
Sustainable Development in a World of Critical Ferment Issue of Compulsion, Not of Choice for Developing Countries

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INTRODUCTION

In recent years, there have been widespread expectations about New Hope because of rapid growth of information technology, genetic engineering and revolutions in health and medicine. There has, however, been a heightened consciousness of the irretrievable destruction of life support systems through toxic wastes, global warming, land development, climatic change and bio-diversity loss. The genesis of sustainable development lies in organization of the United Nations Conference on Human Environment at Stockholm (1972), the simultaneous launching of the United Nations Environment Programme (UNEP) and the publication of 'The Limits to Growth' (Meadows, *et al*, 1972). However, the publication of 'Our Common Future' by the World Commission on Environment and Development (WCED) and the United Nations Conference on Environment and Development (UNCED) (June 1992) brought economic well being, social development and environmental stability issues into a sharper focus. The adoption of Agenda 21, a "global consensus and political commitment at the highest level" and creation of the Commission on Sustainable Development (1992) under the UN Economic and Social Council (ECOSOC) for effective implementation at the local, national, regional and international levels marked welcome progress. Meadows, *et al*. (1992) demonstrated that growth could not continue forever because of the finiteness of the earth. Against the backdrop of declining forest cover, plummeting water tables, increasing soil erosion, rising fresh water scarcity, mounting environmental pollution and eroding overall quality and quantity of natural resources, environmental thinking and sustainability became the focus of the development policy of the 1990s. We need to explore questions like how best can we shift to a culture of permanence, both for ourselves and for the biosphere that sustains us, what are some of the ways that this might happen, what are some of the major forces of resistance to such a change (Wilson, 2002)?

The average annual production of carbon dioxide between 1980 and 1989 was estimated at 7.1 billion tonnes of carbon equivalent. The average annual absorption by all the sinks for this period is estimated at 3.8 billion tonnes of carbon. A concerted attempt to stabilise atmospheric concentration of greenhouse gas emissions (GHGs) was made by The United Nations Framework Convention on Climate Control (UNFCCC), 1992, collectively known as Parties to the Convention - Annex I Parties (members of OECD, particularly economies in transition, Russia and Ukraine) and non-Annex I Parties (remaining Parties) made a concerted attempt to stabilise atmospheric concentration of greenhouse gas emissions (GHGs). The Kyoto Protocol (1997) requires the industrial world to slash its GHGs by an average of 5.2 % below 1990 levels by 2012. It allows a developed country to partially meet its target by funding clean options and technologies in developing countries. Actual reductions in emissions have to be certified through a complex international process. But a developed country could effectively then buy certified emission reduction credits (CERs).

The entire issue of sustainable development needs to be examined afresh in the light of new findings about the effects of global warming, protection of natural habitats threatened by human activities and conserving the rich diversity of life (McDonough, 2002; Hawken and Lovins, 1999; Benyus, 1997; Gretchen and 2002). Dasgupta's incisive analysis (2001) provides the criteria for evaluation of sustainable development policy. Broad-based sustainable development (BBSD) is equitable, participatory, and environmentally sustainable. BBSD policies must, however, be

complemented by several sector-specific policies. The success of BBSD also depends on the global rules of the game of economic interaction between countries. Given the multi-dimensional nature of issues involved, sustainable development should be viewed as a process, in both industrialized and developing countries, achievable only in stages and requiring a number of essential building blocks including an educated and informed public with free access to environmental information, public participation in government decision-making, free-market economic policies, a strong, fair, and enforceable regulatory framework, a sound scientific framework for decision-making, political leadership and vision (Hecht 1999).

