Reorienting Environment Policy in India Towards a Local Area-Based Development and Management Paradigm

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Abstract: *Though based on sound scientific principles and globally recognized norms, India's environmental laws and policy are not effectively implemented. The visible deterioration of city and receptor environmental quality is in stark denial of the avowed state policy precepts such as sustainability and natural resources conservation. Development project clearance methods, environmental management and regulatory practice do not converge with the corresponding capacity and structure of environmental regulation, information and markets at the impact levels. Policy directs Development within environmental carrying capacities, essentially through pollution source-based impact assessments and management procedures. This tends to discourage cleaning up already degraded receptors, shifting polluting development towards cleaner areas. A participative, market oriented, local area-based approach could promote more holistic development extending incentives for polluters and victims alike in cleaning up to ensure incomes from both environmental and conventional economic flows.*

This paper suggests 'eco-synergy' as a framework concept to guide such a development form. It also suggests environmental zoning, local empowerment and management re-structuring as supportive tools to reorient Indian environment policy accordingly.

Keywords: Carrying capacity, receptors, source-based regulation, area-based management, non-point pollution, eco-synergy.

1. Introduction: an overview of the problem

Indian scriptures, the Indian Constitution, her environmental laws and policy all recognize the importance of impact-level local economies, livelihoods, culture, ethics, customs, bio-diversity and their inter-relationships in the design of management standards and procedures (Misra 1997). But at present this recognition is not reflected in the implementation process. One reason could be that environmental policy has been less directional and more a listing of global best-intentions regardless of their compatibility with conditions at the impact level. This is apparent from a general reading of the National Conservation Strategy and Policy Statement on Environment and Development and the Policy Statement on Abatement of Pollution, the two early policy documents issued by the Ministry of Environment and Forests, Government of India in 1992. Environmental fundamentals like sustain-

able development, environmental impact assessment and management planning (EIA-EMP), the polluter pays principle, citizens' rights and related themes are enunciated more to prescribe than facilitate environmentally inclusive development. Though improving on the 1992 policy documents, the National Environmental Policy of the Government of India, 2006 (NEP 2006) also lacks a direction in terms of institutionalizing social monitoring, impact-level information gathering, up-dating, storage and use and natural resource-use management aspects at the receptor levels. Development is perhaps unintentionally encouraged in relatively clean areas with sufficient environmental carrying capacity, than with a legal binding on pollution sources to clean up and develop already degraded lands and water bodies receiving their pollution.

The policy shift required is not in intent but in emphasis. From regulating mainly sources of pollution to an area-based management paradigm, to make global environmental good-practice understandable, compatible, applicable and acceptable at the local impact level, where pollution hurts most.

2. The Legal Frame And Inconsistencies Within

Environmental laws and related amendments are prepared by the Ministry of Environment and Forests in the Government of India in consultation with other relevant ministries at the Centre and in the States. The Central Parliament approves the laws and the implementing structure at the Centre and State levels implements. The generally applicable environmental regulatory and implementation structure throughout India is shown at Figure 1. The Executive and the Judiciary are shown in two vertical sections and three horizontal levels i.e. the Centre, the State and the district and below. The Central Ministry of Environment and Forests in consultation with the Ministries of Urban and Rural Development and Roads and Highways makes policy and plans to be implemented at the State and lower levels. With the help of its technical arm the Central Pollution Control Board this nodal ministry notifies standards for mainly industry sources of pollution and for ambient receptors to meet the ends of the laws. At the state level a similar structure with the help of the State Pollution Control Board, the Municipalities for urban areas and the Gram Panchayats for the rural areas and the Road Transport authorities formulates plans and policies to implement the Central laws under all environmental parameters, air, water and solid waste.

The Judiciary at the corresponding three levels comprises the Supreme Court, the state High Courts and the judicial magistrates and tribunals at lower levels. The Courts examine complaints filed under the environmental laws either by the regulators at the magistrate level or by citizens and civil society groups directly with the higher courts which exercise original jurisdiction under Public Interest Litigation (PIL). The higher courts can direct any executive agency to act in a particular way at any level.

As made clear in the Figure 1, though the planning and policy making process has some level of consultation among the Ministries, implementation is segregated essentially as vehicular air pollution, industrial and domestic pollution management. Citizen grievances on pollution are also made for identified industrial and commercial 'point' sources, non-point and diffused sources of pollution and for vehicular air pollution separately to the State Pollution Control Boards, the elected municipal or rural panchayat authorities and to the Road Transport Authorities respectively. The lack of a holistic comprehension of pollution on an impact-area basis is apparent even in PIL complaints where petitions are separately posed to the Supreme and High Courts. To solve a particular area-pollution problem like a polluted lake, soil contamination, air inversion and the like, where multiple field agencies are involved, court directions are given to State or Central ministries who pass these on to the field agencies for a segregated implementation. Thus if a lake is polluted due to both industrial and domestic effluent as also solid waste, the handling of the complaint can get confused in the overlapping responsibilities of the state pollution control boards and the local authority. Ministry level legal or policy consultation is not on an area basis but vertically segregated. The intensity of pollution in areas is not given policy emphasis or a matter of special coordination among the different field implementation agencies. Thus policies for total sanitation in a city for example would not generally take into account the occupational health and safety issues in industrial hazardous wastes handling in mixed domestic solid waste by municipal workers as that comes within the purview of the State Pollution Control Boards. Industrial

