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TRENDS IN PHILIPPINE ENVIRONMENTAL REGULATORY POLICIES AND THEIR INFLUENCE ON PNOC-EDC'S ENVIRONMENTAL MANAGEMENT PROGRAMS

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ABSTRACT

The environmental statutory state in the Philippines from the 1970s to early 1990s was largely influenced by the command-and-control regulatory appmach. The legislations and their implementing rules and regulations emphasized compliance with emission, ambient and waste management standards. Environmental controls were mainly equated with permitting systems, which in effect were biased towards end-of-pipe controls.

However, due to intensifying global environmental advocacy in the '90s and the need to balance the growing environmental concerns with national development and socio-economic agenda, the government's regulatory framework has since shifted towards the environmental sustainable development paradigm. With a policy objective aimed towards sustainable use, management and conservation of the country's natural resources vis-a-vis protection and enhancement of the quality of the environment, the environmental regulations of the country are now being rationalized through innovative policy reforms and strategies.

In response to these developments, PNOC-EDC has established an evolving environmental management program, which at the minimum ensures compliance with the regulatory requirements through self-regulation. The Company has gone beyond the boundary requirements regulating the energy sector, and has in fact taken the lead in showcasing the government initiatives in rationalizing enforcement of regulations. Moreover, the Company has taken various proactive approaches with the end view of harnessing the indigenous energy of the country in a manner that is environmentally enhancing, socially responsive and economically uplifting for both the Company and the surrounding project communities, and the country as a whole.

1.0 INTRODUCTION

Environmental management has always been a vital component of PNOC-EDC's corporate philosophy. For more than two (2) decades now, the Company, thru its Environmental Management Department (EMD), has been extensively involved in environmental and watershed protection, and enhancement of its project areas. Since its inception in 1978, the EMD has progressively modified its thrusts and programs to adapt to changing national environmental policies and legislations. Because of the experiences gained by the Company in the field of corporate environmentalism, PNOC-EDC is acknowledged as one of the leaders in the local environmental sector and has a high credibility with the regulatory agencies, private sectors and the public in general. Some of its environmental plans and programs now serve as models for other related industries and have been adopted by the government in various national policy guidelines and procedures. Among the Company initiatives worth mentioning are its practices on public consultations, conflict management, social acceptability, multi-sectoral monitoring, social forestry, and participatory EIA procedures (Nieva, 1999).

This paper presents a brief history of Philippine environmental legislations including the dominant trends in local environmental administration and enhancement of current policy reforms, and the institutionalization of environmental management in PNOC-EDC's operation both as a consequence of these changes and as initiatives to enhance the country's environmental development.

2.0 LANDMARKS AND TRENDS IN PHILIPPINE ENVIRONMENTAL POLICIES AND REGULATIONS

The Philippine environmental legislations encompass several laws pertaining to human activities that affect the quality of the environment. In the past, environmental protection was not delegated to a single government agency. Instead, environment-related concerns were part of the directives of several government agencies dealing with agriculture, natural resources, health, housing and public works (EMB-UNDP Training Manual, 1996). It was only in 1964 when the ***National Pollution Control Commission (NPCC)*** was created to handle air and water pollution control in the country. In 1977, the ***National Environmental Pmtection Council (NEPC)*** was created as the primary policy-making body on matters related to the environment. In 1986, however, major institutional changes were introduced in the government as a result of a change in political administration. One of these was the creation of the ***Environmental Management Bureau (EMB)*** in 1987, under the ***Department of Environment and Natural Resources (DENR).*** 'EMB assumed the regulatory functions of both NPPC and NEPC. The ***1987 Philippine Constitution*** further provides the basis for subsequent environmental laws in the country by mandating the protection of the right of the people to a balanced and healthful ecology as one of its major Policy Statements.

2.1 Environmental Framework

The national environmental framework is embodied in the ***Philippine Envimnmental Policy (PD 1151)*** and in the ***Philippine Environmental Code (PD 1152)***, both of which were enacted on June 6, 1977. PD 1151 defines the State Policy on the pursuit of a better quality of life for present and future generations by recognizing the right of ***every*** Filipino to a healthy environment. It was also the first environmental law to introduce the concept of ***Environmental Impact Assessment (EIA)*** in the country. PD 1152, on the other hand, defines the management policy objectives and strategies for water, air, natural resources, land and waste management. It also prescribes the enforcement of environmental quality standards.

In 1996, Congress initiated the revision of the Philippine Environmental Code with the intent of having a holistic national program on environmental management. The original proposal was to integrate all the regulatory requirements of the EIA System, Air Quality Management, Water Quality Management, Waste Management, Environmental Adjudication Commission, and Natural Resources Management. However, due to the sheer magnitude and scope of the proposed Code and the lack of government funds to implement such a scale, the government instead opted to break down the various components into several Acts. Among those already approved are the ***National Integrated Protected Areas System (RA 7586, 1992), Mining Act (RA 7942, 1995), Indigenous Peoples Reform Act (RA 8377, 1997),*** and the ***Clean Air Act (RA 8749, 7999).*** Other Acts currently undergoing review by the Bicameral Committee include the ***Clean Water Act, National Land Use Act, and Sustainable Forestry Act.***

2.2 Pollution Control and Waste Management Laws

In the late '70s, environmental management in the Philippines was largely traditional in approach. Based mainly on command-and-control measures (or the infamous "carrot and stick" method), emphasis was geared more on compliance with ambient, emission, and waste management standards. This posture was aptly captured in ***Pollution Decree (PD) 984*** or the ***Pollution Control Decree of 1976,*** which took effect on August 18, 1976.

The ***Rules and Regulations of National Pollution Control Commission (NPCC),*** otherwise known as the **IRR** of PD **984,** was passed in 1978. The **IRR** established the standards for air and water quality, and the permitting system for the construction and operation of pollution control devices.

Some of the environmental standards contained in the 1978 NPCC **IRR** had undergone several revisions such as the ***Revised Effluent Regulations of 1982,*** the ***DENR Administrative*** Orders ***(DAOs) 34 (Revised Water Quality Criteria) and 35 (Revised Effluent Standards) Series of 7990,*** and the ***7993 Drinking Water Standards*** of the Department of Health (DOH). However, these series of revisions caused some confusion on the part of the regulated

communities since the standards that were not explicitly revised are still in effect, as contained in the previous versions.

