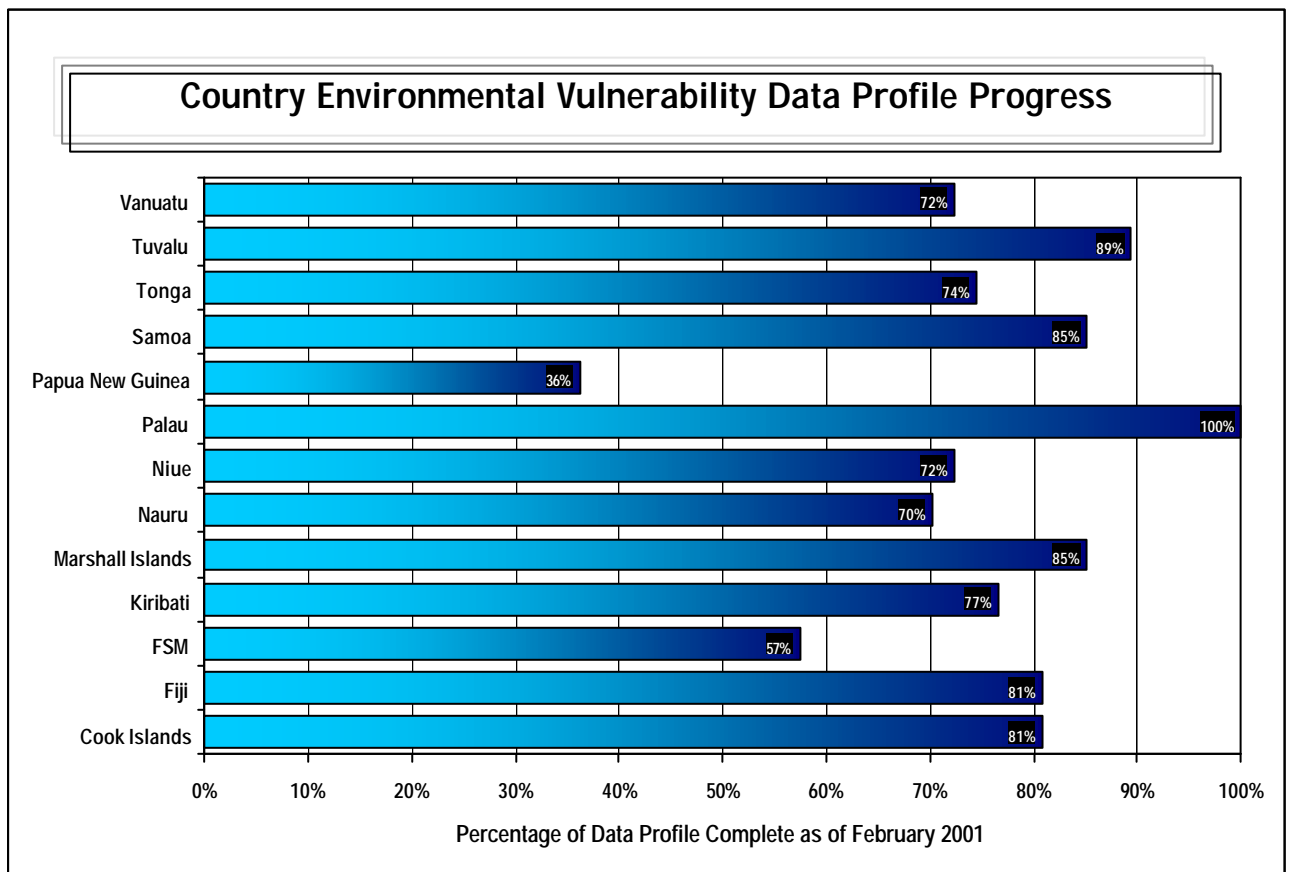
Figure 1: EVI Phase III Target Country List

