THE INDIAN SOCIETY FOR ECOLOGICAL ECONOMICS

Outgoing Secretary's Report for the Years (2004-2006)

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1. Fourth Biennial Conference

(i) The Indian Society for Ecological Economics (INSEE) organised Pre-Conference Workshop on **"Ecosystem Services in Coastal and Marine Systems"** held on June 2, 2005 at Indira Gandhi Institute of Development Research, Mumbai.

- Resource Persons 10
- Participants 14

(ii) The Indian Society for Ecological Economics (INSEE) organised 4th Biennial Conference on **"Ecology and Human Well Being"** held on June 3-4, 2005 in collaboration with Indira Gandhi Institute of Development Research, Mumbai.

- Resource Persons 32
- Papers Contributors 43
- Participants 17

The detailed report of the Conference is enclosed (see Annexure – I)

2. National Symposium

National Symposium on **"Conservation and Valuation of Marine Biodiversity**" held on December 26-29, 2005 organized by Zoological Survey of India – Marine Biological Station, Chennai with the support of the Indian Society for Ecological Economics (INSEE). It was greatly appreciated by the nearly 100 participants of the Conference.

The details of the National Symposium is enclosed (see Annexure –II)

3. INSEE Newsletter

The Indian Society For Ecological Economics (INSEE) brought out Newsletter in August 2005, which was compiled and edited by Dr. Ranjit Daniesl, Care Earth, Chennai, and Dr. Pushpam Kumar, IEG. Delhi

4. Recent INSEE Publication

New Book from INSEE family "*Biodiversity and Quality of Life*" edited by Prof. Nirmal Sengupta and Prof. Jayanta Bandhopadhyay, 2005 published for the Indian Society for Ecological Economics (INSEE) by McMillan India Limited, New Delhi.

The proceeding of Fourth Biennial Conference of the Indian Society for Ecological Economics (INSEE) on "*Ecology and Human Well Being"* are being published in a book form by SAGE Publications, New Delhi.

5. INSEE Membership

As on February 17, 2006 INSEE has 214 Life members, 12 Ordinary members, 3 student members, and 5 Life Members Corporate Bodies. The total membership thus stands at 234.

6. Forthcoming Event

The Indian Society for Ecological Economics (INSEE) is organising Ninth Biennial Conference of the International Society for Ecological Economics (ISEE) on ***"Ecological Sustainability and Human Well-being"*** during December 15-18, 2006 in New Delhi.

7. Financial Status of INSEE

A large number of international and national organizations provided financial help to conduct the INSEE programmes. On behalf of INSEE we record sincere appreciation and thank all of them.

Annexure –I

OVERVIEW OF THE CONFERENCE – By Dr. Madhu Verma, Joint Secretary, INSEE

1. The Two days deliberation of 4th Biennial Conference of INSEE has come to an end, & I have been assigned with the responsibility of giving an overview of the conference. Well we had five technical sessions which run parallel & two plenary sessions. Through the plenary sessions were attended by all but the all technical sessions were simultaneously run, my job is to put summary of all session is a string to as to give you a complete picture of the conference.

   INSEE has been providing a very good platform since 1999 though its Biennial conferences, roundtables & Workshops, newsletter to academicians from various disciplines, professionals, live department people & various Government & Non Government Organisations to share their work & experience & express their views such that on

holistic approach developed and appreciation can be inculcated for different disciplines which is turn express different dimension of the same issue or problem. The 4th Biennial Conference of INSEE on Ecology & Human Well Being has also been an effort in the same direction.

2. The fourth Biennial Conference of the Indian Society for Ecological Economics (INSEE) began on 3rd June 2005 with the welcome remarks by Dr. Sudhakar Reddy, Local Organising Secretary and Professor of Indira Gandhi Institute for Development Research.

Dr. R. Radhakrishnan, Director, of IGIDR, Bombay in his welcome address highlighted the role of Ecological Economics in overall development process and the role of this conference which is designed to investigate the questions of Ecology and Human Well Being. He mentioned that it is time that we should show deep concern on the humanity future & realize the necessity of transition to sustainable development. He hoped that the lessons of this conference contribute to a fundamental re-evaluation of global ecological relationships & to the development of sound values & goals.

3. The Conference theme that is Ecology and Human Well Being was introduced by Dr. Pushpam Kumar, Secretary, INSEE, who highlighted the mission of INSEE and mentioned that through its activities like Biennial Conference, workshop, policy round table and seminar, INSEE has been making concerted effort towards furthering the understanding of ecological economics. Issues in substitutability of man-made capital for natural capital, valuation of ecological functions, efficiency, scale (physical size not the economies of scale), thresholds and uncertainty and the need to bridge the gap of knowledge and epistemology are some issues which have commanded a central place in INSEE's priority. Conferences in the past clearly demonstrate this. While the first conference was on EE for SD, the second was on Water, livelihood and Ecosystem services. The third was on Biodiversity and Quality of Life. The essence of these conferences always revolved around the interface of science and policy with intention to improve human conditions.

