PN-ACQ-278

RD10.00V.P

ENRAP-SARANGANI
INSTITUTIONALIZING AN ENVIRONMENTAL AND NATURAL RESOURCES ACCOUNTING SYSTEM AT THE PROVINCIAL LEVEL[1]

(Process Documentation and Recommendations for Sustainability and Effective Replication)

Department of Environment and Natural Resources

Philippine Economic – Environmental and Natural Resources Accounting System

Environmental and Natural Resources Accounting Project

Supported by the

United States Agency for International Development

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INSTITUTIONALIZING AN ENVIRONMENTAL AND NATURAL RESOURCES ACCOUNTING SYSTEM AT THE PROVINCIAL LEVEL[1]

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ENRAP TECHNICAL PAPER

by

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[1] This document was made possible through the grant provided by the United States Agency for International Development (USAID) under the terms and conditions of Contract No. 492-0465-C-00-4042-00. The opinions expressed herein are those of the authors and do not necessarily reflect the view of the USAID and collaborating institutions. This document may be reproduced or quoted in other publications as long as proper reference is made to the source.

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List of Acronyms

ADB	Asian Development Bank
AIP	Annual Investment Program
BAS	Bureau of Agricultural Statistics
BCA	benefit-cost analysis
CBFM	community-based forest management
CCDP	Commercial Crop Development Program
CENRO	Community (City) Environment and Natural Resources Office(r)
CO	carbon monoxide
CRM	Coastal resources management
CV	contingent valuation
CRMP	Coastal Resources Management Project
DECS	Department of Education, Culture, and Sports
DENR	Department of Environment and Natural Resources
DNS	direct nature service
DTI	Department of Trade and Industry
ED	environmental damage
EMS	Environmental Management System Environmental MIS/GIS System
ENRA	Environmental and Natural Resources Account(s)(ing)
ENRAMIS	Environmental and Natural Resources Accounts – Management Information System
ENRAP	Environmental and Natural Resources Accounting Project
ENRO	Environment and Natural Resources Office(r)
EU	European Union
EWDS	environmental waste disposal services
GIS	Geographic Information System
GOLD	Governance for Local Democracy
GRASS	Geographic Resources Analysis Support System
IEC	information, education, and communication
IIRR	International Institute for Rural Reconstruction
ILO	International Labor Organization

IRAP	Integrated Rural Accessibility Planning
ISF	Integrated Social Forestry
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
LAN	local area network
LGU	Local Government Unit
LPG	liquefied petroleum gas
MAO	Municipal Agricultural Office(r)
MBI	market-based instrument
MCD	municipal coastal database
MEY	maximum economic(ally sustainable) yield
MIS	Management Information System
MIS/GIS	Management Information System/Geographic Information System
MNLF	Moro National Liberation Front
MOA	Memorandum of Agreement
MPDC(s)	Municipal Planning and Development Coordinator(s)
MPDO(s)	Municipal Planning and Development Office(s)
MSY	maximum sustainable yield
NEDA	National Economic Development Authority
NGO(s)	Non-governmental Organization(s)
NO_x	nitrogen oxide
NRD	natural resources depreciation
NRMP	Natural Resources Management Project
NSO	National Statistics Office
NSCB	National Statistics Coordinating Board
OJT	on-the-job training
OPAG	Office of the Provincial Agriculturist
pdf	portable document format
PEENRA	Philippine Economic-Environmental and Natural Resources Accounting
PENRO	Provincial Environment and Natural Resources Office
PHO	Provincial Health Office(r)
PLUP	provincial land-use plan(ning)

PM particulate matter

PPDO Provincial Planning and Development Office

SB Sangguniang Bayan

SEP Socio-Economic Profile

SP Sangguniang Panlalawigan

SOCSARGEN - coined for the provinces of South Cotabato, Sarangani, and the City of Gen. Santos

SOCSKSARGEN - coined for the provinces of South Cotabato, Sultan Kudarat, Sarangani, and the City of Gen. Santos

SO_x sulfur oxide

SQL Structured Query Language

SS suspended solids

SWAT Soils and Water Assessment Toolkit

TA technical assistance

UNDP United Nations Development Program

UNICEF United Nations International Children's Emergency Fund

USAID United States Agency for International Development

VOC volatile organic compounds

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This report paper documents in detail the process of ENRA institutionalization at the Province of Sarangani. It presents the required components of a local ENRA institutionalization as experienced in Sarangani. It draws heavily from the Sarangani experience for its recommendations for project sustainability and effective replication, if and when local ENRA accounting becomes necessary.[3]

I. Introduction

A major task of the Philippine Environmental and Natural Resources Accounting Project (ENRAP) is the investigation of environment-economy interactions for the promotion of sustainable growth and development in the country. Its primary objective is to appropriately incorporate the changes in environment and natural resources, such as natural resource depreciation, environmental waste disposal services, environmental damages and changes in environmental quality, into the existing systems of national accounts.

At the extension and expansion phases[4], ENRAP activities were geared towards institutionalization and capability building, specifically:

- building the capacity of the Department of Environment and Natural Resources (DENR) in the conduct of environmental economic analysis;
- institutionalizing the Philippine Economic-Environmental and Natural Resources Accounting (PEENRA) system into the different responsible government agencies;
- ENRA-institutionalization and capability building in the management of the environment and natural resources at the local government unit (LGU) level.

This paper concentrates on the third activity – the pilot project of institutionalizing an ENRA system in the Province of Sarangani and the capacity building at its planning and development units. It describes the basic components and activities involved in the institutionalization process, highlights the strengths and lessons learned from the pilot-testing activities, and offers invaluable recommendations for the replication of the project to other provinces of the country.

Objectives of the Project

The general objectives of this activity explicit in the Project description are the following:

- To institutionalize the environmental and natural resources accounting (ENRA) system, developed and estimated by ENRAP at the national level, into the provincial level – specifically that of Sarangani Province.
- To build capacity at the provincial and municipal planning units of Sarangani in the implementation and use of ENRA accounts in the management of the environment and natural resources.

However, additional objectives are implied by the pilot nature of the project. These are:

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[3] The paper does not attempt to measure the efficiency of local ENRA accounting *vis-à-vis* centralized/national accounting. Although the Sarangani case can assist in deciding the issue, the Sarangani experience is more relevant, if and when, local ENRA accounting is deemed necessary.

[4] These are the last phases of ENRAP. The extension phase was from October 1997 to September 1998, the expansion phase until September 1999.

- To serve as *learning* laboratory in the institutionalization of ENRA and capacity-building activities at the provincial LGU levels.
- To document the process – identifying the basic components required of ENRA institutionalization, the strengths and weaknesses, and problems and difficulties encountered.
- To offer recommendations, based on this *Sarangani experience*, to facilitate replication to other LGUs.
- To identify the resources needed in the replication process.

Scope and Duration of the Project

The Project is based at Sarangani Province – in the Provincial Planning and Development Office at the Provincial Capitol Building in Alabel. It runs for two years – starting in January 1998 until December 1999[5].

Report Presentation

The report is divided into three major chapters and five appendices and two appendix tables. Chapter 2 highlights the operational components and processes in institutionalizing an ENRA system in Sarangani. Chapter 3 presents the challenges and the nature of difficulties encountered in the implementation of the project. The report ends with Recommendations on project sustainability and on how to effectively replicate the institutionalization process to other provincial LGUs.

The Appendices augment the documentation process. Appendix A revisits the issue of centralized and decentralized ENRA accounting. The technical papers start with the Sarangani environmental MIS/GIS system (Appendix B), its application to policy analysis and development (Appendix C), and a framework for assessing the environmental costs of new investment projects (Appendix D). There is one appendix on counterpart's perspective on the role and significance of ENRAP-Sarangani efforts in the development planning process and policy formulation activities (Appendix E).

The appendix tables present the list of important events and gatherings participated in by the project (Appendix Table 1).

II. The Process of Institutionalization

This chapter identifies and describes the operational components and processes involved in an ENRA-institutionalization and capacity-building for environmental policy analysis and resource management in Sarangani. The chapter recounts a previous ENRAP pollution load study and the subsequent request from Sarangani LGU for extension that led to the inception of ENRAP-Sarangani project. It then proceeds with a cursory identification and description of the operational components of the project.

[5] The Project officially ends in September 1999 with no-cost extension until March 2000. This report covers the process until September 1999 although Project assistance to Sarangani Province continued to December 1999.

ENRAP-Sarangani – A Demand-Driven Project

For the past nine years (in four phases), ENRAP has been in the forefront of generating and upgrading environmental indicators and in identifying and recommending solutions to environment-economy concerns.

The scope of ENRAP activities and researches has been at the national, regional, sectoral, and resource levels. The environmental and natural resources accounting (ENRA) system was designed and made operational at the national level, while most of the environmental management studies were undertaken either at the industry (*e.g.*, leather tanning, oil and transport) or at the resource (*e.g.*, Lingayen Gulf and Laguna de Bay) levels.

On the fourth phase of the project (ENRAP4), a comprehensive study on environment-economy interactions was conducted in the SOCSARGEN (coined from the provinces of South Cotabato and Sarangani and the city of General Santos) area.[6] The specific objectives of the study were to measure the pollution loads and to value the waste disposal services (EWDS) provided by the environment to the industrial, household and agricultural sectors of SOCSARGEN.

SOCSARGEN is one of two growth areas in Mindanao experiencing rapid economic growth and industrial development in recent years. The ENRAP study quantified the level and rate of environmental and natural resources degradation in the region. It also analyzed the economic and environmental impacts of long-term use of the environment and natural resources under different development policy scenarios, and assessed the region's capability in meeting future water demand.

Results of the study revealed a worsening environmental condition in the region and highlighted the alarming pollution rate in Sarangani Bay. Furthermore, the study pointed out the need to invest in environmental protection measures and to implement policies that will lead to better management of the area's environment and natural resources.

The study report, which contains separate and aggregate estimates of the value of the environment as a waste receptor for the Provinces of Sarangani and South Cotabato, and the City of General Santos, was presented to the respective LGU officials. In Sarangani, there was a special study presentation to the Kasfala, a forum or assembly of tribal leaders and elders in the province.

After the series of presentations, the Province of Sarangani was the only LGU to become interested in making an ENRA system operational at the local level. The Office of the Governor and Provincial Planning and Development Office (PPDO) of Sarangani requested the ENRAP project management to that effect. They further requested ENRAP to help build the capability of the planning and development units of the province in utilizing the ENRA system for managing its environment and natural resources.

So that for the succeeding phases of ENRAP, the institutionalization of ENRA and the capacity building at the LGU level becomes one of the major thrusts. And ENRAP-Sarangani Project – the pilot-project for the ENRA institutionalization process as *demanded* by Sarangani Province – was established.

Hence, Sarangani Province becomes the first LGU in the Philippines to use the ENRA system in its development planning process and in managing its environment and natural resources.

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[6] Francisco, H.A., et al. Economic Development, Population Growth and the Environment in SOCSARGEN, Mindanao, Philippines. A Project Report. DENR, 1997.

Project Components and Operational Framework[7]

By design, ENRAP-Sarangani has only one major component – capability building. But environmental management tool-development and policy-analysis are both necessary components for a holistic environmental project implementation approach. They are also the means by which the progress of the capability-building activity is assessed. And as the project progresses, other requisite components become more apparent – advocacy and technical assistance to environmental issues.

Moreover, the complete process of policy development, application, and monitoring, although outside the core activities, enhances the usefulness and sustainability of the project. All these components are incorporated in the project operational framework depicted in Figure 1.

1. Advocacy

The advocacy components comes in different forms; from getting political support through the legitimization process to interfacing with officials during council and committee meetings, from networking with other organizations to community immersions, from organizing environmental conferences to just presenting the ENRAP framework in any forum.

1.a Getting Political Support

Getting political support is part of project legitimization. At the local government, this means that the project must gain the support of government officials and establish a legal basis for its implementation. The legal foundation can take several forms like memoranda of agreement with local executives, recognition by councils, committees, official sanctions by legislative bodies, or acceptance by informal community groups and associations.

The planning activities for ENRAP-Sarangani were initiated as early as October 1997. A concept paper and plan of activities for the project were prepared and approved by the 'core group' from ENRAP and PPDO in January 1998 (Attachment A). Plans of officially launching the project were also made.

Thus, with the signing of the Memorandum of Agreement (MOA) between the Province of Sarangani and ENRAP, the ENRAP-Sarangani Project was formally launched on March 5, 1998. Sarangani Governor Priscilla L. Chiongbian and ENRAP Project Leader Marian S. delos Angeles, were signatories to the agreement, witnessed by DENR-PENRO Cesario Ursua and Sarangani PPDC Fredo Basino and the members of the Sanguniang Panlalawigan. The signing of MOA was done during the Sixth Kasfala Meeting and Official Session of the Sanguniang Panlalawigan (SP) 8 of Sarangani.

The MOA underscores Sarangani's commitment to sustainable development and ENRAP's goal of enhancing capability of LGUs to manage the environment by developing an ENRA management system.

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[7] These processes or components do not necessarily proceed in chronological order or phases. Most of them are overlapping and simultaneously taking place. In the presentation, however, events are grouped into component categories.

[8] Sanguniang Panlalawigan is the provincial assembly.

Specifically, the parties agreed to undertake two major activities:

- Conduct of training programs on environmental and resource economics, and on Management Information Systems (MIS) and Geographic Information Systems (GIS); and
- Provision of technical assistance towards the institutionalization of the ENRA system as a basis for formulating an environmental framework for the management of Sarangani Bay.

ENRAP-Sarangani is given the responsibility of undertaking the above-mentioned tasks while Sarangani Province was requested to create an inter-agency committee to serve as conduit for project implementation. Both parties also agreed to co-finance the conduct of training programs and other project related activities.

The activities and ceremonies associated with the official launching of ENRAP-Sarangani (e.g., signing of MOA during the Kasfala meeting and session of SP, radio and television coverage of the event, and photo-op sessions) contributed to the overwhelming political support for the project. The MOA sealed the full support of the provincial leadership. Through the SP session, the project was officially endorsed by the elected members of the provincial assembly, while through the Kasfala, the tribal leadership bestowed their approval of the project.

This political support was tangibly manifested through the passing of a provincial budget of ₱250,000 per year, for two years, in support of ENRAP-Sarangani as matching and operating funds of the project. The municipal mayors in the province also used the MOA to justify the purchase of new computers in support of the MIS/GIS efforts of the project.

Also, the role of elective officials in the success of the project cannot be overemphasized. They should, however, be well-informed of the proposed and ongoing development activities in the province for them to evaluate and render support, if necessary. On September 8, 1998, ENRAP-Sarangani activities were officially presented to the Provincial Development Council, soliciting the mayors' support to the efforts of the project in establishing an environmental MIS/GIS system at the provincial level with operational networks at the municipalities.

The mayors supported the project with commitment that computers at their respective municipalities be upgraded to conform to the technical requirements of the MIS/GIS system. They also required their planning officers to attend the MIS/GIS training workshop conducted by ENRAP-Sarangani. Several Provincial Offices/Department (*e.g.*, Provincial Engineering Office and Provincial Agriculture Office) and national line agencies (*e.g.*, DECS and DENR) at the province also signified interest in becoming part of the MIS/GIS network.

1.b Existing government institutions, NGOs, and other projects

The PPDO and its municipal counterparts, the Municipal Planning and Development Offices (MPDOs), are the primary recipients of the Technical Assistance from ENRAP-Sarangani. They are the main implementing offices expected to ensure the success of the project. However, the recognition and support of existing institutions in the area can significantly contribute to the effective and efficient implementation of the project. Therefore, coordination and networking with existing government institutions, non-governmental organizations (NGOs), and other internationally funded projects in the area are highly recommended.

At the provincial level, there are different provincial departments and national line agencies. Provincial departments are under the supervision and control of the provincial government. These are the Provincial Planning and Development Office, Office of the Provincial

Agriculturist, Provincial Engineering Office, Provincial Health Office and the like. At the same time, some of the national departments also hold offices at the provincial level. These provincial line agencies are under the direct control and supervision of the national departments or their Regional Offices, to differentiate them from the provincial departments. Some line agencies present in Sarangani are the Provincial Environment and Natural Resources Office (PENRO) of the DENR, and the provincial offices of DECS and DTI.

There are a handful of foreign-assisted projects in Sarangani. In addition to ENRAP-Sarangani, USAID projects in the area include the governance for local democracy (GOLD) project, the coastal resources management project (CRMP) and the natural resources management project (NRMP). The Japan International Cooperation Agency (JICA) and the International Institute for Rural Reconstruction (IIRR) have water projects. The United Nations Development Program (UNDP) is supporting the Moro National Liberation Front (MNLF) projects, while the European Union (EU) has an upland development project.

ENRAP-Sarangani has initiated the coordination and networking activities with these existing institutions during the early stages of the project (from January to April). Coordination meeting with USAID-assisted projects (*i.e.*, GOLD, CRMP and NRMP) was initiated during the Samal Island training (see below) to share study results and compare notes and data generated by each project to minimize overlaps and duplication. Proper coordination among the different internationally funded projects and with the provincial departments was also facilitated by the practice of housing these projects in the Sarangani Provincial Capitol Building complex.

NGOs active in Sarangani on environment are the Mahintana Foundation, South Cotabato Foundation and Tambuyog Development Foundation. ENRAP-Sarangani's interfaces with the communities were through joint activities with these NGOs and USAID projects, especially CRMP, and during the project's household and community surveys.

1.c Environmental Meetings and Conferences

The new fields of *resource valuation, environmental cost assessment, pollution loads estimates, etc.* – the mainstay of environmental accounting, get advocacy mileage during environmental conferences, workshops and meetings. During the June 30th SOCSKSARGEN's Environmental Conference in Gen. Santos City, ENRAP-Sarangani presented the ENRAP framework of environmental accounting. Earlier opportunities were during the League of Provinces Workshop in Davao City on June 16th and 17th, and Sarangani Foundation Week celebration in May 17-21, 1999 where ENRAP-Sarangani had a kiosk of computerized exhibits.

Important meetings where environmental accounting and ENRAP-Sarangani activities were presented were during Sarangani Bay Protected Area Management Board (PAMB) meeting in April 27, 1999 and the coastal resources management planning in Alabel, Sarangani in May 4, 1999.

ENRAP-Sarangani was one of the coordinator of coastal resource management program and policy reviews for the SOCSKSARGEN area and one of the projects assisting Sarangani Province in its role as lead LGU for coastal resources management program in the region.

2. Capacitation

Capability building is the major objective ENRAP-Sarangani and has three types of activities: training and workshops, lecture series, and on-the-job training.

2.a Training/Workshops

The training approach adopted by ENRAP-Sarangani is from general to specialized training. The former is for familiarization and awareness of the general environmental and resource economics with extensive list of participants. The latter is for the more technical and more intensive type of follow-up training workshops designed for select groups on specialized fields like MIS/GIS and environmental policy studies.

Three training workshops have already been conducted since the start of the project - the general environmental and resource economics, the more technical management information system and geographic information system (MIS/GIS), and strategies for populating the MIS/GIS system.

The familiarization and awareness training program was conducted in April 19-28, 1998 at the Paradise Resort in the Garden City of Samal Island. Forty-five participants from the provincial and municipal offices, line agencies, and other USAID projects attended the workshop. The focus was on environmental and resource economics and environmental policy development. Lecture topics were on the basic principles of economics; resource valuation and depreciation; environmental damages and services valuation; the ENRA framework; application of market-based instruments (MBI); and bio-diversity. Practicum on water sampling and laboratory analyses was also conducted.

The primary concern of this training program was to familiarize the participants with the basic economic concepts and techniques applicable to environmental and natural resource management. The participants were also introduced to the system of environmental and natural resources accounting (ENRA framework) for managing the environment and natural resources.

The second training workshop was conducted in September 15-17,1998 at the Family Country Homes in General Santos City. The main objectives of the workshop were to provide technical capability in designing a management information system (MIS) for the province and to train participants in the use of a GIS computer software – Geographic Resources Analysis Support System (GRASS).

ENRAP-Sarangani developed the Sarangani Environmental and Natural Resources Accounting – Management Information System (Sarangani-ENRAMIS)[9] database package for each of the seven municipalities of the province. Sarangani-ENRAMIS is a local adaptation of a national level ENRAMIS developed by ENRAP. It contains the information in the conduct of an ENRA for the province, and at the same time strengthens the information and database systems of the province. Twenty-five participants from the provincial and municipal planning and development units undertook a familiarization course on Microsoft Excel and the Sarangani-ENRAMIS through hands-on use of the software packages.

For the GIS portion of the workshop, Blackland GRASS[10], a powerful GIS software popular among academicians and resource planners, was used to demonstrate the technical features of a GIS. The participants performed various 'hands-on' GIS exercises that explored the capabilities and limitations of a GIS system.

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[9] The ENRA-MIS database is further discussed in Appendix B.

[10] Blackland GRASS is the Windows-version (from Texas A&M University) of the popular GRASS GIS software for UNIX operating system.

An output of the training workshop was an action plan for the design and establishment of a MIS and GIS network that would facilitate the flow of information between and among the different municipalities and provincial government. During the planning session, approaches for the institutionalization and improvement of the MIS and GIS systems were discussed[11].

In June 15, 1999 another workshop on the technical inputs required for the purpose of populating the MIS was conducted. The Municipal Planning and Development Coordinators (MPDCs) from the seven municipalities and their technical staff were the main participants.

The computer program for the MIS was finalized and presented during this workshop. Data requirements were presented to the group. For 1999 survey, most of the required data were already incorporated in the IRAP[12] survey. During the workshop there was a proposal to make the data generation activity more sustainable by establishing a network of data generators and monitoring points at the barangay levels.

In addition, it was suggested to make a set of more user-friendly questionnaires, since data gatherers in Sarangani are unfamiliar with ENRA-type questions. Planning workshop for these activities were set for early January of February of next year. For this year, the IRAP survey should suffice.

2.b On-the-job Training and Lecture Series

On the second year of the project, it was decided by the project management to organize a more intensive training on environmental and natural resource economics for a small group of people from PPDO. Starting February, an 'ENRAP core-group' of seven[13] people attends a regular lecture series on environmental and resource economics and an on-the-job training (OJT) on project activities[14] on one-day-a-week basis. The learning situation is more intensive and more formal – a classroom setting similar to a university graduate program[15].

They also undergo an OJT in conjunction with the technical activities of the Project, including the development of policy research proposals (e.g., pollution management of Sarangani Bay), computer data-banking, and GIS mapping. During the process of populating the MIS, this core-group was instrumental in conducting the household surveys and processing the gathered information.

The various topics of the lecture series and OJT cover the following fields:

- Environmental Economics
- Resource Economics
- Environmental and Natural Resource Accounting
- Econometrics and Statistics (use of econometric/statistical packages including SHAZAM, LIMDEP, SPSS and SAS)

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[11] See Appendix B for details.

[12] Integrated Rural Accessibility Planning, project supported by ILO based at PPDO that conducts regular barangay and sitio level surveys.

[13] From an initial of two people, ENRAP-Sarangani core-group membership increased to seven.

[14] See Attachment C, internal memos to this effect.

[15] The program started in early 1999. A course design to cover the important topics in environmental and resource economics, statistics, and computer programming was setup. However, there was no time limit set for the program. It is estimated to take up to 12 to 18 months to implement.

- GIS applications in GRASS
- Computer Programming (use of computer software like MS-Excel, MS-Access, Visual Basic, and GAMS)

Expected outputs include:

- Environmental/Natural resource policy papers and research proposals
- Provincial and Municipal Environmental and Natural Resources Profiles
- Provincial and Municipal MIS and GIS

The objective is to make ENRAP-Sarangani a sustainable operation. At the culmination of the Project, the trained people of the planning and development units of the Province can continue to undertake the ENRA activities under the Environmental and Natural Resources Accounting *Program* of the Province.

3. Policy Tools

The ultimate goal of ENRA-institutionalization and capacity-building activities of ENRAP-Sarangani is the proper management of Sarangani's environment and natural resources. A requisite to the achievement of this goal is the development of the right set of policies that promote it. The ENRA framework serves not only as environmental accounting or scoring system but also as an environmental policy and management tool.

Another major component of ENRAP-Sarangani is the development of an environmental policy tool that can guide policymakers in the management of the province's environment and natural resources. The project helps establish an environmental database and management information system in the province based on the ENRA framework and accounts.

There are two components of this information system the database, the environmental management information database system and the geographically referenced information system – the geographic information system (GIS). The objective is to add visual and geographic information into the tabular databases and environmental analyses.

3.a Sarangani Environmental MIS/GIS System[16]

The Sarangani Environmental MIS/GIS System (Sarangani-EMS)[17] traces its beginnings with the ENRAMIS database package developed by ENRAP.

ENRAMIS is a computerized database system that generates the ENRA accounts to augment the present system of national accounts. It has the complete ENRA system of environmental accounts: the value of the environment as a waste receptor (EWDS), value of the damages to the environment (ED), depreciation of natural resources (NRD) and the value of direct nature services (DNS). It addition, it estimates the unrecorded value of upland household production (*i.e.*, firewood and unmarketed household production).

The ENRAMIS is the precursor of Sarangani-EMS. But Sarangani-EMS now takes a modular architecture in which ENRAMIS is only one of the modules. There are three general categories under the Sarangani-EMS – Environment, People, and Governance. Under each

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[16] Appendix B of this report presents the technical details of Sarangani-EMS.

[17] Sarangani-EMS also stands for the Sarangani Environmental Management System in which environmental information system is the major component.

category several modules can be included. For the Environment, planned modules are the ENRAMIS and local Environmental Codes. At present, two modules are being developed – the ENRAMIS with the ENRA accounts (initially EWDS and NRD) and a Directory of Government Officials (under Governance category).

In this design, additional modules are added as needed and as funds become available. As a policy, any government project that generates primary information from the province should support the Sarangani-EMS. And any foreign-assisted project with MIS or GIS component is also requested to build its information system as a module of the Sarangani-EMS.

3.b Geographic Information System

The geographic information system (GIS) is an integral part of the Sarangani-EMS. It plays two basic roles in the overall provincial environmental management system. First, it adds visual and geographic dimensions to the information databases. Second, it serves as a modeling tool in the areas of environmental simulations (*i.e.*, flood water transport, erosion, and watershed modeling), agricultural mapping (*i.e.*, crop suitability, land classification), and land-use planning (*i.e.*, zoning, urban planning).

The GIS system is linked (in real-time) with the MIS databases to take advantage of its visual and geographic capabilities. With visual aids like GIS, Sarangani-EMS users including policymakers can now better appreciate and understand the information presented by EMS.

As a modeling tool, environmental scenario analysis is now possible and easier to implement. Under the Commercial Crop Development Program (CCDP)[18] of the Office of the Provincial Agriculturist (OPAG) for example, crop suitability maps of the province can now be instantly generated by overlaying of thematic maps with the use of computerized GIS. The analyst can readily change the parameters or requirements (a 'what if' analysis) to arrive at new decision maps. Likewise, the GIS water transport model can readily estimate the effects of reforestation and watershed rehabilitation on erosion and siltation.

The Sarangani-EMS can both serve as environmental scorekeeper (state and value of environmental resources and services) and an environmental management tool to arrive at specific type of policies efficient in promoting environmental sustainability and growth.

4. Policy Analyses[19]

Environmental management tools, like ENRA and Sarangani-EMS, are useful only if sound environmental policies are generated from them. ENRA-institutionalization, therefore, is not complete if the ENRA framework were not utilized for environmental policy analysis.

Two policy papers for the project were derived from Sarangani-EMS. One is a result of populating the ENRAMIS module of the Sarangani-EMS; the other is in anticipation of increasing environmental costs from prospective investments coming into the Province of Sarangani.

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[18] This program is currently digitizing several thematic maps (nine for each municipality) that can be used in any agricultural mapping and GIS application.

[19] This component is expounded further in Appendix E of this report. Appendix E discusses the role of the project in the development planning process and environmental management in Sarangani Province.

4.a Pollution Abatement Study[20]

The process of populating the Sarangani-EMS offered the opportunity of *hands-on* training for the project counterparts undergoing OJT. It also paved the way to processing and analyzing the information for policy development.

The focus of this initial policy study is on the estimation of pollution loads coming from the household sector and recommends some policy actions for pollution abatement and minimizing environmental costs and degradation.

4.b Environmental Cost Assessment[21]

Investment is coming to this part of the world. Sarangani has been very selective in the kind of investment flowing into the province. Priority is set for light industry and agribusiness. This framework is designed to guide policy makers and development planners in assessing environmental costs of these investments. It also presents the policy measure available to minimize these environmental costs and damages.

The paper recommends that the process of prioritizing investments be established for the province. Priority investment types should then be promoted and encouraged, while non-priority investment types be discouraged.

The framework paper also discusses in detail the various environmental valuation techniques available to the analysts and lists the environmental policy instruments available to policymakers. Among these valuation techniques, the paper favors the adoption the control-cost method for economic analysis (*e.g.*, benefit-cost-analysis). At the same time, the paper proposes to employ the 'state-of-the-art' pollution abatement devices (*design standards*) and charge the firms for the remaining uncontrolled pollution (*pollution charges*) – at a rate corresponding to the marginal cost of abatement.

5. Technical Assistance on Environmental Issues

This component evolved during the implementation phase of the ENRA-institutionalization process. Any project related to environment (*i.e.*, solid waste management, pollution load assessment, environmental accounting, etc.) is expected to possess some *environmental expertise* and, therefore, prepared to offer technical assistance on environmental issues. So that it is often not advisable to initiate an environment-related project and leave the project management to a coordinator or manager whose main expertise is limited to project management. When technical advice is sought on environmental issues the project manager or coordinator should be able to offer sound technical opinion so as not to jeopardize the technical credibility of the project.

Much is expected from an *environment person*. For example, a person whose expertise is on the technical aspect of landfill development may manage a project on solid waste management. But he should also be technically capable of handling issues regarding pollution abatement policies, environmental damage of pollution, tipping or pollution charging, air and water pollution, and similar issues.