CRITICALITY OF BIODIVERSITY

The significance of preservation of biologically diverse organisms ('biodiversity') and the implications of "protection of our resources" for life, sustainability and equity has been increasingly realized. According to the World Resources Institute, "biodiversity is the variety of the world's organism, including their genetic diversity and the assemblage they form. It is the blanket term for natural biological health that under girds human life and well-being. The breadth of the concept reflects the inter-relatedness of genes, its species and eco-system on which enormous damage has been inflicted over the past few decades. Because genes are the component of the species and the species are the components of eco-system, the pernicious move to alter the make up of any level of this hierarchy can change the others - its species are central to the concept of biodiversity". Estimates about the range and composition of organism range from 3 million to 30 million. But only less than 2 million species of animals, plants and organisms have been identified. Yet, millions more exist in diverse areas. The extermination of infinitude of connecting links between the living and the extinct inhabitants of the world cannot persist indefinitely. The spectre of the alarming deterioration in the earth's vital life supporting eco-systems are starkly reflected in the fact that human activities, such as, agriculture, forest clearance and land under urban and industrial use account for 40 % of the annual net photosynthesis production of the world posing a serious threat of an impending Armageddon. Half of all species could vanish by the end of this century unless we mend our collective actions changing the nature of the planet enough to cripple its ability to support life (Wilson, 2002). The deplorable trail of destruction runs through areas like coral reef, ancient lakes, eco-system of the Mediterranean climate region, tidal zones and tropical rain forests together with devastation of terrestrial plant species - all of which are home to rare and endangered, even undocumented, species of flora and fauna (Knoll 1984). Many species became extinct in the past, but they are now becoming extinct 400 times more quickly or are undergoing mutations and physical malformations. The composition of the biotic system and its relation with the environment should enable nature to repeat itself and ensure certain systemic stability or resilience. Viewed in this perspective, the return of the reality-"the wreckage of the planet by an exuberantly plentiful and ingenious humanity"- is manifested in the growing sense of the dread. The destruction of wilderness and its concomitant decimation of species have had such a profound influence on natural evolutionary processes as to be characterised not only as leading to the "death of the species", but also as marking an "end of birth" (Soule and Wilcox, 1980). The main costs of biodiversity loss might not be the loss of genetic material but the loss of eco-system resilience and the insurance it provides against the devastating environmental effects of economic and population growth (Perrings, *et al* 1995). Evidently, such systematic annihilation of annual net food resources is inconsistent with the central theme of biological diversity and stability, which protects watersheds, local rainfall, food supply and soil (Vitousek, *et al*, 1986). Unless we cure ourselves of this need to consume, we kill the Earth - and ourselves. These uneasy thoughts require the removal of nettles that spike development and necessitate a look at the whole picture. All religions emphasise that the future of existing animals, plants and organisms in their present forms is inextricably linked to one another and they can survive only by being "in harmony with nature".

India is a mosaic of agro-ecological zones: each with its distinct species of crops, plants, animals and micro-organisms. India's rich biological diversity, its immense range of eco-systems (forests,

wetlands, grass lands, deserts, marine areas, coral reefs, etc.), species (some 1.3 lakh recorded), and genetic forms (50,000 varieties of rice alone) - is by virtue of its tropical location, climate and physical features. India's geographical composition is unique as it combines living forms from three major bio-geographical realms, viz., the Indo-Malayan, the Agro-Tropical and the Eurasian. India is designated as one of the 12 mega-diversity states in the world. Of the 12 bio-diversity places in the world facing massive threat to flora and fauna, India has the North Eastern Regional and Western Ghats.

Considered in a proper historical and comparative perspective, the increasing loss of biodiversity is unambiguous. Some of the ongoing and continuous drivers of the conventional development paradigm could be isolated and identified as (i) wanton destruction and fragmentation of natural habitat due to the direct depletion of bio-diversity and their specialisation in agriculture, forestry and fisheries (IUCN, 1986); (ii) over exploitation of plant and animal species (IUCN, 1986) and introduction of exotic species wiping out native flora and fauna directly by predation or by competition and indirectly by altering the natural habitat or introducing diseases. (McNelly *et al* 1990, Janzen, 1986); (iii) rising pollution levels and poisoning stress on ecosystem; (iv) irreparable damage to corals by over fishing, sedimentation, pollution and tourism; (v) increasing use of pesticides, troposphere ozone, and Sulphur and Nitrogen oxide; (vi) pollution of rivers by industrial waste, untreated raw sewage and farming chemicals and (vii) nuclear bomb testing. The response to such looming catastrophes necessitates effective correction.

Given the two contrasting truths of unexpected magnificence and underestimated peril of biological diversity, the biodiversity programme transcends the problem of massive extinction of species (e.g., the Project Tiger disaster in Sariska, Ranathambore, Panna, Bandavgarh) to stress the development of the informational, institutional and economic settings to make the private use of environmental resources sustainable. The inalienable right to life, happiness and conservation has highlighted inter-related issues of (a) the physical links between economic activities and change in the composition of the species in an ecosystem and the significance of the change in terms of its impact on the ecological services required for human consumption and production, (b) the reasons for the divergence between private and social valuation of ecological services and (c) the scope for minimising the cost in terms of biodiversity loss of damage inflicted upon habitat and options open to reduce damages to other habitats in the future. While it is difficult to provide a comprehensive treatment of various issues of bio-diversity, human usage of all ecosystems relate to three main aspects (McNeely, *et al*, 1990): (i) ecological functions; including the maintenance and protection of watersheds and soil, the regulation of climate and habitat for wild plant and animal species, (ii) subsistence values; including foods, fibres, medicines and other products that are consumed outside of a market economy and (iii) commercial usage; including extractive products sold on local and regional markets; export goods, such as, resins, dyes, rattan and tropical timber; and genetic resources used in agricultural and forestry crops.