INSEE shares common concerns of other regional societies for Ecological Economics hailing from Europe, US, Canada, Brazil,

Russia and many others, concerning the limitations and 'reductionist' approach of neoclassical economics to deal with the problems of environment and ecology, it also attempts to provide a viable and methodologically robust but empirically supported alternative. It exposes the mechanical outlook of neoclassical economics in order to work with conviction towards critical cultural-traditional and social contexts, which shape the management practices for ecology, and economy as the former ignore these factors. In this context, it is extremely relevant when INSEE decides to hold its Fourth Biennial Conference in 'Ecology and Human Well Being'. Ecology and ecosystem provide an array of goods and services to the humans but their contribution remains blurred in accounting and valuation, although the impact of those contributions happens to be profound.

He highlighted the role of INSEE in the transformation process of Indian economy and said that the process of reforms in domestic and external sector is continuing but its impact on various aspects of ecosystem and well being needs extra attention from academic fraternity as well as development practitioners. As the discipline of economics has never been monolithic so is the impact of changing economic policies on natural resources, their management and the overall impact on different constituents of human well being (MA, 2003). The issue of tiger conservation and rights of tribal people is debated and discussed all around and in this context, it is of extremely contemporary relevance that INSEE has chosen this theme of 'Ecology and Human Well-Being' for its Fourth Biennial Conference. He concluded his address by giving structure of the conference & the relevance of its five sub themes covered through five technical sessions.

4. Dr. N.S. Jodha, President, INSEE in his Presidential address opined that Ecological Economics as compared to many other disciplines, exhibits sharper focus on understanding and addressing ecosystem-social system links and their complementarities in achieving sustainability goals. Because of emphasis on sustainability as a central concern, trans-disciplinary approaches to research and development, sensitivity to human dimensions of natural resource management, balancing of livelihood options and sustainability dimension of resource use are accorded primacy in the research and discourse. Accordingly, the disciplinary thrusts of Ecological Economics appear

to match better with the imperatives of multiple components of emerging scenarios of nature-society interactions. At the same time the above thrusts are full of challenges. The latter in turn are rooted in the broad circumstances and factors historically shaping and guiding the research and reward systems in both natural and social sciences, especially in the developing countries.

But despite concern for multi-disciplinarily, general rule so far is domination of individual disciplines (e.g. economics over other involved natural and social sciences as clearly revealed by INSEE membership and papers in this conference). Similarly, despite concern for human dimension, the past practice of treating communities and their perspectives as "objects of study" rather than involving them as contributing partners in understanding problems and identifying solutions dominate most of the research under Ecological Economics. Similarly, the supply driven, top-down, prescriptive type of approaches to understand and amend nature-society interaction is as strong as in the past. The peer domination of the discourse and possible alternation in it is as yet not substantially declined, as could be verified by ratios of young and senior scholars promoting Ecological Economics. Related to the above is imbalance between the academics and other (e.g. policy-makers/practitioners, activists and community workers) engaged in promoting cause and application of Ecological Economics.

The purpose of above comments is not to belittle the enthusiasm, activities and (in some cases) excellent impact making work of EE workers. Instead, intention here is to provoke the fellow members of INSEE to think, how we address the above imbalances. He ended by putting a question that "do we want INSEE to develop as a "forum of learned scholars" only or a movement, where multiple stakeholders can collaborate and make their respective contributions to human well being in different ecological settings on a sustainable basis.

5. Prof. Juan Martinez - Alier, President ELECT, ISEE and Chairman of Inaugural Ceremony started his address by giving his views on Metabolic Profiles of Economies. He mentioned that the notion of "metabolism" applied to the economy is not new. Liebig's influence on Marx. Podolinsky's study of energy flow in agriculture (1880). There is an essential distinction between endosomatic and exosomatic

uses of energy by humans. He used Indicators and indices of (un) sustainability to distinguish strong & weak sustainability. He considered work on “weak sustainability” (economic valuation of environmental services and environmental damages) a necessary element, because it is socially relevant in a market society. In “strong sustainability” we need physical indicators/indices like Material Flows / Energy Flows/ HANPP.

He further elaborated Social Metabolism. He mentioned that we do not aspire (only) to “internalize negative or positive externalities” back into the price system rather should also recognize the economy as a system open to the entry of energy and materials, and to the exit of waste.