This is not to say that project coordinators are required to render technical assistance on major environmental issues. But it is advantageous for a project to employ a technical point-person

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[20] This policy paper is presented in detail in Appendix C of this report.

[21] This policy paper is presented in detail in Appendix D.

versatile with respect to environmental management. This component, however optional, proved to be a great asset to the project in the ENRA-institutionalization process.

The ENRAP-Sarangani study leader is based in Sarangani Province. He assists the province on environment-related programs and activities. Technical assistance is extended by the project on the following.

5.a SOCSKSARGEN wide coastal resources management

Sarangani province is designated by the SOCSKSARGEN area development project as lead LGU in the area's coastal resources management (CRM).

Even before this designation, the project has been assisting the province with the management of Sarangani Bay, especially with respect to pollution management, coastal resource assessment, and impact of incoming investments on the bay.

With the new role for Sarangani in SOCSKSARGEN-wide CRM, the project continues its technical assistance to the province. It helped plan and package the SOCSKSARGEN-CRM integrative and strategic planning for the management of Sarangani Bay and the region's coastal resources[22].

5.b Pollution abatement of Sarangani Bay

The SOCSARGEN area is a big watershed draining to the bay. A major concern is the heavy pollution going to the bay from various sectors, including industry, agriculture and households. Policymakers are deliberating on issues of environmental cost assessment and pollution charges. The project is active with those deliberations, from the planning and development office of the province to the halls of Sanguniang Panlalawigan, from Provincial Land-Use Council to the Provincial Development Council. Whether assessment of incoming investments or formulation local environmental codes was being discussed, the project is always at hand to render technical advice and opinion.

5.c. Valuation of Stock of Natural Resources

Placing monetary value on environment and natural resources is both practical and novel. Policymakers, planners and ordinary individuals are willing to learn more about resource valuation and they are trying to incorporate such new technology into the development planning process of the province. They long recognize ENRAP as a technology that can deeply enhance awareness and capability of putting value to the environment and natural resources.

ENRAP-Sarangani has been giving technical assistance on valuation of the environment and natural resources and believes that:

- Valuation reminds us that the environment is not free despite the absence of conventional market for environmental services.
- Valuation provides a more accurate indication of economic performance.
- Valuation can serve as a guide for public environmental policy (e.g., taxation, subsidies, conservation, and pollution abatement expenditures).

[22] See Attachment B for the workshop design

- Valuation translates environmental impacts of projects into values for comparison and integration with financial and economic criteria of benefit-cost analysis.

For the SOCSKSARGEN-wide CRM the project will assist the province in valuation of coastal resources as part of Sarangani Bay management plan. There is also a request to assist in the valuation of fish stock and maximum sustainable economic yield of Sarangani Bay[23].

5.d Environment and Food Security

The SOCSKSARGEN area, which includes Sarangani province, is targeted for increased agricultural productivity as part of the country's food-security drive.

In Sarangani Province, the establishment of fish sanctuaries is one of the major undertakings. Technical assistance on the assessment of environmental and economic impacts of these sanctuaries would be extended by the project to the province.

5.e Environment and Eco-tourism

The reputation of Sarangani Province as environment-friendly province is reflective of the general direction of its development thrusts. Development plans of the province are bias towards making the province a major tourist destination because of its eco-tourism sites.

The province is bent on establishing national parks for conservation and eco-tourism purposes. The project is assisting the province in site selection and project proposal preparation. If implemented, the project has a bigger role in resource inventory management, resource valuation, and setting user fees (resource use pricing).

5.f Preparation of Project Proposals[24]

ENRAP-Sarangani officially ends in September 1999, although it continues the technical assistance until December 1999. One of other activities the project is assisting the province is on fund sourcing and preparation of project proposals related to environment and Sarangani-EMS activities. This is in line with sustainability objective of the project. Projects of this type are to be part of the ENRA program of the province.

At present three project proposals are being prepared. One is on the continuation of the Sarangani-EMS activities at the municipal levels, specifically the setting up of data generation network at the barangay and municipal levels. The other is on local area networking (LAN) and computerization of the municipal departments. Each municipality is proposed to have twelve computers (one computer for each department, the mayor's office, and SB office). The third proposal is related to tapping the sun, wind, and water as energy sources for the province. Prototype solar cells are proposed to be placed at the Provincial Capitol Building complex, while wind- and water-run motor/turbine are proposed for two upland sites.

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[23] The plan is to initially base the analysis on a previous fish stock assessment study conducted by Mindanao State University (Gen. Santos City) and Silliman University.

[24] Proposed projects need not be directly related nor exclusive to ENRA accounting. Most of the proposals, however, are environment and MIS/GIS related.

Other proposals on the pipeline are: establishment of provincial parks for conservation and eco-tourism; setting up of self-sustaining network of rural settlements and agricultural production centers; and the development of Sarangani Bay Management Plan.

III. Challenges and Difficulties Encountered

This chapter identifies the nature of difficulties and problems encountered by the project. It discusses the reasons behind those difficulties and determines their effects on the performance of the project.

The project experienced some difficulties during its implementation in spite of stringent planning on the part of ENRAP and PPDO. On one hand, the project is the first attempt at ENRA-institutionalization at the provincial level and all efforts must be taken to ensure smooth implementation. On the other hand, that is what *pilot testing* is all about – gaining valuable practical experience and helpful insights before embarking on a similar or larger undertaking.

In general, most of the difficulties encountered by the project were due to the absence of environmental management/accounting unit in Sarangani and the pilot nature of the project. Other contributing factors are the levels of local resources and capabilities to undertake a novel project like *environmental accounting*, and disaggregation of ENRA accounts by political boundaries.

1. Absence of an Environmental Management Unit

The major difficulty encountered by the project is the absence of an environmental management unit in the province. Unlike the institutionalization process at the DENR, where the counterparts are the Bureaus responsible for environmental management and specific environmental accounts, the province does have a specific department or unit in charged with environmental management and ENRA accounting.

The provincial department that usually takes the lead in environmental management is the Provincial Environment and Natural Resources Office, present in some provinces, but absent in Sarangani[25] during the course of the project. Instead, the project was based at the PPDO without regular staff and budget for environmental management activities. ENRAP provided a TA support - hired a resource economist that provided the training and technical expertise required by the project.

Some of the problems encountered by the project attributable to the absence of environmental management department/unit and its TA character are related to resource allocation; the absence of capital and operating funds, absence of project staff, and difficulty in communication and coordination.

1.a Absence of Capital and Operating funds

Aside from the TA-funding of the study leader, ENRAP also funded the two training workshops and the purchase of Visual Basic computer software. On the part of the province, it allocated matching funds for project operation. Both funds however, were not available for capital-outlays or staff hiring. Hence, staff and computer requirements of the project (for Sarangani-EMS) cannot be provided from these funds.

[25] In recognition for such need and the role it plays in the management of the environment, the PENRO was recently established in Sarangani Province.

Related to this is the dependence of the project to the availability of local funds in meeting capital requirements and operating costs of the projects. Although it is considered good practice to request the LGUs for matching funds, it may not always be feasible. And even if government matching-funds were made available, they are usually not for equipment and staff-hiring. There also exists the chance of delays in fund release or procurement process, which proved costly for the MIS/GIS activity of the project[26].

Had there been a PENRO as project counterpart, funds could have been allocated specifically for environmental management and ENRA accounting, that could be used for capital outlay, manpower support, and operating expenses.

1.b Absence of project staff

The assumption that manpower support for the project could be provided by the PPDO staff proved to be a very optimistic. Without the regular function of environmental management/accounting, any project activity is considered extra work without additional compensation. Added to this is the fact that the PPDO is already understaffed relative to its workload.

On the part of ENRAP, the TA is for one technical person, the study leader. The project has no other technical or support staff. Again, the presumption is that the project counterparts from the province who are recipients of the capability-building activity can provide the required manpower support. However, all of the counterparts are full-time employees and most often did not have the time to spare. Moreover, the arrangement for counterparts to serve as project staff was not specified in the MOA that establishes the project.

Project staff requirement includes a programmer, an economist, and two project coordinators (one for every three municipalities). The presence of project staff makes project management and coordination easier. It also frees the study leader from doing the computer programming work, preparation of survey materials, and other support staff activities to be more productive in the areas of policy research and advocacy.

1.c Difficulties in communication and coordination

Transportation service for a single project may be a luxury. But with inadequate telecommunication facilities around the province, mobility becomes a matter of efficiency. Communication and coordination are hampered by lack of project transportation. At present, response time for a meeting, for example, may take three to five days – compared to a two-hour drive to the farthest municipality. The study leader (and project staff, if available) can visit the municipalities more often if the project were not dependent on public transport facilities.

2. Pilot Nature of the Project

The process of ENRA-institutionalization, by design, has only one project component – capability-building. The other project components evolved during the implementation phase: advocacy, environmental management tool-development, policy-analysis, and technical assistance to environmental issues.

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[26] The case in point is the provincial funding for the purchase of digitizer, plotter, and computer for the MIS/GIS. The process of budgeting and procurement for the plotter and digitizer took more than three years. The plotter and digitizer finally arrived in September 1999, the process continues for a better computer and wider-screen monitor.

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RAM, Windows 95 (or Windows 98) operating system, a CD-ROM drive, and 150 megabytes of disk space.[29]

At the provincial level, computers are stationed at the PPDO, OPAG, Office of the Governor, and Office of the Vice-Governor (or Sanguniang Panlalawigan Secretariat). In addition, a plotter, a digitizer, and a computer with wide-screen monitor are required for the GIS.

The LGUs are also responsible for counterparts' transportation, per diem, and incidental expenses during workshops and meetings related to the project.

The computer requirements (including delays in procurement of plotter, digitizer, and wide-screen computer) became one of the bottlenecks in the operation of Sarangani-EMS.

3.c Institutions and arrangements

One of the reasons ENRAMIS evolved into Sarangani-EMS is its potential for organizing and consolidating the data generation, processing, and dissemination activities of the province and the municipalities.

Data generation network should be established down to barangay levels. Data processing should be setup at the municipal level, while data dissemination should be through the network of computers around the province and the Internet.

This may take a longer period to achieve especially when no semblance of such system is yet in place. Concerted efforts by the provincial and municipal LGUs, inter- and intra-departmental cooperation and coordination are needed to facilitate the establishment of an operational Sarangani-EMS[30].

The Sarangani-EMS activities should have been less difficult if any data generation network were already operational in the province.

4. ENRA Accounting at the Provincial Level

There are two empirical issues that need to be resolved with regards to environmental accounting at the provincial level. First, is the political boundary (as contrasted with resource boundary) issue – how to desegregate the accounts for resources transcending political boundaries. The other is the efficiency of centralized (*i.e.*, by a national agency or bureau) estimation of provincial and regional accounts as compared with the decentralized estimation by the provinces and regions.

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[29] It should be noted that although computers are required to run the ENRAMIS and the full MIS/GIS, the use of these computers is not exclusive to the project. In fact, computers are a standard office equipment which may also be used in the project.

[30] As mentioned earlier, ENRAP-Sarangani's commitment is only for current ENRAMIS and Directory of Government Official modules. But it should be noted that the MIS/GIS system has grown beyond the ENRAMIS and ENRA accounting needs. Nevertheless, it is a useful management tool both for the environment and the other activities of the province.

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4.a ENRA accounts by political boundaries

There are some technical difficulties encountered by the project in estimating the ENRA accounts according to political boundaries. Some of these accounts are pollution from mobile sources, water and air pollution from adjacent LGUs.

For Sarangani, mobile sources (cars, public utility vehicles, tricycles, etc.) are not always registered to their service areas. Most of Sarangani vehicles are registered at the Land Transportation Office in Gen. Santos City. Fuel consumption for mobile sources also poses similar difficulty.

Industrial pollution of Sarangani Bay is mainly coming from the industries in Gen. Santos City and South Cotabato, although more than two-thirds of the Bay falls under Sarangani's political jurisdiction. Similarly, are the emissions polluting Sarangani's ambient air.

The same is true with estimating the resource (*e.g.*, fishery) stock and extraction rate of the Bay and the damage caused by different pollution sources.

The present ENRA framework does not have the mechanism for allocating both environmental harms and benefits to the different political units encompassing the resource 'boundaries'. The ideal provincial environmental accounts should be able to allocate and internalize both the positive and negative externalities crossing the political boundaries.

4.b Centralized vs. Provincial Accounting – the issue of efficiency

Because of the difficulties of disaggregating the environmental accounts, environmental accounting at the national level is deemed easier to implement. The ENRAP-Sarangani Project seems to support this. It cannot, however, determine whether a centralized system or a decentralized system of provincial and regional accounting is the more efficient to implement.

The main argument for the centralized system is that it is easier and cheaper to train a small group of people to do the provincial and regional environmental accounting nationwide. The decentralized alternative is training a group of people from every provincial LGU and region to do environmental accounting in their own area.

The argument for the latter (decentralized system) is that there is transfer of skills and technology, and that the LGUs will have a better understanding of the environmental accounts and their use in environmental management and policy formulation.[31]

IV. Recommendations for Sustainability and Effective Replication

This last chapter offers some recommendations on the sustainability of ENRAP-Sarangani Project and how to effectively implement an ENRA-institutionalization project to other provinces of the country.

[31] Another argument for local ENRA accounting as presented in the main report was the environment-economy tradeoffs and diverging development strategy of the different LGUs around a major resource – in this case, Sarangani Bay.

Recommendations for the Sustainability of the Project

This section presents the steps and activities the Provincial Government of Sarangani must undertake to guarantee the sustainability and to maximize the benefits from the project.

1. Adoption of the project as an LGU program

The project runs for two years, from January 1998 to December 1999. On the third year, the project must be adopted by the province as part of its regular activities. The project should become the environmental management and accounting program of the province – ENRAP-Sarangani takes a new name, the *Environmental and Natural Resources Accounting Program of Sarangani*. The program should now be based at the newly created Provincial Environment and Natural Resources Office (PENRO) of the province, although throughout the course of the project it was based at the PPDO.

Under this program, ENRAP-Sarangani activities continue, while the program itself takes an even broader role. The operation, maintenance, and updating of Sarangani-EMS and its use for environmental policy development are the main activities of the program. The program may also initiate the advocacy and institutionalization drives, which should later take independent project identities of their own. Examples are the drafting of the provincial environmental codes and IEC on land-use and zoning.

2. Packaging of ENRA or environment-related projects

As a new department in the province, the PENRO should be looking for funding sources for the continuity of environment-related activities initiated by ENRAP-Sarangani.

The packaging of proposals for ENRA and environment related projects should be the major program activity during the first semester of Year 2000[32]. Fund sources are internal/local (for Provincial AIP, Food Security funds) and external (foreign funding agencies already identified are JBIC, ADB, JICA, Japanese Government/Embassy, EU, UNICEF, the World Bank). Funding of the ENRA Program and its activities is the priority. Project proposals are grouped into four categories: Sarangani-EMS operation, environmental policy development, advocacy, and institutionalization.

Under the Sarangani-EMS operation, proposals are for data generation, data processing, and data dissemination. Under the environmental policy development, proposals are for the creation of economy-environment policy research team and the use of Sarangani-EMS in environmental management. For the advocacy and institutionalization, proposals are for the formulation of local environmental codes, creation of provincial resource and information center, and inclusion of environmental accounting and economy-environment interactions into the curriculum of STAR learning network.

A project proposal currently underway supporting the EMS is the setting up of computer networks around the province. The proposal is for the establishment of local area network (LAN) of 12 to 15 computers (one per department) in every municipality. Each municipal network, in turn, is linked to the provincial LAN at the capitol building and to the Internet. These computers become the basic data processing and data dissemination networks of the province. Again, it should be emphasized that the networks of computers are a standard office

[32] In October 1999 ENRAP-Sarangani started the packaging of some project proposals for the program to implement. The assistance continues until December 1999.

equipment which could be used as the medium for the Sarangani Environmental MIS/GIS System.

3. Operation of Sarangani Environmental MIS/GIS System (EMS)

The operation, maintenance, and updating of Sarangani-EMS are the immediate activities of the new ENRAP-Sarangani. Initially, program funding is locally sourced. For the year 2000, provincial budget of ₱ 250,000 is already allocated for the continuing MIS/GIS activity.[33] Additional funding will be sought from external sources for the establishment of networks for data generation, data processing, and data dissemination.

The network of data generators at the barangay level would be setup by the program initially for the purpose of updating the ENRAMIS module of the Sarangani-EMS.

Interview schedules for household, barangay, and municipal surveys would be prepared for the purpose of populating the EMS. A network of interviewers based throughout the province will be trained in survey and interview skills and filling-out and *cleaning* of survey forms.

The same network of interviewers will be utilized for generating other data and information for the modules added to the EMS.

Data processing stations are based at the respective municipal departments, and the Mayors' office. The data input and database management modules for the Sarangani-EMS will be installed into these offices' computers. These offices will be trained in data entry, data validation, database management, and report generation.

The aggregation of basic and processed data will be done at the respective provincial departments and offices of the Governor and Vice-Governor.

For the ENRAMIS module, responsible municipal and provincial departments are the planning, agriculture, health departments and the municipal ENROs.

Copies of Sarangani-EMS modules will be stored in compact disks for distribution to the network of computers around the province. They would also be permanently install at the provincial and municipal Intranets (LANs), at the provincial resource and information center, and at the province's Web site in the Internet.

EMS information will also be available to the various government and private institutions or corporations, and to the general public.

4. Environmental Policy Development

The use of Sarangani-EMS in environmental management is the major goal of ENRAP-Sarangani. Under the program, an environmental policy research team (or division) will be created to take care of economy-environment issues affecting the developmental thrusts of the province.

The environmental policy research team will serve as the think-tank of the province in the areas of environment and natural resources management, and economy-environment issues. The team serves as technical support to both the executive and the legislative branches of

[33] These funds were requested by PPDO for the operation of the MIS/GIS.

provincial government. The team forms the provincial technical working group on economy-environment issues.

The environmental policy research team is also the primary user of Sarangani-EMS. Other than ENRA-related management activities, the team can also find application of the EMS in other government activities like ecotourism, food security, watershed and upland development, integrated coastal management, etc.

5. **Advocacy and Institutionalization**

The new program will assist in environment-related advocacy and institutionalization. Activities on the pipeline are the formulation of local environmental codes and the inclusion of ENRA framework as module under the STAR learning network.

The development of Local Environmental Code together with the proposed Investment codes is a right step towards the institutionalization of the province's environmental policies and the use of Sarangani-EMS into the in the development and investment planning in the province.

The program will assist the Sanguniang Panlalawigan and the seven Sanguniang Bayan[34] in the formulation of the environmental and investment codes.

The inclusion of the ENRA framework (*i.e.*, environmental accounting and environmental cost assessment) as a module under the STAR learning network[35] can assist the learning institution in its environmental advocacy and educational campaign drives.

Recommendations for Effective Replication

This last section offers some recommendations on how to effectively implement an ENRA-institutionalization project to other provinces of the country.

As mentioned earlier, the major difficulties encountered by the project were due to the absence of an environmental management unit as project counterpart and the pilot nature of ENRAP-Sarangani project. The following recommendations and implementation strategies zero in on these difficulties.

General recommendations:

- Implement only in provinces with environmental management units – where environmental management and accounting are part of regular functions.
- Make the ENRA-institutionalization and capability-building a complete package with the following component activities: environmental management training; establishment of environmental management system; environmental policy research and management planning; advocacy; and a TA component..
- Pre-package the training materials, advocacy tools, and EMS programs
- Set minimum requirements for prospective provinces

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[34] Sanguniang Bayan is the municipal council.

[35] The STAR learning network is an extra-scholastic institution established by the province in partnership with the Department of Social Welfare and Development, the University of Southeastern Philippines, municipal governments of Sulop and Sta. Cruz, Davao del Sur, and Resource Ecology Foundation for the Regeneration of Mindanao (REFORM). The network specializes in informal and distant learning, and caters to the need of local government officials to be trained in effective governance and efficient social services delivery.

1. *Working with an Environmental Management Department of the Province*

The first recommendation is to implement the project only in provincial LGUs with existing environmental management units or departments. The environmental management unit, usually the PENRO, serves as project counterpart and implementer of the different project activities as part of its regular mandate and functions.

The MOA should clearly specify that the project will only provide for a TA and limited funding for training and raining materials, while the province (or in most cases, the PENRO) provides the project staff and equipment, budget, and transportation and communication support. The idea is that environmental management and ENRA accounting activities are part of the PENRO's mandate and regular functions, while the project is extending technical assistance in accomplishing them.

2. *Environmental Accounting and Management as an LGU program*

The second recommendation is to adopt the ENRA-institutionalization and capability-building as a permanent program of the province under the PENRO (or any other environmental management unit, as the case maybe). Such program should include the following components: environmental management training, environmental management system, environmental policy research and management planning, advocacy, and the TA component (provided by the project).

This recommendation is for a separate TA component supporting the different activities under the ENRA-institutionalization program. Each component activity is in turn a complete undertaking with own funding and set of activities.

2.a Environmental Management Training

The environmental management training component continues to have the following activities; introductory awareness workshops, technical workshop, lecture series and on-the-job training. The lecture series and on-the-job training, however, will be carried out in a different setup.

- Awareness and introductory technical training workshops

The program should continue to have at least three training workshops:

  - A four-day (instead of the previous ten days) familiarization and awareness workshop on environmental and natural resources economics, and the ENRA framework with extensive list of participants.
  - A four-day workshop on environmental accounting, database management, and operation of an environmental management system (EMS). The workshop is for select group of people from PENRO and CENROs, PPDO and MPDOs, OPAG and MAOs, and technical staff of Sanguniang Panlalawigan and Sanguniang Bayans.
  - A three-day technical workshop on use of EMS as an environmental policy tool, with especial focus on use of GIS in environmental modeling. Participants are technical staff of PPDO and MPDOs, OPAG and MAOs, PENRO and CENROs, Sanguniang Panlalawigan and Sanguniang Bayans.

- Lecture series and on-the-job training

The lecture series is a more formal type of training and should be linked with an academic institution, while the on-the-job training is now part of the environmental MIS/GIS system component.

The Sarangani experience revealed the difficulty of conducting intensive academic-type training outside the confines of academic institutions. When employees are requested to regularly attend a formal and highly technical training (requiring 20 percent of their time – one-day-a-week basis) without unloading an equivalent amount of workload, efficiency of doing both the training and office work suffers.

The recommendation is to link the lecture series with a local academic institution or a school extension program. For Sarangani, the Mindanao State University and the STAR learning network are the two likely collaborators.

The *environmental management course* can be integrated into the STAR learning network curriculum[36]. For other provinces without similar learning network program, the environmental management course can be part of local university's management program. The ENRA program provides the technical assistance (*i.e.*, lecturer, lecture materials, hands-on training and research study activities) required by the course.

In both cases, participants to the *environmental management course* undergo regular masteral level of training and instruction. The suggestion is for them to attend a six-week summer program or one semester of course work. School certificate and masteral credits are awarded to the successful participants.

The lecture series is to be an optional component of the environmental management training. This option will depend on the available academic linkages and availability of qualified provincial and municipal staff to undergo such training.[37]

2.b Environmental Management System

This component activity is the core of the program. It consists of construction of the environmental management system (EMS) and the development of provincial and municipal environmental profiles. The on-the-job training is also part of this component activity.

- Environmental MIS/GIS System[38]

The construction, operation, and maintenance of the environmental management system (EMS)[39] and the setting up of data generation, processing and dissemination networks are the main activities of this component.

This component is further categorized into its basic requirements; hardware, software, and institution. The network of computer equipment around the province for processing and distribution is the hardware. The computer programs for the different modules of EMS are the software. The institution is the system and network of data generation, processing, and dissemination from the barangays to the municipalities and the province.

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[36] See previous footnote on STAR learning network under the section on sustainability.

[37] The environment management course and the lecture series may be required for the counterpart (PENRO staff) as part of their staff development program.

[38] Although GIS component (of the MIS/GIS system) was established at Sarangani, it is very expensive and an optional component. The MIS (especially the ENRAMIS) component, however, is a required policy tool component.

[39] As earlier defined, the environmental MIS/GIS system (EMS) is the prototype of the environmental management system (EMS).

- Computer programming and computer applications

  This activity is mainly concerned with the construction and computer programming of the MIS/GIS system. The modular design of EMS made it possible to expand from the basic ENRAMIS module to incorporate other databases and information in the form of modules.

  The computer programming includes the data entry, processing, consolidation, and report-writing for all the modules of EMS.

- Network of computers[40]

  The network of computers around the province is the medium that processes the data and disseminates the information to the end-users. The minimum requirement for each municipality is one computer each for the ENRO, MPDO, MAO, and Office of the Mayor. At the province, at least one computer is required at the PENRO, PPDO, OPAG, and Office of the Governor.

  The ideal setup is for each municipality to have a local area network (LAN) of computers from each department and the offices of the Mayor, Vice-Mayor, and Sanguniang. These municipal LANs are in turn linked (by phone – land or wireless) to the LAN of departmental computers, including the offices of the Governor, Vice-Governor, and Sanguniang Panlalawigan, in the province.

- Network of data generation, processing, and dissemination[41]

  A network of data generator at the barangays should be set up under this activity (or program component). It is this network that prepares the questionnaires for the update the information and generation of information for new modules in the EMS.

  At the municipalities, the data entry and validation are assigned to the respective departments (responsible for specific modules). The final aggregation and consolidation are done at the provincial level, assigned to respective departments.

- Environmental Profiles

  Provincial and municipal environmental profiles are the major documents from this component. The environmental profiling process may include, among others, resource assessment and mapping, resource valuation, and pollution load estimation. The environmental profiles are part of the Environmental Management Plans, which are official documents requiring the adoption by the province and municipalities through the Sanguniang Panlalawigan and Sanguniang Bayan.

- On-the-job Training

  The on-the-job training is now undertaken as part of the environmental management system development activities. The preparation of environmental MIS/GIS and profiles are to be in phases or modules. Each module consists of classroom training, field application, and output preparation – all are part of the on-the-job training of technical staff. As the modules are completed, so are the outputs - the environmental MIS/GIS and profiles.

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[40] The networks of computers (and their provision) are not necessarily part of the program. Computers are standard office equipment, and as such, must be provided as part of office requirement and budget. If available, they are the best medium for databanking activities.

[41] The network is not limited to the ENRAMIS module and may be utilized for other database modules as well.

2.c Environmental Policy Research and Management Planning

For this component, it is recommended to organize an environment-economy policy research team in the province. The team can be a technical working group from the different departments or technical staff under the PENRO, PPDO, OPAG or Office of the Governor. The team should serve as environment-economy think-tank of the province assisting the offices of the governor and Sanguniang Panlalawigan, the planning, environment, agriculture, and health department. They may have counterparts at the municipal level.

As part of the program, the initial task of the policy teams is the use of the environmental MIS/GIS and environmental profiles for the drafting of provincial and municipal Environmental Management Plans.

These plans are official documents adopted by the local governments and serve as blue print for the management of the environment and natural resources. They may require regular updating or revision, which may be done as a regular function of the policy research teams.

The policy research team can later on work on other policy concerns like pollution abatement policies, policies for internalizing environmental costs, and the like. These, however, are already outside ENRA-institutionalization and capability-building program.

2.d Advocacy

The program should only have a small advocacy and institutionalization component. A specific activity of the institutionalization process is the assistance in the formulation of local environmental codes.

The program will also have an advocacy component with government officials and communities as target audiences. Specific activities under advocacy are:

- ENRA-framework awareness campaign among government officials and institutions.
- information campaigns about the environmental policies of the province.
- encouraging the communities to support the government's environmental drives, *e.g.*, solid waste management, establishment of fish sanctuaries, public health and sanitation, etc.

2.e Technical Assistance

Technical assistance and program management staff may be required as a separate component in support of the other activities. The main function of this component is the infusion of additional technical expertise in the different components and in coordinating various program activities.

Technical assistance may also be required in various environment-related activities of the province. It is then recommended that at least one full-time environmental consultant (an environment/resource economist) be based at the province.

3. *Limited Local ENRA Accounting*

There are merits to both centralized and decentralized environmental accounting. While the decentralized accounting is less efficient and more difficult to implement, there is 'technology transfer' and ownership on the part of the LGUs.

The recommendation is for limited local ENRA accounting - local measurement of EWDS accounts for households and industry. Other accounts, especially those of resource stock valuation and accounts transcending beyond political boundaries, should be estimated by a centralized national system or agency in close coordination with the provincial LGU and assistance from the project. However, databanking of all environmental parameters and accounts, measured by a central agency, should still be done with the MIS/GIS system.

4. *Packaging of Training and Advocacy Materials*

The development and packaging of training and advocacy materials and database packages are a prerequisite of the program. The packaging should be a separate activity that should be done prior to program implementation.

There are at least three types of training materials that may be needed. First, is for the awareness and introductory technical training workshops in the fields of environmental and resource economics, environmental accounting, database management, and GIS. Second, are the on-the-job training materials for the construction and operation of the environmental MIS/GIS system. And third, field materials for the preparation of provincial and municipal environmental profiles.

Additional course materials may be prepared for the more formal environmental management course. Advocacy materials for government officials may be prepared beforehand, but materials for educational campaigns for the community may be prepared during the program as environmental policies unfold.

A typical environmental database computer package, which could be locally adapted, can also be prepared ahead of the program.

5. *Selection of Prospective Provinces*

The ENRA-institutionalization and capability-building program should still be demand-driven, that is, the initiative should emanate from the provincial LGUs. However, the LGUs must meet some basic program requirements for consideration.

A basic requirement is the presence of an environmental management unit, whose part of the mandate is environmental management and willingness to adopt an environmental accounting framework of management as a program.

Program funding is another. Adoption of ENRA accounting framework as an environmental management program may be very expensive. Full cost funding for capital outlay (*e.g.*, computers, transportation) and cost of operation (*e.g.* office space, supplies, support staff), including human resources and capital may be required of the LGUs.