The traditional approach to 'production' being based on uniformity, and 'conservation' desperately attempting to preserve diversity as raw material against the force of expanding monocultures, is clearly inadequate to the promotion of either biodiversity or peoples' access to it. The drying up the creative forces of life can be checked only by bringing about a paradigm shift, which makes diversity the basis and foundation of production and economic activity, not merely an 'input'. Every plant, microorganism, animal, bird and insect is extremely important to the earth. Some of the most endangered species today are virtual treasure troves of marine lives, plants, microorganisms, etc. The unique microorganism, the unique environment of such areas can also serve as "natural outdoor classrooms". Opportunities abound there for observing, learning, experimenting and analysing. Further, these places are full of immense potential for research in biomedicine and life sciences. We need, therefore, to understand, assess, assimilate and analyse the entire range of issues involved in biodiversity for meaningful development. The emergence of a set of strategies called "ecoagriculture" shows how to minimise conflicts between the demands of

agriculture and biodiversity, e.g., “sustainable management of forests”/ “reduced-impact logging” (RIL) can be more profitable than reckless conventional methods of timber extraction.

ROLE OF INDIGENOUS PEOPLE IN SUSTAINABLE DEVELOPMENT

Structural transformation, the process by which a traditional, agrarian economy evolves into a modern, industrial, diversified one, is a salient feature of most countries. Most of the planet's "hotspots"-places in which the environment is most severely threatened-are in the developing world, where populations are often extremely poor. The participatory approach, local community involvement and conservation education are significant in the preservation of biodiversity. Economic change invariably produces rapid socio-economic upheavals in transition economies with resultant stresses and strains necessitating concurrent, objective and urgent tackling of compensating the affected individuals, reversing the damage to ecology and strictly monitoring the functioning of the polluting units. Participation of indigenous persons in development is a multivariate function of several determinants operating at the grass root level. Development is a multi-dimensional, systemic process of the culture, values and social and political structures of each society; it also conditions the way society manages the challenges, constraints and opportunities of an often alien modernisation process. Arrow and Fisher (1974) illustrated how “extinction of a form of life, the destruction of a unique geomorphological phenomenon, the toxicity and the persistence, indeed the increasing concentration, of the hard or non-degradable pesticides” can cause irreversible changes in the environment produced by economic activity. In this process the biggest losers have been the indigenous communities that have lived and flourished there from times immemorial. Consequently, a changed track is necessary to integrate livelihood and food security with conservation and a balance struck between the attempts of the indigenous persons to reconcile their desire to celebrate their distinctive local cultures and the overwhelming forces of globalisation to benefit from the opportunities that change creates. Dasmann (1988) distinguishes between “ecosystem people”, such as, indigenous people, whose subsistence comes primarily from the ecosystems where they live, and “biosphere people” who have the whole biosphere at their disposal. Macro level policies and processes have to be dovetailed to local realities through sustainable livelihoods approaches (SLA). Country level development strategies are aimed at reducing poverty within a coherent framework by emphasising national ownership, prioritising poverty reduction and sustainable development and addressing macro-economic concerns and structural and social issues. As sustainable livelihood approaches (SLAs) enhance both the process and content of country level development strategies, such strategies need to be increasingly adopted after adapting them to local realities and needs. Sustainable, participatory and dynamic Periyar model (India) of bio-diversity has important policy prescriptions for the entire world. While eco-development and bio-diversity conservation are prime concerns here, the livelihood of 40000 persons from 6000 homes is also stressed.