He said that there has been much advance in the study of Material Flows. Eurostat has published results for European Union countries 1980-2000. He put a question whether it is this done yet in India? He said that we separateabiomass (as in the biomass budgets in Karnataka, fossil fuels, and other minerals (for metal ores), and building materials. He further mentioned that by looking at Material Flows we may improve our understanding of the link between Ecological Economics and Political Economy. Ecological Economics studies with a variety of methods the relations between the economy and the environment. Political Ecology studies (in my view) “ecological distribution conflicts”. To complete the characterization of the Metabolic Profile of a country or region we need also statistics of Energy use (not all of them included in Material Flows already: nuclear, hydroelectric, apart from biomass, fossil fuels) and we need statistics on the Human Appropriation of Net Primary Production (of biomass)- H. Haberl’s recent work on HANPP and loss of biodiversity in Austria is of great importance.

He raised a question whether this type of work being done in India? Relevant to mention whether LPG substitutes completely for fuelwood and dung as fuels. He gave an example of Human Appropriation of Net Primary Production (HANPP) and Mangroves where the biomass production of the untouched mangrove is much greater than the actual biomass production of the shrimp farm. Therefore it goes beyond the the assessment of “strong sustainability”,

for which we require Physical Indicators or Indices (MF, Energy flows, HANPP
Since social, economic, physical indicators are non-equivalent descriptions of reality, an integrated assessment cannot be money-reductionist nor energy-reductionist, for the matter.

He concluded by saying that challenge for societies like INSEE lies in making the indicators of social metabolism relevant for politics and policies? Some of them are already relevant: carbon dioxide statistics, for instance. Sometimes, discussion starts in a academic contexts, e.g. on Material Flows or HANPP. Then some statistical offices pick them up (it is the case already with Energy statistics, it is beginning to be the case with MF).Then, there is a third step here social or political actors will perhaps use the physical indicators for public arguments. However, the statistical supply of Physical indicators does not always create the social demand to use them.

6. The programme then begun with various technical sessions which proceeded as per the following :

Technical Session – I "Ecological and Social Resilience"

The session began with research finding for building the case for social resilience with discussion on the need for mitigating it through a range of institutional and policy interventions for resource allocation thereby affecting the measure of well – being and value of wealth of society. Concern for ecological and social resilience were deliberated upon for the need for strategic and tactical measures for enhancing resilience power. Presenters stressed the need for improved institutional frameworks with support from governing bodies, local institutions and policy reforms. The session went ahead with broader issues of human well-being and sustainability with attempt to focus on operation criterion for sustainable development. Discussion deliberated on improving current inefficiencies of institutions and economy via macro-economic indicators to account for natural and social capital with issues of genuine investments in case for ecological sustainability. Arguments were built to support the issues of weak and strong sustainability using sustainability as management tool.

Technical Session IB: " Ecosystem Services and Quality of Life

(Wetlands)"

This session initiated with the discussions on water pollution linkages with loss of biodiversity and impacts on fish harvested in Digha fishery. This twin problem has been addressed by modeling an aggregated Gordon-Schaefer while integrating economic biodiversity index and an environmental quality variable under different biodiversity scenarios. It is found that there exists a trade-off between economic biodiversity conservation and profit maximization. Policy measures have to be so designed as to minimize the level of conflict between them. Research findings from a bio-economic model concluded that technological change leads to an expansion of aquaculture industry and contraction of the wild fishery. This result is important from the point of view of policy makers and emphasizes on the need for defining more socially and ecologically responsible aquaculture industries that enhance traditional fishery and reduce current user conflicts that are in existence now. The session taking a lead from the earlier discussion went on for study detailing the economic valuation of some selected wetlands in the Burdwan district of West Bengal It presented before the audience the estimated indirect use values of wetland resources in terms of the environmental and ecological services it provides to support current production and consumption of fisheries.

Technical Session IIA "Ecosystem Services and Quality of Life (Land and Protected Areas)"

The session began with a discourse on management of protected areas from purely conservationist strategies to participatory approaches with a wide range of options that combine different elements of resource sharing, market regulation and privatization. This gave a way to an analysis that the cost of bio-diversity loss and the development of appropriate institutions and incentives should primarily be a local exercise. In another research finding, it held an investigation exploring the relationship of current land use, crop productivity with external factors like climate, fertilizer use and soil quality. The discussion went ahead with developing indices for land degradation through Ranking method, Index method and Principal Component Analysis (PCA). Eventually a need was felt for the on adoption of

integrated pest management practices for sustainability and cost effectiveness also proving to have positive environmental impacts.