Initial estimates from ENRAP show that the program (excluding the TA and GIS) may cost around ₱2 M per year for operation, ₱1 M for GIS equipment (and ₱300,000 minimum for GIS operation) . The provincial LGUs will be responsible for fund sourcing, either internally from the IRA or externally, from foreign funding agencies.

The assumption is that a separate TA funding may become available to selected provincial LGUs.[42]

Attachment A

ENRAP-Sarangani Project: A Concept Paper

Introduction

The 1996-97 ENRAP[43] study of SOCSARGEN identified the existing nature and quantified the level and rate of environmental and natural resources degradation in the region. Results of the study revealed a worsening environmental condition in the region and highlighted the alarming rate of pollution of Sarangani Bay. Furthermore, the study called attention to the need to invest in environmental protection measures and to implement policies that will lead to better management of the areas' environmental resources.

This extension of the ENRAP in the region focuses on the capability building of the local governments of SOCSARGEN, especially the Province of Sarangani, to plan, implement, and monitor the management, conservation, and sustainable utilization of the region's environment and natural resources.

Project Objectives

The general objective of the Project is:

- To develop the capability of SOCSARGEN local governments[44], initially the Province of Sarangani, to plan, implement, and monitor the proper management, conservation, and sustainable utilization of the region's environment and natural resources.

Specific objectives are:

- To train a 'core group' of people from the local government in the areas of environmental and resource economics, technical (biological and chemical) measurement of environmental parameters, GIS/GPS and other environmental modeling techniques.
- To develop and install environmental and natural resources databases
- For the 'core group' to do environmental policy analyses and studies using the above databases and techniques. Specific studies can include:

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[42] Additional criteria and bases for prioritization should be established and made transparent to the LGUs. TA funding requirement (including a full-time consultant and two training workshops) may reach ₱2 M per annum.

[43] The Philippine Environmental and Natural Resources Accounting Project in SOCSARGEN was a project of the Department of Environment and Natural Resources (DENR) with funding assistance from the United States Agency for International Development (USAID).

[44] It is ideal that all local government units of SOCSARGEN (South Cotabato, Sarangani, and Gen. Santos City) be included in the Project. However, only Sarangani has requested from USAID the extension of ENRAP activities in the province. It is hoped later on that the South Cotabato, Gen. Santos City, and possibly Sultan Kudarat (to complete the new SOSKSARGEN growth area) be interested in an ENRAP Project.

Reduction of Pollution Level of Sarangani Bay

Optimal Land-Use Planning for Sarangani Province

Duration of the Project:

The Project is initially set for two years with two phases as follows:

- Phase 1 is for one year from December 1997 to November 1998, and
- Phase 2 is for another year from December 1998 to November 1999

Proposed Activities[45]

To achieve the above objectives, activities of the Project were divided into three major components: training/workshop, database management and policy research/analysis.

Training and Workshops

Training and workshop will be conducted on two levels. A two-week general training and workshop on environmental and resource economics, and technical (biological and chemical) measurement of environmental parameters will be conducted for the 'core group' of environmental analysts.

A select group of people will also be trained in database management, GIS/GPS technique, and environmental policy.

Database Management

The Province of Sarangani is already in the process of gathering and monitoring various environmental and natural resources data. Several initiatives of the Provincial government, DENR projects like NRMP and CRMP, and by NGOs are aimed at inventory and mapping of the province natural resources.

The Project can help in organizing various data and information, and in setting up of a computerized environmental and natural resources database system of the Province. Two sets of complementary databases can be established. The first utilizes the ENRAP database package and the other uses the GIS/GPS system.

Policy Research and Analysis

The above training and workshops, and the computerized databases can be of real value if effective environmental policies are derived from them. As part of the Project's hands-on training, actual planning, monitoring, and policy research activities will be conducted by the 'core group' and select individuals. Two policy studies can be conducted:

The Use of Economic Instruments in Reducing Potential Pollution in Sarangani Bay

Optimal Land-use Planning for Sarangani Province.

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[45] The attached Gantt Chart summarizes the proposed activities of the project.

Attachment A (continued).

ENRAP-Sarangani Project - Proposed Schedule of Activities

	1997	1998										
ACTIVITIES												
	D	J	F	M	A	M	J	J	A	S	O	N
Phase I - Dec 97 - Nov 98												
Planning meetings												
ENRAP and Prov'l. govt.												
Core group												
Kasfala												
Training												
Module/Program Preparation												
Environmental/Resource Economics												
Technical (bio-chem) analyses,												
GIS/GPS, database mgt.												
Database Management												
ENRAP Package												
Computerization												
Data gathering/encoding/mgt												
GIS/GPS												
Training												
Computerization												
Data gathering/encoding/mgt												

Policy Research												
Pollution Reduction of Sarangani Bay												
Training												
Study design												
	1998	1999										
	D	J	F	M	A	M	J	J	A	S	O	N
Phase II - Dec 98 - Nov 99												
Database Management												
ENRAP Package												
Data gathering/encoding/mgt												
GIS/GPS												
Data gathering/encoding/mgt												
Policy Research												
Pollution Reduction of Sarangani Bay												
Conduct of Study												
Validation and Testing												
Report writing												
Application/Monitoring												
Optimal Land-use Planning												
Training												
Study design												
Programming												
Land-use modeling												
Validation and testing												
Report writing												

Attachment B

Integrative and Strategic Planning Workshop for the Management of Sarangani Bay and SOCSKSARGEN's Coastal Resources

Introduction

The management of a complex resource, such as Sarangani Bay and SOCSKSARGEN's coastal resources, requires the collaborative and concerted efforts of the different stakeholders, concerned groups, agencies and organizations, from both the government and private sectors of SOCSKSARGEN, in particular, and of the country, in general.

The task of leading SOCSKSARGEN (composed of the Provinces of South Cotabato, Sultan Kudarat, Sarangani, and the City of General Santos) in the management of Sarangani Bay and the area's coastal resources was recently assigned by the Board of the SOCSKSARGEN Area Development Program to the Provincial Government of Sarangani. At the same time, Sarangani Bay as a protected seascape has its own Protected Area Management Board (PAMB) charged with the policymaking function for the management and protection of the Bay. Together, the Province of Sarangani and Sarangani Bay PAMB are to commence the planning process for the management and protection of Sarangani Bay and adjacent coastal resources by proposing this 'Integrative and Strategic Planning Workshop'.

II. Workshop Objectives

The major objective of the workshop is to generate a strategic plan that can provide appropriate guidance and direction for the proper management and protection of Sarangani Bay and adjacent coastal resources.

However, the workshop is also aimed at achieving the following specific objectives:

Convening the representatives of the different stakeholders; LGUs, concerned groups, agencies and organizations from both the government and private sectors.

Familiarization with current activities and future programs of the different LGUs and organizations concerning the Bay and adjacent coastal resources.

Sharing and consolidation of data related to the Bay and adjacent coastal resources generated by researchers, academe, public agencies, and other data-generators.

Review of government policies and regulations affecting the Bay and adjacent coastal resources.

Identification of policy and data gaps required for the effective management of Sarangani Bay and adjacent coastal resources.

III. Workshop Design an Schedule of Activities

The workshop consists of three major activities: Program Review, Policy Review, and Strategic Planning. For efficiency and cost-effectiveness, these activities are conducted in three phases (different dates and venues) and attended by different (not mutually exclusive) sets of participants.

The Program Review and Policy Review are a one-day activity, while the Strategic Planning is a two-day affair – with one-week break between activities.

The workshop design and activities are graphically depicted in Figure 1.

A. Program Review

The Program Review, scheduled on June 8, 1999 at the Sarangani Provincial Capitol is the first of the series of activities. It is designed to introduce the participants with the various activities, projects, and programs (past, current, and planned) by the different government and non-government groups. The sixty participants and presenters are to come from:

LGUs (of SOCSKSARGEN)

NGOs (*e.g.*, Tambuyog, Mahintana Foundation, South Cotabato Foundation, etc.)

Government agencies (*e.g.*, DENR, BFAR, DA)

The academe (*e.g.*, MSU, Notre Dame College)

Foreign-Assisted Project Implementers (*e.g.*, ENRAP, CRMP, GOLD, NRMP, UNDP)

Private Corporations / Institutions (*e.g.*, Dole Phils., Alsons Corp.)

People's Organizations (*e.g.*, Fisheries Coops, FARMC)

Business sector

Sharing and consolidation of data, and identification of data gaps are also part of this activity.

Policy Review

To give time to consolidate data and synthesize the information from the Program Review, the Policy Review is scheduled a week after, on June15, 1999 at the Gen. Santos City Fish Port facility.

Most of the seventy participants are from the policy-makers and policy-enforcers and regulatory bodies:

Governors and Mayors

Members of Sangguniang Panlalawigans' and Sangguniang Bayans' Environment, Coastal Resources, and Fisheries Committees and their technical staff.

LGUs Planning and Legal offices, MENROs and CENROs
Government agencies (DENR, BFAR, DA, etc.)

PNP, Maritime PNP, and Coast Guard

The rest would come from NGOs, POs, and private and business sectors

Two sets of policies and regulations are to be presented and reviewed, national and local. Initial syntheses of these two sets of laws, policies and regulations will be presented to the workshop – for

further analysis and review. Presenters of initial syntheses are from Sarangani CRM, DENR, BFAR, LGUs, PNP and Coast Guard.

The workshop would then focus on analyzing the reviewed policies and coming up with a set of relevant policies and policy recommendations.

Strategic Planning

After the Program and Policy Reviews, a two-day live-in Strategic Planning Workshop is scheduled on June 22-23, 1999 at one of the convention facilities outside of the city. Participants to this workshop are limited to fifty-five strategic planners - representatives of the LGUs, government agencies, NGOs, and private sector.

A major input for this workshop is the synthesis of the Program and Policy Reviews, highlighting complementations and gaps, while the expected outputs are:

a strategic plan for the management of Sarangani Bay and adjacent coastal resources;

tasking of activities (assignment and acceptance of responsibilities) to the different groups and

an MIS/GIS database system design for Sarangani Bay and SOCSKSARGEN's coastal resources.

From these workshop outputs, a Sarangani Bay Resource Management Plan, with implementation and monitoring phases should later be developed.

IV. Coordination and Support

The DENR (as Chair of the PAMB), the PPDO-Sarangani (for the Sarangani Province) and the SOCSKSARGEN ADP PMU (as coordinator) have agreed to coordinate and act as secretariat to the workshop. And in consultation with the Executive Committee members of the PAMB, they are to prepare the lists of participants and resource persons.

V. Funding and Support

The three-phase Workshop is estimated to cost around P118,500 (Table 1).

The following organizations (LGUs, GOs, NGOs, Projects) have agreed to share the cost of the workshop.

ADP-PMU, ENRAP-Sarangani, CRMP, DENR, Province of Sarangani, General Santos City, Mahintana Foundation, and Tambuyog

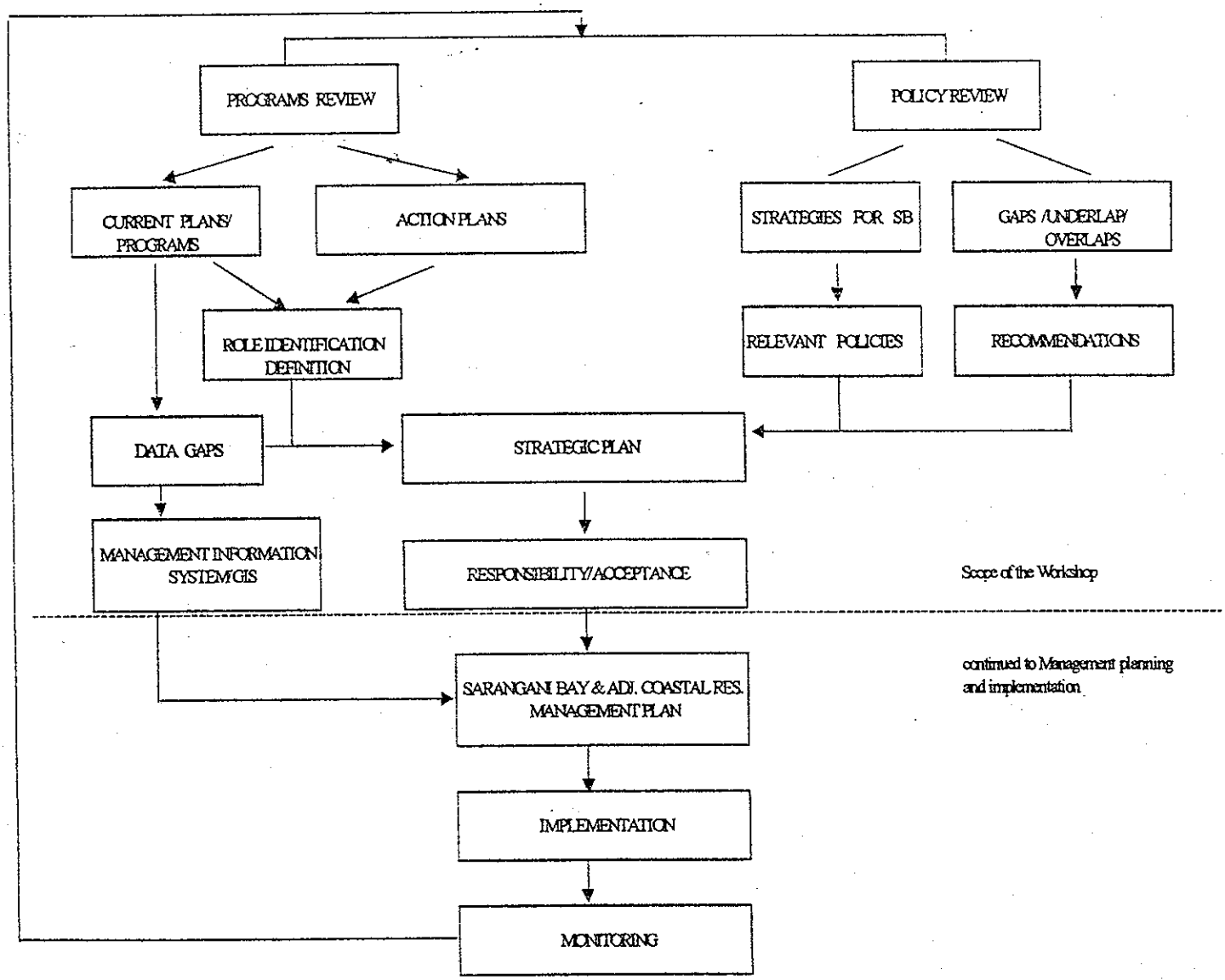
Table 1 - Cost estimate for the three-phase Integrative and strategic Planning workshop.

Items	Description	Cost
Workshop June 8, 1999	Program Review (1 day; 60 participants)	P12,000
June 15, 1999	Policy Review (1 day; 70 participants)	14,000
June 22-23,1999	Strategic Planning (2 days; 55 participants)	82,500
Supplies		5,000
Contingencies		5,000
Total		P 118,500

Note: The Program and Policy Reviews were conducted in October 20-23, 1999. The Strategic Planning is schedule on the third week of November. The Province of Sarangani financed the reviews, while the ADPO-PMU will shoulder the cost of the strategic planning.

Attachment B (continued).

Figure 1 – Integrative and Strategic Planning Workshop Framework



Attachment C

ENRAP-SARANGANI

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Copy: Dr. Ann delos Angeles

Memo for : Mr. Fredo P. Basino
PPDC, Sarangani Province

From : Nicos D. Perez, Ph.D.
Study Leader

Date : 17 January 1999

Subject : ENRAP activities for January and February

Greetings for the New Year!

From our earlier discussion, here is a list of activities we have lined up for the month of January:

1. Provincial and Municipal MIS (database).

   This is our priority for the month.

   The MIS should include not only data on socio-economic and environmental profiles of the province and municipalities but also cultural, historical and political information.

   It should also include **photographs** of elected and appointed officials and important historical sites and tourist spots of the province, and **articles** on its history, economy, culture, polity and environment.

   It is envisioned that the MIS will be the basis of the provincial website on the Internet in the future.

   The following information/data/items should therefore be incorporated into the final MIS

   - Provincial MIS
     - Photographs of Elected Officials – Governor, Vice-Governor, Board Members, etc.

       A 2"x 2" picture of each elected official with 1-page write-up of each (biographical sketch, etc.).
     - Photographs of historical, cultural, tourist and important economic spots.

       3" x 5" or 4" x 6" pictures with 1 pager write-up for each spot.
     - Write-ups on the Provincial historical, social, cultural, economic, political – and environmental profiles (5-7 pages)

- Provincial Departments – Each Department can have up to 4 photographs (2"x 2" photo of the Department head and up to three 3"x 5" or 4"x 6" photos of Department's activities, office or staff). Add a 2-page write-up about the department and its activities.

  In addition, the dataset/information each department regularly gathers should also be incorporated.

- Provincial socio-economic (NEDA, IRAP, DA, etc.) and environmental data (ENRAMIS) should also be submitted.

- Municipal MIS

  The Municipal MIS should be similar to the Provincial MIS. It should likewise include photographs of elected and appointed officials and important Municipal sites (historical, cultural, tourist, etc.) and socio-economic and environmental profiles (both datasets and write-ups).

  - Photographs of Elected Officials – Mayor, Vice-Mayor, SB Members, all Barangay Chairmen, etc.

    A 2"x 2" picture of each elected official with 1-page write-up of each (biographical sketch, etc.).

  - Photographs of historical, cultural, tourist and important economic spots.

    3" x 5" or 4" x 6" pictures with 1 pager write-up for each spot.

  - Write ups on the Municipal historical, social, cultural, economic, political – and environmental profiles (5-7 pages)

  - Municipal Departments – Each Department can have up to 4 photographs (2"x 2" photo of the Department head and up to three 3"x 5" or 4"x 6" photos of Department's activities, office or staff). Add a 2-page write-up about the department and its activities.

    In addition, the dataset/information each department regularly gathers should also be incorporated.

  - Municipal socio-economic (NEDA, IRAP, DA, etc.) and environmental data (ENRAMIS) should also be submitted.

Note that photographs should have glossy finish (not matte) for better scans, write-ups and dataset/numbers should be digital copies (respectively, MS-Word, double space, using Arial font size 11; and MS-Excel format).

Let us set a deadline for the above items – 31 January 1999.

2. Processing of Survey Schedules

The final processing of the two survey schedules gathered in November – IRAP and ENRAMIS, should be undertaken this month up to early February, since they are both vital inputs to the MIS/ENRAMIS (which should be up and running by mid-February).

3. Visits to the Municipalities

If you may recall, we promised the Mayors that we would visit every municipality to help them in the establishment of local MIS. January and early February may be the appropriate time to give them a visit. Please plan to include me in your regular visits to the municipalities.

4. Training of 2 PPDO staff

In line with the process of institutionalization of ENRA in Sarangani Province, we have earlier agreed to assign two key PPDO staff to the ENRAP Project on a regular 'one-day-a-week' basis until the end of the Project, for them to have better training and working knowledge of the ENRA framework and related activities of environmental management.

May I suggest that one should handle the GIS, the other the MIS/ENRAMIS. In addition, the Project may hire a computer expert to help us with MIS/GIS.

Attachment C (continued).

ENRAP-SARANGANI

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Rene Paraba
Dr. Ann delos Angeles

FROM : Nicos D. Perez, Ph.D.
Study Leader

DATE : 17 January 1999

SUBJECT : On-the-Job Training on Environmental and Natural Resource Accounting

Upon the recommendation of the PPDC, you are designated to undergo an on-the-job training (OJT) on Environmental and Natural Resources Accounting and Management commencing the first week of February until the end of September 1999.

Let us meet together, with Mr. Basino and Mr. Paraba, to plan individual workloads and assignments that would enable each one to report to the ENRAP-Sarangani office on a one-day-a-week basis.

A detailed program of activities is being finalized and will be tabled for discussion during the meeting of the Project's coordinating group. In brief, the OJT will focus on the following areas:

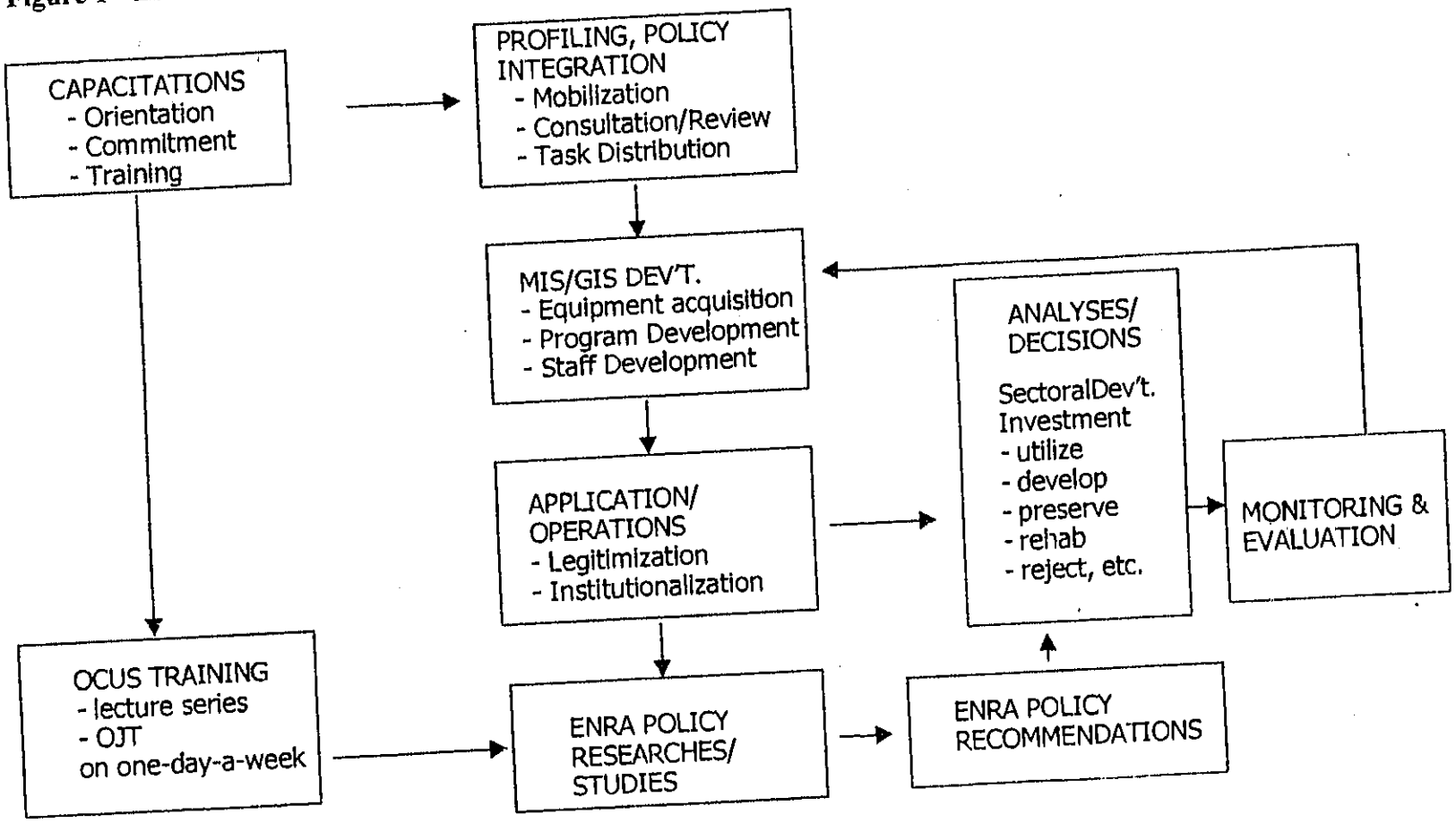
- Environmental Economics
- Resource Economics
- Environmental and Natural Resource Accounting
- Econometrics and Statistics (use of econometric/statistical packages including SHAZAM, LIMDEP, SPSS and SAS)
- GIS applications in GRASS
- Computer Programming (MS-Excel, MS-Access, Visual Basic, and GAMS)

Expected outputs include:

- environmental/natural resource policy papers and research proposals
- Provincial and Municipal Environmental and Natural Resources Profiles
- Provincial and Municipal MIS and GIS

The OJT will start with a review of the things you have already learned from the previous ENRAP-Sarangani training workshops. Please bring with you all the training materials from these workshops on our first meeting in February.

Figure 1 - ENRAP-Sarangani: Project Operational Framework.



APPENDIX A

SARANGANI PROVINCE: A CASE FOR LOCAL ENRA ACCOUNTING?

ENRA accounting at local levels (regional or provincial) poses two empirical issues. First, the political boundary issue – how to desegregate the accounts for resources and accounts transcending political boundaries. The other is the issue of efficiency - centralized (*i.e.*, by a national agency or bureau) estimation of provincial and regional accounts as compared with the decentralized estimation by the provinces and regions.

The main report did not dwell much on these issues; instead, the focus was on process documentation and recommendations for project sustainability and effective replication, drawn from the Sarangani experience.

There are two reasons for this kind of treatment. First, the ENRAP-Sarangani Project was not designed to measure the relative efficiencies of centralized and decentralized accounting. Although experiences from other countries showed that centralized estimation is more efficient, the methodologies for this type of comparison are not universal and the Sarangani project was not set up to use them. Second, the project was a pilot activity to ascertain and to improve on the local ENRA institutionalization process and design for better replication to other provinces – if and when, local accounting becomes essential.

This appendix paper revisits the issue and looks at the specific case of Sarangani Province, its resources, and the obtaining environmental issues in the province and the region. The *case analysis* seeks for evidences, for and against, local ENRA accounting in Sarangani.[46]

Sarangani Province – a brief description

Physical Features

The Province of Sarangani is located at the southernmost tip of the country (see Map 1). It is bounded by the province of Sultan Kudarat in the west, South Cotabato in the north, Davao del Sur in the east and Celebes Sea in the south. It is divided in half by Gen. Santos City that separates the eastern municipalities of Alabel, Glan, Malapatan, and Malungon from the western municipalities of Maitum, Kiamba and Maasim.

The Province has a total land area of 4,442 km^2. Malungon and Malapatan are the largest municipalities with 896 km^2 and 840 km^2, respectively. Maitum has the smallest land area of 324 km^2. About 68 per cent are forestland, 20 per cent cropland, 12 per cent pastureland and 2 per cent built-up areas.

Natural Resources

The major natural resource of the province is the 75,000 ha Sarangani Bay, shared with Gen. Santos City. Aside from the Celebes Sea, Sarangani Bay serves as the province's marine fishing grounds. The bay is rich in natural habitat – coral reefs, seagrass beds, and mangroves. It has several potential tourist destinations, white sand beaches and marine life-rich scuba sites.

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[46] The *case analysis* approach may not fully conform with the methodology of scientific falsification. Nevertheless, it can reveal evidences that may be useful in further investigation and in determining the merits/demerits of local accounting.

Watersheds from South Cotabato, Gen. Santos City, and Sarangani Province drain to the Bay. The major rivers flowing to the bay are: Siguel River, Buayan-Malungon River, Kraang River, Kalaong River, Lun Padidu, Lun Masla, and Glan River.

The province is also rich in mineral resources that are yet unexploited. Geological findings indicate enormous potentials with range of deposits of precious metals and minerals. Metallic mineral deposits such as copper and gold are found in Alabel, Kiamba, Maasim, and Maitum, iron deposits in Kiamba and Maitum, and silica in Maasim. Moreover, the municipalities of Alabel, Glan, Maasim, Maitum, Malapatan, and Malungon are rich with nonmetallic deposits such as guano, phosphate rock, coal, limestone, and sandstone.

Population

Sarangani Province has a estimated population of 415,580 in 1999 with growth rate of 5.3 per cent, total households of 76,652, and density of approximately 93 persons per km^2.

The Economy

Agriculture

The province is principally agriculture. As part of the South Cotabato, Sarangani, and Gen. Santos (SOCSARGEN) growth area, it has contributed to the area's emergence as leading producer of at least eight major commodities.

Due to its rich soil, good rainfall and typhoon-free climate, SOCSARGEN accounts for 29 per cent of the country's corn production, 20 per cent of the total rice, and 10 per cent of coconuts and copra. It also supplies 40 per cent of the total pineapples, 75 per cent of total cotton lint, and 99 per cent of asparagus.

In food production, the major activities of Sarangani Province are crop production, livestock production and fisheries. The key agricultural products are coconut, corn, rice, and copra. The province also produces a number of high value fruit products, such as lanzones, rambutanl peanut, papaya, guava, atis, and jackfruit.

Tourism and Leisure

Sarangani Province has an array of picturesque coastlines, unspoiled beaches, and marine life-rich coral reefs, springs, and caves. The coastal strip along Maitum and going eastward to Glan is known as the area's *beach row*. Numerous resorts with black, gray and coral sand beaches and tourism facilities dot this area.

Also popular is the Tuca Point White Sand Beach in Kiamba, an unspoiled beach area with a series of coves and stretches of white sand beaches. Another beach area blessed with over a kilometer stretch of powdery white sand and coves known for natural beauty is Gumasa Beach in Glan.

Infrastructure & Utilities

Sarangani Province's 2,691 km of road network consists of 271 km national road, 454 km provincial road, 162 km municipal road, and the rest, barangay roads.

Sarangani Province can be reached by sea via the Gen. Santos City Makar Wharf, and by air by the Gen. Santos City International Airport. Philippine Airlines, Air Philippines, and Mindanao Express, are servicing the passenger needs of the area.

The power supply needs of the province are provided by the National Power Corporation and distributed by the South Cotabato Electric Cooperatives.

At present, only the municipality of Alabel is served with telephone lines, but work is underway to cover the whole province with telephone system.

The fish port complex situated in Gen. Santos City serves the fishing industry in the area. The port complex includes a landing /preparation area, a wharf, storage, brine freezer, air blast, and contact freezer and ice plant. It also includes market halls, fishing gear maintenance sheds, fish container storage yard, maintenance shops, power and water utilities system, roads and parking areas, drainage and waste water plants and fuel supply facilities.

