

Issues in Sustainable Development*

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Since 1960, the United Nations General Assembly has proclaimed four successive development decades with different development approaches to focus international action on policies and programs aimed at achieving progress particularly in developing countries.

On a parallel tract, the Philippines has experimented with a whole spectrum of development strategies under the same ruling economic paradigm from import substitution, to decontrol, to complete control and crony capitalism under martial law, to global competitiveness within the current Philippines 2000 strategy of the present administration.

The largest gathering of heads of state of the Earth Summit in Rio last June 1992 was a testimony to both the deficiencies of those past development approaches in eliminating poverty and protecting the environment, and the imperatives of newly recognized limits and parameters for ecological and social sustainability both as a framework and objective of development.

The climate, biodiversity, and forestry framework Conventions and Agenda 21 programs which the UNCED produced embody the normative insights of the global community as well as the resource limitations, and scientific and technological, as well as political difficulties of operationalizing the concept of sustainable development.

Concurrent with the ending of the Cold War and the preparations for the Earth Summit, the Green Forum network of nongovernment and peoples' organizations, and church-based groups have spearheaded advocacy for sustainable development as an alternative development paradigm. They have expanded the Brundtland Commissions' definition of sustainability in their founding framework document to include the values of social equity, cultural integrity and democracy; the need to internalize sustainability in terms of personal decisions on consumption and lifestyles; issues that are now the main concerns of preparations for yet another summit on Social Development to be held in March 1995 in Copenhagen.

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The issue of sustainable development encompasses issues in economics, ecology and social sciences. They interface along two emerging notions. First is the notion that sustainability includes the reality of limits of natural resources and the carrying capacity of our closed biospheric life-support system, the need for social equity and gender balance, the need for cultural diversity and ecological as well as spiritual solidarity as necessary for co-creation and evolution, the need for the preservation of the integrity of cultural units, and the need to foster social cohesion. The second is the notion of development as different from growth—much like cancerous growth is not considered development; that development is not something that government or NGOs can give to people but is a process which they undergo themselves and which therefore needs to be participatory, self-determined and geared toward self-reliance.

What follows is a summary of the nature of what the writer believes are the current critical issues and initiatives in the major interrelated areas of economics, ecology, and the social aspects of sustainable development.

ECONOMICS

The dominant economic paradigm that underpins the current Philippines 2000 Medium Term Development Plan is the neo-classical laissez-faire economics which in the past has failed to address three critical issues in its reliance on market mechanisms.

One is the issue of internalizing the full costs of a product of service such as the cost of loss of soil- and water-holding capacity, not to mention landslides caused by the logging industry so we do not get the right "price" for our natural resources. Much less is the cost of what is called "threshold scarcity" or systems collapse, meaning the cost of a non-renewable resource that is about to be depleted reflected in this system. Efforts like the Environment and Natural Resources Accounting Project of the DENR with the Assistance of USAID through the International Resources Group, is meant to address this deficiency.

The other is the issue of scale. As articulated by an increasing number of advocates of what is called Ecological Economics, there is a limit to the scale of economic activity that the closed biospheric system can sustain in terms of natural resources including primary energy from the sun, and as sink for the absorption of our waste and pollution.

The third is the issue of social inequity and social disintegration. As the trend toward the globalization of markets, capital and technology which the Philippines 2000 strategy for export priority and global competitiveness addresses

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itself unfolds, an effect is the marginalization and exclusion of communities and social groups that are not market players in this process.

ECOLOGY

Ecosystem management is the foundation of sustainability especially in fragile island ecosystems like the Philippines. We have not yet learned to make ecosystem security and development as concurrent goals of our economic plans. The issue of "carrying capacity" is still in the infant stage in terms of the search for measurements and indicators. The input of Haribon Foundation in the current Philippine Human Development Index report (UNDP 1994 Annex 1) on status indicators for our different ecosystems is one of the efforts in this regard.

Bio-resource management, on the other hand, is the major source of development for countries like the Philippines. It provides basic food, medicine and energy, and life information for future development. Without sufficient capital and technology, the information about our rich forest and marine ecosystem biodiversity is the only "futureable" resource besides our human capital that we can count on. This is not a meager resource if we consider information and knowledge to be the main resources of the future.

Natural Resource Management

The issue in natural resource management is one of a planning mono-vision and a time horizon tied to short-term profit maximization and political cycles. This views forests, for instance, merely as warehouses for timber, and coral reefs, as places for maximizing short-term fish catch. Foreign-assisted programs like the USAID-NRMP program are more in aid of open markets and trade than resources conservation and ecological security.

The issues in biodiversity, while recently articulated in the dialogues and debates around the drafting of the Biodiversity Convention, are still sidelined in mainstream development planning and are often relegated to the environment sector.