Technical Session II B Policy Reforms and Sustainable Development

The session began with livestock policy synthesis with its direct and indirect linkages with watershed development approach for improving land management practices enhancing livelihood option for rural people. Livestock census data was put on to support the imperative need for integrating the livestock management options in various watershed development projects across various states of India. The discussion furthered to issues of globalization and sustainable development with the economic and environmental conflicts inbuilt in the theoretical basis of the governing international bodies. Argument was built to present before a case of conflicting interests of economic and environmental globalizations in context of developing countries with special reference studies from India. Discussion went ahead with facets of unsustainabiltity of economic globalisation, development of pollution heavens and irony of Kuznet's curve for development case in countries in India, marching ahead on the path of development. Issues of equivalence of economic globalizations and sustainable development were raised with need for more empirical evidences for holding market forces solely responsible for environmental degradation. The session concluded stressing the need for harmonization of various Multilateral Environmental Agreements with international trade directives under WTO regime and use of market forces for technological innovations for better resource use and pollution prevention.

Plenary Session I : New Environment Policy of India:

The panelists presented before the audience their concerns and viewpoint to the proposed draft of the New Environmental Policy. 2004,The issues raised ranged from corporate response to proposed mechanisms of "Precautionary Principles and Polluters Pays Principle "for technological innovation and environmental management to very basic fundamental issues of policy formulation and its effective implementation in Indian context of rampant corruption and lethargic bureaucratic and operational strings attached with it. The

environmental management principals were also linked to broader debate of putting Development or Environment on First Priority for policy planners. The se discussion met with variety of responses from the audience of integrating environmental concerns for each project undertaken irrespective of scheduled ministry or department henceforth, effective enforcement measures, relevance in current local and global context and harmonization of proposed policy with existing policy and laws for environmental management and protection.

The **second day's** session begun with two simultaneous sessions on Institutions and Governance and Social perception and limitation to Valuation of Ecosystems in the morning session which were followed by two simultaneous sessions on Valuation of Ecosystems and Their Services (Land Resources) and Community and natural resource management. The post lunch sessions were conducted on Collective action for Ecosystem management and sustainable land use management. The technical sessions were then followed by second plenary on fragile ecosystem and vulnerable livelihoods**.** The session wise overview of second day's proceedings are as follows:

Technical Session III-A : Institutions and Governance

It emphasized the inclusion of stakeholders' perception for project formulation and implementation for better participation and governance. Different theoretical models were presented to include these dimensions to the traditional approaches to CPR management. Discussion went ahead with environmental governance and existing administrative legal structure in India with special reference to role of green initiative of judiciary. Various recommendations were proposed for effective administration of environmental laws with new means for compliance by industrial units.

Technical Session III-B, "Social perception and limitation to Valuation of Ecosystems."

The session started with discussion on urban wetlands and need for prioritizing the process of urbanization which generates the greatest volumes of wastes and pollutants as also the large scare conversion for lands-uses. The study attempted to explore people's perceptions

and preferences regarding the wetlands of Kolkata. The next study focused on the question of justifying the benefits that would accrue from the initiative taken to generate degraded lands. It also spoke about looking for mechanisms to value the forests in entirely. Carrying on with the lead the next paper advocated the use of new approaches for measurement of welfares, discussing to a great length the Index of Sustainable Economic Welfare (ISEW). The last paper suggested some practical tips for overcoming barriers to limits of valuation of ecosystem systems in developing countries in particular besides some recommendations for the same.

Technical Session IV-A Valuation of Ecosystems and Their Services (Land Resources)

Growing awareness for the benefits of ecosystem services got reflected in the discussions of the session with research finding ranged across South Asian Countries. It detailed the use of various valuation techniques for ecosystem services rendered by different ecosystem ranging from mangroves to wetlands. It also reflected the need of carefully using the valuation techniques to prevent biases and narrowing down the wide variability of results in the valuation findings.

Technical Session IV-B. "Community and natural resource management"

The session was initiated with the focus to develop a framework for prioritizing ecological issues with forest management through Dalit participation in conserving the ecology both at the micro and macro level. The next paper took up a broader view and raised a pertinent question that is our policies providing enough incentives to promote community participation? It looked at Social, Economic and environmental aspects of the query. The next paper carried on with these multifarious aspects and tried to study the status of food security and vulnerability among RPF members of self help groups (SHG) who have adapted and used appropriate technology and eco-friendly inputs in agriculture. The final paper brought a new aspect of Climate Change in the discussion and tried to raise the problems and infrastructure services that could be affected by the same.

Technical Session V-A Collective action for Ecosystem management.