ENVIRONMENTAL VULNERABILITY INDEX COUNTRY TARGET LIST FOR PHASE III				
SECURED	PRIMARY TARGETS		SECONDARY TARGETS	
	PACIFIC	OTHER	OTHER	
Barbados	Australia	Alaska	Antigua & Barbuda	Kuwait
Cook Islands	Guam	Bolivia	Bahrain	Laos
FSM	New Caledonia	Botswana	Bangladesh	Lesotho
Fiji	New Zealand	Brazil	Canada	Malaysia
Jamaica	Solomon Islands	Costa Rica	Cape Verde	Mexico
Kiribati	Tahiti	Greece	China	Netherlands
Malta		Greenland	Croatia	Paraguay
Marshall Islands		Ireland	Cyprus	Philippines
Mauritius		Israel	Czech Republic	Poland
Nauru		Italy	Denmark	Slovakia
Niue		Kenya	Egypt	Sri Lanka
Palau		Kyrgyzstan	Finland	Sweden
Papua New Guinea		Nepal	France	Tanzania
Samoa		Norway	Guyana	U.A.E.
St Lucia		Singapore	Haiti	Uganda
Tonga		Switzerland	India	United Kingdom
Trinidad & Tobago		Thailand	Indonesia	United States
Tuvalu			Japan	Vietnam
Vanuatu				

Progress with the compilation of environmental vulnerability data profiles within the Pacific member countries has been satisfactory but coverage is not yet complete (Figure 2). Pacific countries, for which EVI data profiles fulfil the 80% data requirement, include: Cook Islands, Fiji, Marshall Islands, Palau, Samoa and Tuvalu. Other Pacific countries whose environmental vulnerability profiles have been initiated and are as yet incomplete include: Federated States of Micronesia, Kiribati, Nauru, Niue, Papua New Guinea, Tonga and Vanuatu. Follow up efforts are required to ensure compilation and completion of all country environmental vulnerability data profiles. The significantly low data profile progress for Papua New Guinea is due to fact that the EVI mission to the country has only recently been undertaken (11 – 16 February 2001).

Delays in successful completion of the various countries' environmental vulnerability data profiles have been due to variety of issues ranging from no responses from government organisations to no available data. These issues are discussed later in this report.

Figure 2: Summary of Country Environmental Vulnerability Data Profile Compilation



It is also important to note here that the EVI has been built as a flexible tool that is able to cope both with raw data as well as educated guesses from experienced professionals. Therefore, although some countries are indicated as satisfying the minimum 80% data requirements they may still be largely dependent upon best guess or data from questionable sources, thus greater efforts may still be required to establish baseline data for a more accurate assessment of a country's environmental vulnerability.

Issues Relating to EVI Data Compilation

The three phases of the EVI project have required an ongoing process of data collection to provide an extensive base of information for the development and testing of a methodology for determining environmental vulnerability of countries. This process has focused primarily on SOPAC member countries, and through the involvement of Pacific countries, efforts have been made to compile environmental vulnerability profiles for each country.

This process of compiling country environmental vulnerability data has involved missions to countries by the EVI team to help build capacity within countries to be able to identify, collect and collate appropriate environmental data. These will be useful in both the development of the EVI and in environmental management and decision-making.

The country environmental vulnerability data profile consists primarily of data required to respond to the 47 indicators that together constitute the EVI (Annex 3). These indicators require data ranging from information on natural events such as meteorological, geological and others; to ecosystem information on biodiversity, areas of natural habitat and areas protected; to information on human activities in terms of population to exploitation of resources and pollution. As the focus of the EVI is to determine an immediate assessment of a country's environmental vulnerability, only recent data is required.

During the process of data gathering by the EVI team in the Pacific, several important issues have arisen both during in-country missions and in the course of compiling data. These have hindered compilation of EVI data profiles. To summarise the EVI team's perceptions and experiences, the following broad issue areas have been identified:

- Identifying Sources of Data
- Accessibility
- Completeness
- Quality
- Capacity

Identifying Sources of Data

The identification of possible data sources and appropriate agencies to approach for the required data has highlighted several issues. Differences in the structure of various governments throughout the Pacific can lead to similar agencies having quite different responsibilities and holding different data sets. This has made the identification of appropriate sources and collection of information more complicated than expected for those countries.

The identification of data held by various agencies is not always known by its officers and data is not always recognised as relevant to the EVI. This issue has arisen mainly due to a limited understanding of an indicator and its data requirements; the changing of staff or just poor knowledge of the databases held by the agency. In-country missions and direct assistance to countries has helped to overcome some of these related issues.