The issue of conservation of biodiversity in the Philippines is tied up with the establishment of a National Integrated Protected Area System (NIPAS) as legislated by Republic Act 7586 and the issue of the rights of indigenous people to their ancestral domain, as has been affirmed by our constitution. On the development side is the issue of lack of local research and training infrastructure for both the inventory and utilization aspects of this resource and the critical absence of trained technologists in the various disciplines necessary.

There is a lot of foreign interest in biodiversity research in the Philippines especially since we have been identified as one of the ten "hot spots" in the world, which possesses significant wealth in biodiversity and is in the most danger of losing it.

Financially, the Philippines stands to benefit from two financial mechanisms: the establishment of the Fund for Philippine Environment (FPE) of \$25 million; through a US Congress appropriation and the recent \$20 million grant by the Global Environment Fund (GEF) to the Philippines for the establishment of 10 priority sites for protection research in biodiversity.

A recent "NGO-PO Working Conference on Biological Conservation in the Philippines" (11-12 Feb. 1994 Ateneo de Manila) sponsored by the NGO counterpart of the Philippine Council for Sustainable Development (PCSD) identified the following needs: 1. knowing what we have; to have inventories by Filipino institutions, local museums as collection centers and mediums for education, fellowship/training for future taxonomists, para taxonomists, biodiversity technologists; 2. setting and enforcing the policies to safeguard the rights of indigenous peoples, local communities and national patrimony with regards to products of biodiversity site research and development; 3. instituting a protocol for research and equitable and sustainable commercialization of biological resources; and 4. defining the ethical and spiritual dimensions of biotechnology.

The reduction of tropical forests and the decline and depletion of fisheries and wildlife are two significant environmental concerns in our country. Aside from the economic benefits that can be derived from these resources, both forests and marine areas are well-known for the vital ecological roles they play, like for stabilizing watersheds, effectively storing water, and maintaining acceptable levels of the atmosphere's oxygen. In addition, our forest ecosystem harbors most of the animal and plant species existing in the country.

In recent years, species diversity has decreased almost as rapidly as the growth of human population. Never before in the history of life have so many species been threatened with extinction in so short a period of time. This situation has been brought about by independent factors such as acid rain, logging and overhunting. Combined together, the impact is disastrous.

People are realizing that what is bad for biological diversity will almost certainly be bad for the human population since humans are dependent on the natural environment for raw materials, food, medicines, water, and other goods and services. Conservation efforts are being undertaken to save what is left of most of our natural habitats and resources. The immediate and effective implementation of NIPAS in the country is one concrete initiative in this area.

A new, multi-disciplinary science has to be applied to deal with the crisis confronting biological diversity, which will help develop and align conservation priorities and human needs. Existing disciplines such as agriculture, forestry, wildlife management and fisheries have been primarily concerned with developing methods to manage a small range of species for the market economy. These disciplines generally have not addressed the protection of the full range of species found in biological communities or have regarded it as a secondary issue. A synthesis of many basic sciences that provide principles and new approaches for the applied fields of resource management is a challenge for today's educators.

Also, it is hoped that the experience gained in the field, in turn, will influence the direction of the basic sciences.

The New Biology is fast becoming the new scientific frontier. More specifically, this includes biotechnologies that use novel biological methods such as recombinant deoxyribonucleic acid cell fusion especially for monoclonal antibodies, and new bioprocesses for commercialization. It is often referred to as a historical development akin to the Industrial Revolution. It certainly promises to impact on plant breeding, agricultural services and the structure of agriculture itself. These, and the more radical goals of the Human Genome project, are raising deep issues of ethics and morality while rich countries like Japan have declared it a strategic industry and a national priority by funding research in the four areas of biotechnology: gene-splicing, large-scale cultivation of cells, bio-reactors or microbes that change one chemical into another; and bioelectronics. Our own STAND does not mention biotechnology at all.

Cropland Ecosystem Management

An ecological perspective is essential in planning for sustainable productivity of our agricultural areas. Current pressure for converting prime agricultural lands to industrial and residential sites, the effects of a chemical-based agriculture, and the damage brought about by increasing effects of deforestation such as drought, flood, and soil erosion are taking their toll.

For the past decade, the Philippines has experienced agricultural "progress" at the price of substantial increases in the use of fertilizers and pesticides, greater dependence on engineered plant and animal varieties, more intensive use of land by multiple cropping and a shift toward monoculture. Food production has increased but future natural carrying capacity has decreased. Initiatives such as those of the NGO/PO coalition for Sustainable Agriculture and farmers' initiatives such as the MASIPAG cooperative are at the forefront of the advocacy against hazardous pesticides; and for Integrated Pest Management (IPM), and recovery of indigenous rice varieties not needing chemical fertilizers. The financial viability of their efforts are beginning to look promising.