The session initiated the discussion on collective participation for conservation and environment protection with examples form cooperative fisheries in Kolkata, forest reserve in Karnataka to Sariska tiger reserve in Rajasthan. Various issues related to human-forest interaction, dependence and management were detained to bring out clarity on the underlined issues. Concerns are raised to careful use radical choice model in congruence with field observation for minimizing the error from the research findings.

Technical Session V B: "Sustainable land use management".

The discussion started with role that can be played by Multiple Goal Linear Programming in land use planning. It tried to approach the objective keeping in mind the various set or constrains. It tried to bring out decision support systems for quantitative land evaluation. The next paper raised an interesting question on the usage of irrigation water. It further discussed a method to quantity the non irrigation uses of canal water and assess the value of the same. The final study found that over the years cropping pattern under shifting cultivation has undergone significant changes mostly in favour of market economy. The paper ends up with the communities' preference of programmes and policies for sustainable development including the planning for land use and reforestation.

Plenary session II: Fragile Ecosystem and Vulnerable Livelihoods

The panelist begun the session with the importance of fisheries and their production regimes in the livelihoods of people. The consequences of the shifting plan priorities from production, exports, increasing subsidies and port facilities and specially the 9^{th} and 10^{th} plan focuses on Maximum sustained yield was highlighted. They showed concern over the changing policies relating to fisheries management have impacted the livelihoods of the fishermen community. The cautioned that we need to be more concerned about the sharks on the land than the lack of fish in the sea. Another

panelist through light on the fragility of an ecosystem and explained that an ecosystem is a system of interaction and is s continuos process. Ecosystem function is a function of quantity or scale and its currently put to work on limits which are artificially set and strangely various components of ecosystem are used as ecosystems. The fragility of an ecosystem is like a broken thing which can be repaired but cannot be restored.. Absence or presence of some species is a reflection of the broken linkages in an ecosystem. The species are said to be the currencies in an ecosystem's economy. Due to degradation of ecosystems the vulnerability of livelihoods dependence of people has increased. Today we can fine basically two types of ecosystem people viz.; traditional like honey gatherers and modern like tourists guides.

It was mentioned that we need to understand the factors that make the ecosystems fragile. Due to these factors the ecosystems have degraded and the livelihoods of many people has been lost completely. Three solutions were prescribed basically which include rehabilitation of people, creation of protected areas and involving communities in the management of the ecosystems. But its shall be a great challenge as to decide which option to be picked up

Conclusion:

I also must not forget to mention about the momentum that we gathered during the one day Pre- conference workshop that we had on 2nd June which was attended by some of INSEE conference participants. The workshop on 'Ecosystem Services is Coastal & Marine System' covered a wide any of topics ranging from the understanding of Mangrove Ecosystem, between Coral reefs & MES & Reptiles & MES. We acknowledge the hard work done by Dr. Ranjit Daniels to rope in excellent conservation biologists to speak to economists. I also sat through Workshop, I can very confidently say on behalf of all the participants that the Workshop was very fruitful. So the academic experience in total was very enriching. I must also not fail in my duties to mention about the non-academic & cultural as part of the conference. Yesterday we had an enchanting experience during the Kuchipudi recital & a gastronomic enjoyment over dinner at the Director's residence. We are indeed thankful to the organizers for same.

Excellent arrangement & warm hospitality extended to us. We look forward for many such occasions & interactions in various ways INSEE has been sending findings of the past conference to the government and it shall be the case for this conference. We are sure that the findings shall provide an enriched and useful input for various policies of the government.

Annexure –II

The tsunami of December 2004 was an event that awakened the world on the need to understand the marine ecosystem in a more holistic sense. While it caused an unprecedented devastation of human lives and property, it created newer ecological opportunities leaving us with a number of perplexing questions regarding the scope of integrating marine biological sciences and socio-economic priorities in the process of rebuilding human confidence and livelihoods, without interfering with the ecological integrity of the marine ecosystem – an ecosystem to be seen as a larger composite unit spread across the Bay of Bengal or Arabian Sea, cutting across political boundaries and encompassing many natural and man-made habitats than previously recognized.

One of the ways of addressing the above concern is through an exchange of ideas and expertise and hence the National Symposium on Conservation and Valuation of Marine Biodiversity was organized essentially to review our knowledge and understanding of the marine ecosystem and its people. The dates of the National Symposium coincided with the first anniversary of the most devastating natural calamity in recent years.

Inaugural Session – Highlights

Dr J T Jothinayagam, Officer-in-Charge, Marine Biological Station (ZSI, Chennai) welcomed the participants and reiterated the scope of

the Symposium emphasizing the need to draft a ‘road map’ that will provide inputs to the various ministries and departments of the Government of India in the conservation and sustainable use of the marine ecosystem.