Environment-Economy Issues in the Area

There are several environment-economy issues obtaining in the province and the region (growth area) that may require further analyses of the tradeoffs between economic expansion and environmental sustainability.

Resource-based economy

The province is principally an agricultural economy, with both land-based and marine-based production systems. The major production activities of Sarangani Province are crop production, livestock production and fisheries. The key agricultural products are coconut, corn, rice, and copra.

Sarangani has fifty-seven (57) coastal barangays (out of 140 or 40 per cent) making fish a major product and fishing along Sarangani Bay a major source of livelihood.[47]

Sarangani Bay is a rich marine resource with diverse marine, estuarine, and mangrove habitats. It is a tuna spawning ground. It also offers great potential for eco-tourism due to its white-sand beaches and beautiful coral reefs and scuba sites. Thus, making Sarangani Bay a major natural resource of the province.

Sarangani Bay, however, is also strategically located in southern Philippines where the climate is pleasant (outside the hurricane/typhoon belt). It is a natural harbor (deep and big cove) and utilized as base of tuna fishing industry and for transshipment of agricultural products from southern Mindanao.

Industrial expansion

The SOCSARGEN[48] area is one of the fastest growing economic clusters in Mindanao. In this economic cluster, growth is induced by its strategic location, Sarangani Bay, and by infrastructure development from the public sector and incoming private investments. While the city of Gen. Santos has embarked into the path of industrialization, the Province of Sarangani is cautiously weighing the economic benefits and environmental costs of industrial development.

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[47] Unlike the big tuna fishing fleet based in Gen. Santos City, Sarangani fisheries is basically municipal.

[48] SOCSARGEN is a term coined from the provinces of South Cotabato and Sarangani, and the city of Gen. Santos.

Industrial expansion is exerting pressure on water quality and natural habitats of Sarangani Bay. Waterfront development in Gen. Santos City is towards industrial, transshipment and harbor development, while eco-tourism is still being vigorously promoted in the Sarangani side of the bay.

Harbor and transshipment

Corollary to industrial expansion is the utilization of the bay as transshipment and docking sites. The bay is a *natural harbor* and strategically located, by description.

The food security drive by the government is promoting Southern Mindanao to become the food basket of the country. With investments in agriculture – crop production, irrigation, farm- to-market roads, processing and post harvest – food production is expect to sharply increase. The Sarangani Bay area is strategically located and a *natural harbor* for transshipment of produce from Southern Mindanao.

Gen. Santos is dubbed as the *tuna capital* of the country. No doubt, the expansion of the fishing industry in the area should also support the food security program in Mindanao, requiring more docking and landing facilities out of the bay.

Pollution and habitat destruction

In some degree, Sarangani Province is slowly giving in to industrial pressure and has allocated industrial zones along the bay, but would like investors to internalize the environmental costs of their projects.[49]

Pollution and consequent habitat destruction are one of the costs of industrial and population pressures. This need not be the case. In one of the forums conducted for the management of the bay, the business sector indicated that they too are for the protection of the Bay environment and are willing to abide with the emission standards set by the authorities – for as long as these standards are transparent and would not drastically affect profitability.[50]

Environmental conservation and eco-tourism

Despite the booming economy of its neighbor due to fishing and *industrial development*, Sarangani remained cautious in embracing the industrial path to growth. Weighing the negative effects industries would cause the bay and the entire environment, Sarangani, instead, embarked in a combination of environment-enhancing eco-cultural-tourism and less polluting agro-industrialization development strategy.

Sarangani is known for its environmental stance, as champion of the environment. Part of its basic philosophy is environmental protection and conservation. So that despite the booming industrial economy of Gen. Santos, the Sarangani part of the bay remained targeted for eco-tourism, marine sanctuaries, and environmental conservation laboratories.

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[49] See Appendix D.

[50] When it is unprofitable to conform to the pollution standards and emission regulations, the investor will divest to another line of business.

Such divergent development thrust may be difficult, if not very costly for Sarangani to maintain – bearing the cost of poor water quality and destruction of marine habitats brought about by industrial expansion in Gen. Santos City.

Sarangani as lead LGU on area's CRM

Recognizing the progress Sarangani has accomplished in managing its environmental resources, especially coastal resources, the provinces of Sultan Kudarat, South Cotabato and the city of Gen. Santos, through the area development program, designated the province of Sarangani the lead LGU in the area's coastal resources management (CRM).

As the lead LGU, Sarangani would take the initiative in the formulation and implementation of management and development plans for the entire Sarangani Bay and the adjacent coastal resources of Sultan Kudarat. It is now incumbent to Sarangani to take the lead in designing a rational management and development plans for the area's coastal resources that should have factored-in all the various biophysical and socio-economic aspects and the economy-environment tradeoffs.

Protected land areas and seascapes

The national integrated protected areas system (NIPAS) law[51] declares certain areas in the country as protected areas – forests, land and seascapes. Protected areas fall within the category of national parks. They are set for conservation, rehabilitation, protection and sustainable utilization.

The whole area of Sarangani Bay and the adjoining municipal waters of Maasim, Kiamba, and Maitum were declared a protected seascape. [52] Other areas in Sarangani declared as protected areas are Mt Balabak (forest reserve) in Kiamba, and Mt. Matutum (protected landscape) in Malungon.[53]

Each protected area is managed by a management board, the PAMB (protected area management board). The law also requires the preparation of management plan and management manual that should serve as the basis of long term framework plan in the management of the protected area.

Watershed approach to environmental management

The integrated upland-lowland-coastal approach to resource management is gaining grounds. The DENR adopts this approach – the watershed approach, to environment and natural resources management. The entire watershed (upland-lowland-coastal continuum) is regarded as a single planning unit in this approach.

By so doing, the cross-spatial externalities (both positive and negative) imposed by the different stakeholders on each other can now be internalized in the basic planning and management

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[51] Republic Act No. 7586, also known as NIPAS Act of 1992, is "an act providing for the establishment and management of national integrated protected areas system..."

[52] By virtue of Presidential Proclamation No. 756, dated March 5, 1996.

[53] By virtue of Presidential Proclamation No. 147.

unit – the watershed. The allocation of costs and benefits among stakeholders can also be more socially efficient.

Mineral resources

Aside from coastal, forest and agricultural land resources, the area is also rich in mineral resources. Metallic and non-metallic mineral deposits are found in the province. Mining explorations in the area indicated huge deposits of copper, mixed with gold and other alloys, which can be commercially exploited. A major mining company has started initial surveys and feasibility study preparation in the area.

Recent accidents in the mining industry, both in the country and around the globe, have made Sarangani and other LGUs more apprehensive about the copper mining operations in the area.

LGU Capability

The Province of Sarangani has maintained a development stance for the protection, proper conservation, and sustainable utilization of its environment and natural resources. In support of this development strategy are the political will, investment support, and assistance from various foreign-funded projects.

Political will and funding support

Political will for the case of the environment is manifested in the development philosophies of the province. Development strategy spelled-out for the province is people-centered, and environment and resource-friendly, delivered through transparent and responsible governance.[54]

Political will is also tangibly manifested through the funding of programs supportive of the environment (*i.e.*, ISF, CBFM, CRM) and development of environmental infrastructure support (*i.e.*, drafting of local Environmental Code, STAR learning network, ENRA, environmental MIS/GIS and IT center).

Environment-related projects

Because of its reputation as environment-friendly province, Sarangani is host to several environment-related projects. Among them are foreign-assisted projects like USAID'S coastal resources management project (CRMP) and governance for local democracy –environment component (GOLD), EU's upland development proggramme (UDP), ADB's community-based forest management (CBFM), and incoming JBIC's Southern Mindanao integrated coastal zone management project (SMICZMP). All of these projects are concerned with resource assessment and, in one way or another, environmental benefit-cost analysis (BCA).

All these projects are also concerned with capability building and the transfer of technology to local workers and constituents.

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[54] See Table E1 of Appendix E.

Case Analysis

An analysis of ENRA accounting needs and local capability is applied in the case of Sarangani.

Need for local ENRA accounting

Resource Assessment

Almost all environment-related projects in the province and in the SOCSKSARGEN area are into assessment of environmental resources. The previous natural resources management project (NRMP) and the current UDP are into forest resource assessment, the CRMP into coastal resources, JICA and IIRR into water resources, and the incoming SMICZMP into watershed resources. The ENRAP pilot ENRA-institutionalization project was into pollution assessment and valuation.

Environmental costs assessment

Economic growth and industrial expansion are exerting pressure to the environmental resources of the area. The area, especially Sarangani Bay, is rich in natural habitat and environmental resources. Full-cost accounting of the benefits and costs of new investment may be required for the estimation of the efficient level of pollution control and abatement.

In addition, Sarangani Bay as a protected seascape demands more stringent water quality standards. Measurement and monitoring of water quality and emissions from various sources – industry, households, and agriculture – may be necessary. Damage assessment with varying changes in water quality may also be required to justify and rationalize the higher water quality standards for the bay.

Environmental cost assessment also considers the alternative uses of the resource – industrial development *vis-à-vis* recreational and eco-tourism, land conversion against environmental conservation.

Management of a protected seascape

Sarangani Bay (protected seascape), Mt. Matutum (protected landscape), and Mt. Balabak (forest reserve) are the protected areas in Sarangani under the NIPAS law. As such, the management boards (one PAMB for each site) are required to come up with protected area management plans and management manuals. The management plan would guide the development of and the operations in the protected area. ENRA accounting included in the management plan/manual would be an invaluable management tool and scoring system for the proper management of the NIPAS sites.

Sarangani Province as a lead LGU in the area's coastal resources management would also be properly guided by the Sarangani Bay management plan that includes ENRA accounting.

Fish stock and natural habitat

The bay is the source of livelihood for Sarangani's coastal population. Dwindling fish production from the bay is drastically affecting the incomes and the economy of the area. Fish habitat protection and rehabilitation may be needed to help arrest the decline in production. Fish stock assessment and the determination of maximum economically sustainable yield may be required to arrest over exploitation of bay fisheries.[55]

Pollution charges

The DENR has initiated the charging for the environmental wastes disposal services of the environment. Pollution charges for BOD loads and heavy metals are being proposed.

Pollution charges is an MBI-type of environmental policy instrument, which need to be encouraged. Pollution charges, however, should be fair – set to the socially efficient level. Doing so requires an accounting of prospective damage and control costs.

Watershed management unit

The watershed encompasses the upland-lowland-coastal continuum. Maximizing the net benefits and the equitable allocation of costs and benefits among the stakeholders of a watershed is the socially efficient level of watershed resource use. Externalities are internalized in this management approach, but measurement of these externalities are required to effectively institutionalize the environmental policy instrument of efficiently allocating the benefits and costs.

Depreciation and Extraction rate of mineral resources

Copper deposits were surveyed to be abundant in the area. Already a major Australian mining company is in the feasibility preparation stage of a copper mining operation in the area.

The rate of extraction and type of mining operation (*e.g.*, open pit, strip, etc.) may affect the value and environmental cost of mining operations. Two ENRA accounts may be needed for the mining industry, depreciation and rate of extraction, and environmental costs of the specific type of mining operations. Added to these are the risks involved, the chances and costs of mining accidents.

Efficiency of decentralized local ENRA accounting

The main argument for a centralized system (by a national agency) of ENRA accounting is that it is easier and cheaper to train a small group of people to do the provincial and regional environmental accounting nationwide. The decentralized alternative is training a group of people from every provincial LGU and region to do environmental accounting in their own area.

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[55] An initial estimate (from a year data) of fish stock and maximum sustainable yield was conducted by Silliman University and MSU-Gen. Santos City in 1996. Time series data and inclusion of economic variables should be added to the research procedure utilized in the said study.

The argument for the latter (decentralized system) is that there is transfer of skills and technology, and that the LGUs will have a better understanding of the environmental accounts and their use in environmental management and policy formulation.

Nationwide versus resource-based accounting

If the comparison were a nationwide ENRA accounting by a national agency or a nationwide ENRA accounting by the different LGUs, efficiency considerations would favor the former. However, since the LGUs have direct hand in the management of its resources, ENRA accounting by the different LGUs may be better (although more expensive) in terms of effective management of the environment and rational environmental policy formulation.

Local ENRA accounting by the LGUs for environment management at the resource level (specific area) may have considerations, other than costs and efficiency. An example is the case of Sarangani Bay accounting as a management tool of the PAMB. It is a limited accounting as compared with a nationwide activity and the main objective is as a management tool, scoring system secondary.

Another consideration that may favor limited resource-based accounting is the cost of a nationwide regional and provincial ENRA accounting. At present, ENRA accounting in the country is at the national level, and yet the latest figures are for 1992 adjustments.[56]

For Sarangani, ENRA accounting of its major resources and protected areas would be the first step towards the provincial level accounting.

Manpower requirements and technical expertise

The skills and technical requirements, if not the costs, of local ENRA accounting may be prohibitive. Nationwide, there are only a handful of trained environmental and resource economists who can undertake environmental accounting activities. The problem is exacerbated at the provincial level. The provincial LGUs do not have the technical capability to conduct such environmental accounting.

Sarangani Province, however, is moving into that direction – training its people in environmental assessment and accounting. Technical staff from the province and the municipalities have been exposed to resource assessments and have been assisting in most of these activities (*i.e.*, forest resources through the provincial land-use planning (PLUP) and NRMP, coastal resources through CRMP, and household and industrial pollution through ENRAP). Moreover, there are ongoing and incoming foreign-funded projects that can build the local capacity.

Because of the priority placed on the environment, the willingness to learn how to properly manage its resources, and the experience and exposure to environmental management, Sarangani Province may be the only LGU in the country who can do local ENRA accounting most efficiently requiring only minimal assistance from an ENRA accounting expert.

[56] Most adjustments were made from 1985 figures.

Findings and Recommendations

There are several evidences that may support local ENRA accounting in Sarangani. Among these are:

- Sarangani has major resources declared as protected areas that require effective management tools. Environmental management plan and ENRA accounts are examples of such management tools.
- The environment-economy tradeoffs are very pronounced in Sarangani Bay. The analysis of alternative uses of the bay and the corresponding costs (including environmental costs) and benefits should be properly considered. A balance between economic growth and environmental sustainability must be established. What is the real cost of industrial expansion?
- Pollution abatement and pollution charges as may be required of users of the bay as a protected seascape should be fair and based on efficient level that maximizes the net benefits to society. ENRA accounting can assist in measuring such level.
- Stock assessment of the bay is an urgent undertaking. The declining fish stock of the bay should be arrested. Policies that promote increased productivity of the bay should be established. One of such policy is not to exceed the maximum sustainable yield (MSY) of the bay. Another is by pushing the MSY outwards to higher levels.
- Multiple uses of the bay can exist. An analytical tool such as ENRA accounts can assist in the choices. Can industrial expansion and eco-tourism co-exist?
- Mt. Matutum and Sarangani Bay are both protected areas and both are part of the same major watershed. An integrated management approach to both resources should be more rational. The externalities and environmental costs can be confined and internalized within the system by managing them as a single unit. The concept of watershed approach to resource management can be tested in Mt. Matutum and Sarangani Bay, with the aid of ENRA accounting.
- With the recent cases of mining accidents, it would be prudent to assess the environmental costs of mining operations in the area and estimate the risks and environmental damages of such accidents.
- There exists local capability to do ENRA accounting with assistance from an ENRA specialist

There are also several recommendations this case analysis would like to advance. These are:

1. The conduct of limited resource-based accounting in the province's major resources.

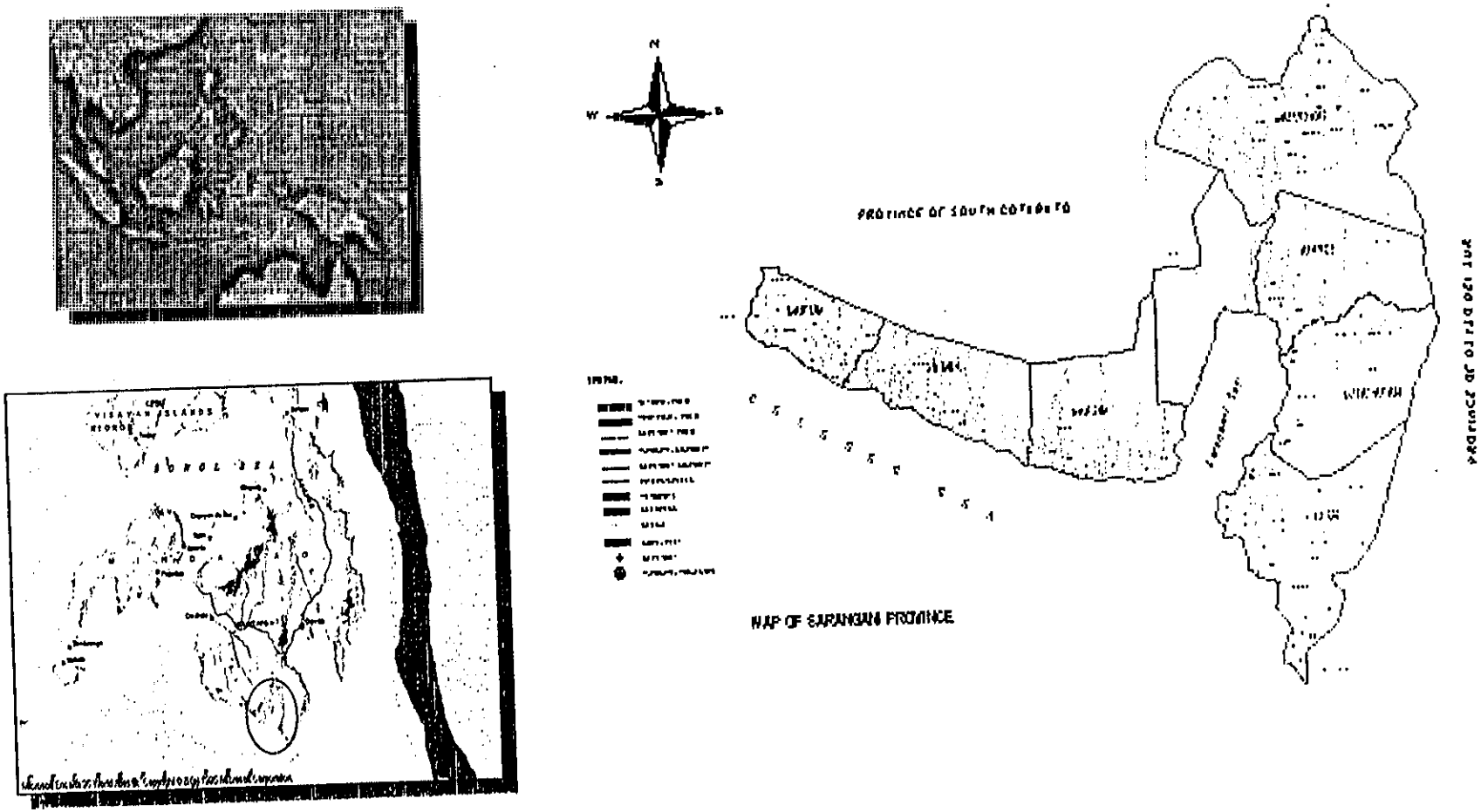
   Environmental accounting by LGU or by the technical team of the PAMB with technical assistance from ENRA experts, can be conducted and limited to Sarangani Bay and Mt. Matutum. Although a centralized provincial and resource-based ENRA accounting may be more efficient, it may not be forthcoming in the near future. Also, for a more effective and responsive environmental management of both resources decentralized resource-based accounting is recommended.

2. Environmental costs study and risk analysis of mining operations should be required of any mining company intending to exploit the area's metallic and non-metallic mineral resources.

3. Continuous capability-building in the areas of environmental management and accounting at the provincial level and the development and operation of environmental management tool like an environmental management system.

   Building capacity at the local level in the proper management of the environment and natural resources should be a continuing learning process. The province should take advantage of the presence of various environment-related projects in the area to help build local capability in ENRA accounting.

Map 1 – Location Map of Sarangani Province.



Appendix B

Sarangani Environmental MIS/GIS System:A Prototype Provincial Environmental Management System

Introduction

Part of an effective local ENRA accounting is the development of an environmental management tool. ENRAP-Sarangani was to help establish an MIS/GIS system in the province.

At the national level, ENRAP has developed an environmental database package aptly named ENRAMIS (for environmental and natural resources accounting - management information system). ENRAMIS estimates the environmental accounts for all sectors. A working copy of ENRAMIS is at the Department of Environment and Natural Resources (DENR) office in Manila.

For Sarangani, the plan is to build a similar database at the provincial level – a Sarangani ENRAMIS or Sarangani Environmental MIS/GIS System.

The ENRAMIS is a database package developed by ENRAP. It is a computerized database system that generates the ENRA accounts to augment the present system of national accounts. ENRAMIS has the complete environmental accounts: the value of the environment as a waste receptor (EWDS), value of the damages to the environment (ED), depreciation of natural resources (NRD) and the value of direct nature services (DNS).

At the national level, ENRAMIS estimates the environmental accounts for 1988 and 1992.

The Sarangani version of ENRAMIS is custom-made for the Province (*i.e.*, provincial level ENRA, aggregation from seven municipalities and 140 barangays). Each municipality has its own municipal level ENRAMIS with barangay level information on sources of pollution. At the provincial level, these seven municipal level ENRAMISes are aggregated into a Provincial ENRAMIS.

Initially, Sarangani ENRAMIS has the value of environmental wastes disposal services (EWDS) accounts. Planned to be added next are the accounts for the values of natural resource depreciation (NRD) particularly mines and forests.

The EWDS portion of ENRAMIS has four basic components:

- Sources of pollution (mobile, stationary and area sources, and by industry) – the 'data entry' portion;
- Pollution coefficients, the bases of pollution estimates;
- Nature and level pollution loads (air, water and solid wastes) from different sources; and
- Estimates of the value of environmental waste disposal services.

The Sarangani ENRAMIS is written in Visual Basic programming language but also uses MS-Access as back-end program.[57] It has data entry and report-writing components. It

[57] As the database grow in size, the plan is to use a SQL server.

automatically estimates the EWDS accounts using pre-determined pollution coefficients,[58] prices, and costs. Charts and tabular reports are also generated from the program.

Evolution to a Provincial Environmental MIS/GIS System

Even before the ENRAP-Sarangani Project, the Province of Sarangani was already contemplating of establishing an MIS/GIS system at the Provincial Planning and Development Office (PPDO) to cater to the data needs of the development planning process. As early as 1997, the province has already allocated some amount for the purchase of a digitizer and plotting equipment[59].

So that ENRAP-Sarangani was also requested to assist in the development of an MIS/GIS system for the province. It was decided that an environmental MIS/GIS system similar to the ENRAMIS, with wider scope and coverage, should be developed and established for the province.

Thus, the Sarangani Environmental MIS/GIS System (Sarangani-EMS[60]) - an information system incorporating all the data and information requirements of the province with special emphasis on the environment and natural resources information databases.

Systems Design and Architecture

The ENRAMIS database package became the prototype design for the provincial environmental MIS/GIS system. It has the 'look and feel' of the ENRAMIS with expanded coverage and modular[61] architecture.

For an MIS/GIS system to be efficiently implemented, effectively disseminated and widely utilized, it should be comprehensive and flexible enough to incorporate the entire data requirements of the province, but compact and manageable enough to be cost effective. With these driving criteria, the Province of Sarangani planned to establish a single Provincial Environmental MIS/GIS System, which incorporates various departmental, sectoral, resources, and project data and information into database modules. It attempts to consolidate all the data banking activities of the province into one unified MIS/GIS system.[62]

There are three general categories under the Sarangani-EMS – Environment, People, and Governance. Under each category several modules can be integrated. For the Environment, planned modules are the ENRAMIS, environmental profiles, and local Environmental Codes. Other sets of information to be incorporated are the provincial socio-economic profile (SEP), investments,

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[58] Coefficients and prices were initially based on national estimates but should be updated with local coefficients. Local estimates were for levels of waste generation and waste disposal.

[59] The digitizer and plotter are for GIS. Due to long procurement process, the equipment set was finally delivered in September 1999.

[60] Sarangani EMS may also stand for Sarangani Environmental Management System, for which the acronym EMS is widely known to stand for. For Sarangani, the Environmental MIS/GIS System is an initial step towards the development of a Provincial Environmental Management System.

[61] It is composed of complementary but independent or 'stand-alone' modules.

[62] The EMS is a single multi-user system. This means that the different database needs of different users will be stored in one and unified system, for efficiency and comprehensiveness. Each user group, however, can have customized views and reports from the same EMS.

budgets and resources (coastal, agriculture, forestry). Project-based databases would also be built around the ENRAMIS and incorporated in the EMS.

Data aggregation and requirements

As far as practicable, the basic unit of all data and information is the barangay. All basic data are gathered at this level. They are in turn aggregated into municipal and provincial levels as they undergo data processing and consolidation.

There are already some data and information gathered by the different departments at sitio and purok levels. Although these will continue to be processed at sub-barangay levels, reporting may only be at the barangay level.

In addition, there are provincial, municipal, and resource based data that could not be further disaggregated even to the next aggregation level. They should remain in such level of aggregation. And there are data that do not have geographic dimension, which cannot be aggregated by political boundaries. These too are special cases that may need a different system of aggregation.

Data requirements may differ from department to department, from municipality to municipality, and by project to project. Ascertaining the data required by each department and each municipality is included in the process of data generation – what and how data would be generated. In a capsule, each department (*e.g.*, agriculture, planning, health, etc.) would conduct a departmental workshop to include their municipal counterparts. The workshop would generate the list of data requirements of the provincial and municipal departments.

Initially, the list of data requirements by the PPDO and its municipal counterparts, the MPDOs (Municipal Planning and Development Offices), would include the indicators for SEP (socio-Economic Profile) established by NEDA. The update of the ENRAMIS module would also be the responsibility of this department (with assistance from the Agriculture Department).

A similar workshop would be conducted with the municipalities where the collated and categorized departmental data listings would be presented. Additional data may be added to the lists as deemed needed by the group. It is also in this forum that the network of data generators would be formally established.

Similar process would be undertaken for individual projects with provincial and municipal coverage.

Data generation, processing, storage and retrieval

The network of data generators at the barangay level would be setup by the PPDO and MPDOs (under the ENRA Program) initially for the purpose of updating the ENRAMIS and SEP modules of the Sarangani-EMS.

Interview schedules for household, barangay, and municipal surveys would be prepared for the purpose of populating the EMS. A network of interviewers based throughout the province will be trained in survey and interview skills and filling-out and cleaning of survey forms.

The same network of interviewers will be strengthened and utilized for generating other data and information for the departmental and project modules added to the EMS.

Data processing stations are based at the respective municipal departments, and the Mayors' office. The data input and database management modules for the Sarangani-EMS will be installed into these offices' computers. These offices will be trained in data entry, data validation, database management, and report generation.

The aggregation of basic and processed data will be done at the respective provincial departments and offices of the Governor and Vice-Governor.

For the ENRAMIS and SEP modules, responsible municipal and provincial departments are the planning with assistance from agriculture, health and the municipal ENROs.

At the municipal level, the MPDO is responsible for collating and storage of municipal and departmental information database. It becomes the repository of municipal information and database. The MPDO would in turn regularly furnish an official copy of municipal database to the PPDO, which is the official repository of data and information of the province.

Further data aggregation and processing would be undertaken at the PPDO for both provincial and municipal databases. Processed data are then stored at the official stations at the municipalities and around the province.

Data dissemination

Copies of Sarangani-EMS modules will be stored in compact disks for distribution to the network of computers around the province. They would also be permanently installed at the provincial and municipal Intranets (LANs), at the provincial resource and information center, and at the province's Web site in the Internet.

EMS information will also be available to the various government and private institutions or corporations, and to the general public through the Internet and distributed compact disk copies.

Depending on the type of data, the Sarangani-EMS would be updated annually, with semestral (every six months) estimates for various agricultural production and socio-economic indicators.

The Multi-Media Components of the EMS

Data and information in the Sarangani-EMS are in three formats. Most of the data will be stored in a database format (*i.e.*, figures and characters organized in data fields and tables). In addition, geographic information (geo-coded data) and electronic documents are also included in the EMS.

GIS is a computer-based system with emphasis on preserving and utilizing the inherent characteristics of spatial data by handling both components of spatial data: the physical location in space and the set of characteristics associated with that location. It facilitates the development, enhancement, modeling and multiple display of spatially referenced data. It integrates spatial and other kinds of information within a single system and offers a consistent framework for analyzing geographical data

It is similar to the 'database management system' (MIS) but deals in spatial rather than in tabular terms. It generates reports of maps as well as of tables and numbers. Thus, we can consider a GIS a 'spatial database system' as opposed to the 'tabular databases'.

For Sarangani, GIS is an integral part of the MIS, and complements the tabular ENRAMIS and other component databases. Blackland GRASS is the software selected to implement GIS.

Adding geographic information (*i.e.*, geo-reference locations, drawings like maps, etc.) is the major function of GIS. It adds geographic dimension to tabular information and visual reference into otherwise dull and boring figures and numbers.

However, GIS computer packages are quite sophisticated and for non-programmers are very unwieldy to operate. It takes a well-trained programmer to run the simplest of the GIS package. It is difficult to write application routines that would make GIS software more user-friendly. This is why most of the MIS systems do not integrate GIS into them. Instead, it is the GIS software that usually incorporates some tabular information into its report and display functions.

For Sarangani-EMS, however, the GIS component is linked into the main MIS with routine programs in Visual Basic. The Visual Basic applications work in the background, transparently running the GIS programs using Visual Basic queries (SQL) instead of GIS commands. Thus the user does not have to know how to run any GIS software to enjoy its capabilities – only the simple computer knowledge of running an all menu-driven MIS/GIS package.

In addition, documents and reports (*e.g.*, development and strategic plans, annual reports, profiles, project reports) are also incorporated in the EMS as electronic files (mainly in Acrobat *pdf* format).