Agricultural lands which are vital to food security and other regional developments for the rural populace have been increasingly threatened by the growing demand of major cities for water supply and energy. Even less concern is given to maintaining gene pools and ecological processes such as in watershed areas and wildlife habitats as the decline of natural lands in rural areas continues.

Urban Ecosystem Management

The mining of natural resources and siphoning of savings from the countryside has caused the increasing migration of the poor to urban areas following the concentration of wealth. It is the same process that draws Filipinos to seek em-

ployment in foreign countries where there is greater concentration of wealth. The inevitable trend is toward a demographic shift to greater population in urban areas by the year 2000 and the proportionate increase in squatter population.

The basic issues are the inadequate environmental and service infrastructures for health, sanitation, and housing. It goes beyond the planning for more housing and resettlement units. While proper human settlements planning and implementation requires huge investments in existing urban centers, it is the price that has to be paid. For at the core of the problem is the spatial concentration of social inequity as we concentrate wealth and development in urban centers. Specific issues to be addressed are housing for the poor, water and power services, waste management, air pollution control, traffic management, and mass transport and communication services.

Concrete initiatives responding to these problems have been carried out by both government and the private sectors.

For instance, the Department of Environment and Natural Resources (DENR), through its Industrial Environmental Management Program (IEMP), has waged a successful waste minimization campaign in industry with the introduction of Pollution Management Appraisal (PMA) services for industries. Several successful cases of waste minimization have been documented.

LUDESCO, a desiccated coconut-producing facility which had generated wastes such as coconut shells, parings, sprouts, rejected coconut meat, spilled desiccated coconut, boiler furnace ash, coconut water and a large volume of wastewater, was able to generate P4 million worth of savings in raw materials and energy use by minimizing waste. It succeeded in doing this by recovering more raw materials from spillage of coconut and desiccated coconut sweepings, installing a pressure-reducing valve in their dryers, and by producing in-house soap from coconut oil by-products.

POLYTECH, a family-owned and managed corporation producing kerosene-cooking stoves and ironing boards, has saved P3,000 monthly from the installation of a spray booth ventilation system, a proposal made as a result of the PMA conducted on its systems. In addition, pollution load and waste was minimized after the establishment of a more systematic workflow at its electroplating plant. This resulted in a P10,000 monthly savings in chemicals and considerable reduction in pollution load.

The Central Azucarera de Don Pedro (CADP) reduced its water use and wastewater generation after a PMA was conducted on its mill and it adopted low cost/no cost waste minimization options such as waste segregation to dry handling of fly ash; recycling bagasse to absorb grease and oil spills; recycling clarified water from ash setting pond and condensate tank overflow for cleaning purposes; good house-keeping practices such as monitoring oil spills, repairing leaking pumps; removing debris from canals; or simply closing faucets immediately after use.

The Puyat-National Pig Development Company (PNPDC) reduced feed spoilage by setting up single space feeders for hogs recommended by the IEMP after a PMA was conducted on the company's operations. Feed spills were also reduced with the introduction of such units. PNPDC has also made a conscious effort to minimize water consumption and reduce wastewater generation.

The government and the private sectors are currently working together in waging a massive information-dissemination campaign to further promote waste minimization and recycling as an alternative to traditional solid-waste management methods such as landfills and incineration.

An Inter-Agency on Toxic Wastes, wherein NGOs have been given a single seat, has also been established to deal with the implementation of the Basel Convention on Transboundary Movements of Hazardous Waste (to which the Philippines is a signatory). A major breakthrough by this inter-agency body is the very recent establishment of interim guidelines for a ban on toxic wastes. These guidelines, which establish qualifiers for the ban, are quite important, as they pave the way for the phase-out period toward a complete ban in 1997.

The Basel Convention, which met last March in Geneva, had agreed on the following points:

- a. the conduct of an assessment of all recycling industries and facilities in the Philippines;
- b. the recommendation of a Code of Recycling for consideration in the Implementing Rules and Regulations of the Toxic Substances and Hazardous and Nuclear Waste Control Act or RA 6969; and
- c. the development of clean and indigenous production technologies.

Atmospheric and Climate Changes

As a result of the growing trends in globalization, policymakers, scientists, and technologists, as well as the public, have come to be aware of "global environmental concerns" such as ozone depletion, background air pollution, and rainfall acidity. Primary causes of such phenomena are the release of industrial pollutants and greenhouse gases such as carbon dioxide, methane, nitrous oxide and bromine (DOST 1990).

Moreover, with the accumulation of greenhouse gases, chlorofluorocarbons and other trace gases in the atmosphere and the oceans, a shift in climate zones has been noted and viewed with apprehension worldwide. In the Philippines alone, a three-degree rise in daytime temperature had been noted in the 1980s.