In 1990, the government approved ***Republic Act 6969,*** also known as the Toxic ***Chemicals and Hazardous and Nuclear Waste Control Act.*** RA 6969 regulates the importation, manufacture, distribution, use, and disposal of chemical substances and hazardous waste that may pose risks to human life and the environment.

In 1992 and 1993, the DENR released ***DAO-29*** and ***DAO-14,*** respectively. DAO-29, which is the IRR of RA 6969, addresses the management and disposal of toxic chemicals and hazardous wastes in the country mainly thru registration, reporting and permit applications. DAO-14, on the other hand, amended the ambient air quality standards and emission levels, specifically Sections 57 to 66 of the IRR of PD 984.

On June 23, 1999, the ***Philippine Clean Air Act of 1999 (or Republic Act 8749)*** was approved. The law, which took effect on July 17, 1999, describes the requirements for a comprehensive air pollution control and management program in the country. Its IRR ***(DAO 2000-81)*** was signed by the DENR on November 7,2000 and became effective on November 25,2000.

On July 24, 2000, the government approved ***Republic Act 9003*** or the ***Ecological Solid Waste Management Act of 2000.*** RA 9003 promotes the adoption of a systematic and comprehensive solid waste management through implementation of sound ecological practices such as conservation and recovery of valuable resources, waste minimization, and improved methods on waste disposal. Its IRR ***(DAO 2001-34)*** was approved only last December 2001.

In retrospect, it can be seen that the government's emphases in the '70s to early '90s were more on "end-of-pipe" controls and layers of permitting system, as evidenced by the earlier regulations. It is apparent that the government equated environmental management with pollution control during the said period. The administrative and regulatory machinenes were focused largely on how to control pollution rather than on pollution-preventive ways to improve environmental quality. In fact, it is quite unusual that the approval of the Pollution Control Law preceded the declaration of the National Environmental Policy. Air and water quality standards were enforced through monitoring, permitting, imposition of fines penalties, and closure of poilution sources. Since the system was excessively prescriptive and intrusive, the relationship between the DENR and the industries was often marked by hostility and resistance.

However, these perceptions changed during the mid '90s. The new decade signaled far-reaching advancement in environmental awareness, with both public and private sectors joining the green bandwagon movement. The sustainable development paradigm advocated primarily by developed nations influenced the Philippines' pursuit of economic prosperity, environmental quality and social equity in equal footing. In fact, recent pollution control and waste management policies in the country promote the integration of other environmental regulations and mechanisms such as the EIA system, market-based incentives, public-private partnerships, and other economic policy instruments other than direct control to address the major resource use and development programs in the country. In effect, the recent environmental laws redirected government focus away from pollution control to pollution prevention.

2.3 Environmental Impact Assessment

The ***Philippine Environmental Impact Assessment (EIA) System*** was officially established in 1978 with the passage of ***PD 1586***. Although the EIA concept was first introduced in 1977, it was only a year after when the framework, working structure and procedures for the implementation of the system were defined. The EIA system mandated the acquisition of Environmental Compliance Certificate (ECC) for projects or undertakings classified either as environmentally critical projects (ECPs) or those that are located in environmentally critical areas (ECAs). The areas and types of projects subject to the EIA System are contained in ***Presidential Proclamation 2146 (1981).*** Geothermal projects are classified as ECPs and are usually located in ECAs, and thus are subject to the EIA system. Since 1978, several amendments on the structure, assessment parameters and procedures, working definitions, and scope of operations, among others, were made to strengthen the EIA System. The latest of these is DAO 96-37 (1996), which further streamlined

the procedures in the conduct of an EIA and enhanced public participation as a major process in validating the social acceptability of the project.

3.0 RECENT GOVERNMENT INITIATIVES ON ENFORCEMENT OF ENVIRONMENTAL REGULATIONS

As mentioned, the '90s heralded a dramatic shift in Philippine environmental policies, development strategies and regulatory reforms. With the belief that successfut environmental governance means allowing industries to achieve profitability while at the same time meeting environmental regulations in a practical manner, the DENR has since crafted new mechanisms that capitalize on the industry's initiative to self-regulate. In contrast to its previous command-and-control attitude, the DENR now believes that a successful environmental compliance program is one that delicately balances enforcement and encouragement – a right mix of carrots and sticks. By cultivating a sense of trust, social accountability and increased environmental awareness in the private sector, the DENR is gradually transforming its stance from merely being a regulator to that of a partner. Thus, recent OENR programs advocating the adoption of the Environmental Management System (EMS), cleaner production practices, pollution prevention programs, phased approach to comptiance, and greater transparency in reporting environmental performance, among others, are meant to encourage the involvement of the business communtty in solving the major environmental problems in the country (Abaya, **2000).**

Below is a discussion of some of the innovative mechanisms and creative policies being instituted by the DENR relative to environmental regulations. Although most of these programs have no legal basis, the DEMR is hopeful that they can serve as incentives to attract the industries to actively participate in environmental management.

3.1 Transparent and Participative Procedures

The DENR believes that public participation is an effective tool to attain and maintain social acceptability among the stakeholders of development projects. During project implementation, this same mechanism is premised on the principle that self-monitoring coupled with intense public scrutiny will lead to better environmental results or performance (Afsah, 2000). The DENR institutionalized public participation thru the EIA System ***(DAO 92-21 and DAO 96-37).*** The DENR ***Manual on Public Participation*** was also released in 1996. Public participation techniques recognized by the DENR include information dissemination, scoping sessions, acquisition of endorsements, public consultations, consensus groups, advisory committees, conflict management, and regulatory negotiations.

3.2 Market-based Initiatives

Market-based instruments (MBIs) are now widely regarded as both philosophic and practical approaches to environmental legislations (Anderson, 1997). Recent regulations such as the ***Philippine Clean Air Act (CAA) of 1999*** and the proposed ***Clean Water Act (CWA)*** promote the use of market-based or economic policy instruments such as transfer of funds between polluters and the community (derived from taxes, subsidies, and effluent charges) and the creation of markets for pollution emissions such as marketable/tradable permits. The government, thru the ***Laguna Lake Development Authority (LLDA),*** initiated the implementation of the ***Environmental User's Fee (EUF) System*** in 1997 (Oledan, 2001). The EUF requires industries within the LLDA area to pay a certain amount for effluents discharged into the lake and surrounding water bodies (Favila, 1996). The fees collected by LLDA are being used for ecosystem rehabilitation, researches, information and educational campaigns, enforcement and monitoring activities, and also as part of their operating expenses.