An eco-friendly strategy, in line with the Man and Biosphere (MAB) Programme of UNESCO, involves increasing use of participatory management model, determination of precise sharing of benefits of the protected area and its resources with local communities. Success stories in India, as indeed elsewhere, demonstrate that local experiments, community enterprises and popular participation led to some of the most remarkable achievements. Almost 80 % of the world population depended on traditional knowledge (TK). TK systems are characterised by diverse structures and contents, a complex versatility and pragmatism together with a distinct, internal logic anchored in specific worldviews. Traditional people and communities are responsible for the discovery, development and preservation of a wide variety of medicinal plants, herbal formulations and agricultural and forest produce. TK is also used as input into modern industries. While TK is widely disseminated and commercially exploited, only a miniscule proportion of the benefits flow back to provider peoples and communities. The Indian Bio-Diversity Bill incorporates provision regarding prior consent of the National Bio-Diversity Authority for access to biological resources from India. While these provisions would ensure prevention of bio-piracy in India and sharing of benefits arising

out of traditional knowledge, this will not prevent persons seeking patents on traditional knowledge in other countries and also using traditional knowledge without prior informed consent and benefit sharing. Therefore, the onus of benefit sharing must also be shared by the user country to create an enabling environment and confidence through legislative measures to ensure compliance of prior informed consent stipulations and for equitable sharing of benefits.

The National Forest Policy 1988 stipulated that area under forest cover should expand to one-third of the total land area in the country. Contextually, WWF-India's community country initiatives, e.g., activities under project SERVE in Darjeeling, rehabilitation of sacred groves in Manipur, orchid cultivation in Apatani Valley and rehabilitation of Rhodorandon forests in Tawang, Arunachal Pradesh use joint forest management (JFM) as a tool for sustainable forest management with the cooperation of the local people. Democracies like India must immediately dispense with the completely ineffective, fratricidal system governing the forest and put in place a new frame of forest governance rooted in rights and leadership of the citizen community with tribal communities being equal stakeholders in development and conservation.

While United Nations' Food and Agriculture Organization's recent report on the state of the world's forests estimates that between 1990 and 2000, Africa's forest cover declined by 0.8 % a year and South America's forest cover declined by 0.4 %, India's State of the Forest Report 2001 shows that the forest cover in the country crossed 20 % for the first time because of the JFM implemented in 22 states, natural regeneration of mangroves and large block plantations as also greater accuracy in the method of measuring forest cover through Digital Image Processing (DIP) data. Adoption of various communication modes for dissemination of information require careful preparation of a socio-economic survey of communities affected by projects to determine the kind of resources used, the manner of their harvesting, the degree of awareness about controlling regulations and possible alternative sources of income. Anthropological studies clearly reveal that human beings, all over the world, be they the Chinese, the Pueblos of South West America, the Kutchins of Burma, value their own life style over those of others. The attempt of the people to assimilate with the mainstream without obliterating their distinctive identities acquires greater force in case of tribal and other vulnerable groups at the periphery. Such tribal groups, e.g., those in Orissa and Jharkhand, are regenerating and protecting their forests on their own simply because their lives and livelihood depend on them. The Scheduled Tribes (Recognition of Forest Rights) Bill, 2005 reaches out to the tribal communities and seeks them to make secure and empowered stakeholders in protection, conservation and regeneration of forests, while strengthening their livelihood possibilities. Leading issues, such as the balancing of ecological rhythm, the aspirations of the local people and the duties and responsibilities of a gram panchayat, particularly in the wake of decentralization of powers, coalesce into the central theme of reconciliation of conflicting objectives of development and eco-balance without exacerbating the pressure on the affected communities. Consequently, the wider objectives of sustainable development need to be pursued by formulating, implementing and communicating people-centered policies and strategies by applying the principles of Ecology to the design of a perpetually regenerating economic system. This requires making the development process environmentally sensitive, consensual and participative, particularly in respect of fragile ecosystems crucial for the water, food and soils security of the country and ecological conservation a mass movement. Efforts have been initiated to save biodiversity both by *ex-situ* and *in-situ* conservation. *In-situ* conservation, particularly of wild flora and fauna, means conservation of species in its natural or even man-made ecosystems. This also applies to the domesticated flora and fauna at the sites of their use by declaring the area as "protected area" (e.g. national parks, sanctuaries, nature reserves, natural monuments, biosphere reserves, etc.) with emphasis either to save the entire area or an endangered species. Some of the most promising strategies to conserve wilderness around the world include debt-for-nature swaps, carbon credit offsets, conservation concessions, ecotourism, marine reserves, wildlife corridors, philanthropy and indigenous control. Apart from legal bans on hunting and trade in India, official attempts have stressed creation of vast protected area network of biosphere, national parks and sanctuaries. India has 85 national parks,

447 Wildlife Sanctuaries and 23 Tiger reserves under the Indian Wildlife (Protection) Act of 1972. At the international level, Conventions such as Ramsar Convention on Wetlands (1981), World Heritage Convention and the Biological Diversity Treaty (1992) accelerated conservation. Under the Ramsar Convention, six internationally significant wetlands of India, viz., Harike (Punjab), Keoladeo (Rajasthan), Chilika (Orissa), Wullar (J&K), Loktak (Manipur), and Sambhar (Rajasthan), have been declared as Ramsar sites. Under World Heritage Convention, five natural sites in India, viz., Kaziranga National Park (Assam), Manas Wildlife Sanctuary (Assam), Sunderbans National Park (West Bengal), Nanda Devi National Park (Uttar Pradesh) and Keoladeo National Park (Rajasthan), have been declared as world heritage sites.