The popularization of issues in climate change have been undertaken by a Philippine Core Group on Climate Change composed of the Haribon Foundation, Green Forum Philippines, Miriam-PEACE and the Green Coalition, which was established in October 1991. An offshoot of the Jakarta meeting of South East Asian NGOs, the Core Group has succeeded in bringing the issue to the public's consciousness through the publication of materials, organization of lectures, and various campaigns.

SCIENCE AND TECHNOLOGY

Agenda 21's program on science and sustainable development, as embodied in Chapter 35 and the Philippine program (see Annex) focuses on four areas: a) strengthening scientific basis for management; b) enhancing scientific understanding; c) improving long term scientific assessment; and d) building up scientific capacity and capability.

In this light, the Environment Management Bureau of the Department of Environment and Natural Resources (EMB-DENR) has identified key areas of compliance by the Philippines.

In strengthening the scientific basis for sustainable management, the Philippines has undertaken the following activities:

- a. Prepared an inventory of the country's natural and social data availability relevant to the promotion of sustainable development.
- b. Formulated a methodology for research needs and priorities in the context of national priorities.
- c. Strengthened and revitalized the Environmental Research and Development Committee of the Department of Science and Technology.
- d. Developed, applied, and instituted the necessary tools for sustainable development.
- e. Conducted case studies to determine quality of life indicators (i.e. health, education, social welfare, state of the environment, economy).
- f. Conducted policy research on new and improved incentive structures for better resource management.
- g. Formulated policies on risk management and environmentally-sound technology assessment.
- h. Supported the Sustainable Development Network.
- i. Incorporated sustainable development principles in human resource development programs.

In the endeavor to enhance scientific understanding, the Philippines has:

- a. Established an Ad-Interim Committee on Ozone Depleting Substances (initiated by Likha and DENR) which monitors the status of proposals on Ozone Depleting Substances.
- b. Established ozone layer monitoring programs (PAG-ASA).
- c. Improved natural resources management and environmental monitoring. In particular, the use of European Space Authority (ESA) ERS-1 capabilities in ASEAN Countries (PAG-ASA, UP, NAMRIA).
- d. Participated in the Philippine-Australia Remote Sensing Project (PAGASA, UP, NAMRIA).
- e. Produced bio-gas from wastes.

- f. Developed biodegradable products.
- g. Promoted waste reduction and recycling.
- h. Developed Anti-Pollution Control Technologies for Urban and Rural Areas through UNDP.

The Philippines has attempted to build up scientific capacity and capability by:

- a. Developing hazardous waste management technology in research and educational institutions.
- b. Establishing the Engineering Science and Educational Programme (ESEP).
- c. Providing technological information services c/o Science and Technology libraries within the Department of Science and Technology.

In general, the complexity and intensity of current environmental issues and concerns besetting mankind definitely call for the development of a new science that is multi-disciplinary, integrative and innovative in looking at the environment.

In view of these particular issues, certain concerns with regard to capability-building for environmental science and management have also been pinpointed by the Environment Management Bureau of the Department of Environment and Natural Resources (EMB-DENR 1992). These are: the need to institutionalize or strengthen degree programs on environmental science and management on the basis of projected demand for such degree courses; the provision of adequate scholarships/fellowships on environmental science and management; and the need to upgrade the technical skills of environmental science specialists through training, research and more field exposure to gain firsthand experience in environmental conservation and management-related work.

The Philippines' Science and Technology Master Plan (STMP) defines its goal as NIChood by the year 2000 through three major strategies: modernization of production sectors through massive technology transfer from local and foreign sources; upgrading of research and development capability; and development of Science and Technology infrastructure and culture.

The strategy sounds more like an expression of desperate need than a doable strategy. The management of technological change is a complex political, economic, and social process. It requires multi-stakeholder partnership that can identify key science and technology "missions" related to solving key development problems and opening up new development options. It is not a question of massive transfer of technologies that is the issue, but the strengthening, across the whole of society, the capacity to manage technological change.

The updated focus of the STMP or the Science and Technology Agenda for National Development (STAND) focuses priority on seven key products and services it calls "export winners". It lacks the creation of objectives and strategies

for application of science and technology to specific development challenges which would be the basis of decisions on allocation of national resources and negotiation with external partners. The issue is not about products alone but about development processes – about well-defined technology development missions. Missions that define the linkages between policymaking, central and local administration, education, and investment decision-making. If the priority is raising the income and outputs, of the poor in rural areas then the educational system must produce graduates able to disseminate more productive technologies in development of bio-resources and insuring ecological security. A multi-disciplinary mission-oriented versus a product-oriented approach will constitute a powerful tool for changing patterns of science and technology efforts. A process of national dialogue identifying and prioritizing a list of missions in major areas of development would bring clarity and purpose to the national development agenda.