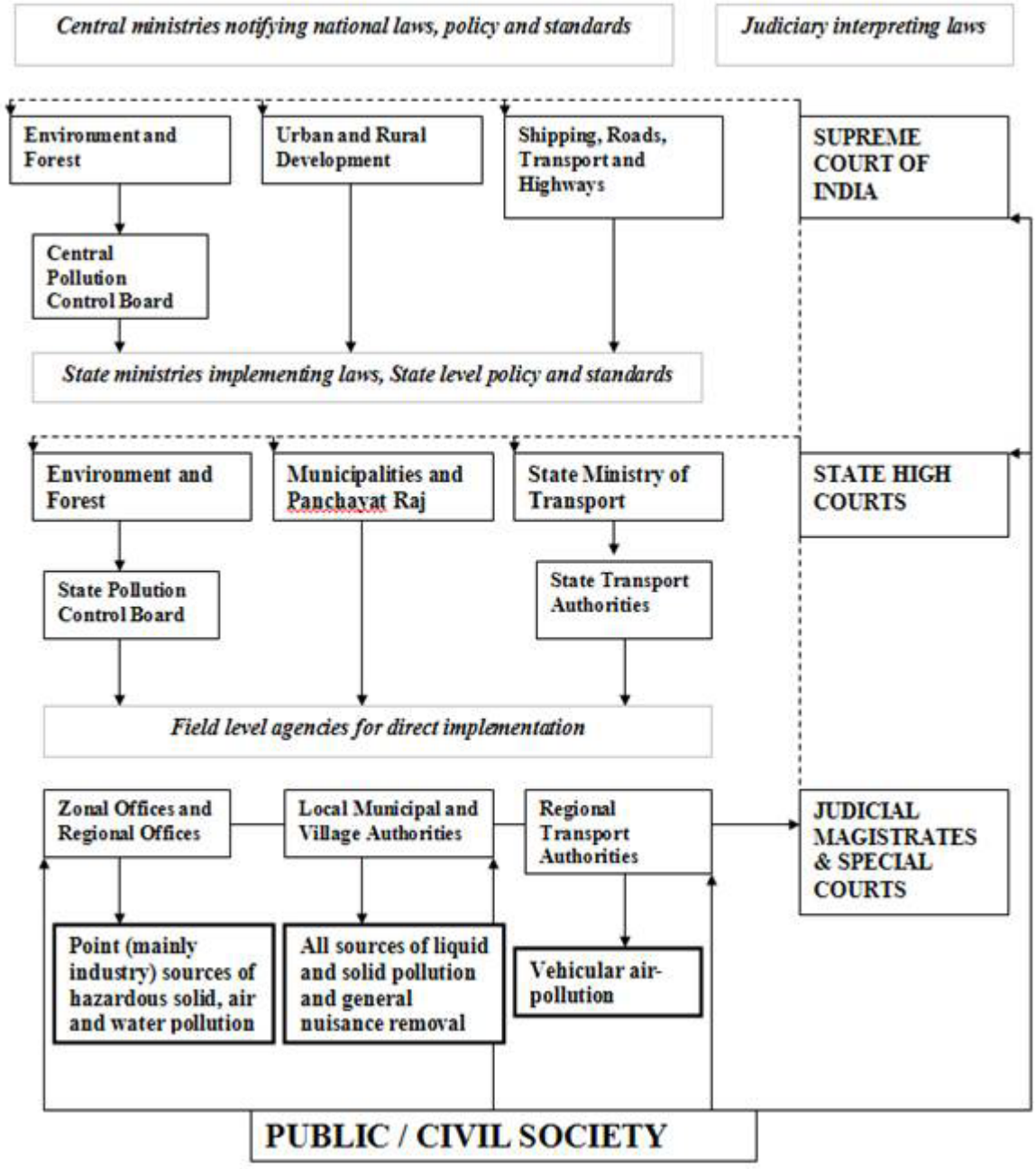


Figure 1: *Outline of the regulatory structure in India.*

effluent standards are prescribed universally and not according to the environmental quality of the receptors. For example, a clean lake maintained by the municipality and used by the public for recreation when threatened with acidification by industrial pollution becomes a problem for the State Pollution Control Board to solve. Though under the municipal laws, the local authority could directly act against the industry sources concerned. The Criminal Procedure Code is followed in the process of prosecution under the Indian Environmental Acts but there have been very few prosecutions filed by the State Boards and only two convictions in the whole country till 2007[1]. The PILs filed directly in courts by a pollution victim or community, have been more effective on the impact-area focus (Jariwala 2004). But these have been one time directions for clean up or remediation without any programmatic follow up.

Four Acts and the EIA notification under the Environment Protection Act of 1981 form the background for policy. The Air (Prevention and

Control of Pollution) Act of 1981 is useful to regulate industrial stack emissions by the Pollution Control Boards. Given the preponderance of vehicular emissions in air in developed areas, the Motor Vehicles (Amendment) Act, 1988 implemented by the Ministries of Transport at the Centre and States has incorporated relevant aspects of the Air Act to regulate ambient air quality only to the extent of vehicular pollution. The Directive Principles of State Policy of the Indian Constitution in Articles 48 A and 51 A (g) assign a foundational role to the environment. Both the protection and the improvement of forests, wildlife, lakes and rivers are emphasised without reference to whether development will be curtailed by such State action. Maintaining water quality is critical for India (Sabine et al. 2004, p 5)[2]. But enforcing this Constitutional directive is hamstrung by a lack of clarity in the line of authority. The Water (Prevention and Control of Pollution) Act of 1974 quite comprehensively covers the functions of maintaining good water quality and places this responsibility on the State Pollution Control Boards and the Central Pollution Control Board. But the Constitutional 73rd and 74th Amendments have mandated that State Legislatures empower the local self-Government institutions to administer and implement laws concerning management of local resources including water quality management and sanitation[3]. Water quality management at the impact level thus also comes within the jurisdiction of the elected local authorities diluting responsibility. A related statute, the Water (Prevention and Control of Pollution) Cess Act of 1977 introduces charges for the consumption and pollution of water by industries and local authorities. The rates of charge are too low if total economic valuation of water or its opportunity cost in the local context is considered (Phillips 1998; Sankar 1998, p13)[4].