Accessibility

Collection, analysis and storage of data are expensive exercises. As a result there is an increasing recognition of the importance and true value of data. This has had a significant impact on access to information. As most government agencies are asked to carry out data collection tasks on ever-reducing budgets, many are gradually looking to recover their costs through charges for both data and time taken by personnel to access and compile requested data.

Also in certain cases, a country may consider particular data sensitive and thus limit access. Although most data required for EVI indicators would not be considered sensitive, there have been several instances where access to information has required special authorisation. The support of government for the EVI and the data gathering process has therefore been essential in overcoming these problems in the Pacific.

Completeness

Despite international recognition of the value and importance of environmental data in decision-making, collection and the maintenance of environmental data sets in Pacific Island countries has not always been given priority. In many countries there is either no data collection, collection is ad-hoc or inconsistent, or when data is collected regularly, there is no proper handling or storage of the data sets leading to incomplete databases and loss of, or poor access to the information. Some countries are also dependent upon external support to maintain databases.

Quality

The issue of data quality is not peculiar to the Pacific. In the course of data gathering, several inconsistencies between local data and international data sets have arisen. The use of different standards or methods of data collection or the use of general assessments based on small-sample-biased data may have contributed to these differences. There is also the potential of inaccurate equipment, lack of proper training in measurement procedures, lack of quality control procedures and many other reasons which could all lead to inaccuracies in data reported.

Capacity

The issue of the limited capacity is a common one throughout SIDS. In Pacific countries this has been one of the main difficulties in the facilitation of EVI data gathering. The lack of capacity is two-fold in that it involves both institutional as well as personnel capacity problems.

In the Pacific, data gathering exercises like the EVI have placed an added burden on existing institutions' responsibilities to provide data and information. With limited resources and few trained personnel this task can often be an impossible expectation. The only way to assist these countries facilitate their country collection of environmental data has been to provide in-country input and assistance. This is extremely costly and it is imperative that alternative approaches are found to provide the assistance needed.

Another issue that has arisen is the difficulties created by an inadequate understanding by personnel of the specific data and information requirements needed for a response to indicator questions. This is due in part to an inadequate understanding of the purpose of the EVI, its mechanics but mainly the inadequate training of personnel in the identification, collection and analysis of data. The EVI in-country missions have made some progress in addressing this issue by strengthening capacity to collate environmental vulnerability information.

As highlighted earlier in Figure 1 of this report, further efforts have been made to secure environmental vulnerability profile data from several other SIDS who have expressed their support and willingness to participate in the EVI project. Unfortunately efforts to compile EVI data profiles for Barbados, Jamaica, Malta, Mauritius, St Lucia, Trinidad and Tobago have met with mixed success. The EVI team experience in these countries has shown that the issues hindering progress in the compiling of environmental vulnerability data for these SIDS are similar in every respect to those that have been emphasised earlier. It has also been found that difficulties with long distance communication have also made progress difficult.

Status of Profile Completion for Pacific Island Countries _____

As highlighted above, the compilation of environmental vulnerability data profiles for participating Pacific countries are in various stages of completion. The 13 Pacific countries for which profiles have been undertaken include:

- Cook Islands
- FSM
- Marshall Islands
- Niue
- Papua New Guinea
- Tonga
- Vanuatu
- Fiji
- Kiribati
- Nauru
- Palau
- Samoa
- Tuvalu

Due to political instability in the Solomon Islands over the past several months, EVI work in that country has been delayed.

Although six of the countries listed above have adequately satisfied the EVI minimum data requirements of 80%, only Palau has been able to provide 100% response to all environmental vulnerability indicators. This indicates that completion of the full EVI database for a country is indeed possible. All other country environmental vulnerability data profiles are still incomplete.

There are several reasons for the difficulties being faced in trying to complete each country's data profile. These range from no responses from countries after requests for indicator information; inability to locate information; need for international assistance to provide data; no expertise in-country to make a best guess response or no data. The issues faced in each country are outlined in summary together with the number of outstanding EVI indicators required to complete 100% of each of the country environmental vulnerability data profiles below.