SOCIAL

As effects of environmental degradation became more evident and dramatic, the victims have become environmentalists. We see their protest in the barricading of logging roads in Bukidnon, in the "Dyandi" blood pact of the Lumands against the geothermal project in Mt. Apo, in the demonstrations of communities in Masinloc and Batangas against the construction of coal-powered plants, and in the objections of some communities in Baguio against the Taiwanese project in Camp John Hay. This has made the issues of "social acceptability" of projects and the creation of ecological refugees as critical problems of the Philippines 2000 program. All these contribute to the imperative for consultations and criteria for "social acceptability" of traditional development projects. On an international level, we see the same concern in the issue of social integration as a theme of the coming Social Development Summit. The UN Commission for this Summit defines Social Development as "an approach which aims to enhance people's capacity to lead secure and productive lives and provide them the necessary conditions for full participation in society."

These developments are of vital importance especially considering the failed socialist experiment of Eastern Europe and the shift to market economies. The ideals of social justice, equity and solidarity are still aspirations of many people. Therefore, social development and social cohesion must be considered as the primary objectives of development projects and not as problems to be hurdled or as hindrances to development. The definition and articulation of a state social policy is essential for sustainable development.

A relevant state social policy should go beyond social welfare programs or "safety nets" to cushion one's fall into destitution. It should be the basis of social acceptability for development projects. Such a policy should be based on the protection of basic human rights including the rights to development and a healthy environment and rights of future generations, all of which are the subjects of

international agreements and covenants. It should provide for informed participation of affected communities, just compensation prior to project implementation, the undertaking of studies of alternatives by the proponent or appropriate government agency, and assistance to disadvantaged and marginalized groups.

Values, Norms and Civil Society

The requirements for a sustainable society depend more and more on the normative integration of values in economics, ecology, and social sciences. The personal decisions of individual citizens on what they will consume and waste, as well as the lifestyles they will pursue, is the bottom line of sustainable development. In responding to this situation, we are seeing the re-legitimization of civil society through voluntary organizations like NGOs that are self-organizing and self-mandating, focusing on personal behavior and public interest. They are providing the normative articulation and alternative building to the power-crafting of political society and the wealth-crafting of the economic society.

Institutionally, a pioneering initiative in partnership or counterparting between the state and civil society is taking place in the Philippines through the creation of the Philippine Council for Sustainable Development through Executive Order 15 signed by President Ramos, as a result of NGO and PO advocacy after the Earth Summit at Rio. Its mandate is to insure compliance with the Philippine government's commitment to the Conventions and Agenda 21, as well as with the operationalization of sustainable development into government and NGO policies and programs.

The Politics of Sustainable Development

The biggest obstacle to the shift to sustainable development is what people normally refer to as a "lack of political will". Actually there is strong political will in favor of vested interest of people in power and possessing wealth. Whether it is the vested interest of congressmen in continuing logging of our forests or the interest of OECD countries in global environmental issues that affect them but not in poverty and development or social equity issues in global commons, people who are currently benefitting from the state of affairs are the main obstacles to change. It is a state of affairs where the main medium by values is money and power, with science and technology as its surrogate.

It is, however, the stage of our evolving consciousness where we are aware that personal behavior in what we consume and what we waste, what we throw away affects our whole community and is therefore public interest. Where what is personal is political. A reclaiming of our exiled self, our psycho-cultural identity from which we can tap our inner resources from our inner ecologies. From where we can tap our rich cultural and spiritual resources; the nature base wisdom of our indigenous peoples, the Buddhist mastery of the functioning of the mind, the

Hindu knowledge of our psychic states, our Christian and Islamic traditions of Covenants for a sacred community whether we call it the Mystical Body or the Ohuma. Resources we need to transform ourselves and our work into meaning making livelihood and our politics into a politics of meaning.

Last June 5, the Green Forum together with Channel 5, convened the leaders of our political blocs representing the entire spectrum from left to right in a two-hour TV Town Hall Meeting with a challenge to make a common commitment to the ecological security of the Philippines. They all signed a covenant to do so. Only time will tell if our leaders have the vision of the welfare of "seven generations" when they make their political decisions or see just the opportunity to develop voter constituency for the next election.

In conclusion, all the above argue for the construction of a Science of Development that can provide normative and functional integration of Economics, Ecology and the Social Sciences and the development of management technologies that look at ecosystems, cultures, ethnicities, community and evolution as units of analysis and management. It suggests the view that sustainable development should be the next revolutionary praxis for a sustainable society for the year 2000 and beyond.

REFERENCES

Agenda 21, Chapter 35.