The Environment (Protection) Act of 1986 (EP Act) is more broad-based. It defines the environment as

'*Environment includes water, air and land and the inter-relationship which exists among and between water, air and land and human beings, other living creatures, plants, micro-organism and property.*'

It delegates environmental enforcement powers from the Centre to the States and the districts, imposing penalties and strengthening the hands of state and district administration. But the same bureaucracies responsible for the present state of pollution are expected to exercise enhanced powers to control it.

The NEP 2006 suffers from a serious lack of emphasis on perhaps India's most important environmental blight: non-point water pollution (Novotny and Chesters 1981; Policy Statement on the Abatement of Pollution 1992; Parikh 2000; CPCB 2001)[5]. Regularly analysing the water quality in the country's major receptors of non-point water pollution in major and minor rivers and lakes the Central Pollution Control Board concludes that organic and bacterial contamination through domestic untreated discharge form the main pollution load. Though marginally improved since 1995, in 2007 about 33% of the analysed samples show Bio-chemical Oxygen Demand levels of higher than 4 mg/l. Pathogenic pollution in water has Total Coliform count ranging from 500-5000 MPN / 100 ml in about 35% of the samples. Faecal Coliform counts in this range are about 23% of the samples observed (CPCB 2008)[6]. The regulatory structure does not help in comprehensively attending to this problem with the State Pollution Control Boards addressing only identified industrial discharge and the local authorities without the capability or resources to continuously clean up affected receptors.

The EP Act and the NEP (2006) encourage the imposing of more stringent local level water and air quality standards for receptors than the universally applicable standards fixed by the EP Act. But most State Pollution Control Boards find it convenient to adopt the EP Act standards at source outlets and receptors alike. This avoids them the trouble of setting and then implementing a higher standard with the risk of losing developmental (mostly polluting) investments compared to other regions with easier EP Act standards.

2.1 The National Environment Policy 2006 needs a strategic focus

Instead of reconciling the issues of regulatory responsibility and focus, the local relevance of economic instruments and standards, the NEP 2006 raises further inconsistencies. While acknowledging that environmental stock resources cannot be subject to conventional economic valuation, the document insists on minimizing direct costs to realise such 'incomparable value'. Intrinsic value which includes the environment's non-use, existence or bequest values

cannot be compared and cannot be less (and has to be more including the non-use loss) than the opportunity cost of losing the commercial gains from these preserved assets. Like all natural resources, the valuation of incomparables should be on total economic value considerations including their use plus non-use value.

Similarly, the NEP's recommendations on the Polluter Pays Principle confuses between its management and environmental implications. To be applied only on regulated polluting sources as a linear measure of damage this instrument misses the environmental impact of non-linear, non-point pollution in most cases of water and soil pollution in India. Accordingly, intrinsic values of receptors are lost forever with even little addition of pollution (Myers 1988; Kolstad 2000; CPCB 2008). To reconcile the difference between measurable financial value and immeasurable intrinsic value the polluter pays principle should again, be considered on total economic valuation principles. Payment to cover an externality differs from place to place for the same pollutant quality / quantity discharge depending on the state of the local receptor. The principle can be applied on sources as a one-time clean up charge, a continuing charge or a quantity limit for polluting a receptor. As a continuing charge it covers the prevention costs of the additional pollution units discharged by the polluter over and above the source-outlet standard. But from a receptor perspective, for each unit of additional pollution charged or prevented, the expenditure on removing three units has to be met i.e. two from the legacy stock of the charged pollutant in the receptor and the third preventing one present unit from discharge at source, to make room in the receptor for a permitted unit. As regulated sources in India are expected to only prevent their own pollution up to the level of outlet-standards without a continuing pollution removal liability, pollution accumulates in receptors. Perhaps it is for this reason that in India the polluter pays principle is applied in judicial pronouncements such that a guilty polluter is expected to remove his / her past pollution along with the present discharge for which he / she is prosecuted[7]. The problem with implementing this principle has been to find polluters who would pay to prevent their own pollution as also clean up their own and others' past pollution from receptors. And the NEP 2006 has no ready solution.

Policy-positions on environmental carrying capacity seem to encourage a shift of polluting economic activity from polluted to clean areas. The 1992 policy papers specifically promote the expansion of environmental carrying-capacity through technology inputs and spatial distribution. The Environmental Impact Assessment Notification of 1994 issued under the EP Act in the same vein advocates that if there is no head-room for polluting an area after studying the expected pollution from a future development project then it should not be located there and go where there is more carrying capacity to absorb the pollution i.e. to cleaner areas. The pollution control technology-fix applied on industries by the Central and State Pollution Control Boards is also misdirected as it encourages industry to adopt technologies that may not be applicable in constantly changing material input and pollutant output-mixes.

Instead of using extant environmental law to train and legally empower urban and rural local authorities in India to manage their local environments as they are legally bound, the NEP 2006 expects the concerned State departments to enforce decentralised operations[8]. But this remains a non-starter because State controlled externalised, bureaucratic and departmental regulatory structures have developed their own power bases and legally valid decentralised operations by local authorities have been known to be thwarted through centralised fiscal and administrative controls (Pinto 2000; Gupta 2004; Patnaik 2006).

2.2 Environmental Impact Assessments by, of and for developers

Along with the local self-government authority, the community and environmental resources like water, soil and bio-diversity have lost the essential economic and livelihood linkage with development. Since 1994, with the Environmental Impact Assessment Notification, development projects have become projects planned and executed externally, making use of environmental resources of local communities, without providing the community any stake in such development. Development based on the project-clearance legacy continues in the NEP 2006, notwithstanding that most polluting industry units penalized in PILs in courts are projects originally 'cleared' but later not sufficiently monitored by the environmental regulators at the National and State levels (Santhakumar 2001). Though the NEP

stresses the need to apply higher doses of localization and decentralisation, the objective seems more to hasten clearances of developmental projects and gain local support and less to mainstream human-environment inter-relationships at the impact level, necessary to sustain these development projects[9]. The EIA-EMP mechanism is geared mostly towards non-local developers 'finding' carrying capacity to pollute. Listing technology safeguards and promising management measures in the Environmental Management Plans attached to the EIA against a project's propensity to pollute is enough to get clearance both at the State and Central levels. After operations start, there is a general apathy towards implementation of the EMP promises. The ambient environment of receptors is normally polluted enough to disguise any new addition.