Figure 3: Summary Table of Issues for Pacific Island Countries with Incomplete EVI Data Profiles (See also Annex 3 for explanation of Indicator Numbers)

Country	# Indicators Not Answered	% Indicators Not Answered	No Data	Data Not Provided
<i>Cook Is.</i>	9	19%	24, 28, 36	1, 2, 9, 15, 22, 42
<i>Fiji</i>	9	19%	14, 15, 24, 36	1, 9, 39, 46
<i>FSM</i>	20	43%	1, 2, 36, 45	7, 8, 9, 16, 19, 20, 21, 22, 23, 24, 28, 37, 38, 39, 40, 43
<i>Kiribati</i>	11	23%	2, 18, 36	1, 7, 8, 9, 22, 28, 42, 43,
<i>Marshall Is.</i>	7	15%		17, 18, 19, 28, 31, 36, 43
<i>Nauru</i>	14	30%	20, 21, 31, 36	1, 2, 9, 17, 18, 22, 27-29, 41
<i>Niue</i>	13	28%		1, 2, 7, 8, 9, 17, 16, 18, 19, 21, 33, 36, 40,
<i>Palau</i>	0	-	-	-
<i>PNG</i>	30	64%	-	1-6, 11, 12, 14, 15, 18, 19, 20, 21, 23, 24, 25, 26, 27, 31, 33, 34, 35, 36, 37, 38, 39, 40, 43, 44, 45, 46
<i>Samoa</i>	7	15%	1, 2, 17, 30, 36, 39	32
<i>Tonga</i>	12	26%	36	1, 8, 14, 15, 21, 22, 23, 28, 30, 40, 43
<i>Tuvalu</i>	5	11%	2, 36, 39	1, 8
<i>Vanuatu</i>	13	28%	14, 15, 28, 36	1, 2, 3, 4, 5, 6, 17, 18

[NB: Status of Country EVI Data Profiles as at 28 February 2001]

To address the need to complete all participating country environmental vulnerability data profiles, the EVI team will have to deal with some of these issues summarised above. Further efforts by the EVI team will be necessary to elicit responses from country representatives to collect data where available or more importantly identify where data gaps exist. The identification of data gaps or inadequacies in current data are important benefits of the EVI development process and although it is beyond the scope of this exercise to address all these aspects of data problems in countries, the importance of information cannot be underestimated. The fundamental basis of the EVI is data and to get an accurate measure of a country's vulnerability of its environment requires good quality data.

It is expected, that by collaborating with all participating Pacific countries to deal with some of these outstanding issues specifically, the minimum data requirement of 80% for the country environmental vulnerability data profiles will be satisfied over the next 6 months. Further efforts by countries together with external assistance may be required to address data quality and data gap issues in countries to enable 100% completion of EVI data profiles.

Status of Profile Completion for other SIDS ---

The compilation of environmental vulnerability data profiles for participating SIDS countries are mostly in the initiation stage although some time have been given to this exercise. The countries for which profiles have been undertaken include:

- Barbados
- Malta
- St Lucia
- Jamaica
- Mauritius
- Trinidad & Tobago

Basic EVI data profiles of up to 25% of the environmental vulnerability data required have been compiled for each of the countries. A country mission was made to Barbados, Jamaica, St Lucia and Trinidad to progress the EVI work that had been undertaken in each of the countries. To date no further data has been collected except for Trinidad and Tobago that has been able to compile 85% of the EVI data requirements. Follow up efforts with countries will need to address data issues and focus on compiling the minimum EVI data requirements. Issues relating to data quality and gaps will also need to be addressed.

Summary of Progress Towards a Global EVI ---

Progress to date with the environmental vulnerability index project has been significant with the successful compilation of several country environmental vulnerability data profiles. These EVI data profiles all satisfy the minimum 80% of data requirement for the EVI:

- Cook Islands
- Marshall Islands
- Samoa
- Tuvalu
- Fiji
- Palau
- Trinidad & Tobago

The compilations of several other countries' environmental vulnerability data profiles have been initiated and are in various stages of progress. Palau is the only country that has completed 100% of its environmental vulnerability data profile. All other countries require further efforts to complete each country's data profile.

During the process of compiling environmental vulnerability data profiles several major issues have arisen. These issues have hindered data compilation and include:

- data source identification
- completeness
- capacity
- accessibility
- quality

These issues make up some of the main obstacles that must be addressed to ensure accurate and complete data profiles are compiled for each country. Some success in addressing of these issues has been achieved by the EVI team primarily through in-country missions to help strengthen capacity within countries to be able to identify, collect and compile data on environmental vulnerability as well as to understand and be able to utilise the EVI tool.