Busch Lawrence, et al. *"Plans, Power and Profit."*

Department of Science and Technology. *"Science and Technology Master Plan."*

Department of Science and Technology. *"Science and Technology Agenda for National Development."*

Department of Science and Technology. *"5 Year Environmental Research and Development Plan."*

Haribon Foundation. *"State of the Environment, Chapter 4."*

Green Forum-Philippines. *"Creating Our Common Future."*

Organization for Economic Cooperation and Development. *"Managing Technological Change in Less-Advanced Developing Countries."*

PCS, HARIBON, FPE. *"NGO-PO Conference Workshop on Conserving and Managing Philippine Biodiversity for Sustainable Development."*

Celdran, A. *"Toxic Waste Trade in the Philippines."*

Fernandez, W.L. *"Microbes and the Environment."*

Industrial Environmental Management Project (IEMP). *"Success Stories."*

Environment Management Bureau-Department of Environment and Natural Resources (EMB-DENR). *"Industry Environews."*

Table 1
Forest, Uplands, Mountain Ecosystem

Function	Service	Status Indicators	Impact on People
1. Providing a habitat for various species and maintaining diversity of life (habitat complexity)	<ul style="list-style-type: none"> sustenance through nutrient cycle gene bank life cycle link 	<ul style="list-style-type: none"> remaining primary forests inventory of indicator species number of species 	<ul style="list-style-type: none"> foregone potential for health, food and other products displacement of indigenous communities loss of subsistence or livelihood
2. Maintaining productivity of the forests	<ul style="list-style-type: none"> materials for food, clothing, and shelter, medicine, fuel, and other products raw materials for industrial uses, e.g. timber, gums, resins, oils, poles, pitprops, paper, pulp wood, dyes 	<ul style="list-style-type: none"> levels of supply forest area by type inventory of timber and other forest resources rate of decline of species stock seedling survival area reforested 	<ul style="list-style-type: none"> reduced potential for health, food and other products reduced supply and higher prices for products
3. Soil Stability	<ul style="list-style-type: none"> prevention of or minimization of soil erosion maintenance of soil fertility control of run-off 	<ul style="list-style-type: none"> soil erosion rate understory regeneration 	<ul style="list-style-type: none"> loss of production lands landslides threats to life and property
4. Water conservation	<ul style="list-style-type: none"> adequate and clean water for drinking, irrigation, washing, recreation and others watershed 	<ul style="list-style-type: none"> water quality stream flow and ground water level humidity 	<ul style="list-style-type: none"> scarcity of potable water, changing water classification floods and drought
5. Atmospheric integrity	<ul style="list-style-type: none"> carbon-dioxide absorption oxygen production clean air climate regulation 	<ul style="list-style-type: none"> air pollution indicators climate change 	<ul style="list-style-type: none"> pulmonary diseases change in sea-level desertification temperature change

Table 2
Freshwater ecosystem

Function	Service	Status Indicators	Impact on People
1. Habitat complexity	fisheries and food biodiversity	fish supply level and reproduction biological displacement, change in species composition or disruption of migration	pollution-related diseases flooding
2. Water distribution	water supply, irrigation, power generation conveyance	salt-water intrusion water building water availability or volume water quality	relocation of individuals and families reduced water supply drought power outages fish kills poor state of public health and safety

Table 3
Croplands Ecosystem

Function	Service	Status Indicators	Impact on People
1. Soil fertility	nutrient recycling crop production	level of crop production biomagnification	price levels and fluctuations low incomes
2. Habitat complexity	biological pest control providing sustenance and livelihood	number of strains and species resistant to pesticides	pesticide-related diseases infestation

Table 4
Marine and Coastal Ecosystems
(Wetlands, mangroves, seagrass, seaweeds, coral reefs, soft bottom)

Function	Service	Status Indicators	Impact on People
1. Coastline stability	<ul style="list-style-type: none"> sedimentation trap wind- and wave-breaker fuel wood supply 	<ul style="list-style-type: none"> mangrove forest cover seagrass areas coral area 	<ul style="list-style-type: none"> threats to life and property in coastal communities
2. Marine productivity	<ul style="list-style-type: none"> indigenous and commercial uses 	<ul style="list-style-type: none"> fish yield 	<ul style="list-style-type: none"> low productivity and incomes poorer health and nutrition among communities
3. Atmospheric integrity	<ul style="list-style-type: none"> carbon sink 	<ul style="list-style-type: none"> marine pollution levels 	<ul style="list-style-type: none"> diseases and poisoning (e.g. red tide) fish kills
4. Habitat provision and biological diversity	<ul style="list-style-type: none"> sustenance and livelihood gene bank life-cycle sink 	<ul style="list-style-type: none"> lower yields species diversity 	<ul style="list-style-type: none"> lower productivity and incomes poorer health and reduced potential for pharmaceutical, food, and other consumption or industrial products