Hardware and Software[63]

The equipment requirement to implement the Sarangani-EMS include; computers (either stand-alone or in a network), printer, digitizer, plotter, and computer software (database in Visual Basic and a GIS software).

The minimum computer requirement for the Sarangani-EMS is one computer per department or office at the provincial and municipal levels. Although these computers can be 'stand-alone', ideally they should belong to local area networks (LAN) established in every municipal hall and at the provincial capitol. These networks of computers should run under Windows environment with database programs in Visual Basic.

At the provincial capitol, a centralized GIS system may be installed at the PPDO's MIS computer. This system requires a digitizing table, a plotter, and a GIS software – Blackland GRASS. Due to the high costs of a GIS system, all GIS requirements (*i.e.*, digitizing, mapmaking, plotting/printing, GIS analyses) of the province and the municipalities would be provided by the PPDO's MIS/GIS section.

MIS – Visual Basic and Database Programs

The database programs for Sarangani-EMS are implemented in Visual Basic. Visual Basic is a high-level, object-oriented version of BASIC programming language. Microsoft developed Visual Basic for building Windows-based applications.

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[63] It should be noted that the hardware and software required in the Sarangani-EMS are not for the exclusive use of the EMS. Their use as standard office equipment with multiple functions can justify their costs.

Visual Basic was selected because it is easier to implement and can handle very large-size databases. And since it uses a programming environment in which basic program components are selected through menu choices, buttons, icons, and other predetermined methods, the user interface programs can be very user-friendly.

Another advantage of Visual Basic is that the MIS programs can be implemented both in an intranet (LAN) or Internet, and on stand-alone computers. In the former, the databases are updated through 'file-sharing' in the network. They are updated, in the latter, by the replication capability of Visual Basic.

In terms of database management and report writing, Visual Basic takes advantage of its SQL database language. An SQL (Structured Query Language) is a database language used in querying, updating, and managing relational databases – the de facto standard for database products.

GIS – GRASS (Geographic Resources Analysis Support System)

The GIS component of Sarangani-EMS is implemented with the use of Blackland GRASS GIS software. Blackland GRASS is written by the Texas Agricultural Experiment Station (Blackland Research Center), a part of the Texas A&M University System. This program allows any Windows user to access a GRASS database (including the database created in UNIX platform) and manipulate data much like the UNIX GRASS program.

Blackland GRASS contains over 40 programs to render images on monitor and paper; over 60 raster manipulation programs; over 30 vector manipulation programs; nearly 30 multi-spectral image processing manipulation programs; 16 data management programs; and 6 point file management programs. The Blackland GRASS commands are designed to do complex geographical data management, analysis and display.

Blackland GRASS is a Windows version of the powerful and popular GRASS GIS software. GRASS runs on different platforms, including UNIX and Windows. Discussions on GRASS below apply to GRASS software in general, irrespective of computer platforms.

GRASS (Geographic Resources Analysis Support System) is a public domain raster-based GIS, vector GIS, image processing and graphics production system. Originally developed by the US Army Corps Engineers for UNIX platforms, it is now used extensively at government offices, universities and commercial organizations throughout the world.

GRASS's strengths lie in several fields. The simple user interface makes it an ideal platform for those learning about GIS for the first time. On the other hand, advanced users wishing to write their own code can do so by examining existing source code, interfacing with the documented GIS libraries. This allows for more sophisticated functions to be fully integrated within GRASS.

Other strengths include GRASS's pioneering of mixed resolutions and geographic coverage areas in a database; raster image compression techniques via run-length encoding and reclassification lookup tables; GRASS's rescaling of display images; plus its fundamental design criterion of powerful computer-assisted scientific analysis of environmental issues (as opposed to merely going for intricate cartographic output of relatively simple processes).

GRASS offers considerable potential for:

- *Use as a scientific, as well as a traditional graphically-oriented GIS.* Many GIS can make pretty maps, but cannot easily perform certain scientific analytical functions as easily or as powerfully as GRASS. GRASS was designed and developed in response to a perceived need for scientific GIS, specifically for environmental analysis, and the environmental management/ protection of public lands.

- *Education.* GRASS is easier to teach and learn than some other GIS. It is easier to modify (for those that want to learn GIS as computer science, rather than as 'geography') than most other GISs that come without source code and treat the program as a magical black box. Moreover, it is more affordable for students than many other GIS.

- *Applications to research and development.* Many universities have used GRASS. Its available source code, easy modification and scriptability, among others, give it distinct advantages over some more closed systems.

- *Public Service.* GRASS has been used as a scientific GIS for many public service applications.

The EMS Modules

The modular structure of Sarangani-EMS makes it possible to start a database system from a small module and gradually grow into a bigger multiple-module database. Modules are added into the EMS as needs arise and as funding sources become available.

Starting Modules

As a start, the EMS will have only two modules, both developed by ENRAP-Sarangani – the ENRAMIS with the ENRA accounts (initially EWDS) and a Directory of Government Officials and Employees (under Governance category).

Ideally, the ENRAMIS module should estimate all the environmental accounts. However, the technical and financial difficulties involved in estimating all the environmental accounts at the provincial level, limit the number of estimated accounts. The ENRAMIS module, therefore, estimates only the value of environmental wastes disposal services (EWDS). Other environmental accounts, which are more efficiently estimated by a central body or agency, would be recorded in the EMS as often as such estimates are made available.

The Directory of Government Officials and Employees includes the positions/ offices, names, photographs, addresses, and bio-data of the entire provincial and municipal elective and appointive officials and the roster of provincial and municipal government employees. Initially, the list included the Governor, Vice-Governor, SP Members, and Department heads at the provincial level and the Mayor, Vice-Mayor, SB Members, Department heads, and Barangay chairmen at the municipal level. The Directory was later expanded to include all the government officials and employees of the province and the municipalities.

On the Pipeline

On the pipeline are the CRMP, SEP, Agriculture, and Fisheries modules.

CRMP (Coastal Resources Management Project) is a USAID-assisted project with Sarangani as one of its 'learning areas'. CRMP has started building its own database (Municipal Coastal Database – or MCD) for all its learning areas. Basically, the MCD is a database at the municipal level with primarily focus on coastal resources and investments for coastal environments. It aims to serve as a management tool for the management of the municipality's coastal resources.

The MCD is an example of a project-based database that needs to be incorporated[64] in the provincial EMS. Work is underway to incorporate MCD into the Sarangani-EMS.

The SEP (Socio-Economic Profile) module is a departmental database of PPDO and MPDOs. The SEP includes the socio-economic indicators as identified by NEDA. Development of this module is scheduled for the Year 2000 as part of PPDO's MIS program.

The same is true for the Agriculture and Fisheries modules of the OPAG (Office of the Provincial Agriculturist. MIS funds have been allocated for the purpose in the Year 2000 budget.

Both departments will conduct workshops for determining the data needs of the departments and the process of generating them.

Other Modules

As the Sarangani-EMS becomes operational, it is expected that other departments would build their modules into it. The same is expected from incoming foreign-assisted projects like the Upland Development Project of EU, the community-based forest development project of ADB, and Mt. Matutum and Sarangani Bay development projects of JBIC.

In addition, the Project Monitoring section of PPDO has started computerization of its project monitoring system. It monitors all the projects being implemented in the province by all government agencies. It is also expected to build a database module in the provincial EMS.

Populating the EMS – the Short-Term Plan

The MIS/GIS systems will be institutionalized at the municipal levels, with barangays as the minimum unit of information. The establishment and operation of this kind of system is not an easy task. This means that all the seven municipalities and 140 barangays have to be mobilized and all of the activities are properly coordinated.

To orchestrate this extensive activity, an action plan for the implementation of MIS/GIS in Sarangani was formulated.

Data gathering and consolidation of available information

In anticipation of setting up a MIS system in the province, the *ad hoc* committee on database management was convened on August 21, 1998. Composed of representatives from different provincial and line agencies, the system shall be used to assess and consolidate the available data and information in their respective offices. Each department prepared a long list of available data and information for consolidation by PPDO.

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[64] As a matter of policy, the province may require any project (foreign or locally funded) that gathers primary data to build a project-based module in the Sarangani-EMS.

The committee also decided on what other information the different departments should gather regularly and what strategy to use to minimize the data gathering effort. It was also decided to gather information at the barangay level.

As an initial activity on data gaps analysis, a list of data required for the operation of the ENRAMIS database package for Sarangani was prepared by ENRAP-Sarangani from which data availability and data gaps were determined. The exercise led to the formulation of databasing strategy - to build the Provincial MIS around the ENRAMIS system, with additional data and information systematically incorporated into the basic ENRAMIS database.

The operation of the GIS system goes hand in hand with MIS. With GIS, the spatial dimension is added to the information in the MIS database. Graphical displays and analyses in the GIS should complement the tabular data of the MIS.

Gathering additional information

There are two kinds of projects with respect to funding sources – foreign and locally funded. Most often than not, the PPDO and the provincial departments are the implementers of locally funded projects and programs. Some of these projects are continuing activity and gather information on a regular basis. Examples of these projects/activities are the Integrated Rural Accessibility Planning (IRAP) surveys and NEDA's regular SEP (Socio-Economic Profile) surveys. As a matter of strategy, PPDO would start to piggyback on these projects the data gaps and requirements of the departments and ENRAMIS.

Other projects are one-time deals and provide snapshot type of information. Some projects and programs require much disaggregated data (barangay and sitio levels), while others need only aggregated information (provincial and municipal levels). Again, as a matter of strategy, PPDO would request ongoing projects and requires incoming ones to gather, at the minimum, barangay level data.

For 1999, gathering of data for ENRAMIS was made easier and less expensive by the inclusion of the required information into the IRAP survey[65]. IRAP surveys are done every three years with barangays and sitios as basic units of information.

Included in the process, is maintaining the quality of gathered data or data integrity. To maximize accuracy, 'quality control' of information is assigned to the respective MPDOs. They are expected to validate gathered information and to be familiar with the technical feasibility of the information.

Populating the ENRAMIS – Sample Survey Method

A major setback in populating the Sarangani-EMS (initially the ENRAMIS module) is the absence of data generating system or institution in the province that extends to the barangay level. High expectations on the efficiency of IRAP survey mechanism to do the ENRAMIS survey proved

[65] Gathering of environmental data for the ENRAMIS, riding on the IRAP survey, proved to be ineffective. The data generators were not adequately trained with the techniques of generating resource and environmental information. This is one of the major setbacks of the Sarangani-EMS. Populating the ENRAMIS module proved to be a special skill that requires careful design of survey schedules and intensive training on the part of the data generators.

to be overrated. In addition, the set of questionnaires used, proved to be technically incomprehensible to some IRAP data generators.

Learning from the IRAP experience, another survey for the purpose of populating the ENRAMIS was scheduled for August 18-20, 1999. Simpler and more user-friendly sets of questionnaires (household and community) were prepared by the project study leader. The staffs from the PPDO undergoing on-the-job training were trained with the use of the instruments in the conduct of the survey.

Due to limited time and scarcity of funds, the sample barangays and households were used to estimate the provincial values of EWDS from the household sector[66]. This estimating procedure should suffice for 1999, but a more intensive survey is planned for the Year 2000.

Scope of Work for Year 2000

For the year 2000, setting-up of the networks for data generation and data dissemination is the priority.

- *Network of Data Generators*

The PPDO and MPDOs will spearhead the setting-up of the network of data generators at the barangay level. A workshop during the first quarter of the year aims to establish the data requirements for the update of ENRAMIS module and the establishment of the SEP module. Survey forms and other data generation instruments would be developed during this workshop, including the strategy for gathering the needed data and information.

Initially, the EMS would have the ENRAMIS, SEP, Directory of Government Officials, and IRAP[67] modules. The ENRAMIS and Directory of Officials are already on board. The other components – the SEP and the IRAP surveys, would be incorporated immediately.

Some foreign-assisted projects like the upland development project of the EU and Mt. Matutum and Sarangani Bay development projects of OECF will also be commencing this year. So that databasing activities of these projects would be coordinated with the update and expansion of the Sarangani-EMS modules.

- *Minimum data requirement*

At the minimum, data should be at the barangay level. Some projects require information at lower level of aggregation (*i.e.*, sitio and household levels). This information can be incorporated as a special component of the MIS. However, in the main components of MIS, data are at the barangay level.

- *Resources modules*

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[66] More detailed discussions on the sampling procedure, the survey instruments, and survey results are found in Appendix B - Level of Pollution and Abatement Policy for the Household Sector of Sarangani: An Application of the Sarangani-EMS in Policy Analysis.

[67] IRAP (Integrated Rural Accessibility Planning) survey is a regular barangay/sitio level survey conducted every three years. It will also be incorporated into the Sarangani-EMS as a module maintained by the PPDO, but would not be updated until 2002.

Other modules would be systematically added to the existing EMS modules throughout the year. These include resource-based information (*i.e.*, forest, agriculture, coastal, fisheries), existing institutions and other supplemental data deemed necessary by the municipalities and the province in the conduct of their mandate.

- *Responsible Persons*

The process of gathering data permeates from the provincial to the barangay level. Provincial departments and line agencies are tasked to gather information. Municipal offices are also involved in the process, as well as barangay officials, volunteers and workers. Coordination of the process, however, is delegated to the MPDCs.

- *Integrity and relevance of data*

The MPDOs are assigned to validate and ascertain the integrity and relevance of data from municipal departments and barangays. They are expected to validate gathered information and be technically familiar with the feasibility of the information.

- *Network of computers*

The first quarter of the year would also be devoted to the preparation of several environment and EMS-related project proposals for outside funding. One priority EMS proposal is the setting-up of a network of computers in every town hall. The computer networks will serve different purposes, including the processing and dissemination of Sarangani-EMS data and information.

- *Institutionalization/Legitimization*

For the effective implementation of Sarangani-EMS at the municipal level, it should be acceptable to the local officials and policymakers. Activities to gain the support of the local officials would be undertaken starting the second quarter of the year. One of these is by scheduling a series of demos of the EMS (MIS and the GIS) for the local officials and members of the Sanguniang Bayan. Another is for the municipalities to legally adopt the EMS by way municipal ordinance or an Executive Order from the Governor.

The institutionalization/legitimization process should result to the direct operation of the EMS by the municipalities – sharing some of the operation costs, maintenance and acquisition of computer units.

- *GIS and map digitizing*

The operation of the GIS using Blackland GRASS will proceed from the provincial level. The PPDO will select the thematic maps to be digitized and processed in the GIS. This component of the EMS will commence during the first quarter of 2000.

- *Set of Deadlines*

Accomplished ENRAMIS data forms should be submitted to the PPDO on June 30, 2000. The SEP part is due by the end of September, while deadlines for the project modules would be set later.

Sustainability of EMS – The Longer-Term Plans

The longer-term plans for the EMS include; permanent home for the EMS, standardization with national databases, expansion of networks of data generation and dissemination, and the use of the EMS in development planning and environmental management.

Permanent Home for the EMS

A provincial Resource Center (or an IT Center) managed by PPDO will be established at the provincial capitol complex. The Resource Center would house the information and computer services of the province. It will also be the permanent home of the Provincial Environmental MIS/GIS System (Sarangani-EMS) with database replicates at the municipal computer networks (LANs).

The Resource Center will be responsible for the operation, maintenance, expansion, and the management of the EMS. It will assist the municipal LGUs in keeping their system up-to-date with the provincial EMS.

Standardization of Data and Information

The Sarangani-EMS in the long-term is envisioned to complement the databasing functions of the national agencies like NSO, NSCB, BAS, and NEDA. The PPDO/ Resource Center should therefore coordinate with these agencies in standardization of the EMS data and information.[68] It should also seek accreditation from the respective agencies to make 'official' most of the EMS data and processed information.

Networking for Data Generation and Processing of Information

In coordination with various national agencies (*i.e.*, NSO, NSCB, BAS, NEDA, DENR, etc.), a more permanent system of data generation at the barangays and data processing at the municipalities should be established.

Data and information exchange, and cost-sharing with the above agencies should also be explored to minimize duplication and to maximize the benefits from government expenditures.

Development Planning and Environmental Management - Applications of Sarangani-EMS

The value of the EMS is maximized by its application to development planning and environmental management. The EMS supplies the data needs of PPDO and other departments and offices for development planning. It can also serve as tool for the management of the province's environment and natural resources.

Following the process of gathering data and converting them into usable information through the EMS is a series of data analyses. This involves the process of making the information as useful tools in generating sound environmental and resource management policies. It should be emphasized that the nature of analysis influences the nature and type of data. This means that data gathering and data analysis are two-way process – feedback mechanism from the data analysis phase guides the data gathering process.

At present, however, ENRAP-Sarangani is still at the mobilization phase of data collection and databasing. It is expected, though, for the analyses phase to commence in the second half of year 2000. Possible policy researches for the program are: ENRA system, land-use planning and agricultural sector modeling, MBI for pollution reduction of Sarangani Bay and watershed modeling.

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[68] These may include uniform indicators, definition of terms, sampling procedures, and methods of estimation and projection.

Incorporating the ENRA system

The major objective of ENRAP-Sarangani is to institutionalize the ENRA system developed by ENRAP at the Province of Sarangani. Previous experience in other countries, however, should warn us that a full ENRA is not easy to setup. The task entails the incorporation of a satellite ENRA account into the national accounts (in our case, the provincial accounts). The ENRA entries adjust the conventional measure of growth to account for: the value of the environment as a waste receptor (EWDS), value of the damages to the environment (ED), depreciation due to the use of natural resources (NRD), and the value of direct nature services (DNS).

For Sarangani, only the EWDS is included in the ENRAMIS module. The depreciation of natural resources (NRD), which are mostly for forestland, mines, and fish stock in the case of Sarangani may also be estimated using the EMS data.[69] Together, these two measures are already a significant portion of the ENRA, and can already serve as a good policy tool for the management of the environment and natural resources.

The ENRA system accounts for the changes in the natural capital of the country (*i.e.*, environment and natural resources). It is a 'correction' to the present system of national accounts, which failed to include the natural capital in the analysis. The ENRA accounts can be presented as a satellite or appendage to the main national accounts.

At the provincial level, the ENRAMIS is the operating mechanism that institutionalizes the ENRA framework of analysis in the environmental and natural resources planning and management process. The proper valuation of the environment and natural resources is the strength of ENRAMIS that plays a major role the efficient allocation of resources. The complete ENRAMIS, which includes all the ENRA accounts, utilizes the most efficient mechanism of resource allocation – the pricing system.

Therefore, ENRAMIS would be an invaluable material and practical guide in the management of the environment and the development of local Environmental Codes.

Market-Based Instruments (MBI)

Results of ENRAP study of SOCSARGEN highlighted the alarming pollution rate of Sarangani Bay. With the increasing levels of pollutants from all sectors expected in the coming years, the ability of Sarangani Bay and its tributaries to provide various services is seriously threatened. Many parts of its water, particularly those along General Santos City, are already polluted. If this condition continues and expands to other areas, Sarangani province will suffer most of the losses.

South Cotabato accounts for most of the household and industrial pollutants that go to the Bay. Sarangani contributes the least, yet stands to lose the most with the environmental degradation of the Bay. It is therefore, in Sarangani's best interest to initiate workable solutions to reduce pollution in the Bay. The role of economic instrument, backed up by well-defined property structures over the Bay, can be an area of study in the future.

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[69] This option may not be as efficient as the alternative centralized estimation by a national agency. See previous discussions on the efficiency of environmental accounting.

GIS Applications

As mention earlier, the Blackland GRASS GIS software will supplement the tabular MIS. Other than adding the spatial dimension to tabular data, in Sarangani the following are its major areas of practical application:

- Mapmaking

  Though not limited to making of maps, Blackland GRASS is an excellent map-making tool. Raster and vectors maps can be overlaid to produce composites of thematic maps. The maps' projections and resolutions are easily changed with GIS, so is the printing – zooming in or out is possible.

- Management of environment and natural resources

  In conjunction with ENRAMIS, Blackland GRASS is an efficient way of monitoring and managing the environment and natural resources. Biophysical models can also be interfaced with Blackland GRASS to do environmental modeling, *e.g.*, SWAT watershed modeling and Spatial Hydrology.

- Emergency planning and routing

  Blackland GRASS can also be used in emergency planning and routing, *e.g.*, flash floods, landslides and road accidents.

- Simulating environmental effects

  The graphical interface of Blackland GRASS is a powerful tool in simulating environmental changes. It can simulate and display 'before-and-after' scenarios. This is useful in visualizing the effects of utilization of the environment and natural resources, *e.g.*, graphical display of the strip-mining effects on the environment.

Agricultural sector modeling and land-use planning

The development of an agricultural/forestry sector model (A/FSM) of Sarangani as a tool to analyze the impact of any policy affecting the agricultural and forestry sectors and to explore other options for the future is being contemplated.

The A/FSM is a mathematical programming model of Sarangani's agricultural and forestry sectors. The model simulates competitive market equilibrium behavior through maximization of the sum of consumer and producer surpluses across markets. Land-use patterns, commodity prices, production, consumption, imports and exports are all endogenous in the model. Moreover, it is able to simulate market responses to changes in the economic environment and resource base of the production systems. The model can thus simulate the impacts of environmental and natural resource degradation.

Watershed Modeling

Another policy modeling under consideration is the construction of a hydrologic model of Sarangani's watershed system. A watershed model can simulate the dynamics of soil, water and liquid waste movement from the watershed areas to the groundwater system, to the network of rivers, to the lowlands and to Sarangani Bay. This model can be useful in measuring the soil and water (liquid) pollution loads, and in determining the direction and rate of water flow and liquid

waste dispersion. It can also be used in the impact analysis of changing land-use patterns on land and water resources.

The watershed model can be best appreciated in conjunction with a GIS. A watershed simulator, Soils and Water Assessment Toolkit (SWAT) can be used in the development of a Sarangani Watershed Model. At present, ENRAP-Sarangani has a Windows version of GRASS-GIS software with a SWAT interface.

Appendix C

Pollution and Abatement Policy for the Household Sector of Sarangani: An Application of the Sarangani-EMS in Environmental Policy Analysis

INTRODUCTION

The use of the EMS for policy analysis is a component of an effective ENRA institutionalization process. For Sarangani, one application of Sarangani-EMS is for the development of policies that promote the proper management of the province's environment and natural resources. This study is a part of an ongoing policy research that utilizes the EMS in estimating the level and value of pollution from industry, agriculture, and household sectors of Sarangani Province.

The present study is limited[70] to the estimation of pollution loads coming from the household sector. Household pollution loads come from solid waste disposal activities, wastewater (toilet facilities, soap and detergent) and fuel consumption. It aims to recommend some policy alternatives and estimate the costs of addressing the pollution problems from the household sector.

The Sarangani-EMS is a provincial database system of Sarangani Province.[71] Included in the EMS is an ENRAMIS module that estimates the environmental accounts, both as scorekeeping and management tools for the management of the environment.

The present ENRAMIS module focuses on the environmental waste disposal services (EWDS) account. The EWDS estimates the pollution loads and the value of waste disposal services the environment renders to various sectors of the economy, including industry, agriculture, and household.

POLLUTION FROM HOUSEHOLDS

The study used primary and secondary data to populate the ENRAMIS. Household surveys were used to estimate solid waste generation and disposal, and consumption of fuel, water, and soap and detergent.

Selection of sample households was done in three stages. The first stage was purposive selection of municipalities – those that are mainly upland, lowland, and coastal municipalities. Malungon was selected to represent the upland areas, Alabel the lowland areas, and Glan the coastal areas. The second stage was also purposive selection of representative barangays from each municipality. Tamban was selected to represent the upland barangays, Maribulan the lowland barangays, and Gumasa the coastal barangays. The third stage was random sampling of twenty households from each selected barangay.

The small sample was due to limited time and scarcity of funds. This procedure should suffice for 1999 as initial estimates of the level, nature, and value of pollution from households. More intensive surveys may be conducted in 2000.

The population estimates were based on national population census of 1995 projected to year 1999. While the number of toilet facilities by category and coverage of garbage collection were estimated from the surveys of the Provincial Health Office (PHO) of Sarangani.

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[70] The estimation process for industry and agriculture sectors is still ongoing until the second quarter of year 2000.

[71] See Appendix A for details on Sarangani-EMS.

Household Surveys

The household surveys were undertaken in August 18-20, 1999 for the purpose of populating the EWDS part of ENRAMIS. A user-friendly set of questionnaires (household and community) was prepared by the project and administered by the staffs of PPDO undergoing on-the-job training.

A set of questionnaires is composed of barangay, industry, and household interview schedules. Sample questionnaires are shown in Appendix Form B.1 to B.3, for barangay, household, and industry respectively.

The household survey forms include information on:

- Sample ID (location, head of household, date, respondent code)
- Household size (adult and children)
- Daily fuel consumption (in kg for fuel wood, charcoal, crop residues, and in liters for LPG and kerosene)
- Daily volume of solid wastes (garbage) generated and method of disposal
- Daily consumption of soap, detergent, and shampoo
- Daily water consumption for various uses.

All interview schedules were checked and validated on site. Later on at the office, all accomplished survey forms were processed using simple computer spreadsheet program (MS-Excel).

Survey Results

Summary of survey results are presented in Table B.1 with barangay tallies in Tables B.1a to B.1c. Fifty-eight sample households[72] were interviewed using the household survey instruments to estimate the household consumption of fuel, water, and detergent, and generation and disposal of solid waste. Consumption rates are in units per day per person (capita) for uniformity and aggregation purposes.

Fuel consumption

Fuelwood, charcoal, and crop residues are the main fuel type Sarangani households are using. On average, rates of fuel consumption are 0.53, 0.04, and 0.04 kg/day per capita respectively for fuelwood, charcoal, and crop residues. Fuelwood and crop residues consumptions are highest in the upland area.

Consumption rates are lower for liquefied petroleum gas (LPG) and kerosene, respectively at 0.01 and 0.02 li/day per capita. LPG is rarely used in upland and coastal areas, but used by 50 per cent of sample households in the lowland (with 30 per cent of all sample households using LPG as supplement to fuelwood).

[72] Two questionnaires were discarded due to double counting. Two household members, at different locations, responded for the same household.

Garbage disposal

On average, the volume of solid waste generated by households amounts to 0.7 kg/day per capita. The rate is highest in the uplands at 1.14 kg/day per capita. The lowland and coastal areas generate lesser amounts at 0.487 and 0.481 kg/day per capita.

Fifteen per cent of solid wastes generated daily are non-biodegradable, composed mainly of plastics, bottles, and tin cans.

Burning is the most common method of garbage disposal (41 per cent), followed by dumping on land and water bodies (28 per cent), and burying (20 per cent). Only 8 per cent of garbage generated are composted and 3 per cent are fed to animals.

Soap and detergent Use

The sample households use detergent (bar and powder) at a rate of 16 gm/day per capita, with rates higher in the coastal and lowland areas (respectively 21 and 15 gm/day per capita).

Bathsoap is consumed at a rate of 3 gm/day per capita, while shampoo and dishwashing soap are used at rates of 2 and 0.2 gm/day per capita.

Water consumption

The average consumption rate of water is 59 li/day per capita, most for bathing (27 li) and laundry (17 li) use. Consumption rate for drinking and cooking is around 7 li/day per capita. Water for other uses (cleaning, toilet, etc.) consume an average of 8 li/day per capita.

Consumption is higher in the lowlands (83 li) than in upland (50 li) and coastal (45 li) areas.

Population, Toilet Facilities, and Garbage Collection

Results from secondary data for population estimates, toilet facilities, and garbage collection are presented in Tables B.2 and B.3. Table B.2 estimates the 1999 population, number of households, and toilet facilities, by municipality, in the province of Sarangani. And Table B.3 presents the extent of government garbage collection activities in the province.

Population estimates

Population estimates (projections) for the province, by municipality, based on 1990 and 1995 NSO population surveys are presented in Table B.2.

The province has a total population of 415,580 with 76,652 households, and average household size of 5.4. Malungon and Glan are the most populated with 116,810 (19,891 households) and 80,890 (14,855 households) respectively, accounting for almost 50 per cent (197,700) of the province's population.

The capital town of Alabel has a population of 50,896. Malapatan has 52,902; Kiamba has 43,132; while the municipalities Maitum and Maasim have 36,969 and 33,990 respectively.

Toilet facilities and sanitation

Table B.2 also presents the level of sanitation (in terms of available toilet facilities) of the households.

Only 75 per cent of households have toilet facilities, of which 49 per cent are sanitary and 26 per cent are unsanitary. One in every 4 households (or 25 per cent) does not have any toilet facility.

The situation is most severe in Maasim where 46 per cent of the households are without any toilet facility. In Maasim 31 per cent of the households and 29 per cent in Glan do not have toilet facilities.

The capital town of Alabel, on the other hand, has the most toilet facilities – 92 per cent of the households have toilets with sanitary toilets accounting for the 89 per cent.

Garbage collection coverage

Government garbage collection covers only 11 per cent of households (Table B.3). The other 89 per cent remain uncollected and are disposed of by the households by various means, as presented above in the section on waste disposal.

Malungon town has no garbage collection trucks, while in Glan garbage collection covers only 7 per cent of the households. Garbage collection coverage is highest in Malapatan (29 per cent of households), followed by Alabel (18 per cent), Kiamba (14 per cent), and Maitum (13 per cent).

Provincial Summary

Table B.4 summarizes the results from Tables B.1 to B.3 into provincial aggregations.