Further efforts will also need to focus on overcoming specific problem areas particularly in relation to the incomplete sections of the various country environmental vulnerability data profiles. One of the primary obstacles to completing country EVI data profiles successfully has been the poor response and follow-up by country representation to collect data and fill data gaps.

The EVI team intends to work with all SIDS to address data compilation issues. By working with countries the team intends to elicit the necessary responses from various responsible organisations within countries for data requests, train and collaborate with organisations in data identification and collection for various indicators and assist in identifying data gaps.

It is expected that some countries may require external assistance to overcome some of the obstacles notably in addressing the issues of data quality and data gaps as highlighted in this report. This is essential in some cases to enable countries to satisfy the minimum 80% data requirements for calculation of a country's environmental vulnerability index. It is also essential that good quality data be provided for use in the EVI to get an accurate understanding of environmental vulnerability for a country.

The SOPAC EVI is gaining international acceptance since its initiation in 1998. In 2000, at the World Economic Forum Annual Meeting in Davos, Switzerland, the Global Leaders of Tomorrow Environment Task Force released a report on a Pilot Environmental Sustainability Index (ESI). A subsequent report has recently been released describing their progress over the past year in developing the ESI. Although not specifically referenced to us, the ESI uses a very similar approach to solving the problem of dealing with heterogeneous data. Their approach does however tether results to a normal distribution, a parametric procedure that the EVI specifically avoids. The ESI focuses on sustainability of human development as an entirely different approach to environmental management. The EVI focuses on risks to the continued health of the natural environment, which is the life-support of all human systems. We look forward to further developments of the ESI, as together with our efforts, the area of environmental management and the vital roles of indices in human advancement will continue to grow.

Future Directions

The compilation of data profiles will provide the basis for the testing and refinement of the EVI in Phase III. Data profiles for all participating Pacific countries should be complete within 6 months. Further efforts will be required to complete other SIDS data profiles. The involvement of at least 10 non-SIDS/non-Pacific countries, with different characteristics of climate and biogeography, in the EVI project will be the focus of further data compilation efforts.

Compilation of environmental vulnerability data profiles for several non-Pacific countries will require their full support and involvement. The provision of sufficient and accurate environmental vulnerability data for use in the testing and refinement process is essential to ensure the EVI's global robustness, workability and applicability.

The United Nations Environment Programme (UNEP) has had an ongoing involvement in the development of the EVI. To further strengthen this partnership the EVI team in collaboration with UNEP had proposed to co-host a meeting of countries interested in participating in the EVI project late 2000. Due to delays in getting commitment and the lack of response from targeted countries the meeting had to be postponed. The EVI team with UNEP have scheduled the meeting for August 2001.

The meeting is aimed at encouraging participation and voluntary collaboration from as many targeted countries as possible. The planned meeting will concentrate country participation on compiling EVI data profiles. Follow up efforts to complete the minimum 80% data requirements for each country EVI data profile will be required. All completed country environmental vulnerability data profiles will provide the basis for alpha testing of the EVI.

100% EVI IS POSSIBLE

- Palau is a model example, having provided 100% of its EVI data, showing that the EVI is achievable
- Sufficient data for a valid EVI (minimum 80% data requirements) have been collected for 6 out of 13 Pacific countries included so far
- 5 Pacific countries have over 70% of the required data and with some effort will all meet the 80% EVI data requirement

ANNEX 1: Complete List of EVI Publications

Briguglio L and Kaly U. 1999. *Extending SOPAC's Environmental Vulnerability Index to the IMA and Caribbean Regions*. Background Paper for UNEP Meeting of Experts on the Environmental Vulnerability Index, Malta, 1999.

Briguglio L., Kaly U. and Pratt C. 1999. *Report of the Meeting of Experts on the Environmental Vulnerability Index, Valletta, Malta, 29 November - 3 December 1999*. UNEP. Islands and Small States Institute in collaboration with South Pacific Applied Geoscience Commission.