UNCED Programme Areas

A. Strengthening the scientific basis for sustainable management

UNCED Activities

- a) Prepare an inventory of their natural and social science data holdings relevant to the promotion of sustainable development
- b) Identify their research needs and priorities in the context of international research efforts
- c) Strengthen and design appropriate institutional mechanisms at the highest appropriate local, national, subregional and regional levels and within the United Nations system for developing a stronger scientific basis for the improvement of environmental and development policy formulation consistent with long-term goals of sustainable development
- d) Develop, apply and institute the necessary tools for sustainable development with regard to:
 - i) Quality-of-life indicators covering, for example, health, education, social welfare, state of the environment, and the economy;
 - ii) Economic approaches to environmentally-sound development and new and improved incentive structures for better resource management; formulation, risk management and environmentally-sound technology assessment

Philippine Activities

- Prepare an inventory of the country's natural and social data relevant to the promotion of sustainable development
- Formulate a methodology for research and priorities in the context of national priorities
- Strengthening and revitalizing of the Environmental Research and Development Committee of the Department of Science and Technology
- Develop, apply and institute necessary tools for sustainable development
- Conduct case studies to determine quality of life indicators (i.e., health, education, social welfare, state of the environment, economy);
- Conduct policy research on new and improved incentive structures for better resource management
Formulate policies related to risk management and environmentally-sound technology assessment

UNCED Programme Areas

UNCED Activities

- e) Collect, analyze and integrate data on the linkages between state of ecosystems and the health of humans in order to improve knowledge of the cost and benefit of different development policies and strategies in relation to health and the environment, particularly in developing countries
- f) Conduct scientific studies of national and regional pathways for sustainable development, using comparable and complementary methodologies
- g) Improve capabilities for determining scientific research priorities at the national, regional, and global levels to meet the needs of sustainable development
- h) Develop methods to link the findings of the established sciences with the indigenous knowledge of different cultures

Philippine Activities

- Conduct research
- Support Sustainable Development Network
- Incorporate in Human Resource Development programs, sustainable development
- Technology Transfer
- Ad-Interim Committee on Ozone-Depleting Substances (initiated by Likha and DENR) whose function is to monitor proposals on Ozone Depleting Substances

B. Enhancing Scientific Understanding

- a) Support development of an expanded monitoring network to describe cycles (i.e., global, biochemical and hydrological cycles) and test by hypotheses regarding their behavior and improve research into the interaction among the various global cycles and the consequences at national, subregional, regional and global levels as guides to tolerance and vulnerability

UNCED Programme Areas

UNCED Activities

- b) Support national, subregional and international observation and research programs in global atmospheric chemistry the sources and sites of greenhouse gases' accessible and understandable forms
- c) Support national, subregional, regional and international observation and research programs on marine and terrestrial systems, strengthen global terrestrial databases of their components, expand corresponding systems for monitoring their changing states and enhance predictive modelling of the Earth system and its subsystems, including modelling of the functioning of these systems assuming different intensities of human impact
- d) Encourage coordination of satellite missions, the networks, systems and procedures for processing and disseminating their data and develop the interface with the research users of Earth observation data with the UN EARTHWATCH system
- e) Develop the capacity for predicting the responses of terrestrial, fresh water, coastal, and marine ecosystems and biodiversity to short- and long-term perturbations of the environment, and develop further restoration ecology

Philippine Activities

- Ozone layer monitoring program (c/o PAGASA)
- Improvement of Natural Resources Management and Environmental monitoring , particularly, the use of European Space Authority (ESA)ERS-1 capabilities in ASEAN countries (PAGASA, UP, NAMRIA)

UNCED Programme Areas

UNCED Activities

- f) Study the role of biodiversity and the loss of species in the functioning of ecosystems and the global life-support systems
- g) Initiate a global observing system of parameters for the rational management of coastal and mountain zones, and significantly expand freshwater quantity/quality monitoring systems particularly in developing countries
- h) In order to understand the Earth as a system, develop Earth observation systems from space which will provide integrated continuous and long-term measurements of the interactions of the atmosphere, hydrosphere and lithosphere, and develop a distribution system for data which will facilitate the utilization of data obtained through observation
- i) Develop and apply systems and technology that automatically collect, record, and transmit data and information to data and analysis centres, in order to monitor marine, terrestrial and atmospheric processes to provide advance warning of natural resources

Philippine Activities

UNCED Programme Areas

C. Improving Long-Term Scientific Assessment

UNCED Activities

- a) Coordinate existing data and statistics, gathering systems relevant to developmental and environmental issues so as to support preparation of long-term scientific assessment (e.g., data on resource depletion, import/export flows, energy use, health impacts, demographic trends, etc.). apply the data obtained through the activities identified in programme area B (environment/development assessments at global, regional and local levels); and promote the wide distribution of the assessments in form that is responsible to public needs and can be widely understood
- b) Develop a methodology to carry out national and regional audits and a five-year global audit on an integrated basis