In the true letter and spirit of the 'Public Trust Doctrine' promoted by the NEP 2006 there is need to set guidelines for public / State certification of social and environmental quality baselines to support EIAs and EMPs in the future. Without such facility the developers themselves gather and provide the data. The State and Central EIA appraisal-project clearance authorities depend on the data supplied by the developers. It is therefore in the interest of project proponents to manipulate site-monitoring data and show more carrying capacity of the receptors to exploit. The misleading use of carrying capacity can lead to the cumulative degradation of receptors as no serious carrying capacity measurement is technically feasible in changing environmental conditions. The EIA exercise also belies the cost-minimisation mandate of the NEP 2006. More than fifty-percent of a developer's expenses on the EIA-EMP exercise are on monitoring for baseline database development. If more than one industrial or commercial project comes up around the same receptor, normally the baseline data should be shared by them as representing the same bio-geo-physical features as also to save on costs. But actually each developer spends separately for individual EIA reports and monitoring data, though of the same area. Clearly, one motive could be to manipulate the ambient pollution status to suit one's own pollution potential to get easier clearance for the project.

3. Analysing a New Direction for Development

From the foregoing critique it becomes clear that while Indian environmental laws retain the basic fundamentals of environmental protection, in that water quality, air quality, forests and environment as a whole must be retained in or restored to pristine forms, post-1987 environmental policies seem to have encouraged a subservient position for the environment and placed it in support of the development paradigm such that the pristine forms are no longer available or very expensive to regain.

3.1 The sustainability context

After the seminal Brundtland Commission Report of 1987, India adopted 'Sustainable-Development' as a guiding principle to bring in the 'internalisation of environmental considerations in developmental decision-making'. Perhaps this laudable purpose still eludes the country because by its very nature, development is and brings change and cannot be sustained in one form. Conversely, the environment cannot continuously feed changing development needs unless natural support systems are made sustainable. Considered an oxymoron in academic circles, sustainable development has not been able to address conservation and sustenance of nature or culture but facilitated accelerated economic growth (Sachs 1994), generally and particularly in India.

Assessing by a well recognized indicator of sustainability that is the Human-Development-Index (HDI), India stands far below a few medium / low-income countries whereas one of its main indicator of growth, Gross Domestic Product by Purchasing Power Parity (GDP-PPP) places it very high on the development index[10]. The gap in India's ranking between the two indices shows that the rise in purchasing power must be at some cost reflected in a lack of human well-being. Some of this cost is observed to be covered by 'ecological poverty' that is ignored in normal economic performance indicators like Gross National Product or Gross Domestic Product but which is a real socio-economic cost borne by about 500 million people in the world, including a large population in India that still belong to a biomass based economy (Agarwal 1999).

With trees and grasses replaced by large scale cement and bitumen paving, eroded and chemically

destroyed soil incapable of producing food and a disturbed hydrological cycle, most of India's poor people cannot meet the HDI indices like life expectancy, especially child welfare with bad water quality alone killing about 1.5 million children under the age of five every year from water-borne disease in India.

No doubt Sustainable Development is not all about the environment. But seeing beyond the broad parameters of environmental management at the global and national levels that it promotes, perhaps the concept should be broken down to its local impact level components and related apples-to-apples with developmental drivers. This one to one relationship is feasible at the local and impact level as here both sustainability of environmental resources and growth of economic well being are most visible and easier quantifiable among the affected community. Policy should be encouraging of action to make natural resources sustainable and development flexible as they are by definition.

3.2 From carrying capacity to the 'development capacity' of the environment

Instead of exploiting, development can actually sustain or even enhance environmental carrying capacity to support more development of the same or of a different kind. Development can be planned to create pollution prevention and removal capacity in addition to economic benefit streams around local natural resource bases. 'Sustainable-Environment' would be a more relevant concept that defines, limits and legitimises environmental-development interventions through an area-based approach. This review paper promotes the concept of development capacity as not how much pollution the environment can absorb but how much pollution it can profitably remove and prevent.

Development has to create environmental capital, finding eco (economic and ecological) synergies in projects, relating them locally to existing environmental conditions. Three types of synergic products can be promoted:

(1) Direct upgrades in environmental stock like refined aesthetics, clean air, clean water, remediated soils for higher productivity or alternate use, clean work places and homes, landscapes and the like. These can reduce community transactional, time and health costs and add advertisement, real estate, investment potential, recreational and bio-diversity value for the community.

(2) Composite conventional projects that can be made to profitably remove receptor pollution faster than its accretion in the catchment and gain from the resultant environmental flows. Chemical (acid) recovery plants, recycling systems, composite transportation and irrigation projects are a few examples in this category.

(3) Market goods and services that can be successfully produced only with the support of environmental flows for example tourism schemes, sports complexes and amusement parks, commercial complexes and township development.

Policy support for these three product lines has to be multi-sectoral. For example, from the product end: how can a road, a building, a commercial complex, a hotel, an industry, surface irrigation and other large-scale development produce new environmental services? Like using up 'technical nutrients' which otherwise would be dumped as waste by these projects and generating new 'bio-nutrients' that would contribute to enhancing natural environmental cycles, not possible without these developments (McDonough and Braungart 2002)? Input side examples include off right-of-way ribbon development along roads, cleaning up solid and liquid waste and transplanting avenue trees that would otherwise be cut down for road-widening thus adding real estate value to vast linear polluted stretches. An airport runway or a highway can harvest all the rain and wash water that fall on it and use the treated water for irrigation or washing purpose saving on buying expensive clean water[11]. Eco-synergy projects can be encouraged in growth corridors of India in ways that will enhance the benefits from local natural resources with new developmental investments specific to the location.