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ANNEX 2: List of Meetings at which EVI was Presented or Discussed

- SOPAC Consultation Meetings with CROP Organisations and regional experts, Suva, August 1998
- STAR/SOPAC Annual Session, Suva, October 1998
- START Oceania Workshop, Suva, October 1998
- SPREP Pacific Regional Input to CSD7/GEO2 Workshop, Apia, Samoa, November 1998
- Forum Secretariat/SPREP Trade & Environment Workshop, Suva, January 1999
- SIDS Meeting, New York, United States, February 1999
- CSD 7, New York, March 1999
- Committee for Development Policy (ENCDP / UNDESA) Technical Group's Meeting on the Vulnerability Index, London, March 1999
- AOSIS Clean Development Mechanisms for Climate Change Meeting, Majuro, Marshall Islands, June 1999
- Fiji Country Visit, June 1999
- Vanuatu Country Visit, June 1999
- Pacific Science Congress, Sydney, Australia, July 1999
- Australia Country Visit, Canberra, July 1999
- Forum Economic Ministers Meeting, Apia, Samoa, July 1999
- IPCC Meeting of Lead Authors of Chapter 17 on SIS, Malta, July 1999
- Pacific Science Congress, Sydney, Australia, July 1999
- IOC General Assembly Meeting, Paris, France, July 1999
- IDNDR Meeting, Geneva, Switzerland, July 1999
- CROP Meeting, Nadi, August 1999
- Samoa Country Visit, August 1999
- Pacific Island Climate Change Assistance Programme (PICAPP) Meeting on Climate Change Integrated Model (PACCLIM), Auckland, New Zealand, August 1999
- International Workshop on Sustainable Development in SIDS, Loftan, Norway, August 1999
- UN General Assembly on Special Session on SIDS, New York, September, 1999
- International Expert Group Meeting on the EVI, Pacific Harbour, Fiji, September 1999
- UNEP Global Workshop on Vulnerability and Adaptation, Nairobi, Kenya, October 1999
- Pacific Island Forum, Palau, October 1999
- South Pacific Tourism Organisation (SPTO) Governing Council Annual Session, Apia, Samoa, October, 1999
- SOPAC Governing Council Annual Session, Nadi, Fiji, October 1999
- Diplomatic Training Workshop for Forum Island Countries, Suva, Fiji, November 1999
- UNEP / FIS University of Malta Meeting of Experts on the Environmental Vulnerability Index (EVI), Valetta, Malta, November 1999
- UNEP / Australian Institute of Science (AIMS) Meeting on Information Management and Decision Support for Marine Biodiversity Protection and Human Welfare: Coral Reefs, Townsville, Australia, December 1999
- Bermuda Workshop on Vulnerability and Risk, International Ocean Institute, Bermuda, February 2000
- Global Conference on Development Agenda for Small States (Commonwealth Secretariat/World Bank Joint Task Force on Small States), London, February 2000
- Committee on Development Policy (UNCDP/UNDESA) Expert Group Meeting on Testing and Simulations of the Economic Vulnerability Index, February 2000
- Kiribati Country Visit, April 2000
- Nauru Country Visit, April 2000
- Leaders Summit, Tokyo, Japan, April 2000
- CSD 8, New York, April 1999
- Presentation on Ongoing Work on the Environmental Vulnerability Index (EVI) to SIDS, New York, June 2000
- Tonga Country Visit, June 2000

- Pacific Islands News Association Millennium International Media Conference on the Environment, Nadi, Fiji, July 2000
- Forum Economic Ministers Meeting, Niue, July 2000
- Cook Islands Country Visit, August 2000
- SOPAC Annual Session, Kiribati, September 2000
- Marshall Islands Country Visit, November 2000
- Niue Country Visit, November 2000
- Jamaica Country Visit, November 2000
- Barbados Country Visit, November 2000
- St Lucia Country Visit, November 2000
- Trinidad Country Visit, December 2000
- UNEP Mission, Nairobi, December 2000
- FSM Country Visit, January 2001
- Palau Country Visit, January 2001
- PNG Country Visit, February 2000

ANNEX 3: Summary Table of EVI Indicators

Each indicator is accompanied by a short form key name, detailed definition, list of key words that describe the main factors for which it is a proxy. Cat = Categorisation where: REI = Risk exposure sub-index; IRI = Intrinsic resilience sub-index; EDI = Environmental degradation sub-index; Met = Meteorological; G = Geological; CC = Intrinsic country characteristics; B = biological and A = Anthropogenic indicators.