3.3 Public-Private Partnerships

In support of the objectives of the ***Philippine Strategy for Sustainable Development (PSSD)*** and the ***Philippine Agenda 21,*** the DENR has undertaken several technical assistance programs that capitalize on the establishment of a broad-based partnership with industries and financial institutions. Examples of these DEMR-initiated programs are the ***Industrial Environmental Management Project (IEMP)***, the ***Integrated Envimnmental Management for***

Sustainable Development (IEMSD), the ***PRIME Project*** (or ***Private Sector Participation*** *in* ***Managing the Environment),*** and the ***Industry Initiatives*** for ***a Sustainable Environment (IISE***). These programs seek to strengthen the private sector initiatives in reducing the environmental footprints of industries by promoting the adoption of the Environmental Management Systems (EMS), Pollution Prevention/Cleaner Production (P2/CP) practices, and other economic incentives to reduce pollution generation among industries throughout the country. Through these partnerships, the proponents are given the flexibility to strategize on ways to meet government regulations by allowing them to decide on the most cost-effective environmental management method.

In terms of legal basis, ***DAO 93-17*** provides that industries participating in ***Pollution Management Appraisal (PMA) Programs*** are given a one-year moratorium on compliance with effluent and emission standards upon demonstrating their seriousness to minimize waste generation. This same policy mechanism is contained in the ***1999 Clean Air Act,*** which recognizes that industries adopting the Environmental Management System (EMS) on a voluntary basis are given a grace period of 18-30 months to reach regulatory compliance.

3.4 Formulation of a Rationalized Standards Policy

In revising the environmental standards of the country and in setting national goals and priorities for air, water and waste management, the DENR takes into account the benefits of proposed standards . versus the cost of compliance, its administrative and technical feasibility, and the trade-offs associated with standards setting. In particular, the DENR-ADB Study on ***"Evaluation*** of ***Environmental Standards for Selected Industry Subsectors" (March 1997 – November 1998)*** presented the methodological approach to the rationalization of Philippine environmental standards by combining the adoption of certain standards based on financial and economic tools, adoption of more environmentally sound processes by industries, and consideration of local sensitivities and absorptive capacities of the receiving environments, instead of merely adopting the standards of other countries. The DENR further recognized that successful monitoring and enforcement procedures could only be attained when the standards imposed are realistic or capable of being met within the context of a developing country.

3.5 Use of the Environmental Impact Assessment (EIA) System as a Planning Tool thru Programmatic Compliance Procedures

Programmatic compliance can be implemented for a project that is subdivided into several phases or stages, whether situated in a contiguous area (like an industrial estate) or is geographically dispersed. Instead of repeatedly preparing several EIS reports, the proponent can opt to prepare a single EIS by taking into account the environmental carrying capacity of the area based on ecological profiling and the cumulative impacts associated with the overall development plan. With the use of programmatic procedures, the proponents can save on EIS preparation-related expenses. At the same time, a more holistic view of the multi-staged development project over a longer timeframe is derived since the overall environmental carrying capacity is accounted for in the assessments undertaken. The ***Programmatic Compliance Procedures within the Environmental Impact Statement (EIS) System*** took effect thru ***DAO 94-11*** and ***DAO 2000-05***. The first Programmatic EIS in the country was submitted to DENR by ***PNOC Petrochemical Development Corporation (PPDC),*** a sister company of PNOC-EDC. The OENR is currently revising some aspects of the programmatic procedures in a new DAO targeted for release within the year.

3.6 Integrated Management with Safety and Health

The OENR regularly coordinates with the ***Department*** of ***Health (DOH)*** and the ***Department*** of ***Labor and Employment (DOLE)*** in implementing health and safety measures as integral components of environmental management protocols. As early as 1991, the government manifested its commitment in protecting public health from problems related to environmental degradation by forming the ***Inter-Agency Committee on Environmental Health (IACEH)*** thru ***Executive Order*** 489. In 1993 to 1997, the ***Department*** of ***Energy (DOE)*** activated the ***Geothermal Task Force (GTF).*** Among others, the objectives of the GTF include the strengthening of public awareness on

geothermal operations and environmental health-related concerns, establishment of a database and industry standards on safety, health and environmental protection related to geothermal operations, and implementation of medical surveillance programs in geothermal project areas. In 1997, the DOH released the *Philippine National Framework and Guidelines for Environmental Health Impact Assessment (EHIA)*. The EHIA addresses the assessment and management of potential project-related environmental and occupational health problems.

3.7 Provision of Socio-Economic Benefits to Host Communities

From among the project Stakeholders, the government prioritizes the host communities surrounding the project as primary beneficiaries with respect to allocation of socio-economic benefits. Benefits may include priority employment of qualified residents, provision of social development projects and basic extension/livelihood services, taxes, subsidies, and royalties. In the energy sector, benefits to communities hosting energy projects are contained in *Energy Regulations (ER) No. 7-94 (IRR of the Department of Energy Act of 7992).*

4.0 PNOC-EDC'S ENVIRONMENTAL MANAGEMENT INITIATIVES

4.1 Corporate Adaptation of an Environmental Policy

The current *Corporate Environmental Policy Statement* of PNOC-EDC was officially approved in February 1994. The policy embodies the deep commitment of the Company to protect and maintain a sound environment in all its energy project sites and surrounding communities. However, even long before environmentalism became an emerging trend in the country, the Company had already put in place major policy commitments such as environmental compliance (1978), watershed management (1983), and community relations (1986) as part of its work practices. In implementing the Policy Statement, the following aspects were prioritized by the Company as key implementing guidelines.

a. Environmental Planning

The Company ensures that environmental planning is incorporated in all aspects of project design, development, and operation. In assessing the potential effects of its projects, appropriate actions are pursued by the Company by integrating protective measures as early as the planning phase in order to prevent or reduce project impacts on the environment, public health and safety. Way back in 1979, even before the implementation of the EIA system, PNOC-EDC had already prepared and submitted to then NEPC the *Tongonan EIA* as the first EIS report in the Philippines.