PERSPECTIVE OF THE DEVELOPING COUNTRIES

According to the *Asian Environmental Outlook 2001*, “environmental degradation in (Asia and the Pacific) is pervasive, accelerating and unabated. At risk are people’s health and livelihoods, the survival of species and eco-system services that are the basis for long-term economic development” (ADB 2001). While developing countries saddled with three times more population than the developed countries, have been far less responsible for “polluting” the global atmosphere with GHGs, the contribution of developing countries to the worsening of environmental problems is increasing rapidly. A ‘dualistic society’, wherein environmental problems emanate basically from the greed of the rich and the poverty of the poor characterize most developing countries. Conventional wisdom suggested that less developed countries (LDCs) were ‘too poor to be green’. However, strong environmental movements sprung up over recent decades in most LDCs because of agricultural intensification, industrialisation and rising energy use, particularly, of fossil fuels. The Energy Conservation Act, 2001 recognises a paradigm shift from supply dominated approach to an integrated approach of a mix of investment in supply side capacity, operational efficiency improvement in power plants, reduction in T&D losses, end-use efficiencies and renewable technologies. The strategy of effective environmental management, *interalia*, requires local to global interventions for expanding water and sanitation coverage, tackling indoor air pollution, controlling disease vectors in the local environment, eco-friendly industrialisation by pollution abatement measures, reducing exposure to the worst offenders and cleaner production in the future, etc. Holistic development of developing countries requires the integration of the agricultural, economic, social, and environmental sectors of the economy with combinations of practical, applied, and theoretical perspectives. Dole et al have persuasively argued, “Perhaps the biggest question for environmental policy in developing countries is not how to improve an existing system, but rather how to build a system relative to a country’s given economic, social, and political status” (Dole, D. and Abeygunawardena 2002).

INDIAN INITIATIVES: UNFINISHED AGENDA

India is the first country with provisions for the protection and improvement of environment in its Constitution as reflected in the 42nd Amendment to the Constitution in 1976. While there were provisions in various enactments, such as, The Indian Penal Code, The Criminal Procedure Code, The Indian Forest Act, The Merchant Shipping Code, etc., these were inadequate in checking environmental degradation. Consequently, uniform laws for broad environmental problems endangering the health and safety of people and flora and fauna, e.g., The Water (Prevention and Control of Pollution) Act, 1974, The Air (Prevention and Control of Pollution) Act, 1981, etc., were framed. Widespread devastation caused by the Bhopal gas tragedy led to The Environment (Protection) Act, 1986 to provide a sharper focus. The onerous responsibility for implementation of The Environment Protection Act has largely been entrusted to the same regulatory agencies created under The Water (Prevention and Control of Pollution) Act, 1974. Other agencies are also entrusted with the responsibility of implementing specific provisions of the Act. While both the substantive and

procedural laws relating to environment certainly need to be tightened, what is basically needed is social will, which precedes the law.

In conformity with Indian culture and philosophy, successive Five-Year Plans stressed the need for harmonization of development plans with maintenance of the eco-balance. But environmental plans and programmes and a comprehensive legal framework need to be reinforced by executive interest, strict enforcement of regulations and an increased green consciousness. For, as Mr. K.C. Pant, stressed, "administrative and legal measures for controlling emissions, while important in themselves, are no substitutes for appropriate pricing regimes, on the one hand, and development of requisite technologies, on the other. Since energy usage has strong externalities through its impact on the environment, there is good economic rationale to tax energy consumption in a manner so as to encourage a shift towards more energy-efficient technologies. Similarly, pollution taxes can also be persuasive instruments for transitioning to more environment-friendly technologies and practices. These new Market Based Instruments for control and abatement of pollution will need to be implemented to supplement our traditional approach. However, for such measures to be successful without adversely affecting our pace of growth and development, the necessary technologies must exist and must be available at reasonable costs. This is the challenge before us".