3.3 A rationale for Eco-Synergy

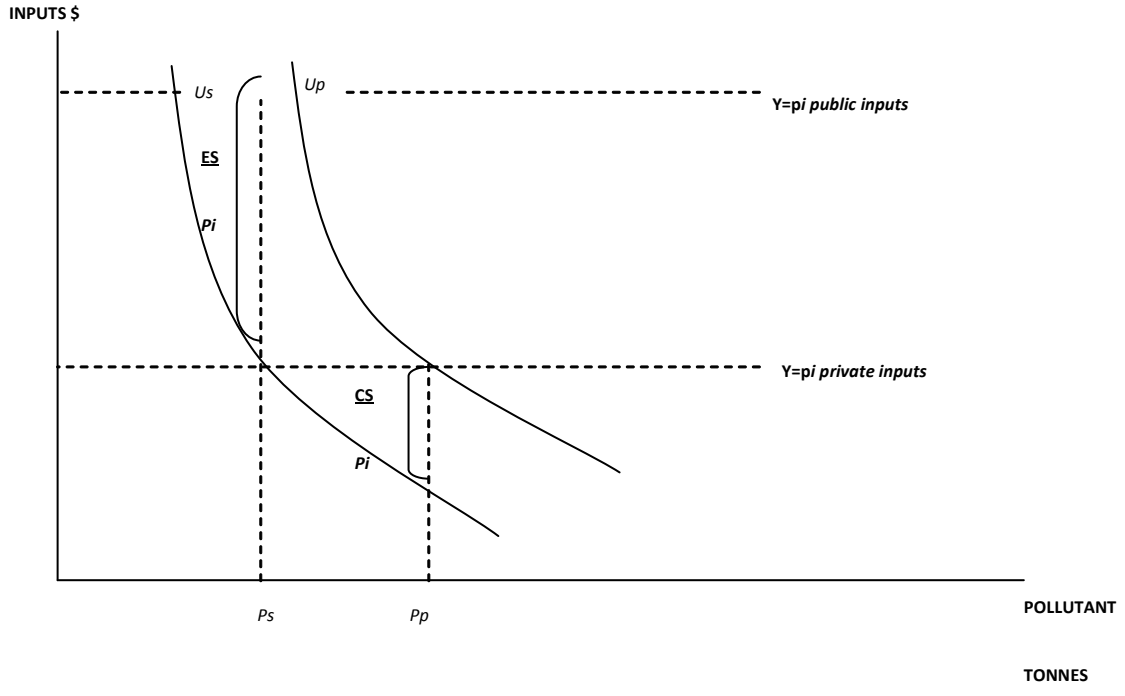
Development capacity of the environment also lies in capturing the consumer surplus latent in the receiving community's surrendered or compensated right in accepting development with pollution or what it perceives to be cleanliness (Chatterjee 2005). The market has to pick up this surplus through eco-synergy products offering equal or higher benefits

and choices unavailable under business-as-usual receptor conditions. From the receptor-catchment perspective the polluters and their victims are the same, all individuals in the same community discharging pollution into a common receptor, a lake, the sea or an industrial estate and suffering from it. As individuals they let out their pollution beyond their private boundaries. But as a community they respond to the environmental condition of the receptor in the public domain. In a non-point pollution situation where individual responsibility is difficult to establish, large polluters like industry or commercial establishments may even join pressure groups or civil society representatives to contribute to clean ups of the receptor or pressurize Government to fund such remediation. This could be to create carrying capacity in the receptor to absorb future pollution or as a social obligation against odour, colour or other community perceptions of the receptor's water quality.

Eco-synergy is modeled as an Equivalent Surplus. A community response to the individual private trade-offs in environmental welfare and economic benefit as shown in Figure 2.

Figure 2 represents a typical non-point water pollution receptor situation, with individual polluters and their victims buying inputs or paying compensation (*X* axis) against loads of a critical pollutant, increasing rightward (*Y* axis). As the receptor is in the public domain with the ambient pollutant standard at P_s individuals can pollute it freely using substitutional inputs for protection and / or paying and receiving compensation for health costs or damage. This is represented by the shift in community utility anywhere between the standards position (U_s, P_s) and the presumed social tolerance or community perception of pollution position (U_p, P_p), within the combined private income limit for inputs ($Y=p_i$ *private inputs*). This shifting utility space is a trade-off zone between community desire for clean water in the receptor and the desire of individuals in the community to preserve their private spaces while gaining economically from pollution savings. It includes the compensated surplus from out of pollution savings and surrendered rights (CS/p_i).

The equivalent surplus area (ES/p_i) technically lies beyond the private space of the CS and includes the costs incurred by individual polluters and victims



Adapted from Kolstad 2000

Figure 2: *Diagram showing the modeling of eco-synergy as equivalent surplus.*

under baseline conditions. Here, ES has been modeled as a community eco-synergy response with the starting point as the ambient receptor standard for the measured pollutant. For the receptor catchment one or more projects has to meet the utility levels of all individuals in the community as if at U_p, P_p but without changing the actual utility position from U_s, P_s.