Dr J R B Alfred, Director – Zoological Survey of India (Kolkatta) in his presidential address highlighted the magnitude of marine living resources and their sustainable use. While there are 80 different marine habitats that can be enumerated for India, the shallow coastal waters (not exceeding 200m depth) are the most productive (90% of the fish catch is from this zone) contributing most significantly to the ocean’s ecological diversity.

Prof T N Ananthakrishnan, Former Director of the Zoological Survey of India lauded the integration of NBA and ZSI and called it a partnership that ‘has come to stay’. He stressed the need to re-assess the biodiversity of the seas around India, especially in well-known locations like the Gulf of Mannar, and compare it with the information gathered 50-60 years ago to understand trends of change.

Prof S Kannaiyan, Chairman of the National Biodiversity Authority (Chennai) in his inaugural address remarked on the efficient manner in which the post-tsunami relief and rehabilitation was handled in our country. He however called for further understanding of dealing with natural calamities to ensure better preparedness as the Japanese are known for.

India being one of the 12 mega-diverse countries should accord greater focus to the management of bio-resources for human welfare; for instance, the 250 million people who live within 50km of the coast in India. Therefore, we need to find ways by which conservation and sustainable use of marine resources could be integrated with the livelihoods of the coastal human communities.

That the Global Biodiversity Inventory lists only 40,000 species from the oceans suggests our lack of knowledge about the marine biodiversity. India should take advantage of its 200 year history of inventorying marine biodiversity (that no other Asian country can match) and build on the same.

Keynote Lectures - Highlights

Dr R J Ranjit Daniels (Director, Care Earth, Chennai & Member, Executive Committee, INSEE): *Conservation of Marine Biological Diversity: An Overview*

Conservation is a science that involves the following four components

- Assessment
- Valuation
- Protection
- Utilization

Assessment can be quantitative and qualitative; qualitative assessments are substantiated by quantitative data. Valuation is normally done using either ecological or economic attributes. Protection and utilization have traditionally been addressed by designating certain species of plants and animals as protected species and their habitats/landscapes as 'protected areas'. Effective protection and regulated utilization of species and habitats have been achieved through imposing bans, restrictions on access, etc.

The four broad components of conservation can be integrated into a practical strategy for managing the earth's marine ecosystem with the human livelihoods and well-being in focus by

- Recognizing knowledge gaps
- Recognizing/weighing economic benefits as against the dangers of over-exploitation
- Recognizing ecosystem principles

Dr M Saktivel (President, Aquaculture Foundation of India, Chennai): *Salient Issues on Conservation of Marine Biodiversity and its Significance in Food Production System*

Stressed on the need for more awareness in local people on biodiversity – its definition and scope and reiterated the need to educate people about the potential use of marine biological resources in managing the food crisis as 90% of the world's biomass is in the

oceans and 4/5 of the world's protein needs are met by the seas. He called for a 'blue revolution' in the conquest of hunger, poverty and malnutrition.

He also stated that when the fishing industry is projected to reach US $ 100 billion by 2025, the pressure on the marine biodiversity will increase which in turn will entail,

- Eco-friendly fishing technology
- Assessment of risks and benefits in introducing exotic species and not recommending outright rejection
- Establishment of a 'fisheries information system' at the scale of the ecosystem
- Minimizing by-catch discards which is about 20million T/year.
- Understanding the low biodiversity and short food-web communities (eg, phytoplankton-krill-whale) and their frequency in the Indian Ocean
- Establishing marine refugia that function as 'no take reserves'
- Mitigation of the impacts of over-harvest through ranching/farming (eg. Seaweeds)
- Improving the livelihood of coastal people to prevent further erosion of biodiversity

Prof S Ajmal Khan (CAS in Marine Biology, Annamalai University, Parangipattai): *Ecological Valuation of Marine Biodiversity*

Reviewed the many conventionally used diversity indices in ecological valuation such as Shannon, Simpson's, Hill's, etc and demonstrated their usefulness in the evaluation of biodiversity. He also drew attention to the more recent diversity indices used in evaluating the marine biodiversity eg. Taxonomic diversity index, V Statistics, etc.

The traditionally used Shannon-Weiner Index can be used effectively to estimate biological diversity not only at the level of species but also of genera, families and other higher taxa. He emphasized the need to use quantitative data that permit the estimation of diversity using any of the indices and help in evaluating biotic and abiotic impacts on biological communities in the marine ecosystem.