Ministry of Environment and Forests (MoEF), the nodal agency for management and control of hazardous substances, progressively attempted to disseminate clean technology and environmental management through propagation of ISO 14000 and EMS, greening the supply chain, integrated bio-technological approach for restoration of disturbed eco-system and proper afforestation, due diligence, transformed management systems to improve sustainable environment through better management techniques, governance, partnership with industry and civil society. MoEF is implementing "India: Environmental Management Capacity Building Technical Assistance Project" (EMCaB) with World Bank assistance across the full range of issues, such as, priority setting, cost-benefit analysis of alternative policies for pollution control, resources management and biodiversity conservation.

STRATEGY FOR ENVIRONMENT-FRIENDLY DEVELOPMENT

Environmental problems emanate from land degradation and depletion of natural resources; human settlements unfit for living due to inadequate shelter, sanitation and water supplies; soil, water and air pollution; and global issues like global warming, ozone depletion, acid rain, the management of rangelands, eutrophication of lakes, pollution of estuaries trans-boundary movement of hazardous waste and environmental problems in developing countries (Nordhaus, 1990; Costanza, 1991; Walker, 1993). Accordingly, environmental concerns need to be dovetailed into development planning at all levels-national, regional, sectoral and project-to formulate a coherent strategy for environment-friendly development. Environmental impact assessment (EIA) processes emerged because of "dangerous inadequateness" of development planning in considering detrimental impact of economic development. Sustainable development requires a careful integration of environmental, economic and social needs to achieve both an increased standard of living in the short term and a net gain or equilibrium among human, natural, and economic resources in the future.

Cost-benefit analysis of projects must factor in appropriate discount rates, substitutability and the assurance of inter and intra-generational equity through institutional regulation, community participation and education to seek long-term solutions. Cohesive environmentally sustainable efforts require four pre-requisites: (i) the rate of regeneration must exceed or equal the rate of harvest; (ii) waste emissions should not exceed the renewable assimilative capacity of the micro-environment; (iii) the rate of exploitation of non-renewable resources (NRR) must always be less than or equal to the rate of creation of renewable substitutes; and (iv) in case an existing renewable resource is to substitute for a depleting NRR, its rate of harvest must be strictly less than its rate of regeneration to the extent necessary to prevent this substitution. Some countries, e.g., France, UK, Canada, Germany, Italy, USA, Japan and Denmark have been successful in reducing the

consumption of non-renewable resources (Janicke, et al, 1989). But reckless consumerism and high population growth exacerbated pressure on environment resources. India loses over 10 % of its GDP annually because of loss in agricultural productivity, loss in timber value due to degradation of forests, health costs due to polluted water and air, and costs due to depleted water resources; the economic loss of soil degradation resulted in an annual loss of 11%-26% of agricultural output; the total growing stock of forest is only 63% of the potential growing stock of the forests on the existing forest area; air pollution has significant impact on the health of people, specially those residing in urban slums; growing population, poverty, and inadequate access to clean fuels in rural areas have perpetuated the use of biomass fuels, thereby condemning more than 90% of rural households and more than 35% of urban households to higher levels of indoor air pollution; the incremental annual cost of ensuring safe drinking water and adequate sanitation facilities ensuring safe drinking water and adequate sanitation facilities to all is estimated at 3 billion dollars (TERI, 1998). A recent report of the Salim Ali Centre for Ornithology and Natural History (SACON) revealed that all the wetlands studied in 14 states were polluted and each of the nearly 1500 fish samples analysed from 115 water bodies either had pesticides or heavy metals.

MULTIPLE DIMENSIONS OF ENVIRONMENTAL POLLUTION

Environmental self-annihilation occurred because of obsolete and inefficient technologies, large and unplanned industrial conglomeration, inadequate resources for pollution control enforcement programmes, lack of public/market pressure for improving environmental performance, performance of labour-intensive or capital-intensive industries. Hence, pollution needs to be tackled by mandatory efficiency norms for upcoming process industries, energy labeling, waste minimization and promotion of recycling, self-regulation, enhanced R&D and development of clean technologies. Consequently, we need to build different scenarios, formulate proactive approaches to change related to business performance, stipulate practical steps for handling change and co-ordination of environmental policy incentives and programmes between Central, State and local governments, between different administrative institutions and ministries and between institutions themselves.