The eco-synergy response cannot be a one time solution or clean up but has to continue providing conventional benefits as at U_p, P_p while cleaning the receptor upto and even leftward of the standard. Accordingly, the capital and operational costs of an eco-synergy product has to take into account not only the price of the product but also the incremental rate of change in the water quality it has to achieve over and above the baseline conditions. Using a production function model developed by Courant and Porter (Courant and Porter 1981, p 321-329) the community defensive expenditure is adopted as total community expenditure on an eco-synergy project / product for a period, a month, a year or any convenient monitoring period to record changes in the water quality of the receptor caused by the pollutant measured. The total expenditure is worked out as the product of the price of the product / project and the ratio of the incremental unit costs of removing the pollutant from the receptor over and above the same for the baseline pre-change position with respect to the incremental quantities of the pollutant to be removed for each adopted period of monitoring. For convenience in implementing these projects a receptor's water quality changes monitored annually for critical pollutants over a past decade or so will provide a series of change rates, the maximum or the median of which can be adopted to design the project at commencement. Thereafter, actual monitoring of changes in the quantity of the pollutant in the receptor can form the basis for calculating increments or decreases in the total expenditure to be defrayed as a fee for members who wish to gain from the community level eco-synergy product[12]. Individuals can buy into the project through shares, sweat equity or by paying fees for conventional economic benefit while as a part of the receiving community they benefit from the environmental gains made possible by the project.

Though the Courant and Porter model was originally used to quantify market driven pollution-substitution (Dickie and Gerking 1991, p 1-16) the methodology can be used for eco-synergy products working opposite to the logic of substitution. While substitution values pollutant units avoided by individuals as being equal to the market price of substitutes they individually buy, eco-synergy values a market good as being equal to its price as increased or decreased by the required rate of change in the stock of pollutant units present and expected in the receptor, thus characterising the good as an environmental as also an economic good. Substitutes buy protection from pollution and may or may not be otherwise useful. But eco-synergy represents a combined effect of all individual substitutes. By removing pollution from the receptor continually individuals are protected as from substitutes, but the community also gets the benefit of a clean receptor.

To cite a live example of a potential eco-synergy project that can work in a rural context the case of canal-catchment farmers of Krishna, West and East Godavari districts of Andhra Pradesh in the villages of Voyyuru, Chagallu and Jegurupadu is examined. There is a general preference here for groundwater irrigation as the irrigation canals are too polluted by mixed domestic waste water, distillery and paper recycling trade effluent. By not contributing to cleaning up and widening the canals the farmers ostensibly gain a double-benefit: they can continue polluting the canal along with the industry, as also irrigate their fields through tube-wells purchased from compensation paid by industry. But if the eco-synergic alternative of cleaning and improving the canal includes a new economic opportunity of transporting farm produce free or at lower cost than the present road transportation, then the farmers will not invest in groundwater irrigation and would rather pay for cleaning up and the industry can reduce their compensation payments. The substitution with ground water that allows the pollution of the canals causing high levels of compensation from industry, health problems of the community and operational costs of road transportation and maintenance of tube wells gets replaced by the multiple benefits of a clean canal, less health problems, canal transportation and irrigation and less or no compensation payments. The environmental alternative characterises the market good (service) of canal transportation in a way that it becomes economically viable for the community to invest in.

Eco-synergy projects could invite wide community participation at the receptor level when a social benefit gained also translates into an individual benefit at equal or lesser individual cost. In the case of the canal side farmers, canal clean-up creates a social benefit with irrigation as an individual benefit at least equal to the earlier groundwater option and transportation comes free or at lesser cost to individual farmers than the earlier road transportation.

4. Policy Support For Eco-Synergy

In a sense, the environment becomes dependent on development----especially on technologies like information-technology, pollution-removal technology, a variety of private and public participation methods, knowledge creation and exchange, sectoral and departmental coordination in planning resource-use and in attracting individual investments for a community and individual gain. Rules and procedures to legitimise these new local-level inter relationships are required to standardise the process. In support of the eco-synergy initiative future environmental policy has to

1. decentralise the EIA-EMP process
2. create environmental zones based on certified local area databases
3. empower local authorities and partnerships.

4.1 Decentralising the EIA-EMP process

An important local input in the present EIA-EMP exercise is the public hearing. Development proponents present their EIA and EMP reports to the public at the proposed project site with the local authorities attending. To make this process more meaningful and transparent to the local residents it is felt necessary for the State Pollution Control Boards to first present and explain the existing environmental site conditions especially of the concerned receptor(s). The development project presented by the developers would have to then clearly state to the public how the existing and future environmental baseline would improve due to establishing the project. The public EIA presentation should explain meaningfully the increments to pollution at the receptor / pathway in load terms, over fixed periods and not only as absolute values of pollutant concentrations at the outlet that the development project would likely have. The EMP should quantify and source the investment that will assess, strengthen and develop the local natural resource base, either to support one or more economic activities pertaining to the business at hand or to produce new income streams for stakeholders or both. The EIA process would change in scope from being source and project-based to becoming receptor and area based. Each EIA of a receptor would relate to all EIAs of other developmental projects on the same receptor as all the projects would use the same baseline environmental quality data obtained from and certified by the local State Pollution Control Board. In valuing the impact of existing and expected non-point and point-source pollution the new version EIA would follow the costing rationale of eco-synergy to arrive at the developer's own and the community liability to be incurred in the future through appropriate composite projects. To limit the possibility of manipulation and lowering of the required rate of change in pollution quantities in an EIA, locally relevant pollution load removal standards and environmental zonal regulations have to be in place.

Project clearance will also be area based and the appraisal authority will find the gap in environmental costs projected in all EIAs pertaining to one receptor and the income flows projected from eco-synergy activities of all projects being appraised on the same receptor. The objective of clearance would be to clear projects that would achieve the fastest clean up of a receptor and projects with the highest need to maintain the receptor clean would get priority. Clearance of multiple projects on the same receptor would involve an area-based trade off between their economic compulsions and environmental benefit such that the latter always maintains an edge.

The EIA-EMP mechanism and the regulatory regime would have to adjust to the use of local socio-environmental indices where pollution increments to realistic baseline conditions would account for both individual and community pollution control and reduction. The focus of development will in time shift from protection to technologically feasible enhancement of local environmental resources and conditions.