b. Consultation with Stakeholders

The Company also conducts regular consultations with the local government units (LGUs), government agencies, surrounding communities and other stakeholders. Adequate consultations on project activities and developments, related environmental issues, and project benefits are made with concerned sectors to elicit their participation in environmental management and enhancement of the project. In 1990, the Company pioneered public consultation as a test case in Mt. Apo (Mindanao Geothermal Project) as a critical strategy to alleviate severe public opposition. Subsequent enhancements of this mechanism were also initiated by the Company in Mt. Labo and Northern Negros Geothermal Projects in 1994-1996. In fact, these two (2) projects were among the first in the country to model the complete *participative process.*

c. Compliance

It is the policy of the Company to comply with all relevant environmental, health and safety regulations, including permitting and licensing systems, and commitments entered into with government agencies and communities. In complying with relevant environmental standards, the Company adheres to the intent of industry guidelines based on best practicable and economically sound technologies. In addition to environmental monitoring, the Company implements regular inspection of project facilities to detect and minimize unanticipated incidents, which may result to a state of non-compliance.

d. Corrective Action and Emergency Response Programs

The Company ensures the implementation of timely and efficient corrective actions to any environmental damage that may be caused by its activities. Corrective actions are based on established corporate procedures and industry guidelines. The response plans developed by the Company include an operational plan that defines decision-making authority, methods of implementation, and available resources; a communication plan that includes internal and external communication segments; public disclosure policies; and procedures by which the plan can be evaluated.

e. Research and Environmental Consciousness

The Company encourages and supports researches relevant to improving the Company's environmental, public health and safety measures. Other studies are also undertaken to support new proposals to DENR, specifically those related to natural resources and waste management. By cooperating and networking with academic institutions, non-government organizations (NGOs), other industry players, private associations, and government agencies, efforts are made to develop research methods on relevant environmental issues. The results of these non-proprietary research programs are made available to the public.

The Company also promotes the development of environmental consciousness among its employees, contractors and suppliers, and Multi-Sectoral Monitoring Team (MSMT) members by conducting regular briefing, orientation and training programs on new environmental regulations, and by incorporating environmental provisions in contracts entered into by the Company. The Company convened the first MSMT in the country in 1992 thru its Mt. Apo Project.

4.2 Integrated Environmental and Watershed Management Approach

The Company believes that an integrated environmental and watershed management approach is one of the key elements in ensuring an ecologically sound and healthy environment in its project sites. The integrated programs have successfully enhanced not only the geothermal watershed areas but have also uplifted the economic status of the upland dwellers by providing them with sustainable livelihood options. Results of the EIA studies and subsequent environmental monitoring are also integrated with forestry and other watershed data to derive the most appropriate land uses and zones within geothermal reservations. The Company works hand-in-hand with concerned local government units (LGUs) by relaying relevant information that can be used in LGU zoning and land use management plans.

The management systems implemented by the Company are multi-disciplinary in orientation. Aside from the standard air and water quality monitoring, the Company implements regular monitoring of the terrestrial and aquatic biota (flora and fauna) and land environments, and conducts surveys of socio-economic indicators. In parallel, the Company has also instituted several watershed management strategies such as reforestation and stabilization of opened-up areas, resource management, forest protection, community development and extension services for the surrounding inhabitants. The Company's environmental measures and practices, community-based EIA process, social forestry and community development, biodiversity monitoring, and accounting of CO_2 sequestration in forest vegetation are among those acknowledged by national and international organizations as models for environmental protection and development. PNOC-EDC takes pride in implementing these programs as they reflect the Company's genuine corporate social responsibility.

4.3 Going Beyond Compliance with Environmental Regulations

In response to the rapidly evolving regulatory prescriptions imposed by the DENR and other government agencies, PNOC-EDC started to innovate its environmental strategies in the early '90s. Its experiences in geothermal projects like Mt. Apo, Mt. Labo, Northern Negros and Southern Leyte helped shape the Company's pioneering efforts in environmental protection and management technology. Below is a summary of the key elements in the Company's environmental management program.

a. Self Monitoring and Audits

Regular environmental monitoring and audits that go beyond the regulatory requirements mandated by the government are systematically conducted by EMD. Such activities ensure compliance with environmental legislations and standards, adherence to corporate policies and industry guidelines, and detection of any environmental change or trend that may occur as a result of its project activities. Audits also help enhance the Company's in-house environmental management system, which is basically similar to the principles espoused by ISO 14001. Being a performance-based system, well-defined environmental parameters or criteria are used to measure the performance and improvement of EDC projects over time. These in-house initiatives are also necessary since lending institutions conduct due diligence audits and require compliance to national laws. The environmental guidelines used in audits are periodically reviewed and updated to ensure that they reflect the best practicable technology.

b. Environmental Legislation Review, Government Policy Interventions, and Networking with other Private Business/ Energy Industry

The Company perceives its tasks relating to legislation review as an opportunity to participate in setting national industry standards. Because of its high credibility in the environment sector, the Company is a recognized member in review committees and technical working groups convened by regulatory agencies and the Senate and House Committees on Ecology and Natural Resources.

Policy intervention, extensive sectoral networking (both regional and national linkages) with other private groups and major industry players, and lobbying with the regulatory agencies for more practicable and cost-effective policies and laws are other avenues wherein the Company is actively involved. Interventions, especially from the regulated communities, are needed when government policies, laws or standards are impractical or unattainable due to current technological constraints or financial setbacks. The Company participates in these collaborative sessions by sharing its experiences in environmental management with the regulatory bodies for the improvement of environmental policies, mainly in the energy sector.

c. Conflict Resolution/Management with Affected Stakeholders

The Company provides relevant information on its corporate policies and activities in a timely fashion to the government and the public. Consultation meetings, dialogues, multi-sectoral monitoring and other public disclosure practices are held on a regular basis to ensure that all necessary concerns and issues are responded to and appropriate actions are implemented as necessary. Thru these mechanisms, the Company ensures transparency in dealing with the stakeholders and the recognition of the public's right to know.