While environmental problems stem from intensified use of natural resources, the process of development also encouraged use of environmental protection technologies. Institutional factors like mode of production, patterns of ownership and systems of employment have significant environmental implications. Hence, all these aspects need to be factored in for a comprehensive assessment and perspective. Issues, such as, (environmental) Life Cycle Assessment (LCA) of products, Ecodesign, etc. have become significant for companies to improve environmental performance of their products and production processes for both internal (improved efficiency) and external (perceived image) advantages. The interrelationship between environmental quality and industrialisation necessitates an exploration of environmental threats associated with poverty and unwise development. While common effluent treatment plant (CETP) reduces wastewater of individual industries up to the desired concentration by techno-economic solutions, CETPs could themselves increase pollution loads through contaminated wastewater and large quantities of toxic sludge. Wastewater management projects are limited to places with at least some environmental regimes. Accordingly, economic analysis of such projects is conventionally confined to a least cost-analysis without gauging the environmental impact in monetary terms (Dole 2002). Important issues in measures for optimum efficiency relate to ownership aspects - government, consortium of industries or an independent body, conveyance system through gravity flow, by tankers, etc., cost-effective treatment supported with a system of regular collection/ payment of treatment charges by each member unit while maintaining its effluent quality within acceptable norms, criteria for cost-effective based on the volume of effluent, consideration of dilute streams and conveying highly toxic waste to CETP, appropriate design of CETP based on low capital investment and lower operation and maintenance cost. Biotechnology can play an important role in effluent treatment. Eco-competitiveness agenda for industry, i.e., move towards zero emission and zero effluent goals; adopt

an integrated approach towards environment, quality, health and safety; translate cutting edge technology into environmental benefits; utilise new markets for environment trading and CDM projects and adopt environmental performance as corporate social responsibility, needs to be pursued by strengthened linkages between formal and informal / non-formal institutions. Together we can extricate ourselves from this morass by focusing on the set of possibilities that have now emerged rather than the constraints that have always been there through strategic direction, thorough consultation, business creativity and innovative market solutions together with a long-term partnership between business and government.

IMPERATIVES OF CLEANER PRODUCTION TECHNOLOGIES

Despite widely varying industrial technological practices, the fault lines of the conventional process are real and worrisome. Waste minimization and the involvement of business in agreement on benchmarks and targets for every major energy-using industry requires adoption of technologies, best practice techniques, process changes and effective charter on Corporate Responsibility for Environment Protection (CREP) Implementation and Monitoring. Companies need to undertake self-regulation initiatives by environmental audit and strong internal monitoring system. Cleaner production (CP), the continuous application of an integrated preventive environmental strategy to processes and products to reduce risks, leads to financial benefits of 10-15 % through energy savings, waste reduction, waste conservation and higher-quality-output. Despite the demonstrated benefits of cleaner production technologies, firms' reluctance to install cleaner technologies arises from the difficulty in accessing finance, higher cost of investment *vis-à-vis* the benefit and insufficient mechanisms in terms of regulations and monitoring and enforcement measures. The service industry also needs to adopt an eco-friendly approach through a holistic approach of reducing cost, increasing productivity, conserving resources and environment.

Initially, the emphasis on controlling industrial pollution was at discharge points ('end of the pipe') aimed at cleaning up emissions prior to discharge. However, increasingly stringent legislation, development of economic policies and measures to foster environmental protection and the growing concern of individuals, groups and societies necessitated a paradigm shift from pollution control to Environmental Management System (EMS), such as, ISO 14001 and Eco Management and Audit Scheme (EMAS). While ISO 14001 is the specification, describing the core elements for certification or self-declaration of environmental management system, ISO 14000 is a non-certifiable guidance standard. In India, about 140 companies, mostly in the large industry sector have obtained ISO 14001 certification. ISO 14001 plus approach, creation of a national accreditation body in the country and engagement of competent groups of environmental auditors and certifying agencies needs to be adopted.

ORGANISATIONAL CHOICES AND CHALLENGES

Appropriateness, scale and environmental impact of organisational activities, products and services in improving environment to preserve health, protect safety and enhance the quality of life must be considered. Organisational pollution control requires cost-effective cleaner technologies, afforestation and appropriate pollution control technologies, formation of Waste Minimisation Circles (WMCs), taxation on wastage, and prior environmental clearance for establishing industries. Preparation of a comprehensive data-base on industries, rehabilitation of industrial units in non-conforming areas, determination of optimal size of industrial units, demonstration of waste minimisation options and cleaner production techniques, proper training of personnel, R&D activities and close monitoring of CETPs in industrial estates/clusters would help businesses in responding to major social and environmental trends reshaping markets. Energy Service Companies (ESCOs) can help Indian industry become cost competitive in the global market and significantly slash its energy costs, while at the same time reducing the risk of projects "going wrong". This requires surmounting problems of