Prof L Kannan (Director – Research, CAS in Marine Biology, Annamalai University, Chidambaram): *Coastal and Marine Ecosystems of India*

The need for long-term research programs supported by sophisticated facilities for deep sea explorations was reiterated. Prof Kannan also highlighted the inadequacy of studies that focused on the conservation value of specific habitats and communities, such as mangroves, coral reefs, sea grass beds, etc. He drew attention to the lack of recent surveys using standard techniques; for example 75% of the Andaman and Nicobar Islands are still unexplored. A few habitats however are intensively studied. For example, mangroves of Pichavaram in Tamil Nadu are probably the most intensively studied in India.

Monitoring programs as that in coral reefs should not only look at species diversity but also assess the incidence of diseases such as white band, black band, pink line disease, necrotic patches, etc. He added that not all seaweeds are harmless in the marine ecosystem; certain species of *Sargassum, Gelidiella* and *Turbinaria* are coral borers that destroy reef building species of corals.

Prof Paul. P. Appasamy (Member Secretary, Centre for Excellence in Environmental Economics, Madras School of Economics, Chennai)

Prof Appasamy explained the basics of economic valuation by stating that biodiversity is seen as goods and services by economists. Conceptually, any resource is valued based on scarcity. It is always better to focus the valuing on specific target organisms than attempt valuing regional or local biodiversity as a whole. Valuation of ecosystem and the invisible services they provide also needs to be considered. For instance, major ecosystem services are provided by wetlands like purification and filtration of water; mangroves and coral reefs in offering protection against natural disasters; mangrove – fishery linkages etc.

Professor Appasamy explained the scope of valuation as follows:

- Project Appraisal
- Environmental damage / compensation
- Management cost
- Natural resource accounting

The basic methods of economic valuation most often adopted are categoried as 1) Stated preference methods – which includes contingent valuation and 2) Revealed preference methods – which includes hedonic valuation, travel cost etc.

He drew attention to the fact that value of bio-resources also concerns local communities and traditional knowledge, common property resources and bio-prospecting. There is a greater need to understand and apply the existing policy frameworks – especially the Biodiversity Act, 2002. He concluded by emphasizing the urgent need to apply economic valuation to coastal ecosystems.

Paper and Poster Presentation – Highlights

The 22 papers and 22 posters presented during the Symposium focused on three broad issues viz

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- *Marine Biodiversity and its Significance*
- *Ecological valuation of Marine Biodiversity*
- *Economic Valuation of Marine Biodiversity*

Key issues and points are summarized below:

Species Diversity and Taxonomic Capacity

The apparently lower biodiversity in the oceans (250,000 named species in seas as against the 1.7 million named species on earth) may be justified as an artifact of inadequate explorations especially of the deep seas, and taxonomic studies.

This is further illustrated by those groups of animals that are relatively well studied such as the marine fish, which have higher species diversity when compared to freshwater fishes.

Also, recent taxonomic research on lower organisms (invertebrates) has brought to light the higher number of species in each group and the many unidentified ones that are being collected from the marine ecosystem.

For example, of the 156 species of sea fans collected from the coasts of Tamil Nadu, only 60 have been previously identified; of the 50 species of brachyuran crabs (true crabs; many being food species) collected in Karwar (Karnataka) 37 are new to the locality and at least 1 new to India; of the nearly 40 species of benthic polychaetes of Tamil Nadu that were recently collected, 1/3rd are new to India; there are 294 species of reef-building corals known from India till date with the possibility of adding another 400 species.

Of the 87 species of marine mammals, 26 are found along the Indian coasts. There is a need to develop simple field guides for identification if effective monitoring has to be achieved.

Lack of taxonomic facilities and incentives for being professional taxonomists (of marine biodiversity) have contributed to the slow pace at which marine species are being discovered and described. Suggestions made to bridge this gap are listed below:

- National Biodiversity Authority should accord greater attention to taxonomic capacity building
- The existing initiatives of the GOI/MoEF like the 'All India Coordinated Project on Taxonomic Capacity Building' should be more publicized so that a larger spectrum of biologists across the country benefit by them
- A national institution for taxonomic studies to be established
- Monographs on the taxonomy of lesser known animal groups can be published by the Zoological Survey of India as an incentive to taxonomists and motivation/guide for others

Alternate views on the apparently poorer species richness in the seas drew attention to the fact that there is greater diversity at the higher

taxonomic categories especially the phyla; of the 33 animal phyla known to science, 32 occur in the sea and 15 are exclusive to the marine ecosystem.

The greater diversity of animal phyla (most represented by smaller number of species) may suggest that marine faunal diversity is a 'relic'; and that oceans have experienced much greater episodes of mass extinctions in the prehistoric past.