4.2 Environmental zones based on certified local area databases

In India today there is just no accessible local socio-economic or environmental quality data to base this localized regulatory framework on. There is need for supportive environmental zoning of the

catchments that cover the main growth corridors of the country. Environment policy has to lay down guidelines for creating and regulating these zones and State Governments have to be urged to use the environmental zones as planning tools for all land and natural resource-use development decisions in growth corridors.

An experiment in environmental zoning using digitized satellite imageries of roadside micro-catchments of 22 districts in Andhra Pradesh was conducted on a Geographic Information System platform in the years 1999 – 2001 to assist the State Government to plan future locations of industrial estates, urban, commercial and environmental infrastructure and in planning agricultural cropping pattern change besides to regulate water pollution. This area-based initiative grouped and mapped inter-connected environmental indices like water, soil, city-air and bio-diversity quality along with socio-economic parameters like population density, income, prevalence of water borne diseases, health and education facilities, land and habitation zones by agriculture, industry, commercial classifications and other major indicators of the local economy. For easy working, the software allowed 168 of these inter-relating variables to be layered in suitable combinations to indicate ecology and economy mixed groups homogenized by the highest co-relation of variables to classify high pollution zones, coloured Red like for urban areas, areas of large-scale industrial and commercial activity and investment with high development potential. Developing zones with little industry and urbanization were mapped as Brown zones and biotic-resource bases like reserved forests, rain-fed agriculture, grazing and outlying areas were mapped as Green zones. Specific regulatory norms were planned for applying separately to Red, Brown and Green zones such that no one zone lost out on investment while improving environmental conditions from Red to Brown, Brown to Green and with Green zones preserved to supply biotic strength to the lower drainage levels (INRIMT REPORT 2003)[13].

Eco-synergy projects can be planned in the Red and Brown zones not only to clean receptor pollution in them but also to generate resources to pay for preserving clean receptors in Green zones through instruments like transferable development rights (Panayotou 1994).

From the present day policy perspective, a Red zone would be taboo for new development as it is presumably too polluted with less carrying capacity. But it is urged in this paper that with higher investment and infrastructure interests in Red zones than in Brown and Green areas, there is local paying capacity as also potential to attract external investments for composite eco-synergy projects. Analogously, less polluted zones (Brown and Green) will have less local 'development' or investment potential and would require external funding. In Brown zones townships and horizontal spreads of commercial development can be encouraged to enhance the option value of natural stock and productivity of flow resources for the community. With a weak financial local base, non-local investments in non-polluting and environmentally enhancing investments should also be encouraged here to turn these areas into biosphere reserves or future natural stock providing the necessary recharge and nourishment to the Red zones to recuperate. Investors can have ownership of usufruct rights of flow resources and through the local authority can have collateral user-rights over the stock resources of the area. In Green zones zero-discharge industry, soil and moisture conservation structures, plantation of endemic medicinal species that have inelastic value-addition markets all over the world, gene-pool preservation through stocking and regenerating, patenting in the name of the local authority can be business opportunities. It is also feasible that less polluted zones, located adjacent to or within highly polluted Red zones are networked in the environmental and economic web, such that maintenance and enhancement of the green zone becomes a part of the development project of removing pollution in Red zones.

Environmental zoning, if applied selectively throughout the country will lead to natural development of satellite towns around large cities interspersed by green conserved zones, very different from the centrifugal growth of cities, commerce and industry that present 'carrying capacity' based development results in.

In zoned areas the present day universally applicable regulatory standards would need to be modified into locally relevant, load-based reduction targets with staggered time frames for achieving these[14]. Time-spacing for the three zones to achieve the same pollutant load reduction would depend on

the intensity of a particular critical pollutant in the zone. Assuming very high intensity in the Red zone high reduction loads with suitably advanced technology and management requirements and long time targets would be allotted. The composite eco-synergy projects cleared for these areas would try and capture as much investment potential as possible in these already developed zones and the long time frame will allow easier information flow, more community participation and more individual investments towards cleaning up. Lower load targets with less time would be permitted in the cleaner zones to encourage cleaner development projects there. These developments would be lower in costs of technology and management with short or no time targets for immediate and total implementation of localized standards.

The Environmental zones once identified need to be notified, publicized and certified by the State Pollution Control Boards as the baseline environmental quality map-database that would be available to the public electronically, presented at public hearings and otherwise to be used as baseline to prepare future EIA-EMP reports of development projects. This will reduce the need for repeated data gathering by developers seeking clearances and their costs of preparing these reports. At the State level the zonal maps would have to be updated continually depending on the nature and intensity of changes recorded in the water, soil and air quality of major receptors and cities in the zone. The Central Government in the Ministry of Environment and Forests can take the initiative to start a few pilot projects of zones and train the corresponding State and District level teams to carry them through towards implementation of composite eco-synergy projects.

4.3 empowering local authorities and partnerships

Localised area based management of environmental quality as this paper promotes would largely depend on creating incentives for local community cohesion on the present and future values of their environmental assets. Pollution receptors like water bodies, wild-life, wilderness, forests, productive soil, temple-groves and wetlands in India are mostly State owned and managed. State control has not been effective in preventing their pollution and deterioration. To the extent it is technologically feasible to restore and enhance biotic productivity of these natural resources, legal sanction for local control on their use could be made more real. From the present free access regime to graduate to a controlled access regime would require creating community ownership through the local authority of the Rights of Use of these resources as distinct from full ownership. These rights will allow the Authority to profit from the flow benefits of these environmental assets creating an incentive for the voluntary protection and enhancement of the stocks through eco-synergy projects. Any local or external developer intending to use these flows like clean water for example would have to acquire these rights on royalties or against a stream of economic benefit flows projected over a period from a eco-synergy development project. To oversee the implementation of these rights the democratically elected local authority has to be empowered, trained and professionalized to represent the user-public interest in any development. To initiate the process of change the following government-departmental networks need a decentralised focus:

All Central and State Government developmental agencies located within the receptor/s' catchment, that have a bearing on environmental management would come under the control of the elected Local Authority.