5.0 CONCLUSIONS

The Philippine government has accorded environmental protection as one of the priority considerations in formulating its development strategies. The legislative framework is already well established. In fact, the Philippines has one of the most extensive set of environmental protection laws in the ASEAN Region. However, despite these laws, problems related to enforcement of environmental standards and regulations are still encountered mainly because of the government's lack of resources, expertise, and political will. Effective enforcement requires well-structured and well-supported administrative machineries that truly reinforce existing legislations (DENR-UNDP Training Manual, 1996).

To partially address these administrative constraints, the DENR has recently modified its previous command-and-control approach by tapping the industries and public bodies in committing resources in the pursuit of its environmental objectives. Several innovative DENR programs that promote industry self-regulation are now being implemented and participated in jointly by the government, private sectors and funding institutions. These government-industry-civil society partnerships are aim to enhance environmental quality thru improved environmental performance while increasing productivity at the same time.

Notwithstanding these developments, current environmental governance can still be improved.

In particular, DENR can further enhance its programs by having a realistic plan for program execution, clearly stated procedures, and databased and goaldirected policies. Some of the areas where formulation of policies and procedures can be reinforced are (a) streamlining of permitting process and reporting requirements, including inconsistencies in interpretation of laws by different government agencies; (b) improving public participation in decision-making by educating the stakeholders and incorporating public values in decision-making; (c) undertaking regular evaluation of program accomplishments and progress; and (d) providing additional incentives for industries involved in enhancement of environmental programs.

In parallel, PNOC-EDC needs to redirect its management plan in line with the deregulation of the power industry *(RA* 9736 or ***the Electric Power Industry Reform*** Act of *2001)*, the impending enforcement of market-based instruments **(MBIs)** for air, water and waste management, and the Company's diversification and marketing plans. The challenge, really, is to maintain competitiveness in an open market at a time when new regulations require substantial investments in pollution prevention and environmental management that may result in significant increase in the cost of indigenous power.

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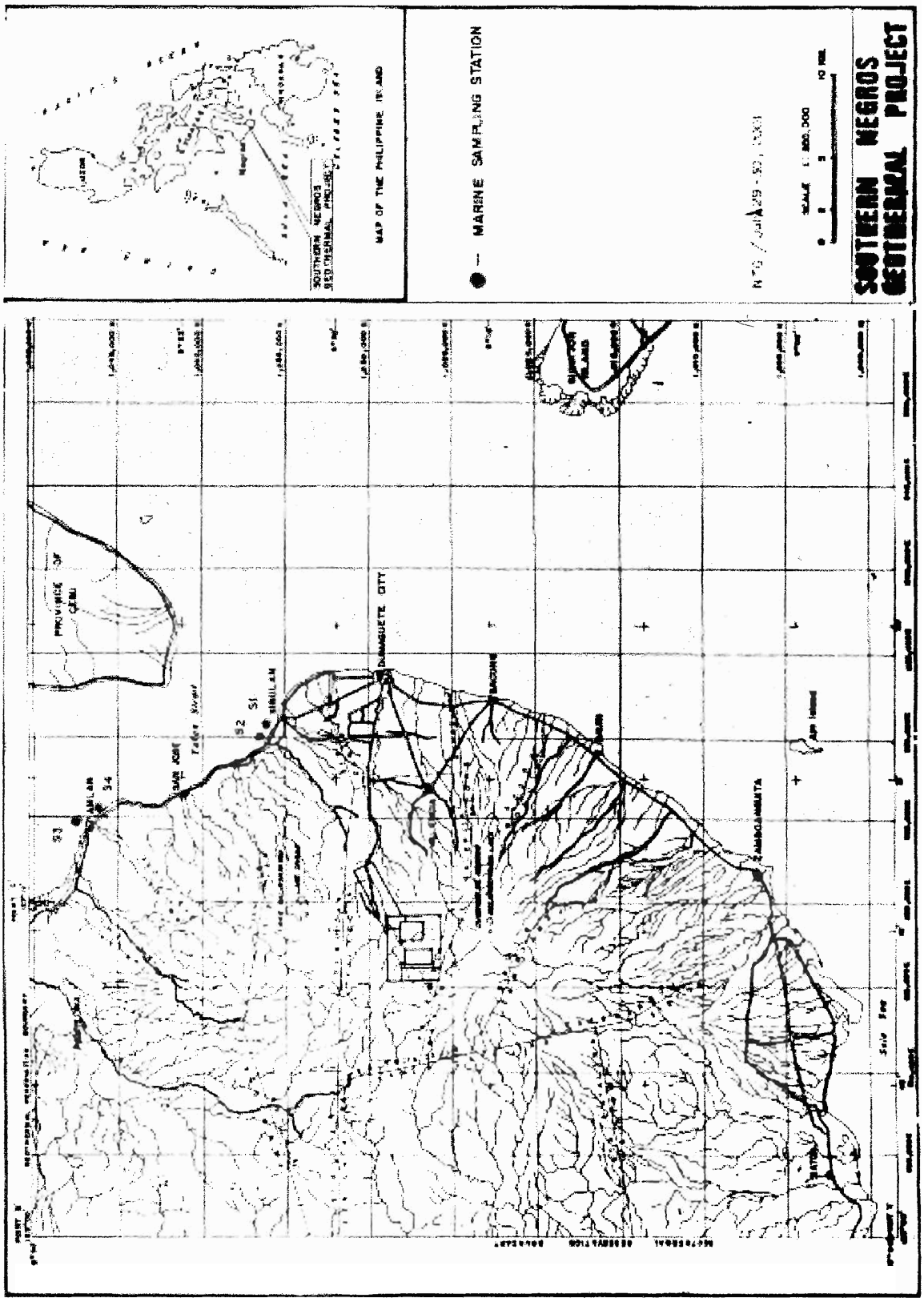

Figure 1. Map showing the marine sampling stations located in Sibulan and Amlan waters.

MARINE LIFE	OKOY		AMLAN	
	% COVER	NO. OF SPECIES	% COVER	NO. OF SPECIES
SEAWEEDS	53.76	12	36.60	4
SEAGRASSES	45.80	2	0	0
HARD CORAL	2.21	4	2.40	5
OTHER INVERTEBRATES	7.31	5	45.40	1
ABIOTIC				
DEAD CORAL	0.60		0	
SAND WITH SILTED ROCK	34.04		115.60	
SILTY SAND	57.10		0	

quantitative assessment of dominance and production of seaweeds and seagrasses (Fortes, 1989).