customer inertia, lack of technical resources, absence of focus, poor understanding of project synergies and lack of awareness among CEOs and CFOs. A recent Leader in *The Economist* cogently argued that a leapfrogging is needed “from the dark ages of clumsy, costly, command-and-control regulations to an enlightened age of informed, innovative, incentive-based greenery”. There are, however, doubts about the success of “money-reductionism” attempts to internalize externalities in many economic activities (e.g., pollution of rivers by industries, destruction of forests and livelihoods of indigenous communities by large dams) (Martinez-Alier, 2005). Establishing economic value in fictitious markets is, however, complex because there are “incommensurable values” and “unresolvable uncertainties” regarding the future impact of a project. Given the easy manipulation of the “discount rate”, multi-criteria matrices may be used. Such matrices may use monetary methods without foreclosing the possibility of rejection of projects for violation of non-negotiable considerations (e.g., natural habitats in the silent valley). WDR 2003 stressed the interaction between economic, social and environmental problems and opportunities are manifested spatially-where people live; problems that require lasting solutions often are not susceptible to quick fixes; institutions need to be improved at many levels – from the local to the global- to promote growth in ways that protect environmental and social assets and strengthening the foundations for better institutions requires overcoming the inequitable access to assets and the pervasive barriers to inclusion.

THE WAY AHEAD

Developing countries need to transform systems and institutions, broaden inclusiveness in the access to assets and increase transparency. In the ultimate analysis, eco-friendly development is often the best, sometimes the only method, of enhancing economic development. There is no unavoidable trade-off between environment and development objectives and a synergistic relationship exists between growth and employment, employment and environment and environment and growth. As Barbier (1987) said, “the primary objective of sustainable development is to reduce the absolute poverty of the world’s poor through providing lasting and secure livelihoods that minimize resource depletion, environmental degradation, cultural disruption and social instability”. Worldwide experiences demonstrate that environmentally unsustainable practices turn out to be more expensive in the long run because of human and health costs and loss of capability. Dithering on sustainable development arises from “the social and political problems associated with distributing costs and benefits within and between groups and generations” (WDR, 2003). Devising an appropriate policy framework to evolve a suitable collaborative arrangement between the government and the voluntary sector is necessary to satisfy the concerns of all stake holders - the government, industry, neighboring community, customers and the society at large in overcoming environmental catastrophe.

Financing sustainable development transcends financing environmental protection. Hence, strategic action agenda must encompass promotion of centrality of sustainable development in agriculture, trade, investment, R&D, infrastructure, and finance; designing of new policy packages that reduce the role of subsidies without causing hardship, particularly to poor populations and small-scale industry; initiating steps to raise awareness of the linkages between subsidies and environmental degradation; developing new financial mechanisms, particularly loan systems, to bring about the rapid dissemination of cleaner and more efficient production techniques; improving public access to environmental information and disseminating advantages of cleaner and more efficient production techniques to more industrialists, particularly in developing countries. A reality check also necessitates introduction of small levies on emissions to shift market conditions in favour of cleaner technology in the energy and other sectors; make full use of economic instruments that treat land and water as scarce economic resources; establish secure land and water property rights, where these do not exist; strengthening national cross-cutting institutions while maintaining strong environment agencies able to implement environmental policies, enforce environmental laws, and

assess the overall state of the environment; accompany government decentralization with local capacity building and a redistribution of financial powers and accountability; increase support for international environmental organizations to enable them to improve their advisory, coordinating, mediating, implementing, and assessment functions (UNEP, 1999).

The promotion of wholesome development is not easy. But with cutting edge policy advice, advocacy and networking services, together we must make a difference to the management of the dynamics of development. Maintenance of eco-balance is a matter of choice, not chance. The world has several countervailing sets of instrument to reduce the threat of the impending crises but the wit and wisdom to use these instruments properly is required. Environmental determinism fundamentally requires a new and higher level of thinking and effective action on several fronts simultaneously. The success of this strategy requires turning the campaign for sustainable development into a mass movement with people back at the centre of the human economy, subsuming economics to the interests of the public good. Otherwise, the outcome would be “the worst of all possible worlds” for the citizens of the world, whose tragedy is “awesome” because of “the integral and interdependent nature of the Earth, our home”.

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