Another attribute of the marine biological diversity that renders it poorer than terrestrial biological diversity is the lower levels of endemism; example of the Andaman and Nicobar Islands can illustrate this; of the 5344 marine animals that are known till date from the islands only 297 (5.5%) are endemic. Endemism is highest in mollusks – snails and allied animals (14%).

If these alternate suggestions are plausible, more taxonomic capacity and explorations can only marginally increase the number of species that are known from the seas.

That there is greater need to better understand the diversity of life forms within species and across species can be seen in the variations in size within a taxa that have not been surpassed by the species on land – example sharks, marine mammals like a small dolphin and the blue whale; the tiny sea cucumber (holothurian) of 2mm to the giant *Synapta maculata* that reaches 2m in length.

The great variety of life forms in the life history stages of marine animals suggest that the ecological diversity of the oceans may be comparable to that on land or even higher.

Systems of categorizing the life forms as distinct 'ecological species' and using them in ecological valuation may prove to be a better choice in the evaluation of marine biodiversity.

Whether all species need to be identified in ecological studies or the principles of 'taxonomic sufficiency' be adopted in rapid evaluation has to be considered according to the overall goal of the study; the two approaches cannot be mutually exclusive.

Ecological Communities, Valuation and Conservation

At the ecological scale, it emerged that there is a continuous decline in the range and abundance of species in the different marine habitats. The issue was highlighted using examples of

- Migratory birds that have declined to an extent of 70% in 30 years (along the southeast coast of India)
- Sea turtles
- Coral communities in general and specifically in the Andaman and Nicobar Islands as a result of the tsunami
- Fishery yields (eg tuna, sharks, etc)
- Seaweeds (eg *Gelidiella acerosa*)
- Sea cucumbers (holothurians)
- Mangroves
- Lobsters
- Sea perches

Fishing gear that selectively eliminate a particular sex of target/non-target animals: example more males in the case of sharks and tunas; more females in the case of sea turtles, can prove dangerous in the long run.

All loss of biodiversity (species, communities or habitats) was attributed to the following:

- Lack of awareness
- Lack of institutional coordination (eg. Dead coral a substrate for fresh growth vs substrate for seaweeds; or rubble in construction and raw material for cement)
- Lack of proper implementation of existing laws

Ensuring better participation of people in the conservation of marine biodiversity by providing alternate livelihoods and packages for sustainable extraction of biological resources and sea farming/ranching was strongly recommended.

The lack of infrastructure and incentives to pursue specialized research in marine biology (eg sea cucumber spawning and culture)

has driven well-trained personnel to other countries. This issue needs to be addressed.

Finally, the need for more interaction between biologists and economists emerged rather clearly during the symposium and has been stressed in the 'road map' that has been drawn at the concluding session of the 4-day Symposium.

A Road Map for an Integrated Conservation Programme on Marine Biodiversity in India

The existing link between human communities, their livelihoods and marine ecosystems has received greater attention after the Tsunami of December 26, 2004. A possible consequence of this attention and human-centric restoration efforts may lead to further destruction of the already fragile marine ecosystem.

As we try to balance recurrent natural disturbances and increased human demands, there is a need to integrate our understanding of marine biology with human ecology through the pathway provided by ecological economics.

As biodiversity is often treated as an anthropocentric construct, we need to provide well researched inputs into policy formulation – for instance, a ban on the harvest of certain species or actions that have been labeled as ecological destructive, need to be reviewed.

Such a scenario is possible only if adequate funding and long term support is made available for basic research in marine biology.

This necessitates collaborations between various agencies and departments of the government such as the NBA and ZSI, at different levels. It also suggests that newer partnerships and collaborations be forged between institutions and individuals representing academics, research institutions, NGOs etc.

The lack of trained personnel and incentives for pursuing taxonomy needs to be realized and active efforts should be made to revitalize the earlier taxonomic traditions of India. India should take advantage of

the long history – 200 years, of inventorying marine biodiversity (that no other Asian country can match) and build on it.

It is evident that to sustain taxonomy as a basic science, taxonomic research needs to be integrated into applied research and policy formulation.

The notion of large marine ecosystems is very relevant in the context of assessing and mitigating the impacts of natural disturbances; and this needs to be complemented through a greater focus on integrated research addressing communities and habitats such as mangroves and coral reefs.

Despite the long history of human dependence on marine biological diversity, the principles of economic valuation have not been adequately applied in conservation initiatives and this lacuna needs to be addressed.

Recognising the merit of integrating marine biology and economics especially in the context of balancing human needs and conservation and bio-prospecting, regular interactions between the practitioners of the two disciplines through workshops, symposia, training programmes, exchange programmes etc should be actively pursued by the organizers of the current symposium.

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