2.3 Coral Reefs

Benthic sampling was done in Okoy and Amlan following the Line Intercept Transect Method of English et. al. (1994). All flora and fauna encountered along transect were identified and recorded. Specimens that could not be readily identified were collected and preserved in 10% formaldehyde. Data on local names and economic significance of species were obtained from interviews of coastal residents.

Living coral cover was categorized as Excellent (75-loo%), Good (50-74.9%), Fair (2549.9%) and Poor (0-24.9%) following the procedures of DENR (1994). Their categories include both stony and soft corals.

Reference books used in identifying corals and reef fishes were from Veron (1986), Wood (1986), Rau and Rau (1980) and English et. al. (1994).

2.4 Diversity and Similarity Indices

The ecological parameters determined in each community were the abundance/density, diversity, dominance, evenness, spatial distribution and frequency of occurrence. All accumulated data were then subjected to Ecostat Program to determine the Diversity Indices per sampling site (Towner, 1992). Then the sampling stations were compared through the use of Jaccard Similarity Index following the formula below (Magurran, 1988):

$$Cj = j/(a+b-j) \quad (1)$$

where:
j = the number of species found in both sites
a = the number of species in Site A
b = the number of species in Site B

3.0 RESULTS AND DISCUSSION

3.1 Community Composition: Seagrasses and Seaweeds

A total of two seagrass and twelve seaweed species were recorded in the study sites (Table 1). In Okoy area, the seagrass population was comprised of Cymodocea rotundata and Halophila ovalis, with a total cover of 45.8%. The seaweed population, on one hand, has a total cover of 53.76%, and is composed of 11 species, distributed as follows: eight Chlorophytes, one Rhodophyte and two Phaeophytes. Cymodocea rotundata has the highest density with a cover of 35% while Dictyota sp. and Neomeris sp. were lowest at 0.18%. In contrast, seagrass was absent in Amlan area while seaweeds were composed of four species distributed, as follows: two Chlorophytes, one Rhodophytes and one Phaeophyte, covering a total of 36.6%. Halimeda sp. (32%) has the highest density, followed by Padina minor (6%)> Dictyota sp. (3.6%)> Padina australis (2%)> Porphyra sp. (1%)> Actinotrichia fragilis (0.36%).

The seagrasses and seaweeds in both study areas were patchy in distribution and limited only in the hard substrata. The thalli of the vegetation were covered with silts, which may have hindered their growth. The runoff substantially increases the sediment load of water and the plants tend to accumulate sitt, affecting their photosynthetic activity. Such stress favors the

Table 2. Analysis of marine water quality sampled in Okoy and Amlan (July 29-30, 2001).

Location	pH	Temp	As	B	Ca	Cd	Cl	Cr	Cu	Hg	Na	Pb	TDS	TSS
S1	7.7	29.4	<0.02	3	1120	0.15	12400	0.05	0	<0.0001	8910	0.35	25889	1559
s2	8	29.2	<0.02	4.5	18200	0.2	19300	0.05	0.08	<0.0001	12000	0.44	34147	2727
s3	7.7	29.2	<0.02	2.9	12100	0.14	12300'	<0.05	0.06	<0.0001	8910	0.35	25914	2756
s4	6.5	29.1	<0.02	<0.10	96	<0.10	540	<0.05	<0.02	<0.0001	300	<0.05	971	1889
~Class SA	6.5-8.5	-	0.05	-	-	0.01	-	0.05	-	0.002	-	0.05	•	•
~Class SB	6.5-8.5	-	0.05	-	-	0.01	-	0.1	-	0.002	-	0.05	1000	50
-Class SC	6.5-8.5	-	0.05	-	-	0.01	-	0.1	-	0.002	-	0.05	-	150
~Class SD	6.5-9	-											-	</30mg/L inc

growth of only few species, notably fiber-strand grasses, e.g. Halophila. Halophila is euryecious and thus able to survive in condition of low turbidity by penetrating the substrate with their fibrous roots (Nateekanjanalarp et al., **1991).** Euryecious plants have wide range of tolerance to environmental changes. Seagrasses require good water quality with reduced turbidity and sedimentation for optimum production.

3.2 Community Composition: Coral Reefs and Associated Organisms

A total of six coral species belonging to four families were observed in Okoy and Amlan. The total coral cover of the area was 4.6% and can be categorized as having poor coral conditions. Most of the observed colonies were small in size and the extent of coral coverage was concentrated to only few meters from the shore. Most of the live coral growth was evidently limited to the upper sub-tidal region. Their frequency rapidly declined seaward. The most commonly occurring reef building coral in Okoy transects was Porites. This is known to thrive at more exposed areas **(Wood, 1983).** However, the Goniopora, a sub-massive form, was highest in Amlan area. This supports the finding of Sudara et al. **(1991),** which indicated that Porites and Goniopora could thrive at more exposed and silted areas by secreting mucus to protect them and getting rid of the mucus periodically.

Corals cannot thrive near river mouth primarily due to freshwater influx and siltation. Veron **(1**986) suggested that prolonged exposure of corals to low saline water would result to reef degradation. Computation of salinity in Okoy ranges from **23** to **35** ppt while Amlan has a range of **0.99** to **23** ppt at approximately 200 meters distance from the river mouth. Fluctuating salinity values in the areas is one factor that might have caused its low coral diversity.

The total suspended solids (TSS) in Okoy have an average level of **2,143** mg/L while Amlan has **2,323** mg/L (Table **2).** At this concentration in both stations, the sediment from the river run-off is high enough to choke the filter-feeding mechanism of coral polyps (White, **1987).** Aside from this, the hermatypic corals, also known as reef-forming corals require adequate light for survival. With high TSS levels in both stations the light penetration is too low to support the required light intensity of this organism (White, **1987).**

Other macrobenthic associating organisms observed were sponges, sea urchins, bryozoans, tunicates and feather stars. These organisms were present in very low densities. Existence of these species may be due to the presence of varieties of habitats and food sources within a seagrass bed (Thayer and Phillips, **1977).**

Abiotic factors, such as silty sand, rocks and dead corals, showed higher percentage Over the live hard coral. The study area is approx. **57.8%** sandy-silty-rocky while dead coral in **Okoy** area accounted for 0.6%. No dead corals were observed in Amlan area.