- ***Population***. The province has a total population of 415,580 with 76,652 households, and household size of 5.4.
- ***Toilet and sanitation***. A quarter (25 per cent) of households do not have toilet facilities. Another 26 per cent have unsanitary toilets. Only 49 per cent have sanitary toilet facilities.
- ***Solid waste management***. The volume of solid waste generated in the province was about 291 mt everyday, or an equivalent annual total of 106,332 mt of garbage. Only 11 per cent of households were covered by government garbage collection. The rest (89 per cent) disposed of their garbage by burning (37 per cent of all households), dumping (25 per cent), burying (17 per cent), composting (7 per cent) and feeding to animals (3 per cent). About 15 per cent of solid wastes were non-biodegradable, or around 15,493 mt for the year.
- ***Fuel consumption***. The majority of households around the province used fuelwood. Fuelwood consumption was about 0.53 kg/day per person, the equivalent of 80,677 mt per year for the entire province. Charcoal consumption reached 5,775 mt and crop residues 5,376 mt. LPG and kerosene burners are not widely used. LPG consumption was only 1,787 ('000 li) for the year while kerosene consumption reached only 3,466 ('000 li) – both comparably lower than fuelwood.

- *Soap and detergent*. The per capita daily consumption of detergent (bar and powder) was 16 g. This summed up to 2,010 mt of laundry bar and 436 mt of powder detergent in one year for the entire province. Consumption of bath soap, shampoo, and dishwashing detergent were relatively less at 480 mt, 328 mt, and 30 mt per annum.

- *Water consumption*. Total water consumption for 1999 reached 9.02 million cu. m. Forty-five per cent was used for bathing – 4.07 million cu. m., 29 per cent for laundry – 2.65 million cu. m., and 11 per cent for drinking and cooking – 1.02 million cu. m.

Chapter I - ENRAMIS - SOURCES AND LEVEL OF POLLUTION

With the use of the ENRAMIS module of the Sarangani-EMS, the sources and level of pollution are readily estimated.[73] The data from Tables B.1 to B.4 were used to update the coefficients to local values and populate the household sector of the ENRAMIS. In turn, the ENRAMIS estimated the sources and level of pollution, and the value of environmental services for Sarangani Province in 1999.

Liquid wastes

Domestic effluents are classified into sanitary wastes, leachates from solid wastes, and phosphates from soaps and detergents. The pollution loads (emissions) from sanitary wastes and detergents/soaps are shown in Table B.5, with municipal tallies in Tables B.5a to B.5e. Leachates from solid wastes are presented in Table B.6 and discussed in the next section.

Domestic effluents are high in biochemical oxygen demand (BOD_5), suspended solids (SS), nitrogen (N), phosphorus (P), and Coliforms. Pollution loads from sanitary wastes for Sarangani for 1999 are estimated at 11,377 mt of BOD_5, 11,377 mt of SS, 1,820 mt of N, and 303 mt of P. Coliform count totaled to 993.5 quadrillion[74] for the year.

Malungon and Glan have the highest loads of all types of pollutants due to high number of households and low percentage of sanitary toilets in both municipalities. BOD_5 and SS levels for Malungon were 3,198 mt and 2,214 mt for Glan. N loads for Malungon were 512 mt, 354 mt for Glan. P loads from sanitary wastes were 85 mt for Malungon, 59 mt for Glan. The values from soaps and detergents were 128 and 89 mt form Malungon and Glan respectively. Coliform counts for Malungon reached 279.3 quadrillion and 193.4 quadrillion for Glan.

Maasim and Maitum, on the other hand, have the lowest level of pollution due to low population and relatively higher incidence of sanitary toilet facilities.

Solid wastes

Pollution loads from solid wastes are generated from leachates and from burning of garbage. Leachate is generated from garbage classified as collected, dumped, buried, and unclassified (others). Garbage burned is accounted under air (area) emissions.

Table B.6 presents the total volume of solid wastes and emissions generated from the leachates. Table B.6a to B.6e show the loads by municipality.

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[73] As a computer software package, the ENRAMIS program has built-in formulae to estimate pollution loads and values of environmental services. Coefficients and prices, however, could be localized.

[74] Quadrillion is equal to 10^{15} or million billion count.

The total volume of solid wastes generated by the province in 1999 amounted to 106,332 mt. However, only 53 per cent (56,378 mt) were collected, dumped, and buried (and unclassified). Only this volume produced the leachates and pollutants.

The BOD_5 loads from solid wastes were estimated at 28,189 mt for the year. While N and P loads were estimated at 451 and 90 mt.

Since the generation of solid wastes was estimated using per capita values, the municipalities with most population are expected to generate the most pollution loads from leachates.[75] Malungon and Glan have the most population and the most volume of solid wastes generated.

Malungon has a total population of 116,810 that generated 28,888 mt of solid wastes, of which 47 per cent (14,157 mt) were collected, dumped, and buried. This volume of solid wastes produced leachates that accounted for the 7,078 mt of BOD_5, 113 mt of N, and 23 mt of P loads for Malungon.

Glan has a total population of 8,890 that generated 20,697 mt of solid wastes, of which 51 per cent (10,570 mt) produced leachates. Pollution loads from leachates were estimated at 5,285 mt of BOD_5, 85 mt of N, and 17 mt of P for Glan.

With the lowest population, Maasim generated the least pollution loads from solid wastes, estimated at 2,328 mt of BOD_5, 37 mt of N, and 7 mt of P.

Air emissions

Air emissions from household sources are generated from use of fuel for cooking and lighting, and from burning of garbage. Pollutants from combustion are particulate matter (PM), sulfur oxide (SO_x), nitrogen oxide (NO_x), volatile organic compounds (VOC), and carbon monoxide (CO).

Table B.7 presents the estimates of pollution loads from household combustion (burning of fuel and garbage). The estimates are for the entire province for 1999.[76]

Fuel consumption of the province amounted to 1,787 mt of LPG; 80,677 mt of fuelwood; 5,775 mt of charcoal; 3,466 mt (or 000 li) of kerosene, and 5,376 mt of crop residues. The amount of garbage burned was 39,161 mt.

Pollutants from household fuel combustion amounted to 4,978 mt of PM; 24 mt of SO_x; 131 mt of NO_x; 7,909 mt of VOC; and of 37,545 mt of CO. From burning of garbage, pollution loads generated are also substantial estimated at 2,157 mt of PM; 8 mt of SO_x; 56 mt of NO_x; 3,427 mt of VOC; and 16,267 mt of CO.

Fuelwood and crop residues are the most polluting fuel, while LPG is the cleanest. Burning of garbage produces same level of pollutants per unit as those of fuelwood and crop residues.

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[75] Except in cases where the volume burned, composted, and fed to animals are high enough to offset the effects of population. This was not the case for municipalities of Sarangani.

[76] Estimates were at the provincial level. Survey results were used to estimate provincial consumption levels and provincial coefficients. The survey sample size was too small to be able to estimate municipal level consumption and coefficients with wider confidence intervals.

ABATEMENT POLICIES

Results from the ENRAMIS module showed that the level of pollution from households, in addition to population, were dependent on (a) the level of solid wastes generated and the methods of disposal; (2) the presence or absence of sanitary toilet facilities; (3) the consumption rate and type of fuel used for cooking and lighting; and (4) the rates of consumption of soap and detergent and water.

Therefore, pollution abatement policies can focus on two things; (a) the rate of consumption and waste generation and (b) the means, the technology, or method of abatement.

Sanitary wastes abatement and costs

Abatement policy regarding sanitary wastes has a direct bearing not only on pollution, per se, but on the general health and sanitation of the community. Pollution loads from sanitary wastes can be highly reduced if all households are provided with sanitary toilets with on-site treatment facilities (septic tanks) desludged regularly.

For Sarangani, this option[77] involves the construction of 38,963 sanitary toilets (with on-site septic tanks) to replace the 20,120 unsanitary toilets and provide toilet facilities to 18,842 households that are currently without toilets. In addition, the septic tanks should be regularly deludged.

Annual costs for the above alternative with two options for frequency of desludging (every 2 or 5 years) are estimated in Table B.8.[78]

For the first option (desludged every 2 years), the annualized capital costs were estimated to be ₱161million, annual maintenance costs ₱93.6 million, for total annual abatement costs of ₱254.6 million. The second option (desludged every 5 years) has the same capital costs but with lower annual maintenance costs of ₱64.6 million for a total annual abatement costs of ₱225.6 million.

On a per household basis, the first option costs ₱2,101 of capital, ₱1,221 of maintenance, for a total of ₱3,322 per annum. The second option costs a little lower for each household at ₱2.944 per annum.

Solid Wastes Management

Pollution loads from solid wastes are from leachates of dumped garbage and air emissions from burning of garbage. Therefore, the ways to minimize this type of pollution are to (1) minimize burning of garbage and (2) minimize leachate leaks to the environment. The former calls for limits to burning of garbage, the latter for sanitary landfills and minimizing the total volume of garbage.

Decreasing the volume of generated solid wastes is an obvious way of reducing pollution. Recycling can contribute towards this end. Another is by simply not consuming goods that produce more garbage (*e.g.*, can goods, and items with heavy packaging). Charging prorated garbage collection fees (as opposed to flat rate or no fees at all) is also a possibility.

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[77] Other options are sewerage system and combinations of septic tanks with wastes stabilization pond, aerated lagoon, and activated sludge.

[78] The annual abatement costs can also be considered as the value of environmental wastes disposal service for sanitary wastes. These are prospective costs of reducing pollution from current levels to a non-polluting level according to established environmental quality standards.

Other options, less obvious in Tables B.6 and B.7, are composting of garbage and feeding to animals. Both are not contributing to pollution loads found in Tables B.6 and B.7, implying non-polluting alternatives of solid waste disposal.

The ENRAMIS module does not have (yet) any value estimate for this environmental service. The relevant abatement costs are the alternative costs of operating sanitary landfills (and ancillary services of garbage collection activities), mass composting of garbage, establishment of recycling centers, and any combination of these three.

Air Pollution Control

Air emissions from households are mainly from the use of fuel for cooking and lighting, and from burning of household garbage. As discussed in the previous section, limiting the practice of burning of garbage could drastically reduce air pollution from the latter. For obvious reasons, the same measure is not applicable to the former.

Instead, the strategy is to encourage the use of cleaner and more efficient type of fuel. Among the currently used fuel type, LPG is the least polluting (Table B.7). And based on heating value, 1 mt of LPG is equivalent to 3.784 mt of fuelwood. A shift to the use of LPG is both less polluting and more efficient. At the same time, it reduces the strain on the forests as sources of fuelwood.

Similar to commercial LPG is methane from agricultural wastes. Household level production of methane gas from agricultural and biodegradable wastes should also be encouraged as alternative 'cleaner' fuel source.

Abatement costs are estimated to be the costs of shifting from fuelwood to the clear LPG considering relative prices and heating efficiency. At present, the ENRAMIS does not have the relative prices for Sarangani.[79] At the national level, ENRAP estimated that, all things considered, there are no incremental costs incurred when shifting from fuelwood to LPG. This is also adopted in the present study.

SUMMARY OF POLICY RECOMMENDATIONS

This study showed the usefulness of the ENRAMIS in quantifying the pollution loads from various sources and in estimating the value of this type of environmental services. The ENRAMIS also serves as a tool and guide for the development of efficient environmental policies.

In the present study, pollution loads from household sources in Sarangani were classified into different type of emissions and pollutants and quantified and quantified for 1999. Some values of environmental wastes disposal services were also estimated and served as basis for the estimates of abatement costs.

To minimize pollution loads from household sources, the study offers the following environmental policy recommendations.

- ***Promote the construction and maintenance of sanitary toilet facilities with on-site septic tanks.***

[79] The survey did not include the relative prices of LPG and fuelwood. But even if it did, the prices would not be comparable. LPG is not widely used in the upland areas and the existing marketing mechanism and costs do not extend to the uplands. On the same token, fuelwood is cheaper in the upland areas than they are in the lowlands.

This involves the construction of 38,963 new toilets to replace the existing 20,120 unsanitary toilets, and provide toilet facilities to 18,842 households. In addition, both old (37,689 units) and new toilet facilities should be regularly desludged every two years. The estimated annual cost of this abatement policy is ₱254.6 million.

There are three types government interventions recommended with this abatement policy: permitting, subsidy, and IEC.

The policy should be incorporated in the building permit system. All new buildings (including houses) and subdivisions should be required to have sanitary toilets only. The permitting system could be extended to monitoring for building code compliance, by incorporating into the building code the sanitary toilet requirements.

Government subsidy may also be required for the poorest sectors of the economy. Ten per cent of abatement costs (₱22.56 million) may be allocated by the government as direct subsidy for the construction and maintenance of sanitary toilet facilities.

Information and educational campaign should be initiated by the government for the promotion and improvement of health and sanitary conditions of the every community in the province.

- ***Promote the construction and maintenance of sanitary landfill(s) for the province; encourage recycling of non-biodegradable and composting of biodegradable wastes.***

The province is generating a large amount of garbage annually- 106,332 mt. Proper garbage disposal should be a prime environmental concern. Sanitary landfills, however, are an expensive facility and depending on the volume of garbage processed, may not be cost-effective.

A garbage collection system for the entire province, and probably with adjacent LGUs, should be carefully planned. It might be more cost-effective if several municipalities share one landfill site. Or tipping system for collected garbage may be institutionalized to offset some of the costs. Garbage collection fees based on volume would also encourage recycling and decline in garbage generation.

In addition, composting of biodegradable garbage should also be promoted. It is recommended to establish two composting centers in the province, one each on the west and east districts. These centers can generate organic fertilizers for use in agricultural activities of the province.

- ***Promote the use of less-polluting and more energy-efficient fuel, like LPG and methane gas.***

Fuelwood is the most polluting type of fuel presently available to the households. It also puts pressure on the environment and the forest by the cutting of tree sources.

At present, LPG is the cleanest and the most energy efficient among the fuel type available to the households. Shifting to the use of LPG may be the effective way of reducing

air emissions from the households. And according to ENRAP studies, it is also the most cost-effective.[80]

This recommendation, however, is not limited to shifting to LPG, but in general recommends the use of any cleaner and more energy-efficient alternative to fuelwood. Methane gas from agricultural and other biodegradable wastes is one of such alternative, whose production and use in the province should be encouraged.

[80] This is only true to areas where LPG is readily available. In the case of Sarangani, some level of cost-effectiveness may be lost due to difficulties of transporting and marketing LPG in the uplands.

Table C.1 - Household survey results, by barangay, Sarangani Province, 1999.

Item	Sample Barangays			All
	Tamban	Gumasa	Maribulan*	
Sample Household				
Number of households	20	20	18	58
Total HH members	106	154	81	341
Average HH size	5	8	5	6
Total adult	63	90	55	208
Total children	43	64	26	133
Fuel Consumption/capita				
wood (kg)	0.74	0.57	0.29	0.53
lpg (li)	0.01	-	0.03	0.01
kerosene (li)	0.02	0.03	0.02	0.02
charcoal (kg)	0.02	0.02	0.08	0.04
crop residues (kg)	0.07	-	0.03	0.04
Garbage Disposal (per capita)				
vol. generated/day (kg)	1.135	0.481	0.487	0.701
dumped (%)	41.18%	20.24%	22.04%	27.82%
burnt (%)	29.65%	34.17%	59.96%	41.26%
composted (%)	20.91%		3.89%	8.26%
buried (%)	4.17%	40.36%	14.11%	19.55%
fed to animals (%)	4.09%	5.23%		3.11%
total (%)	100.00%	100.00%	100.00%	100.00%
non-biodeg (%)		18.01%	11.13%	14.57%
soap/detergent consumption				
bathsoap (gm)	2.29	4.54	2.66	3.17
laundry (gm)	9.75	13.60	16.42	13.25
powder (gm)	2.07	1.88	4.69	2.88
shampoo (ml)	2.44	1.65	2.39	2.16
dishwashing (gm)	0.05	0.06	0.49	0.20
bleach (gm/ml)	0.89	0.72	0.76	0.79
water consumption/capita	50.14	45.07	83.16	59.46
drinking/cooking (li)	6.36	4.81	9.08	6.75
bathing (li)	25.57	22.88	31.94	26.30
laundry (li)	13.31	12.66	26.46	17.48
others(li)	4.91	4.71	15.69	8.44

*Two questionaires were discarded from Maribulan due to double- counting. Two family members (one at home, the other at the store) responded for same household.

Source: ENRAP-Sarangani household surveys, 1999.

Table C.2 - Population, number of households, and toilet facilities, by municipality, Sarangani Province, 1999.

Item	Sarangani	Alabel	Glan	Kiamba	Maasim	Maitum	Malapatan	Malungon
Total Population	415,580	50,896	80,890	43,123	33,990	36,969	52,902	116,810
Total Number of Households	76,652	9,331	14,855	8,566	6,405	7,001	9,778	19,893
Average Household Size	5.4	5.5	5.4	5.0	5.3	5.3	5.4	5.9
Number of Households								
using sanitary toilets	37,689	8,259	5,650	5,216	3,304	3,693	4,217	6,522
using unsanitary toilets	20,120	285	4,923	1,115	151	1,641	2,543	9,577
without toilet facilities	18,842	787	4,282	2,235	2,951	1,668	3,018	3,793
Per cent of Households								
using sanitary toilets	49.17	88.51	38.03	60.89	51.57	52.75	43.13	32.79
using unsanitary toilets	26.25	3.05	33.14	13.01	2.35	23.43	26.00	48.14
without toilet facilities	24.58	8.44	28.82	26.10	46.07	23.82	30.87	19.07

Sources of basic data:

Population: PPDO. Based on Municipal Population Projections - 1995 Census-Based National, Regional and Provincial Population Projections, NSO

Toilet facilities: PHO. Based on annual survey.

Table C.3 - Population, number of households, and garbage disposal, by municipality, Sarangani Province, 1999.

Item	Sarangani	Alabel	Glan	Kiamba	Maasim	Maitum	Malapatan	Malungon
Total Population	415,580	50,896	80,890	43,123	33,990	36,969	52,902	116,810
Total Number of Households	76,652	9,331	14,855	8,566	6,405	7,001	9,778	19,893
Number of Households								
garbage collected by trucks	8,562	1,611	1,045	1,233	752	913	2,800	0
garbage not collected	68,090	7,720	13,810	7,333	5,654	6,088	6,978	19,893
Per cent of Households								
garbage collected by trucks	11.17	17.27	7.04	14.39	11.74	13.04	28.64	0.00
garbage not collected	88.83	82.73	92.96	85.61	88.26	86.96	71.36	100.00

Source of basic data: PHO, based on annual survey.

Table C.4 - Household pollution indicators, Sarangani Province, 1999.

Item	Sarangani
Total Population	415,580
Total Number of Households	76,652
Average Household Size	5.4
Toilet and Sanitation	
Per cent of Households	
using sanitary toilets	49.17
using unsanitary toilets	26.25
without toilet facilities	24.58
Solid Wastes Management	
Per cent of Households	
garbage are collected (by trucks)	11.17
garbage are not collected	88.83
dumped	24.71
burnt	36.65
composted	7.34
buried	17.37
fed to animals	2.76
Volume of solid waste generated	
per capita/day	0.70 kg
total for the province/year	106,332 mt
per cent non-biodegradable	14.57
Volume collected	11,877 mt
Volume not collected	94,455 mt
Fuel consumption	
Fuelwood	
per capita/day	0.53 kg
total for province/year	80,677 mt
charcoal	
per capita/day	0.04 kg
total for province/year	5,775 mt
Crop residues	
per capita/day	0.04 kg
total for province/year	5,376 mt
Kerosene	
per capita/day	0.02 li
total for province/year	3,466 ('000 li)
LPG	
per capita/day	0.01 li
total for province/year	1,787 ('000 li)

Table C.4 - continued.

Item	Sarangani
Total Population	415,580
Total Number of Households	76,652
Average Household Size	5.4
Soap/Detergent Consumption	
Bath soap	
per capita/day	3.17 g
total for province/year	480 mt
Laundry bar	
per capita/day	13.25 g
total for province/year	2,010 mt
Powder detergent	
per capita/day	2.88 g
total for province/year	436 mt
Dishwater detergent	
per capita/day	0.20 g
total for province/year	30 mt
Shampoo	
per capita/day	2.16 ml
total for province/year	328 ('000 li)
Water consumption	
Drinking/cooking	
per capita/day	6.75 li
total for province/year	1,023,766 cu m
Bathing	
per capita/day	26.80 li
total for province/year	4,065,023 cu m
Laundry	
per capita/day	17.48 li
total for province/year	2,650,728 cu m
Others	
per capita/day	8.44 li
total for province/year	1,279,796 cu m
Total annual water consumption	9,019,313 cu m

Sources of basic data: Tables B1-B3, this document.

Table C5 - Summary pollution loads from domestic effluents, Sarangani, 1999.

Type of Facility	Type of Emission				
	BOD_5	SS	N	P	Coliform
	metric tons				billion count
From Sanitary Waste	11,377	11,377	1,820	303	993,547,885
Sanitary toilet	5,481	5,481	877	146	478,562,326
Unsanitary toilet	3,105	3,105	497	83	271,186,944
No toilet facility	2,790	2,790	446	74	243,698,615
From Soap/Detergent				455	

Source: ENRAMIS module. Sarangani MIS/GIS System, 1999.

Table C5a - BOD_5 loads from domestic effluents, by municipality, Sarangani, 1999.

Type of Facility	BOD_5							
	Sarangani	Alabel	Glan	Kiamba	Maasim	Maitum	Malapatan	Malungon
	metric tons							
Sanitary Waste	11,377	1,393	2,214	1,180	930	1,012	1,448	3,198
Sanitary toilet	5,481	1,233	842	719	480	534	625	1,048
Unsanitary toilet	3,105	43	734	154	22	237	377	1,540
No toilet facility	2,790	118	638	308	429	241	447	610

Source: ENRAMIS module. Sarangani MIS/GIS System, 1999.

Table C5b - SS loads from domestic effluents, by municipality, Sarangani, 1999.

Type of Facility	SS							
	Sarangani	Alabel	Glan	Kiamba	Maasim	Maitum	Malapatan	Malungon
	metric tons							
Sanitary Waste	11,377	1,393	2,214	1,180	930	1,012	1,448	3,198
Sanitary toilet	5,481	1,233	842	719	480	534	625	1,048
Unsanitary toilet	3,105	43	734	154	22	237	377	1,540
No toilet facility	2,790	118	638	308	429	241	447	610

Source: ENRAMIS module. Sarangani MIS/GIS System, 1999.

Table C5c - N loads from domestic effluents, by municipality, Sarangani, 1999.

Type of Facility	N							
	Sarangani	Alabel	Glan	Kiamba	Maasim	Maitum	Malapatan	Malungon
	metric tons							
Sanitary Waste	1,820	223	354	189	149	162	232	512
Sanitary toilet	877	197	135	115	77	85	100	168
Unsanitary toilet	497	7	117	25	4	38	60	246
No toilet facility	446	19	102	49	69	39	72	98

Source: ENRAMIS module. Sarangani MIS/GIS System, 1999.

Table C5d - P loads from domestic effluents, by municipality, Sarangani, 1999.

Type of Facility	P							
	Sarangani	Alabel	Glan	Kiamba	Maasim	Maitum	Malapatan	Malungon
	metric tons							
From Sanitary Waste	303	37	59	31	25	27	39	85
Sanitary toilet	146	33	22	19	13	14	17	28
Unsanitary toilet	83	1	20	4	1	6	10	41
No toilet facility	74	3	17	8	11	6	12	16
From Soap/Detergent	455	56	89	47	37	40	58	128

Source: ENRAMIS module. Sarangani MIS/GIS System, 1999.

Table C5e - Coliform loads from domestic effluents, by municipality, Sarangani, 1999.

Type of Facility	Coliform							
	Sarangani	Alabel	Glan	Kiamba	Maasim	Maitum	Malapatan	Malungon
	billion count							
Sanitary Waste	993,547,885	121,879,012	193,387,768	103,096,312	81,281,593	88,383,637	126,476,457	279,263,508
Sanitary toilet	478,662,326	107,897,879	73,554,777	62,775,243	41,910,201	46,618,814	54,544,779	91,560,834
Unsanitary toilet	271,186,944	3,716,251	64,093,927	13,415,627	1,912,646	20,709,512	32,888,658	134,450,324
No toilet facility	243,698,615	10,265,682	55,739,064	26,905,442	37,438,748	21,055,311	39,042,020	53,252,350

Source: ENRAMIS module. Sarangani MIS/GIS System, 1999.

Table C6 - Summary of solid wastes generated and emissions from leachates, Sarangani, 1999.

Garbage Disposal	Volume	Type of Emission		
		BOD_5	N	P
	metric ton			
Total	**106,332**	**28,189**	**451**	**90**
Collected	11,423	5,711	91	18
Uncollected	94,909	22,478	360	72
Dumped, buried, others	44,955	22,478	360	72
Composted, fed to animals	10,793			
Burned	39,161			

Source: ENRAMIS module. Sarangani MIS/GIS System, 1999.

Table C6a - Volume of solid wastes generated from domestic sources, by municipality, Sarangani, 1999.

Garbage Disposal	Volume of Solid Wastes Generated							
	Sarangani	Alabel	Glan	Kiamba	Maasim	Maitum	Malapatan	Malungon
	metric tons							
Total	**106,332**	**13,023**	**20,697**	**11,034**	**8,697**	**9,459**	**13,536**	**29,888**
Collected	11,423	2,249	1,456	1,588	1,021	1,234	3,876	-
Uncollected	94,909	10,774	19,241	9,446	7,676	8,225	9,660	29,888
Dumped, buried, others	44,955	5,103	9,114	4,474	3,636	3,896	4,575	14,157
Composted, fed to animals	10,793	1,225	2,188	1,074	873	935	1,098	3,399
Burned	39,161	4,446	7,939	3,897	3,167	3,394	3,986	12,332

Source: ENRAMIS module. Sarangani MIS/GIS System, 1999.

Table C6b - BOD_5 loads from leachates of solid wastes generated by domestic sources, by municipality, Sarangani, 1999.

Garbage Disposal	BOD_5							
	Sarangani	Alabel	Glan	Kiamba	Maasim	Maitum	Malapatan	Malungon
	metric tons							
Total	28,189	3,676	5,285	3,031	2,328	2,565	4,226	7,078
Collected	5,711	1,124	728	794	510	617	1,938	-
Uncollected	22,478	2,552	4,557	2,237	1,818	1,948	2,288	7,078
Dumped, buried, others	22,478	2,552	4,557	2,237	1,818	1,948	2,288	7,078

Source: ENRAMIS module. Sarangani MIS/GIS System, 1999.

Table C6c - Nitrogen loads from leachates of solid wastes generated by domestic sources, by municipality, Sarangani, 1999.

Garbage Disposal	N							
	Sarangani	Alabel	Glan	Kiamba	Maasim	Maitum	Malapatan	Malungon
	metric tons							
Total	451	59	85	48	37	41	68	113
Collected	91	18	12	13	8	10	31	-
Uncollected	360	41	73	36	29	31	37	113
Dumped, buried, others	360	41	73	36	29	31	37	113

Source: ENRAMIS module. Sarangani MIS/GIS System, 1999.

Table C6d - P loads from leachates of solid wastes generated by domestic sources, by municipality, Sarangani, 1999.

Garbage Disposal	P							
	Sarangani	Alabel	Glan	Kiamba	Maasim	Maitum	Malapatan	Malungon
	metric tons							
Total	90	12	17	10	7	8	14	23
Collected	18	4	2	3	2	2	6	-
Uncollected	72	8	15	7	6	6	7	23
Dumped, buried, others	72	8	15	7	6	6	7	23

Source: ENRAMIS module. Sarangani MIS/GIS System, 1999.

Table C7 - Summary of air pollution loads from domestic sources, Sarangani, 1999.

Source	Volume	Type of Emission				
		PM	SOx	NOx	VOC	CO
	metric ton					
All sources	**136,243**	7,135	31	185	11,335	53,812
Cooking and lighting	**97,081**	**4,978**	**24**	**131**	**7,909**	**37,545**
LPG (000 li)	1,787	0.06	0.02	1.95	0.16	0.40
Fuelwood	80,677	4,444	16	113	7,059	33,513
Charcoal	5,775	239	1	8	379	1,798
Kerosene	3,466	n.a.	5	n.a.	n.a.	n.a.
Crop residues	5,376	296	1	8	470	2,233
Burning of garbage	**39,161**	**2,157**	**8**	**55**	**3,427**	**16,267**

n.a. - means estimate not available.
Note: LGP is less polluting. Based on heating value, 1 mt of LPG is equivalent to 3.784 mt of fuelwood.

Source: ENRAMIS module. Sarangani MIS/GIS System, 1999.

Table C8 - Annual costs of alternative domestic wastewater treatment methods, Sarangani, 1999.

Type of Facility	Number of Households	Desludged every 2 years			Desludged every 5 years		
		Capital Cost Annualized	Maintenance Costs	Total Annual Costs	Capital Cost Annualized	Maintenance Costs	Total Annual Costs
		million ₱			million ₱		
All Types	**76,652**	**161.0**	**93.6**	**254.6**	**161.0**	**64.6**	**225.6**
Sanitary toilet	37,689	-	46.0	46.0	-	31.8	31.8
Unsanitary toilet	20,120	83.1	24.6	107.7	83.1	17.0	100.1
No toilet facility	18,842	77.9	23.0	100.9	77.9	15.9	93.8
Cost per household	**76,652**	**2,101**	**1,221**	**3,322**	**2,101**	**843**	**2,944**
Sanitary toilet	37,689	-	1,221	1,221	-	843	843
Unsanitary toilet	20,120	4,133	1,221	5,354	4,133	843	4,976
No toilet facility	18,842	4,133	1,221	5,354	4,133	843	4,976

Notes:

- Costs are based on the cost of on-site treatment facilities, i.e., individual septic tanks. They are more suitable for non-point sources such as domestic wastes. They are also more applicable in areas where land is not a constraint such as in the rural areas or in areas where a common waste treatment plant is not feasible, or in the absence of sewer lines and municipal waste treatment facilities.
- To increase the efficiency of septic tanks, the frequency of desludging is every 2 years instead of every 5 to 10 years.
- Abatement costs consist of annualized capital and annual maintenance cost (cost of desludging, done every 2 years).
- Astimated total abatement cost consists of the cost of maintaining existing sanitary toilet facilities plus the total annualized cost (capital and maintenance cost) for the required additional facilities to be set up; the latter is equal to the number of other types (unsanitary) of toilet facilities and those with no toilet.
- Other alternative domestic wastewater treatment methods were also explored, viz: waste stabilization pond, aerated lagoon, and activated sludge (including pumping and sewerage cost). The individual septic tanks are more economical and more practicable for Sarangani.