D. Building Up Scientific Capacity and Capabilities

- a) Promote the education and training of scientists not only in their disciplines but also in their ability to identify, manage and incorporate environmental considerations into research and development projects; ensure that a sound base in natural systems, ecology and resource management is provided; and develop specialists capable of working in inter-disciplinary programs related to environment and development, including the field of applied social sciences

Philippine Activities

- Hazardous waste management of research and educational institutions' wastes
- Engineering Science and Education Program (WB)

UNCED Programme Areas

UNCED Activities

- b) Strengthen the scientific structure in schools, universities and research institutions, particularly those in developing countries providing adequate scientific equipment and access to current scientific literature, for the purpose of achieving and sustaining a critical mass of highly-qualified scientists in these countries
- c) Develop and expand national scientific and technological databases, processing data in unified formats and systems, and allowing full and open access to the depository libraries of regional scientific and technological networks; and promote submission of scientific and technological information and databases to global or regional data centers and network systems
- d) Develop and expand regional and global scientific and technological information networks which are based on and linked to national scientific and technological databases; collect, process disseminate information from regional and global scientific programs; and expand activities to reduce information barriers due to language differences

Philippine Activities

- Engineering Science and Educational Program (ESEP) Institutional Building, Supply Scientific Equipment and Library
- Techno Information services c/o STIL (networking of Science and Technology libraries within the Department of Science and Technology)

UNCED Programme Areas

UNCED Activities

Philippine Activities

- e) Develop, strengthen and forge new partnerships among national, regional and global capacities to promote the full and open exchange of scientific and technological data and information, and to facilitate technical assistance related to environmentally-sound and sustainable development
- f) Improve and develop new links between existing networks of natural and social scientists and universities at the international level in order to strengthen national capabilities in the formulation of policy options in the field of environment and development
- g) Compile, analyze and publish information on indigenous environmental and developmental knowledge, and assist the communities that possess such knowledge to benefit from them

Rapporteur's Report

"Issues on Environmental Science and Sustainable Development"¹

Speaker : Mr. Maximo T. Kalaw, Jr.
Panelists : Ms. Jessica Soho
Moderator : Academician Edgardo D. Gomez
Rapporteur: Academician Filomena F. Campos

SUMMARY

The paper presented delved on the issue of sustainable development discussed from the economic, ecological and socio-cultural perspectives. Two notions that are closely intertwined are the limits of the natural resources: the carrying capacity of the closed biospheric life-support system and the need for social equity, gender balance, and cultural diversity. The underpinnings for cultural diversity and evolution and the preservation of the integrity of cultural units to foster social unity were presented.

The other notion is that development is not growth and that it is a process which all those involved should undergo; hence it should be participatory, self-determined and geared toward self-reliance. Several case studies and real life situations have been expounded to bring out the message that there is an urgent need to formulate a state social policy geared toward the reduction of poverty and the promotion of gainful employment.

PANEL REACTIONS:

A DR. BAGADION, DENR

1. DENR does not consider sustainable development as just an alternative paradigm but rather that it is the key to survival.
2. He concurs with the speaker's point of view that in order to truly realize sustainable development, it should be grounded on the economic, socio-cultural and spiritual basis. In order to concretize this effort, the government should urgently formulate a state social policy.

¹Delivered during the 16th Annual Scientific Meeting of the National Academy of Science and Technology, July 14, 1994, PICC, Manila, Philippines

3. DENR has not been remiss in its mandate to protect the forest ecosystems and the effort is amplified through institutionalizing community-based forest management systems coupled with vigilant monitoring and "policing" activities.

4. DENR is thankful for the involvement of the NGO's as partners in saving the terrestrial, forest and marine ecosystems and the many national, regional and international agencies which have extended financial assistance in support of research and related activities. He cautioned however that development should not just be a displacement or dislocation of a large sector of society from a purely environmental perspective.

5. There is a need to develop appropriate indigenous technologies which are attuned to the socio-economic background of the beneficiaries which will eventually lead to easier transfer and adoption of technology.

B. MS. JESSICA SOHO, Newscaster, Channel 7

1. The paper of the speaker was written in a rather technical manner which if presented to the common mass would not be comprehended and will not elicit any positive reaction or acceptance.

2. Suggestion was offered that environmental messages should be written in "gut-lingo" and the use of catchy colloquial vocabulary should be considered.

3. Wholistic approach to environmental concerns rather than in a "patchy" manner. Sincerity and full commitment should be inculcated through value system, through formal or nonformal education, and/or through massive media services.

4. Need to develop practical, low-cost solutions for the sustenance of environmental resources.

5. Need to improve on a truly, effective political will to address primarily the issue on poverty and social inequity.