#	Cat	Key name	Indicator text	Main proxy factors
1	REI Met	Sea Surface Temperature	Greatest average annual deviation in Surface Sea Temperature in last 5 years from long term mean (30 years) (Centralised database)	Coral bleaching; fisheries; currents; eddies; ENSO; cyclones
2	REI Met	High winds	Number of days over the last 5 years during which the max recorded wind speed (3 second gusts) >20% higher than the average maximum for that month (use 30yr average for each month as reference) (Data accumulated over all reference climate stations / # stations)	Cyclones; tornadoes; storms; erosion
3	REI Met	Dry periods	Number of months over the last 5 years during which rainfall >20% lower than the 30yr average for that month. (Data accumulated over all reference climate stations / # stations)	Droughts; dry spells; water resources
4	REI Met	Wet periods	Number of months over the last 5 years during which rainfall >20% higher than the 30yr average for that month (Data accumulated over all reference climate stations / # stations)	Floods; wet spells; coral reefs; pollution; erosion
5	REI Met	Heat waves	Number of days over the last 5 years during which the max temperature >5 C higher than the mean monthly maximum for that month (use 30yr average for each month as reference) (Data accumulated over all reference climate stations / # stations)	Heat waves; desertification; water resources; temperature stress
6	REI Met	Cold snaps	Number of days over the last 5 years during which the max temperature >5 C lower than the mean monthly minimum for that month (use 30yr average for each month as reference) (Data accumulated over all reference climate stations / # stations)	Cold snaps; temperature stress
7	REI G	Volcanic eruptions	Number of volcanoes with potential for eruption \geq VEI 4 (Volcano explosivity Index) within 100km of country land boundary / area of land	Eruptions; landslides; geysers; gas; fires; ash; dust; marine kills
8	REI G	Earthquakes	Earthquakes within 100km of country land boundaries / land area with ML \geq 6.0 and \leq 15km depth over last 5 years	Earthquakes; landslides
9	REI G	Tsunamis	Number of tsunamis or storm surges with run-up >2m above MHWS / 100km coastline since 1900	Tidal waves; erosion; habitat disturbance and organism kills
10	IRI CC	Land area	Total land area (sq km)	Richness of habitat types; refugia; species redundancy and richness
11	IRI CC	Fragmentation or "islandness"	Length of ocean shoreline or land border divided by total land area	Fragmentation; erosion; exposure at borders or coasts
12	IRI CC	Isolation	Distance to nearest continent within 10 degrees latitude (km) (Australia is smallest continent)	Proximity to refugia; recolonisation; biodiversity
13	IRI CC	Vertical relief	Altitude range (Highest point - lowest point in country)	Biodiversity of habitats and species
14	IRI CC	Lowlands	Percent of land area <10m above sea-level	Floods, areas of accumulation of pollution, sensitive habitats
15	IRI CC	Coastal vulnerability	Percentage of land area <10m elevation within 2km of coast composed of unconsolidated sediments (excluding coral reefs and ice)	Storm surges; cyclones, erosion
16	IRI CC	Endemic species	Number of known endemic species / sq km land area	Biodiversity; unique species
17	REI B	Pathogens and plagues	Number of reported (and verified) organism outbreaks over the last 5 years / land area (competitors, pathogens, blooms, plagues etc)	Ecosystem stress; eutrophication; pollution; introductions; disturbance
18	REI B	Potential for introductions	Total tonnage of freight imported / year / sq km land area	Potential for Introductions
19	EDI B	Introductions	Number of all introduced species / sq km land area since 1900	Past introductions; biodiversity
20	EDI B	Endangered species	Number of endangered and threatened species / sq km of land area (IUCN definitions)	Biodiversity; Keystone species
21	EDI B	Extinctions	Number species which have become extinct since 1900 / sq km land area (IUCN definitions)	Biodiversity; Ecosystem structure and function
22	EDI B	Natural vegetation	Percentage of natural and regrowth vegetation remaining (e.g. forests, mangroves, saltmarshes, prairies, savannah, desert, tundra)	Ecological redundancy; Biodiversity; Ecosystem services and goods
23	EDI B	Intensive farming	Tonnage of intensively-farmed animal products / yr / sq km land area (includes aquaculture, pigs, chickens, etc)	Pollution; Eutrophication
24	EDI B	Fisheries	Percent of fisheries stocks overfished (FAO)	Resource depletion
25	EDI A	Coastal settlements	Density of people living in coastal settlements with city centre within 20km of coast (people per sq km land area)	Stress on coastal ecosystems; pollution; eutrophication;