Source: ENRAMIS module of Sarangani MIS/GIS System, 1999.

Appendix Form C.1

ENRAP-Sarangani

Barangay Survey Schedule

Municipality: _____ Date: _____

Barangay: _____ Barangay code: _____

Barangay Chairman: _____

Address: _____

Population: Total: _____ Male: _____ Female: _____

Number of Households: _____ Average Household size: _____

Toilet Facilities:

Sanitary: _____ Unsanitary: _____ No Toilet: _____

Garbage Disposal:

Collected: _____ Uncollected: _____

Land Area:

Total area: _____ Agricultural: _____ Forest: _____

Erosion class (ha.) Slight: _____ Moderate: _____ Severe: _____

Soil nutrient (kg/mt) N: _____ P: _____ K: _____

Rate of Reforestation, 1998 (ha/yr) DENR: _____

Non-Gov't.: _____

Livestock Industry:

Number of Commercial Farms: _____ By type: _____ _____

_____ _____

Estimated Production (heads): _____ _____ _____

_____ _____

Number of Backyard farms: _____ By type: _____ _____

_____ _____

Ave. number of heads: _____ By type: _____ _____

_____ _____

Sand and Gravel Quarry:

Number of Quarries: _____ Production Estimate (cu.m.): _____

Number of Gas Stations: _____ **Number of Power Plant:** _____

Number of Hotels and Lodging Places: _____ Total Capacity (heads): _____

Number of Motor Vehicles:	Gas	Diesel	By Industry
Cars: _____	_____	_____	_____
Utility: _____	_____	_____	_____
Buses: _____	_____	_____	_____
Trucks: _____	_____	_____	_____
MC/TC: _____	_____	_____	_____

Area Sources:

Kaingin

Total area burnt(ha): _____

Building construction

Total floor area (sq.m.): _____

Residential: _____

Non-Residential: _____

Surface coatings (li) glossy enamel: _____ flatwell enamel: _____

Adhesive sealant(li) _____

Road constructed Total length (km): _____ area affected: _____ ha/km

Construction period (mo.): _____

Fires Number of automobile fires: _____

Number of structural fires: _____ (houses, buildings)

Dry-cleaning Total volume (mt): _____

Charcoal Total Production(mt): _____

Appendix Form C.2
ENRAP-Sarangani
Household Survey Schedule

Municipality: _____ Date: _____

Barangay: _____ Respondent code: _____

Head of Household: _____

Barangay Address: _____

Household size:

Number of Adults (15 years old and above): _____

Number of Children (below 15 years): _____

Fuel consumption: (Final information is consumption per day. Computations can be based on daily, weekly or monthly information)

	Daily Consumption	*Computations*
Fuelwood (kg):	_____	
LPG (li):	_____	
Kerosene (li):	_____	
Charcoal (kg):	_____	
Crop residues (kg):	_____	

Garbage Disposal: (Final information is solid waste generation per day. Computations can be based on daily, weekly or monthly information. Total percentages equal 100)

Daily volume of solid waste generated (kg): _____ % plastics/non-biodeg.: _____

Per cent dumped	_____	buried	_____
burnt	_____	fed to animals	_____
composted	_____	others	_____

Soap/Detergent Consumption: (Final information is consumption per day. Computations can be based on daily, weekly or monthly information)

	Daily Consumption	*Computations*
Bath soap	_____	
Laudry bar	_____	
Laundry powder	_____	
Shampoo	_____	
Dishwashing soap	_____	

Note: Final unit is kg per day, but standard unit for each item should suffice, e.g., small, medium (3 oz), large (5 oz) for bath soap; standard bar (1 cut) for laundry bar; kg or oz for powder, shampoo, and dishwashing soap.

Water Consumption: (Final information is liter per day. Computations can be based on daily, weekly or monthly information)

	Daily Consumption	*Computations*
Drinking/Cooking	_____	
Bathing	_____	
Laundry	_____	
Others	_____	
Total	_____	

Appendix Form C.3

Industry Survey Schedule

Municipality: _____

Barangay: _____

Location: _____

Date: _____

Firm code: _____

Distance from river (km): _____

Type of Livestock Farm: _____

Name of the Firm: _____

Current Inventory (heads): _____

Production last month (heads): _____

Annual production (heads): _____

Water Consumption:

Daily consumption (cu.m.) _____

Monthly consumption (cu.m.) _____

Annual consumption (cu.m.) _____

Pollution Control Device

Type: _____

Description: _____

Cost of Operation: _____

Appendix D

Environmental Cost Assessment: Framework of Analysis for New Investment Projects in Sarangani Province

Introduction

The SOCSARGEN[81] area is one of the fastest growing economic clusters in Mindanao. In this economic cluster, growth is induced mainly by infrastructure development from the public sector and incoming private investments. While the city of General Santos has embarked into the path of industrialization, the Province of Sarangani is cautiously weighing the economic benefits and environmental costs of industrial development.

Sarangani is most concerned with the proper management of its environment, especially that of Sarangani Bay, an important resource providing livelihood, food and environmental services to its people. The assistance of ENRAP was sought to institutionalize an environmental management tool for the province. Such environmental management tool should also assist in the assessment of the environmental costs of incoming economic and development investments.

This appendix paper is part of the report on the institutionalization of an environmental management system in the province. Specifically, this paper addresses the need for a framework of analysis for evaluating the environmental costs of new investments in Sarangani Province. It outlines the process of evaluation and the use of existing development plans for the prioritization of incoming investments, presents the valuation techniques of consequent environmental effects, and the available environmental policy instruments as means of internalizing those costs.

The Provincial Development Plans

As part of development planning process, the Province of Sarangani has accumulated several documents and development plans for the province. These documents represent the development priority areas of the province in relation to the municipal, regional, and national development thrusts. The development plans include the Provincial Development Plans (physical framework plan and comprehensive development plan), Provincial and Municipal Land Use Plans, and Regional Development Plan from NEDA.

The drafting of Provincial Environmental and Investment Codes are planned for 2000 and may specify site-specific regulations and incentives in addition to national environmental laws and policies already included in the Clean Air Act and Clean Water Act (still in progress).

In relation to private investments and development activities, the Provincial Physical Framework Plan (PPFP) serves as the general implementing guidebook for the province. At present, this document serves as the provincial development plan that translates the provincial policies and development goals and objectives into a general *land use plan* indicating the manner in which land shall be put to use in the next ten years.

The PPFP delineates the direction and extent of expansion of urban and other built-up areas of the municipalities of the province, the alignment of transportation networks, the location of major infrastructure projects and facilities and all major land development proposals that have provincial, regional, or national significance.

The PPFP establishes the general land use zones in the entire province, and in conjunction with the Municipal Land Use Plans, identifies among others, the areas for industrial and commercial development.

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[81] SOCSARGEN is a term coined from the provinces of South Cotabato and Sarangani, and the city of General Santos.

Incentives for Priority Industries

The Province of Sarangani, as indicated in its development plans, has come up with a preferred spatial development strategy known as Agro-Eco-Tourism Strategy. This strategy is a combination of eco-cultural tourism and agro-industrialization. These are the priority investment types and development projects being encouraged in the province, with larger areas allocated for them. Industrial estates, on the other hand, can also be accommodated in the municipalities of Maasim, Alabel, and Glan.

However, the policy documents that would identify priority industries and specify investment incentives are the provincial investment and environmental codes. The Provincial Investment Code spells out the specific incentives to be granted to priority industries, while the Provincial Environmental Code regulates the type and level of pollutants from these investments.

Although these codes are still in the planning stage, the drafting is expected to commence within the year.

Environmental Costs

The guiding principles in the implementation of environmental policies in the province are minimizing emissions and internalizing the environmental costs of economic activities.[82] This means that the government should be able to ascertain the value of emissions (pollution) and the corresponding pollution abatement accompanying any economic activity. The policymakers should also be cognizant of the different instruments they can use for minimizing and internalizing these costs.

VALUATION OF ENVIRONMENTAL COSTS

Due to imperfect conversion process (of inputs to outputs), any production and development activity results to residues and emissions that can affect the environment. These environmental effects are costs not usually reflected on the prices of goods and services. These costs are called *externalities*. These are costs external to the producers, but costs imposed on society. So that the true (or social) cost of a good or service is the sum of the externalities and the market price of the good or service.

Although it may require some level of expertise for proper application, economists have developed several valuation techniques that can be used in assigning monetary values to environmental effects of economic investments and development activities.

Use and Non-use Values

Before any discussion on the valuation techniques, it is worthwhile to note that an environmental resource may have two kinds of values, *use* and *non-use values*. Wilderness areas, like Mt. Makiling and Mt. Matutum, provide recreation for hikers and mountain climbers – recreation that may be curtailed if the areas are harmed. The worth of this recreation is referred to as a *use value*, because the benefits are derived from actually using the wilderness area.

In addition to use values, a person may value something, even if he does not use it. This *non-use* value, also known as *passive-use* value, measures the worth ascribed to something that is not used.

Attaching monetary figures to use values can be challenging, but involves well-defined principles in economics. On the other hand, non-use values by definition involve few outward signs making more difficult to estimate their monetary values.

(Additional materials on *use* and *non-use values* are presented in Box 1).

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[82] Although not yet formalized into a Provincial Environmental Code, pronouncements from the provincial leadership (e.g., the Governor, Vice-Governor, SP members, and PPDO) are pointing to this direction.

Valuation Methods

Valuation is a method, used in environmental cost studies, of assigning monetary values to the environmental effects of production. Examples include finding the value individuals attach to improving urban air quality, or assuring clear visibility.

There are several valuation techniques used in environmental cost assessments. They include market and non-market valuation techniques - since the values of most environmental effects are not observed in the market. The different valuation techniques can be categorized into five general valuation methods: (1) market valuation, (2) contingent valuation, (3) hedonic valuation, (4) control cost valuation, and (5) mitigation cost valuation.

Market valuation uses existing market prices to estimate environmental damages. *Hedonic valuation examines* existing market prices for evidence of implicit values assigned by consumers to environmental factors. *Contingent valuation (CV)* elicits estimates from consumers by the use of survey techniques. *Control cost valuation* examines existing regulations and policies to detect implicit valuation of environmental factors by government regulators. *Mitigation cost* valuation examines the cost of *repairing* environmental damages in order to estimate the value of preventing such damages from occurring.[83]

Choice of Techniques

The application of valuation methods for estimating environmental costs is relatively new to policy makers. However, even economists debate on which valuation technique is the more applicable for environmental analysis.

The differences among valuation techniques involve the types of evidence considered. Market and hedonic methods look at the purchasing decisions of individual consumers in actual markets, control cost valuation examines the decisions of government regulators, and contingent valuation examines the answers of survey respondents.

A longstanding debate over valuation methodology has been between the use of *damage costing* (*i.e.*, market, hedonic, and contingent valuation) or *control costing* (i.e., control cost and mitigation cost valuation) in environmental cost studies. *Damage costing* estimates the costs of environmental effects by the value of all the environmental damage they incurred. *Control costing*, on the other hand, estimates the costs of environmental effects by the costs of control or abatement.

This distinction is of particular importance for Sarangani, since the choice of technique is also used as a policy instrument – as an incentive or a disincentive.

Instruments for internalizing environmental costs

There are several instruments available to policymakers to achieve environmental goals. The environmental effects of economic and development activities can be minimized and internalized by using these environmental policy instruments. Pollution charges is just one of them.

Environmental goals can be reached in many ways. To lower the pollution from a source, the government can do any of the following:

- Charge a fee (pollution charge) on emissions to discourage releases to the environment.
- Hold pollution sources liable for any resulting damages.

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[83] Box 2 offers more detailed discussions on the different valuation techniques.

- Specify the end result – by the amount of pollution from the source or by the type of pollution control technology the source should install. If there are multiple sources, trade of these requirements within or among facilities could also be allowed.
- Require the source to publicly report the type and level of emissions and the risk to human health and the environment.
- Help the source through technical assistance program or a subsidy for cleaning up.

Alternatively, the government can do any combination of the above.

These approaches are the environmental policy instruments through which the government encourages or forces to achieve society's environmental goals.

Box 3 presents the technical terms used for these environmental policy instruments and discusses them in detail (Box 4 briefly defines them).

Process of Evaluating New Project – Framework of Analysis

The framework presented here is limited only to the evaluation of environmental effects of a new project proposal. Any other criteria or requirements the province may impose that can affect the approval or disapproval of such project are not considered in this framework.

The proposed framework for evaluating the environmental costs of new investment or project proposal starts with the matching of the proposed project location and the provincial/municipal land-use plans. It is followed by examining the emissions from the specific project and measuring the consequent environmental costs. The process ends with the application of environmental policy instruments for minimizing and internalizing the environmental costs by the project.

Step 1. Project location against the Provincial/Municipal Land-use Plans

The Provincial/Municipal land-use plan organizes the zoning and location of all economic and development activities in the province. Industrial projects (*e.g.*, manufacturing and processing) must be located in industrial zones, commercial projects (*e.g.*, trading, services) should be located in commercial areas and residential houses at residential areas.

In time, the land-use plans and zoning ordinances may change, but existing land-use plan and the zoning ordinance currently in effect must be used in evaluating any project proposal.

There may be cases that projects are allowed to be located in a different zone, (*e.g.*, commercial project in a residential areas, industrial project in an eco-tourism zone) with payment of some fees or zoning fines. For environmental costs assessment, however, an additional charge may also be imposed with the use of *damage cost* assessment instead of *control cost* (see below).

Step 2. The Project and Environmental Changes

Once the proposed project is properly located (in the right land-use zone), the next step is to ascertain the environmental effects of the activity.

The questions to ask next are: What are the environmental changes that the project would introduce? Are these changes damaging to the environment? What are the type and level of pollutants the project would emit? Are these emissions regulated? What abatement measures the project is going to apply?

(The question of whether the proposed project is a priority industry or not need not be asked here. The assumption is that the project proponent has already weighed the relevant incentives (or disincentives) accorded to his project – and decided to proceed with it).

Step 3. Measuring Environmental costs

There are two general methodologies of assigning monetary values to environmental effects. The first is *damage costing*. *Damage costing* estimates the costs of environmental effects by the value of all the environmental damage they incurred. The valuation methods used are *market*, *hedonic* and *contingent* valuation techniques.

For damage costing, the province should conduct (or commission) environmental costs studies on its major resources (*e.g.*, Sarangani Bay, major watersheds, agricultural areas, forest resources). These environmental cost studies would estimate the value of damages to these major resources. These estimates become the bases of environmental cost valuation of new projects affecting these resources.

The second is *control costing*, which estimates the costs of environmental effects by the costs of control or abatement. The valuation methods usually used are *control cost* and *mitigation cost* valuation methods.

Control costs are easier to estimate. The environmental costs of a new project are estimated from the costs of control. Control costs are estimated with the use of *state-of-the-art technology*, or *reasonable and available technology*. After the application of such pollution control technology, the unit cost of remaining emissions are estimated by the ratio of the costs of the pollution control technology over the reduction in emissions.

When to apply control costing. Control costing would be applied to regulated emissions from projects located at the right land-use zones (*i.e.*, use of state-of-the-art pollution control technology then pro-rated costing for remaining uncontrolled emissions).

When to apply damage costing. Damage costing would be applied to regulated emissions from projects not located at the right land-use zones.

The justification for this rule is that in the land-use planning and zoning ordinances, damage costs by prospective projects were already considered (and regarded as acceptable costs borne by society) and most often minimized (*e.g.*, by locating industrial zones in less critical/fragile environment). This is not case when projects are not properly located to the right zones. When this is the case – damage costing is the more applicable method of valuing environmental costs.

Step 4. Minimizing and Internalizing Costs

The final step is the application of environmental policy instrument to minimize environmental costs.

Although there are several environmental policy instruments at the disposal of the policymakers, the suggested instruments here are those so-called incentive- or market-based instrument (as opposed to *command-and-control* instruments).

The specific policy instrument, however, to use would depend on the type of the project, the existing regulation (based on national laws like the Clean Air Act, Clean Water Act, etc. and the Provincial Environmental Code), the type of emissions, the location, and affected environment and population.

(The environmental policy instrument that is getting wide support in the Philippines is *pollution charges*. It is used in Laguna Lake, and advocated by DENR as charging mechanism for BOD loads from the industry, and solid wastes from household and commercial sectors. Pollution charge is a market-based type of instrument and may be used in Sarangani – if applicable to the type of industry in consideration).

Shipyard and dry-docking facilities: Case Analyses

There are currently two project proposals for the construction of shipyard and dry-docking facilities in the province, one in Bgy. Tinoto at Municipality of Maasim (Case A), the other at Bgy. Kawas at the Municipality of Alabel (Case B).

Case A. There is a current project proposal to establish a floating-type shipyard and dry-docking facilities at Bgy. Tinoto at the Municipality of Maasim, adjacent to Siguel river. Although a floating facility, a permanent structure (a wharf) is needed to secure and serve the facility.

Analysis. *Step 1.* Comparing and checking the proposed site against the land-use plan (and municipal zoning ordinance) of the said location. The proposed location is zoned or classified into eco-tourism and recreation site, contrary to an industrial type of proposed usage. The proposal failed in the first step.

The initial recommendation by the provincial land-use committee is for the proponent to reconsider and relocate his project at the industrial site of Maasim – at Bgy. Kamanga next to Bgy. Tinoto.

The proponent insisted on its proposed location at Bgy. Tinoto.

Alternative courses of action. The Provincial and Municipal governments can reject the proposal outright, or the proponent can propose a change in the zoning classification of the area from eco-tourism/recreation to industrial. The latter is a lengthy and tedious process and does not guarantee successful change at the end (since this requires votes from Sangguniang Bayan and Sanggunian Panlalawigan, and other land-use/zoning committees).

Another alternative is to approve the project location despite conflict with zoning classification but require the proponent some payment or fees (if the law allows). If this is the case, the analysis proceeds to *Step 2*. (Note that damage costing in *Step 3* also applies).

In *Step 2*, the change in the environment and the type of pollutants are identified and measured (based on the proposal and knowledge of the industry). Ascertaining whether these changes are damaging to the environment, and whether the emissions are regulated or not.

Construction of a permanent structure (in this case, a wharf) may entail some environmental damage. Emissions from the project may also have damaging effect to the environment.

What do regulations (*e.g.* Clean Air Act, Clean Water Act, and Provincial Environmental Code) say about the emissions (emissions are in the form of oil spill, paint dust and solvents, anti-rust and anti-barnacle chemicals, etc.) from this industry? Pertinent regulations should then be applied.

Step 3 applies damage costing to this case. (An environmental cost study of Sarangani Bay from different pollutants should have been conducted earlier, which should become the basis of damage costing). An environmental cost study of Sarangani Bay from pollutants of this industry should be conducted and becomes the basis of damage cost estimates.

Step 4 calls for specific policy instruments to minimize environmental damage. A combination of instruments can be used. Since emissions from this industry are highly toxic, technology specification may be used (a *command-and-control* type). Any remaining emissions should be assessed with a pollution charge – based on damage costing.

Case B. A current project proposal to establish a land-based shipyard and dry-docking facilities at Bgy. Kawas in Municipality of Alabel.

Analysis. Upon inspection, the proposed site is not zoned for industrial development. The recommendation of the provincial and municipal land-use committees is similar as in Case A - to reconsider and relocate to the nearby industrial zone. But unlike in Case A, the proponent in Case B agreed to relocate to the industrial zone of Alabel.

The proceeding analysis should be similar to Case A, except that for Case B control costing applies – rather than damage costing.

Recommendations

The framework presented in this paper is based on the principle of minimizing and internalizing the environmental costs of any economic project and development activity. But it also applies the valuation and costing methods acceptable in resource and environmental economics circles as a means for sustainable growth and development.

To fully implement the framework, however, the following recommendations need to be undertaken.

a. The Provincial Investment and Environmental Codes should be passed.

The Provincial Investment Code would identify the priority industries of the province and grant incentives to encourage them. Priority industries could be the agro-industries and eco-cultural tourism as specified in the Provincial Physical Framework Plan, or the less polluting industries.

The Provincial Environmental Code should regulate highly toxic and harmful pollutants. It should also legitimize the framework presented here.

b. Environmental costs studies should be undertaken in the major resource of the Province.

Selected resources where environmental cost studies from varying pollutants should be undertaken for Sarangani Bay, the major watersheds, agricultural lands, and major forestlands.

These studies become the bases of damage costing analysis of new investment projects in the province.

These studies would also augment and update the current ENRAMIS module of the Sarangani Environmental MIS/GIS System, which is a very important environmental management tool.

c. In addition to environmental costs study of Sarangani Bay, an integrated management and development plan for the entire bay should be drafted

Sarangani Bay is one of the major natural resources of the province and the region. New investments in the province (and SOCSARGEN) are more likely to affect the Bay. An integrated management plan (using watershed approach) would definitely facilitate the proper management of the bay including the environmental effects of investment activities in the area.

Box 1 – Non-use Values

In addition to *use values*, derived out of using something, a person may still value something, even if he does not use it at all. This is called *non-use* value, also known as *passive-use* value, which measures the worth ascribed to something that is not used.

Non-use values are divided into three general categories:

- *Option value* - the value of preserving a resource for potential future use. For example, even though someone may not be considering an immediate visit to Mt. Matutum national park, he may wish to preserve the option for a future visit.
- *Bequest value* - the value of preserving a resource for future generations. Even though an individual may never expect to visit Mt. Matutum national park, he may wish to preserve that option for future generations.
- *Existence value* - the value of *knowing the resource exists*. Some individuals attach value to the existence and protection of a resource, even if they never expect anyone to use it. Others assign value to the knowledge that an endangered species continues to exist.

Assigning monetary figures to *use values* can be challenging, but oftentimes involves well-defined principles in economics – *e.g.*, they can be measured by individual's behavior, for example, by how far a person travels to use a recreation area.

In contrast, *non-use values* by definition involve less outward signs, making more difficult to estimate their monetary values. So that there remains substantial disagreement on how to measure them more reliably and more accurately.

Box 2 – Environmental Valuation Techniques

There are five general categories of environmental valuation methods: market valuation, contingent valuation, hedonic valuation, control cost valuation, and mitigation cost valuation.

Market valuation uses existing market prices to estimate environmental damages.

Environmental impacts of production may affect things with existing markets and therefore have market prices. For example, hydropower facilities of the National Power Corporation along the Lanao Lake effluent (Agus River) can reduce goby[84] population by hindering the downstream migration of adult gobies to spawn and the upstream migration of juvenile gobies toward the lake. One method of estimating the cost of a reduced goby population is to multiply the reduction by the market price of gobies.

Although market valuation has the definite advantage of relying on readily available market data, it also has some subtle pitfalls. Market prices may be distorted, since they may not include all relevant costs (including some externalities!). Market prices may not completely reflect true values, *e.g.*, others argue that forests have higher value than the commercial value of the timber or that the value of animal life is higher than the market price of the hide or meat.

The major limitation of market valuation, however, is that most environmental impacts affect things with no defined markets. Market valuation techniques cannot estimate the value of such things as visibility, the preservation of endangered species, and health impacts.

Hedonic valuation examines existing market prices for evidence of implicit values assigned by consumers to environmental factors.

One way to estimate the value of a recreational area is to examine the travel costs borne by people visiting the area. And a way to estimate the value associated with personal safety is by comparing the wages of workers in dangerous jobs with those in safer (but otherwise similar) occupations.

Like market valuation, *hedonic methods* have the advantage of estimating values from choices made by consumers in active markets. Unlike market valuation, however, hedonic methods must adjust for all the other factors that influence price - other than the object of valuation. For example, to determine the value of clean air by using property values, analysts must also account for all the other reasons property values may vary (*e.g.*, quality of home, access to services, proximity to workplaces).

In addition, prices may not accurately reflect how people value environmental effects. For example, wage differentials may not accurately reflect risks to workers. Workers may not be aware of the risks they face or they did not bargain effectively for their wages to adequately compensate them for their risks.

Contingent valuation (CV) elicits estimates from consumers by the use of survey techniques.

Contingent valuation (CV) consists of direct surveys of individuals about the value they attach to environmental damages. A typical survey provides information about a hypothetical program or project that prevents future damage to the environment. The respondent is asked how much he is willing to pay, individually, to implement the program. The goal is to elicit an economic value that the individual attaches to the program, as realistically as possible

[84] An endemic fish species of Lanao Lake that breeds downstream and in estuaries.

The technique's greatest application is for estimating the value of goods and services that do not have existing markets. CV is the only method that can evaluate *non-use values* - a potentially important component of environmental costs.

However, CV is far from being universally accepted. There are several criticisms made on CV, among them are:

Results are very sensitive to the way the questions were asked. Subtle differences in the wording, in the order of questions, or in the supporting evidence given, can substantially affect the answers of respondents.

Some results are not consistent with basic tenets of economic theory. Economists expect that the total value of goods increases as quantity increases. For example, if someone is willing to pay ₱30 for a kilo of mangoes, he should be willing to pay substantially more than ₱30 for two kilos of mangoes. Respondents in CV studies have not always behaved as economists expect. In one study, the average willingness to pay to prevent 2,000 migratory birds from dying was as great as that for preventing 20,000 or 200,000 birds from dying.[85]

CV studies sometimes appear to produce unreasonable answers. Some argued that CV studies on the value of environmental damages produced estimates that are unreasonably high when aggregated on a national level. One reason for these large values is that respondents do not have a realistic budget constraint. And since responses to a CV are hypothetical, respondents may not meaningfully consider the tradeoffs involved in their responses – that is, hypothetical answers to hypothetical questions!

Respondents may give 'strategic' answers to survey questions intended to influence public agencies. A respondent might believe that, by stating a high value, he encourages the government to undertake the programs described in the survey. Alternatively, respondents may believe that, by stating a low value, they will reduce or avoid a future tax increase to pay for such programs.

Respondents may not fully understand the questions or the information provided by the survey. The CV survey questions on environmental impacts are not similar to choices made by consumers. Evaluating environmental effects deals with topics (*e.g.*, ecology, biology, and atmospheric science) unfamiliar to most respondents. Respondents may not understand the questions correctly, so that they may not produce an accurate assessment of their willingness to pay.

CV studies are subject to a variety of biases. Extra care is needed in the design, conduct, and reporting of CV studies.

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[85] Kenneth Arrow, et al., "Report of the NOAA Panel on Contingent Valuation," January. 11, 1993.

Control cost valuation examines existing regulations and policies to detect implicit valuation of environmental factors by government regulators.

Control cost[86] valuation infers the value of environmental impacts by examining the pattern of public decisions embodied in regulations, laws, and court rulings. The monetary value of environmental effects are estimated by determining the cost of the controls mandated by these laws and decisions.

For example, to estimate the environmental cost associated with various air emissions, including NO_X, SO_X, and CO_2, an analyst can estimate the costs for various pollution control devices mandated by government regulations. He then divides these costs by the emission reductions (in kilograms) the technologies or devices achieved. This calculation produces a cost per kilogram value, which is an estimate of the environmental cost of a kilogram of emissions.

The major advantage of control cost valuation is its simplicity. Control costs are calculated by dividing the cost of mandated controls by the emissions reduction achieved by such controls. The data for these two numbers are relatively easy to obtain than the alternative methods of tracing the emissions from production (e.g., SO_2 from a plant), through intermediate pathways (acid rain), to eventual environmental impacts (forest damage) – before the value of the impact could be estimated.

However, several criticisms are associated with control cost valuation.

Control cost valuation represents circular reasoning.

One important goal of environmental cost analysis is to compare the costs and benefits of environmental regulations. If the cost of regulations (*i.e.*, cost of environmental control technologies) is used to estimate the benefits (*i.e.*, environmental costs avoided), then there is no meaningful comparison of costs and benefits. Control costs can vary widely.

Studies in the US showed large variations in the values implied by the costs and benefits of different regulations. This variation can mean problems with the method. If the values vary so widely, then regulations do not represent a rigorous weighing of costs and benefits. However, analysts using the control cost method argue that control costs indicate the minimum cost regulators are willing to impose – analysts, most often, use the highest cost of control. Mitigation cost valuation examines the cost of repairing environmental damages in order to estimate the value of preventing such damages from occurring.

Like control cost valuation, mitigation cost valuation infers environmental costs from the costs of responses to environmental damage. In contrast to control cost valuation that examines costs imposed by current regulations, mitigation cost valuation examines the *prospective* mitigation costs - under the presumption that additional environmental impacts are to be avoided. Mitigation can involve reversing damages (*e.g.*, treating diseases or replacing damaged goods) or intervening between intermediate and final environmental effects (*e.g.*, 'liming' lakes to reverse the effects of acid rain).

Mitigation cost and control cost valuation both have the advantage of simplicity and the disadvantage of being viewed as involving circular reasoning.

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[86] Control cost valuation is also termed *shadow pricing* or *revealed preference* valuation.

Box 3 – Environmental Policy Instruments

Environmental policy instruments are grouped into: (a) instruments with fixed pollution reduction targets, and (b) instruments without fixed pollution reduction targets.

Product bans and limitations restrict the manufacture, distribution, use, or disposal of substances that present unreasonable risks to health or the environment. Product bans and limitations focus on the commodity itself rather than the emissions. This instrument is used to ban hazardous products like pesticides or herbicides (e.g. DDT and products with DDT).

Multiple-source Instruments

In a single-source instrument, explicit emission targets for each source are established and therefore, the basis for verifying compliance is straightforward. They, however, do not address concerns about compliance costs because they do not offer the flexibility of achieving same environmental goals in a more cost-effective manner.