A total of twenty-three fish species belonging to fifteen families were found in association with

Table 3. List of Fishes encountered in Okoy and Amlan (July, 2001).

NO.	FAMILY	USES	SPECIES	OKOY	AMLAN
				No of individuals	
1	Acanthuridae	T	*Naso sp.*		5
2	Blenniidae		*Meiacanthus sp.*		2
3	Canthigasterinae		*Canthigaster sp.*		1
4	Chaetodontidae	I	*Chaetodon sp.*	3	4
		I	*Heniochus acuminatus*	15	
5	Cheilininae		*Cheilinus sp.*		3
6	Diodontidae		*Diodon hystrix*		2
7	Hemulidae		*Scolopsis sp.*		2
8	Labridae	I	*Halichoeres sp.*		7
		I	*Labroides dimidiatus*		1
		I	*Thalassoma lunares*		3
9	Mullidae		*Mulloides sp.*		1
			Mulloides vanicolensis		2
			Parupeneus sp.		3
10	Pinguipedidae		Sandperches		2
11	Pomacentridae	I	*Dascyllus reticulatus*		2
		I	*Dascyllus sp.*	14	
		I	*Dascyllus trimaculatus*		11
		I	*Pomacentrus pavo*	10	115
12	Priacanthidae		Bigeyes		1
13	Scorpaenidae		*Pterois antennata*	3	
14	Serranidae	T	Serranid		2
			TOTAL NO. OF INDIV.	**45**	**169**

Table 4. Species diversity, dominance and evenness indices (July, 2001).

SPECIES	OKOY STATION			AMLAN STATION		
	SPECIES DIVERSITY (H')	DOMINANCE (L)	EVENNESS (J)	SPECIES DIVERSITY (H')	DOMINANCE (L)	EVENNESS (J)
SEAGRASSES/ SEAWEEDS	1.855	0.199	0.703	0.457	0.770	0.330
CORALS	1.002	0.225	0.723	1.561	0.333	0.970
OTHER INVERTS	1.250	0.232	0.777	0.000	1.000	0.000
FISH	2.056	0.249	0.917	2.118	0.469	0.557

coral reefs and seagrass beds (Table 3). Pomacentrus pavo was predominant constituting about 58% of the total fish count, followed by long-fin bannerfish, Heniochus acuminatus at 7%. In Okoy area, five fish species belonging to three families were recorded. Heniochus (15) was the most abundant, followed by Dascyllus (14)> Pomacentrus (10)> Pterois (3) and Chaetodon (3). The butterflyfishes, Chaetodon, are indicators of health reef. Unfortunately, this indicator species occurred in very low number (3). Few number of butterflyfish suggests a poor coral state. In contrast, Arnlan area has a total of 17 fish genera belonging to 13 families. Pomacentrus pavo has the highest density count (115), followed by Dascyllus trimaculatus (11)> Halichoeres (7)> Mulloides and Canthigaster (1). Health reef indicator species found was butterflyfishes (Chaetodon sp.) having a total count of 4 individuals only. The target species also known as commercially important species were Serranid and Naso species has very low individual count in Okoy and Amlan stations. Most of the fish species found in the two stations were juveniles. This is the result of the poor condition of coral reef and seagrass/seaweed habitats. The Occurrence of high population count of juveniles in the area indicates over fishing and over exploitation by coastal communities.

3.3 Diversity and Similarity Indices

Table 4 shows the diversity, dominance and evenness indices of the study areas for various marine groups. Okoy station has higher species diversity index (1.855) for seagrasses and seaweeds compared to Amlan station (0.457). High diversity in Okoy was due to even distribution of species. The low diversity index in Arnlan area was attributed to absence of seagrass species and dominance of seaweed

NO. OF SPECIES	OKOY			AMLAN		
	1980	1989	2001	1980	1989	2001
SEAGRASSES/SEAWEEDS	14	23	14	0	8	4
CORALS	2	0	4	0	6	5
OTHER FAUNA	39	22	4	0	8	1
TOTAL	55	45	21	0	22	10

species. The species diversity in Okoy for corals is 1.002 while in Amlan is 1.561. Low diversity in both stations was due to presence of only four coral species in Okoy and five species in Amlan. There were no domineering species observed in Okoy (0.225) and in Amlan (0.333), hence, high evenness index in both stations. The other invertebrates such as sponges, bryozoans, echinoderms, tunicates and feather stars registered low species diversity in Okoy (1.250) and zero (0.000) index in Amlan. Zero diversity index of the latter indicates dominance of only one species, the sponges, thriving in the area.

For the fishes, the high diversity index (2.058) in Okoy was the result of even distribution of individual species. Although there was more number of fish species observed in Amlan, species diversity index (2.118) was low due to high dominance of conspicuous damselfishes (Pomacentrus pavo).

Comparison of species richness of macrobenthic fauna in Okoy and Amlan are presented in Table 5. Only species richness of the 1983 PNOC-EDC Environmental Impact Assessment (EIA), 1989 Silliman University survey and 2001 PNOC-EDC survey were used, as the data on abundance were not comparable. Findings showed that the surveys in 1980, 1989 and 2001 had declining species richness in both stations (Figures 2 and 3). It was observed that there was shifting of dominant group for each station. In Okoy, the dominant group in 1980 was mollusks however in 1989 and 2001, the seaweeds and seagrasses replaced the mollusks as dominant group. Possible population decline could be due to Over collection as these are commercially important species. In Amlan, benthic species were totally absent in 1980 marine survey. However, in 1989 and 2001 surveys, the dominant group was seaweeds.