26	REI A	Human population density	Total human population density (per sq km land area)	resource depletion All incidental damage caused by human activities
27	REI A	Human population growth rate	Annual human population growth rate (percent) (average over last 5 years)	Potential for future incidental damage caused by human activities
28	REI A	Rate of loss of natural vegetation	Net percentage of land area changed by the removal of natural vegetation over last 5 years	Pollution attenuation; biodiversity; soil formation; natural resources; groundwater regeneration; CO ₂ fixing
29	REI A	Tourists	Annual number of international tourists * average days stay / 365 / sq km land area (last 5 years)	Additional load of all human impacts not reported in population statistics
30	REI A	Wastewaters	Litres / sq km / day of untreated industrial and domestic wastewater discharged	Eutrophication; water pollution
31	REI A	Production of hazardous and municipal wastes	Total net tonnage of generated and net imported toxic, hazardous and municipal wastes / sq km land area / year (average last 5 years)	Pollution; habitat destruction; groundwater damage
32	REI A	Waste treatment	Mean percent of hazardous, toxic and municipal waste "effectively" managed or treated / year	Proportion of wastes rendered less harmful
33	REI A	Oil spills	Number spills of oil and hazardous substances >1,000 litres during last 5 years on land, in rivers or within territorial waters / sq km land area	Pollution
34	REI A	Toxic industries	Number of nuclear, chemical and other major industrial facilities that could cause significant damage / sq km land area	Pollution; acid rain
35	REI A	Vehicles	Number of vehicles (World Bank definition) / sq km land area	Habitat damage; habitat fragmentation; pollution; mining; hazardous wastes
36	REI A	SO ₂ concentration	Max 24 hour SO ₂ concentration (micro g /cubic m) (average over last 5 years)	Pollution; attenuation rates; acid rain
37	REI A	Fertilisers	Tonnes of N,P,K fertilisers used / sq km agricultural land area / year (average last 5 yrs)	Eutrophication; pollution; soil damage; loss of arable land
38	REI A	Pesticides	Tonnes of pesticides used / sq km of agricultural land / year (average last 5 years)	Pollution; soil damage; damage to reproductive systems of organisms
39	REI A	Fisheries stocks	Number of new fisheries stocks or expanded fisheries efforts (>20% increase in catches) added to country over last 5 years (within territory)	Rate of resource depletion
40	EDI A	Degradation	% Land area degraded since 1950 (includes salinisation, desertification etc.)	Rate of habitat loss
41	EDI A	Water resources	Mean rate of water usage per capita per day	Use of surface free water and groundwater; groundwater, river and habitat damage
41	EDI B	Water resources	Annual internal renewable water resources per capita (average annual runoff plus recharge of groundwater from endogenous precipitation)	Use of surface free water and groundwater; groundwater, river and habitat damage
42	REI A	Sub-surface mining	Tonnes of mining material (ore + tailings) extracted / sq km land area / year (average last 5 years)	Pollution; habitat disturbance; heavy industry
43	EDI A	Surface mining	% Land, rivers and coastal zone affected by mining and quarrying	Habitat disturbance
44	EDI A	Terrestrial reserves	Percent of terrestrial zone set aside as reserves	Increases resilience, pollution attenuation, limits loss of biodiversity
45	EDI A	Marine Reserves	Percent of marine zone set aside as reserves (mean high tide to continental shelf)	Increases resilience, pollution attenuation, limits loss of biodiversity
46	EDI A	War / civil strife	Number of war or civil strife years over the last 50 years within the territory	Habitat disturbance; pollution; habitat degradation
47	EDI A	Legislation (discarded)	Environmental legislation with regulations	Controls; management of goods and services
47	EDI B	Sanitation	Percentage of population with access to safe sanitation (WHO)	Eutrophication; pollution