Some policy instruments impose regulatory limits on pollution from multiple sources rather than from single sources. Multi-source instruments allow a regulated firm additional flexibility on how it complies with emission limitations. A source can either comply with the limitation, or it can arrange for another firm to comply with the limitation on the source's behalf.

The ability to transfer or negotiate responsibility of compliance among firms distinguishes multi-source from single-source instruments. Multi-source instruments include; *tradable emissions, challenge regulation*, and *integrated permitting*.

A *tradable emissions* program often consists of transferable government-issued permits that allow the owner to emit a specific quantity of pollutants over a specified period, and which can be bought from and sold to others. The government agency typically caps aggregate emissions from sources within a geographic region consistent with environmental goals. Firms are then allowed to trade or transfer their permits.

A relatively new approach to tradable emissions is an 'open market', in which unregulated sources may opt into the program voluntarily.

With *challenge regulation*, the government establishes a clear, measurable environmental target with a timetable for implementation. The multiple sources are given the responsibility of designing and implementing a program to achieve that target. Challenge regulation differs from purely voluntary programs in that the government imposes mandatory requirements or sanction should progress toward achieving the targets be unsatisfactory.

Integrated permitting incorporates multiple requirements into a single permit, rather than having separate permits for each emissions source at a facility. A facility-wide integrated permit might list emission limits for each source within the facility, or the permit might list a single limit per pollutant for the entire facility, allowing the facility to meet an overall emissions cap using any combination of controls. A *multimedia integrated permit* may combine limitations on emissions to air, water, and land in a single permit, taking into account the potential for pollution to move between media.

Multi-source instruments are an effective choice when resource demands are of particular concern. These instruments allow facilities to seek out the most cost-effective approach to achieving a particular level of aggregate emissions, whether through negotiating emissions control responsibilities with other facilities or through the use of an integrated permit with flexible source emission limits at a particular facility. Multi- source instruments still require a particular level of pollution abatement, so that they too provide a significant degree of assurance that environmental goals will be met.

Instruments without Fixed Pollution Reduction Targets

Instruments without fixed pollution reduction targets are instruments that encourage pollution prevention and control without setting specific emission targets. Some of these instruments are *nonregulatory* in nature, while others require a particular action, such as payment per unit of emissions or an emissions report.

Instruments that move behavior in the right direction, without setting fixed pollution control targets, are particularly appropriate if the policymaker desires an environmental program that can readily adapt to changing science and control capabilities.

Instruments that move behavior in the right direction fall into two subgroups:

- Instruments that make it easier or less expensive to lower pollution by providing knowledge or financial assistance; and
- Instruments that raise the financial stakes of continuing to behave in environmentally harmful ways.

Instruments that encourage facilities to prevent or control pollution include *technical assistance* and *subsidies*. Both approaches assume that sources will be willing to change once they know of the benefits of alternative types of behavior and are more likely to change if the expense is at least partially offset by others.

Technical assistance helps firms make better environmental choices by clarifying the consequences of their actions and what techniques or equipment reduce those consequences. Technical assistance may also focus on educating the general public about the environmental implications of existing and proposed programs and policies. Technical assistance may take many forms, including manuals and guidance, training programs, and information clearinghouses.

Subsidies provide various forms of financial assistance, which can act as an incentive for firms to change their behavior or to help defray the costs of mandatory standards. Subsidies might be provided by the government, NGOs, or by other parties. Subsidies can come in many forms: grants, low or no-interest loans, preferential tax treatment, and deposit-refund systems.

Instruments that increase the cost to sources of environmentally harmful emissions include; *pollution charges*, *information reporting*, and *liability*. These instruments are based on the assumption that sources will emit less pollutants if they cost them something, either as direct payments to an agency or harmed parties or indirectly in terms of reputation.

Pollution charges require a regulated firm to pay a fixed amount for each unit of emission. Pollution charges do not set a limit on emissions or production; instead, the government must calculate what level of charge will change the behavior of regulated firms enough to achieve environmental objectives. Sources are free to choose whether to emit pollution and pay the charge or to pay for the installation of controls to reduce emissions subject to the charge.

Information reporting affects firms' behavior by increasing public awareness of the firms' pollution. It requires targeted firms to provide specified types of information to a government agency or to the public directly. Required information typically involves activities affecting environmental quality, such as emissions, product characteristics, or whether risk to the public exceeds a threshold. The hope is that the public's heightened awareness will encourage firms to be good neighbors and reduce their pollution, and that public support for pollution control programs will increase.

Liability provisions require those firms undertaking activities causing pollution or other environmental harms on others to pay those who are harmed to the extent of the damage. Liability can provide firms with a significant motivation for environmentally sound behavior because the monetary amounts involved can be very large.

Box 4 – Environmental policy instruments- brief definitions.

Instruments that Directly Limit Pollution	
Single-Source Instruments or 'command and control'	
Harm-Based Standards	Describe required results, leaving regulated entities free to choose compliance methods.
Design Standards	Describe required emissions limits based on what a model technology might achieve; sources use the model technology or demonstrate that another approach achieves equivalent results.
Technology Specifications	Specify the technology or technique a source must use to control its pollution.
Product Bans and Limitations	Ban or restrict manufacture, distribution, use or disposal of products that present unreasonable risks.
Multi-Source Instruments	
Integrated Permitting	Incorporates multiple requirements into a single permit, rather than having a permit for each individual emissions source at a facility.
Tradable Emissions	Allow regulated entities to trade emission control responsibilities among themselves, provided the aggregate regulatory cap on emission is met.
Challenge Regulations	Give target group of sources responsibility for designing and implementing a program to achieve a target goal, with a government-imposed program or sanction if goal is unmet by the deadline.
Instruments That Do Not Directly Limit Pollution	
Pollution Charges	Require regulated entity to pay fixed amount of fee for each unit of pollution emitted or disposed; no ceiling on emissions.
Liability	Requires entities causing pollution that adversely affects others to compensate those harmed to the extent of the damage.
Information Reporting	Requires entities to report publicly emissions or product information.
Subsidies	Provide financial assistance to entities, either from government or private organizations.
Technical Assistance	Provides additional knowledge to entities regarding consequences of their actions, and what techniques or tools reduce those consequences.

Source: Office of Technology Assessment. *Environmental Policy Tools: A User's Guide.* OTA-ENV-634 (Washington, D.C.; U.S. Government Printing Office, September 1995).

Appendix E

Counterparts' Perspective: ENRAP-Sarangani and the Development Planning Process[87]

Laying the Foundations

Sarangani Province was carved out from the Province of South Cotabato by virtue of RA 7228 in 1992. It was formally operated as Fifth Class Province after the first elected officials were sworn into office on January 10, 1993.

For the past six years, Sarangani has been advocating a development paradigm anchored in the synergy of community interactions. The foundations of development were painstakingly laid down by the communities and leaders, and spelled out in the *Planning Principles, Philosophies and Values* presented in Table E1.

The development strategy started by looking into Sarangani's strategic advantage and by looking up to all development assistance (local and foreign) as *community enabler* rather than resource provider. It also institutionalized a *policy generator system* (the Kasfala) to ensure teamwork and shared responsibility with the community and stakeholders.

These led to an integration system that revolutionizes the localization of all development endeavors as part and parcel of the community way of life. Thus, from this concept, the integrated governance and development system for Sarangani was conceptualized (Figure E1).

Through this system, development gaps and strategies were identified as the missing working link to internalize the implementation of Sarangani's development efforts down to the community level.

Although it has been long recognized that responsive and creative development initiatives must be founded upon concrete and reliable data and information, the efforts exerted to establish a database information system were dissipated by the limited absorptive capacity and fiscal capability of the province.

Over the years, development efforts have been restraint by the tedious data gathering, storage and retrieval for the system, yet the institutional network to establish a functional environmental management system and databank system were not effectively installed.

Putting Substance to the Ideas

Fortunately, the timely interfacing of ENRAP when it presented its Pollution Load Assessment Study of Sarangani Province, posed an opportunity to localize the program and technology. It was perceived as a necessary tool that would augment and complete the planning initiatives for the province.

Originally, ENRAP was viewed as a technology that could deeply enhance environmental awareness and management through the capability of environmental and natural resources valuation. The training program in the Garden City of Samal further opened and deepened the understanding about the inter-connectedness and interdependence of environment, natural resources and life itself in the sphere of Bio-Cycle (Figure E2). Furthermore, the training program

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[87] This Appendix E was written by Rene Paraba, Project Evaluation Officer at the PPDO of Sarangani Province. He is a local project counterpart and member of the project's core group.

led to greater appreciation of the concepts of allowable sustainable utilization, and economy-environment trade-offs, as well as in the use of market-based instruments (MBI), and other economics principles as a means to ensure sustainable development.

Today, ENRAP-Sarangani has undergone an evolution from the original intention of building local capabilities in the valuation of resources. It now evolved into a system that institutionalizes local environmental databanking and resources accounting, biodiversity, development initiatives, etc., down to the barangay level. It also adds substance to the Strategic Environmental Management Framework the Province of Sarangani would strive to pursue (Figure E3).

Presently, ENRAP's capacitation training inspired municipal officials to institutionalize ENRAP database program. In fact, their eagerness to understand sustainable resource utilization, the extremes of pollution load, and the value of their resources and biodiversity prompted them to allocate funds and mobilize task force to establish their respective MIS/GIS.

Role in the Planning Process

At present, the project has several tangible outputs already, in addition to the technical knowledge acquired by the key staff from PPDO, MPDOs, provincial offices and line agencies. The Provincial Environmental MIS/GIS System added structure and flesh to the Sarangani Development Plans and Programs that is comprehensive even at the community level.

Among the different plans and programs in the Province, ENRAP-Sarangani evolved to become the integrating mechanism (Table E2 and Figure E4). ENRAP-Sarangani, therefore, will lay an essential foundation for effective and responsive development planning, service delivery system and decision making for Sarangani Province.

Figure E1. PLANS AND PROGRAMS INTEGRATION SYSTEM

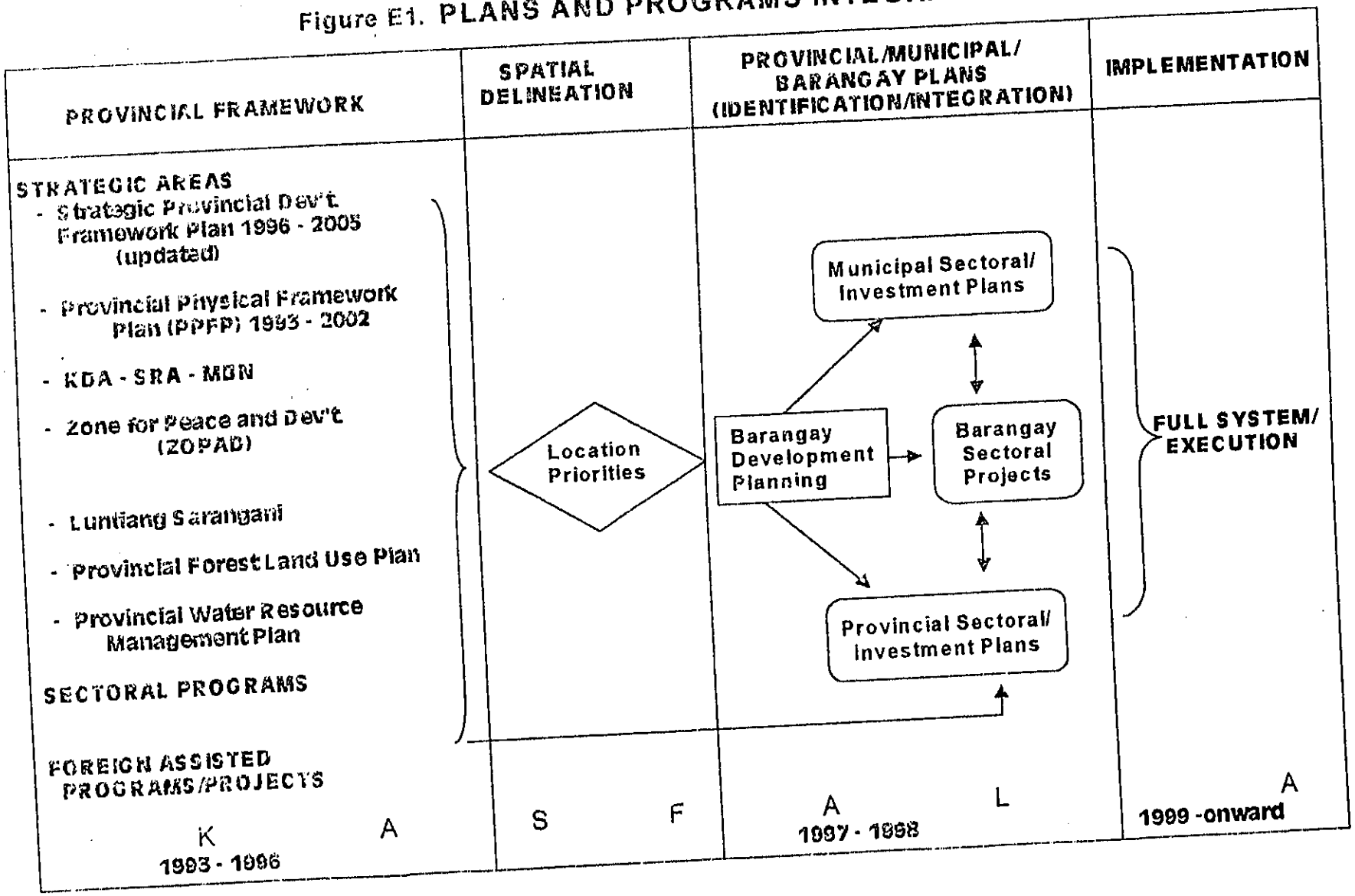

Fig. E2. SYSTEM VIEW OF SUSTAINABLE DEVELOPMENT

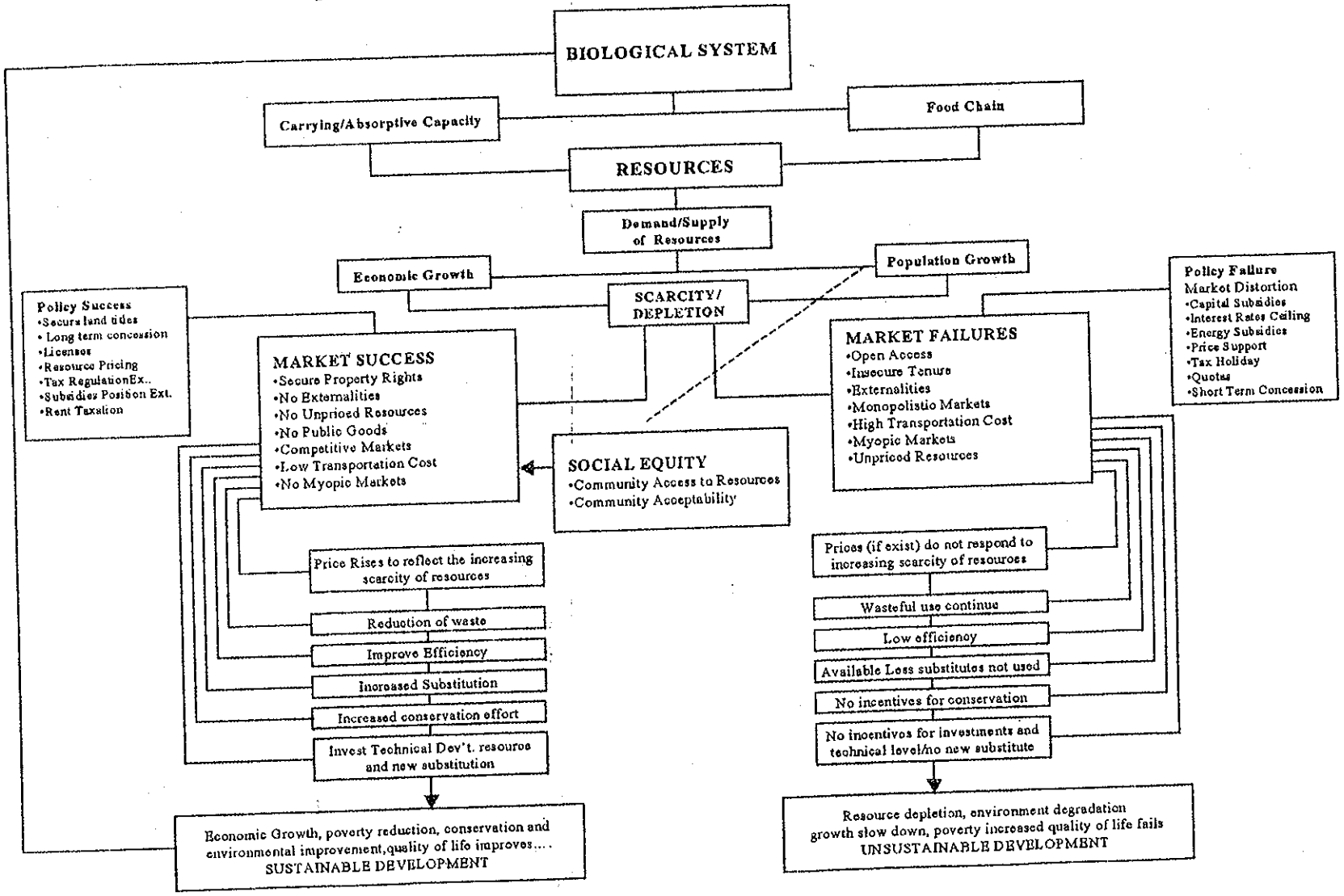

Fig. E3. STRATEGIC ENVIRONMENTAL MANAGEMENT FRAMEWORK PLAN FOR SARANGANI PROVINCE

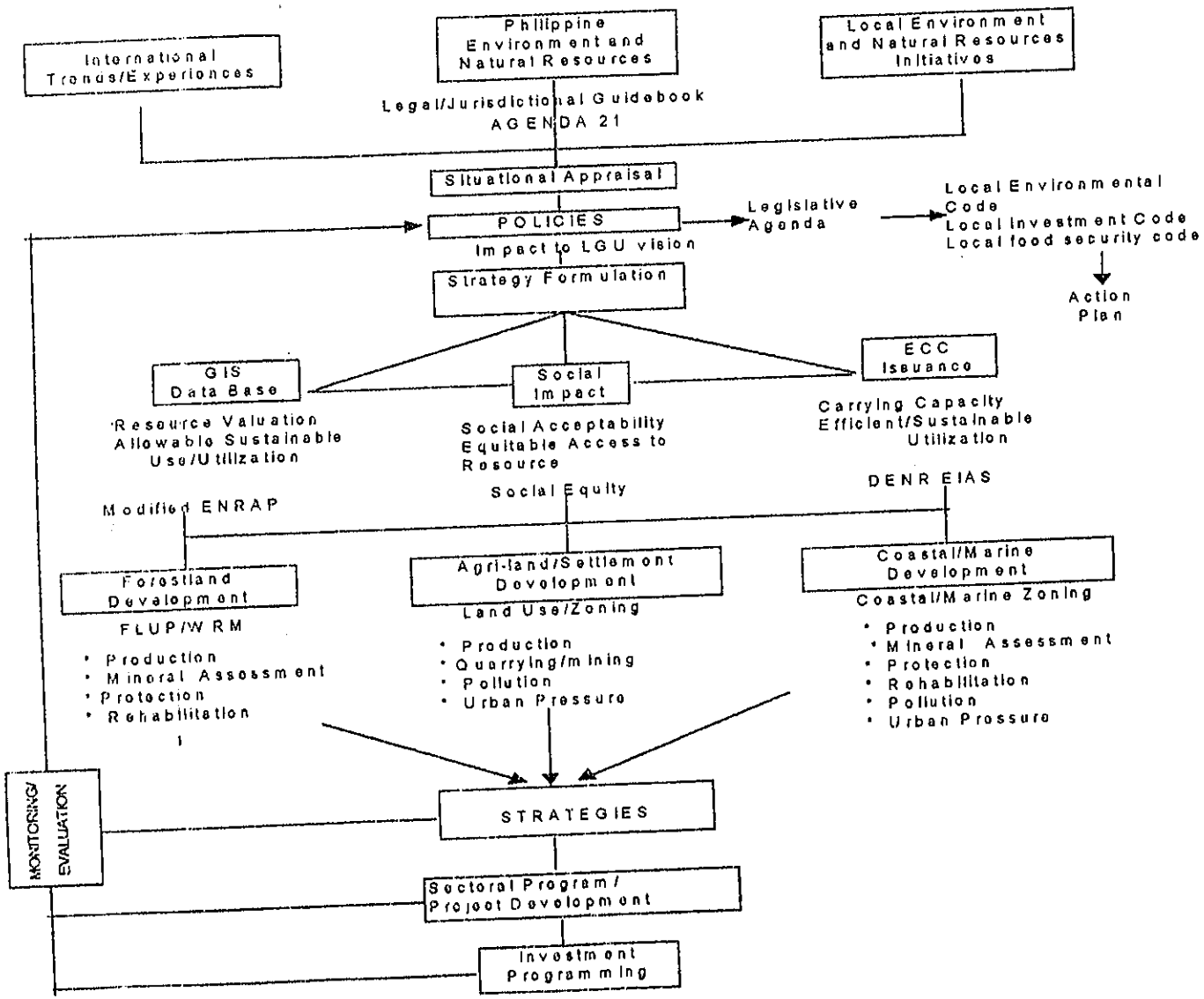

Figure E4 - Relationship of Existing major Plans and Programs Sarangani Province, as of June 1998.

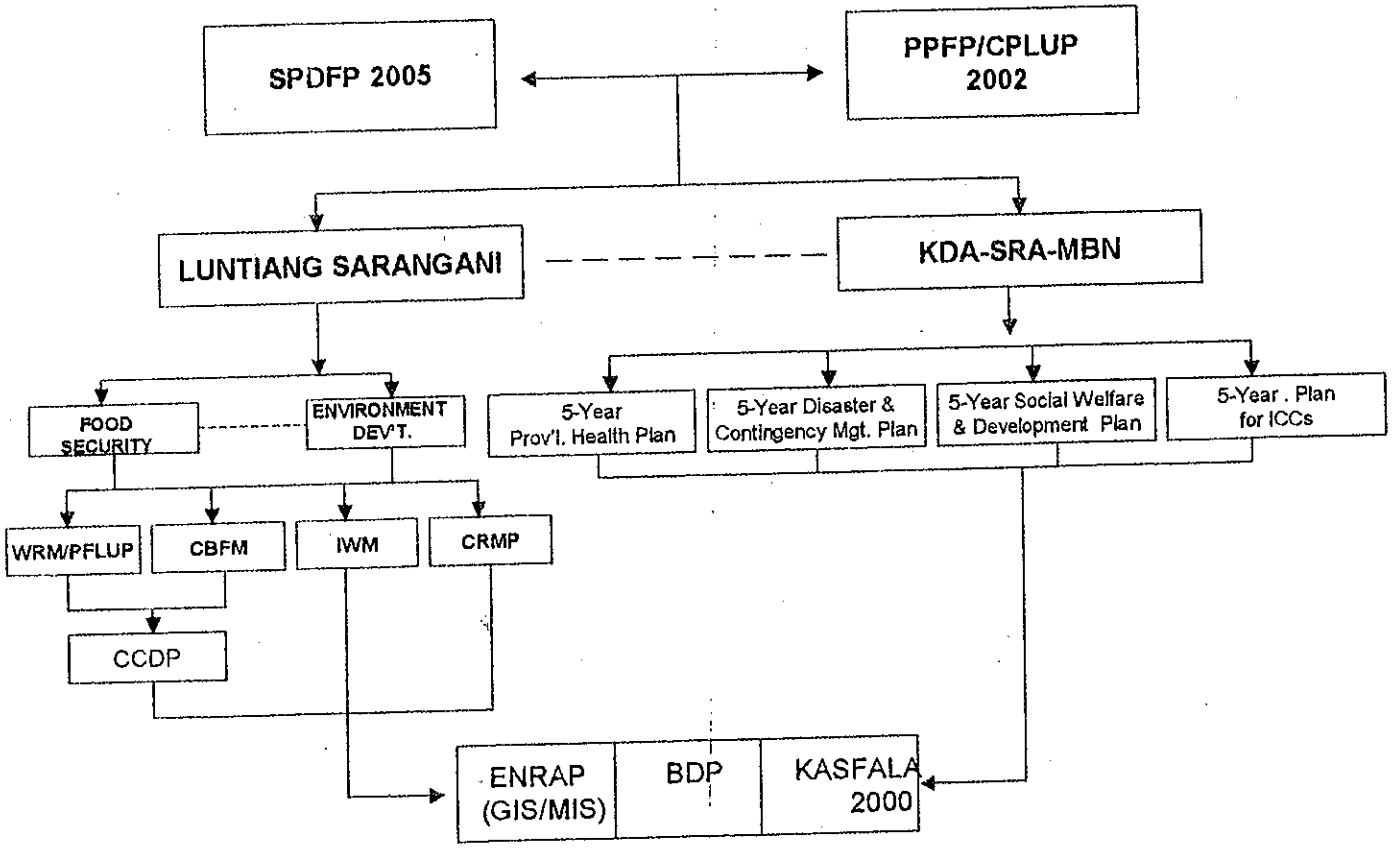

Table E1. Planning Principles and Basic Philosophies.

Planning Principles/Concepts

The Planning of the development of Sarangani Province revolves around the following principles/concepts.

1. Should serve as strategic context for local decisions
2. A central task of government
3. A continuous process
4. Should be genuinely participatory
5. Should extend to the level of community
6. Should be user friendly

Planning Context

Key Elements:

1. Conscious mgt. of urban and rural changes
2. An attempt to relate knowledge to action in the public interest
3. Emphasizes the inter-relationship between social, spatial, economic and natural environment factors
4. Expressed in a set of structures of administration and legislation

Geopolitical Considerations:

1. Strategic Sarangani Bay
2. Multi-Ethnicity
3. Poverty in Prosperity
4. Ecological Vulnerability
5. Peace and Development

Development Response:

1. Transparency
2. Participatory Management
3. Environmental Focus
4. Learning vs. Provision
5. Mobilization of Resources
6. Physical planning
7. Process Rather than Ends

BASIC PHILOSOPHIES
(Learning to Grow)

"Devolution finds its greatest meaning when the basic unit of government - the Barangay is strong and capable in administering the affairs of governance."

Hon. Priscilla L. Chiongbian
Governor

" Democracy finds its greatest fulfillment when this governance manifests a strong participation of people in the day-to-day affairs of managing growth."

Hon. Priscilla L. Chiongbian
Governor

" Development at the expense of environment is not progress".

Hon. Priscilla L. Chiongbian
Governor

APPENDIX TABLE A

LIST OF ACTIVITIES, CONFERENCES, WORKSHOPS, MEETINGS PARTICIPATED IN BY THE PROJECT

Date	Activity	Location
3-4 March 1998	ENRAP-Sarangani Team meeting in preparation of project launching	Manila
5 March 1998	ENRAP-Sarangani Project launching and Kasfala meeting	Sarangani
19-28 April 1998	Training workshop on Environmental and Natural Resources Policy Development	Samal island
3-4 August 1998	ENRAP-Sarangani Team meeting	Manila
26 August 1998	Western Mining Presentation	Sarangani
8 September 1998	Provincial Development Council meeting – ENRAP presented the project activities	Sarangani
8 September 1998	Meeting with JICA water team	Sarangani
15-17 September 1998	MIS/GIS Training Workshop	Gen. Santos City
18 September 1998	ENRAP-PPDO workshop evaluation meeting	Sarangani
18 February 1999	ENRAP-Sarangani Team meeting	Manila
22-23 February 1999	ENRAP in-house workshop	Laguna
22 April 1999	DENR-ENRAP Discussion Series	Manila
23 April 1999	ENRAP-Sarangani team meeting	Manila
27 April 1999	Sarangani Bay PAMB meeting –presented the ENRA framework	Sarangani
28 April 1999	FARMC meeting for Sapo cove zoning	Malapatan, Sarangani
30 April 1999	Coastal resource assessment	Malapatan, Sarangani
6,14,26,28,31 May 1999	PAMB core-group meetings in preparation of the CRM Program and Policy Reviews	Sarangani
17-19 May 1999	ENRAP exhibition – during the Provincial Foundation Week	Sarangani
19 May 1999	Coastal resources management workshop – Municipality of Alabel – invited as resource person	Sarangani
2 June 1999	SOCSKSARGEN Area Development Program meeting – ENRAP and the Province of Sarangani presented the framework for area's coastal resource management	Gen. Santos City

Date	Activity	Location
15 June 1999	MIS workshop for Municipal Planning and Development Coordinators	Sarangani
16-17 June 1999	League of Provinces Conference – ENRAP presented the Sarangani work	Davao City
30 June 1999	Environment Month Conference – ENRAP presented a paper on environmental management and accounting	Gen. Santos City
14-16 July 1999	Consultative Meeting on Pollution Charges	Davao City
2-3 August 1999	GOLD Regional roll-out – ENRAP presented project activities	Gen. Santos City
10-11 August 1999	ENRAP-Sarangani Team meeting	Sarangani
16 August 1999	Provincial land-use council meeting – ENRAP presented environmental costs assessment	Sarangani
18-20 August 1999	Household pollution survey	Sarangani
6 September 1999	ENRAP in-house workshop	Manila
9 September 1999	ENRAP-Sarangani Team meeting	Manila
4 October 1999	Provincial Tribal Council Strategic Planning Workshop	Gen. Santos City
5-6 October 1999	Joined the USAID Team – visited sites in Sarangani and Gen. Santos	Sarangani, Gen. Santos City
11-13 October 1999	Provincial Eco-Tourism Strategic Planning Workshop	Gen. Santos City
21-23 October 1999	Coastal Resource Management Workshop: Program and Policy Reviews	Sarangani
1-3 December 1999	ENRAP in-house workshop	Tagaytay
7-9 December 1999	Joined the USAID Team visiting SOCSARGEN area	Sarangani, Gen. Santos, and South Cotabato