Differentiating the two stations using the Jaccard Similarity Index (Magurran, 1988), it showed that the degree of similarity between the two sites was very low (0.081). There were only ten

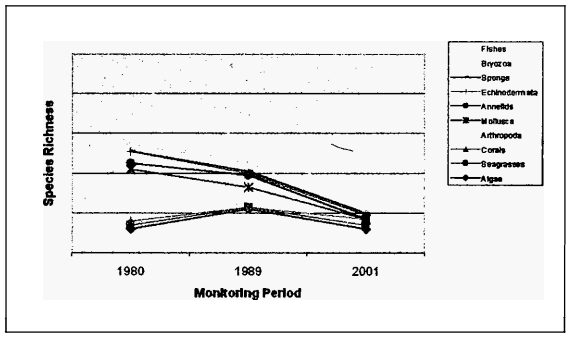

Figure 2. Trends of species richness (in terms of no. of species) of marine life in Sibulan during 1980, 1989 and 2001 surveys.

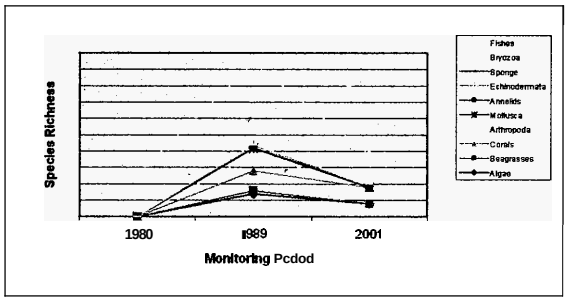

Figure 3. Trends of species richness (in terms of no. of species) of marine life in Amlan during 1980, 1989 and 2001 surveys.

species common to both sites composed of: 5 species of seaweeds (Dictyota sp., Halimeda macroloba, Lobophora variegata, Padina australis and P. japonica); 2 species of corals (Fungia sp. and Montipora sp.); 1 species of crustacean (Pagurus sp.) and 1 species of mollusk (Nerita sp.) (Table 6).

3.4 Threats to Marine Resources

One major factor affecting the declining trends of corals and seagrasses/seaweeds could be runoff. Runoff substantially increases the sediment load of water and the organism accumulates the silt, depressing the food-making characteristics of the plant thereby stressing them. High sediment load in both stations was evident as shown by its high TSS

	OKOY	AMLAN
TOTAL NO. OF SPECIES	109	24
SIMILAR NO. OF SPECIES	10	
JACCARD SIMILARITY INDEX (CJ)	0.081	

Table 7. Average water quality data at Tanon Strait (August, 1980).

		Stations								
PARAMETERS	UNITS	Mouth	1	2	3	4	5	6	7	8
Temperature	°C	27.76	28	28	28.5	28.66	28.5	28.5	28	28
TDS	ppm	2536.66	3256.66	42366	32500	31066	31400	33833	32733	30100
TSS	ppm	53.33	10	12.33	9	13	10	7	14.66	12
Turbidity	ppm	190	<25	<25	<25	<25	<25	<25	<25	<25
COD	ppm	4	34.66	35	36.33	44	49.66	40.66	54.33	34.5
Chloride	ppm	2052.33	1886.66	18933	19000	19033	19000	16500	18733	18850
Arsenic	ug/ml	0.07	0.02	0.02	0.02	<0.02	0.02	0.02	0.02	<0.02
Cadmium	ppb	19.33	0.08	0.733	0.4	0.2	0.4	0.533	0.133	0.5
Lead	ug/ml	0.226	0.9	0.9	0.766	0.833	0.966	0.8	0.9	0.866
Mercury	ppb	0	0	0	0	0	0	0	0	0

levels (average: 2,233 mg/L) in both areas during sampling (Table 2).

Movement of sediments in the area may also attribute to the reduction and eventually loss of coastal vegetation. The primary cause of the thinning of seagrass was the movement of sediment towards seagrass beds (Fortes, 1991). Small-scaled quarrying activities along Amlan river mouth observed during the 2001 survey are also another factor that wilt contribute to the movement of the sediments. Around ten people were actually observed collecting sand and stones along Amlan river mouth fronting the coastal water.

During the 2001 underwater survey, it was also observed in Amlan the presence of non-biodegradable wastes such as used tires, plastic bags, broken glasses, rotten twigs, cans and shoes in the sea bottom. Those wastes may have been carried out from upstream by river run-off or unlimited dumping by the local people.

During interviews with the fishers regarding the fishing practices in the area, they confessed that beside the conventional fishing methods, some of them practiced dynamite fishing, a major contribution to the destruction of marine habitats (Fortes, 1991).

Results of the water quality analyses showed that the geothermal operations upstream of Okoy river have no impact on the marine environment. The effect of poor reef condition and low fish assemblage of the sites is not related to geothermal operation of PNOC-EDC as supported by its low and within standards values of arsenic (Tables 2 and 7) and chromium (Table 2) values, which are elements indicating presence of geothermal discharge that could have emanated from the project to the river tributaries and finally to ocean basin. Hence, this shows the efficacy of the reinjection procedure of all discharges being implemented by PNOC-EDC.

4.0 CONCLUSION AND RECOMMENDATIONS

There were indications that the seagrass, coral and associated organisms in both study areas have deteriorated over the years. Major causes of the declining marine population could be due to low salinity level coupled with high sedimentation/siltation rate. Findings further showed that the sites were dominated by seagrass and seaweed. The coral cover was poor. Few numbers of butterfly fish observed in the two sites indicates poor coral state. The density and diversity of associating marine communities were low. The effect of over fishing

and over harvesting is obvious in the areas assessed.

Low cover of seagrass, seaweed and coral and low fish diversity of the sites are not related to geothermal operation of PNOC-EDC. The arsenic and chromium readings, which are elements indicative of geothermal discharge, are low and within the standards on DENR criteria for marine water classes. This finding suggests that the reinjection procedure of all discharges being implemented by the company is effective.

On the part of PNOC-EDC, efforts like institutionalization of regular field monitoring and evaluation of the monitoring scheme and environmental results are underway to establish firmly the hypothesis and come up with data trends. To further qualify the statement that PNOC-EDC's geothermal project do not affect the marine ecosystem, additional sampling stations will be established and the following data will be gathered periodically; 1) marine water quality; 2) human population growth and present activities of the area; and 3) additional parameters like current velocity, salinity, dissolved oxygen and transparency.

Finally, data showed that there would be a possibility of resources depletion if there were no regulations. It is recommended to protect *such* remaining resources before they would completely vanish. Concerned agency should conduct public awareness on the ecological and economic importance of coral reef and seagrass ecosystems. Application of most practical and proven means of rehabilitating degraded marine habitats should be intensified.

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