All statutory receivables in terms of license and trade fees, revenues and penal charges should be apportioned equally between the local body and the State Government to provide some financial leverage to the local bodies. Eco-synergy schemes would be like any other private enterprise for which contracted dues to the local body must be paid against services like executive-assistance in user-charge collections, monitoring environmental performance, assessing, negotiating and up-dating user-charges and for being responsible to the state and community for implementing contractual commitments.

The State Pollution Control Board will monitor the development and maintenance of the zones and report to the local and state authorities through its local and state offices respectively. It will change its role from a mere source-regulator to that of an area regulator and technical arm of the local elected authorities. This will not call for any drastic change in the field level set up shown at Figure 1.

The Standing Committees and all other relevant sub-committees of the local authorities must be

strengthened by including educated and professional local institutional and women representation so that decisions are progressive, gender-sensitive and less politically motivated. The less would be the discretionary margins available for corruption and related delays in decision-making (Chatterjee 2002, p 47-78).

Weaving the three themes together are public-private partnerships. India's experience in this area is new and mainly in infrastructure building using various kinds of Government-Private Build-Operate-Transfer contractual arrangements. The Planning Commission in the Government of India has developed model concession agreements and guidelines for the Central and State Governments to follow allowing for a few locally applicable variations (Planning Commission, Government of India 2006). Environmental infrastructure development does not form part of this framework and can be considered to enhance the economic viability of eco-synergy projects. Projects like roads, railroads, ports, port-hinterlands, industrial-parks, residential and commercial developments can all have eco-synergy elements woven into the planning and estimation stages so that when expression of interest bids are called the projects would be valued as near as possible to their total economic value. Instead of projecting the revenue streams primarily to toll and 'fare-box' collections which are not enough to meet the annuity payments for these expensive projects, new eco-synergy revenue streams should be built-in with an eye on positive cash flows over long periods of contract. Thus the developers can be leased land and other state or community environmental assets within the right of way or areas of influence of the projects for periods ranging from 30 years and above to ensure fair returns on investment. On behalf of the local authority the concessionaires can sub-lease and out-source or directly use these assets for developing and operating eco-synergy projects.

Sustainable partnerships would finally depend on positive cash flows and tangible environmental benefits for the resident community, the developer and the local authority or authorized government agency bidding out a project. This three-way arrangement is best possible at the project level where the local community can take part in the project operations as contract workers, customers, sweat equity holders and as social monitors to ensure the tripartite commitments. The developer's incentive to be environmentally responsible would be the expanded scope of the project allowing new diversified possibilities out of cleaning up leased areas to develop new businesses over and above the core. The zonal standards and contract conditions being aligned to the pollution intensity of receptors would also be aligned to expectations of returns from business.

As evident, eco-synergy contracts would not follow a pattern as we go down the scale of operations from large scale roads and rail to the small scale village tourism, city hotel or lake recreation projects. The variety of these projects would generate innovative institutional forms of public-private and private-private contractual partnerships at the local level. The private operator can become the central focus with legally enforceable agreements between the Authority on the one hand and user associations on the other. Present day centralised government control would not be adequate for these active decentralized operations.

5. Conclusion

This paper is directed at the grey zone that connects the environmental science and economics of policy with the impact-level experience of reducing pollution through a market process, regulated by elected local level management. It suggests a shift from the source-based, centralised environmental management of the present to a local area-based approach using existing legal and institutional mechanisms. In so doing the scourge of non-point water and soil pollution is directly addressed. The recommended policy focus on local pollution receptors as being public-equity in future developmental projects adds value to natural resources as business assets instead of being free factors as now. The local orientation of environmental impact assessment and management encourages inclusive development that cleans up legacy pollution while preventing future pollution. The eco-synergy intervention requires some structural support in the form of environmental zones and a higher level of empowerment of local elected authorities. The idea is to keep the change manageable within present legal and policy frames by tinkering rather than suggesting wholesale reformist legislation. It merely adds a local basis to apply global norms re-directing rather than changing existing policy towards impact level arrangements that will help in implementation of the salutary goals of the NEP 2006.

Glossary of terms used

Bio-Chemical Oxygen Demand (BOD): A measure of organic pollutant load in water. It is the rate of up-take of dissolved oxygen used up by biological organisms in water. The upper limit for BOD in water quality is 4 Mg/litre in India

Carrying Capacity: Pollutant absorption limits of natural receptors and stock resources

Catchment: Basin limits that drain into a receptor like lake, river or valley

Centre: the Federal law and policy making level

Gram Panchayats: Elected local self-governing authority for the rural areas

Municipalities: Elected local self-governing authority for urban areas

Public Interest Litigation: social action litigation. Direct petitioning for judicial intervention by a citizen for a public injury caused by any breach of public duty. This concept of seeking judicial redress directly by citizens and civil society was popularized by Justices Krishna Iyer and J. Bhagwati of the Supreme Court of India in the Nineteen Eighties. Environmental cases in Public Interest Litigation peaked in the end Nineties with more than fifty percent of all environmental case-laws in the country being in the nature of Public Interest Litigation.

Right-of-way ribbon development: linear development immediately alongside a road's notified width

Source-Based Pollution: Identified source-outlets of pollution like industry, sewage drain outlets, smoke-stacks and the like

State: the State law and policy making and implementation level

Total and Faecal Coliform Count: Measures of disease causing bacteria in water mixed with human and animal waste

Notes

1 Modi Distilleries vs. the UP PCB in Volume 3 page 684, in Supreme Court of India (1987) and Nalin Thakore vs. State of Gujarat in Volume 12 page 461, Supreme Court of India cases (2003).

2 The authors show that in water quality India ranks 120th in a list of 122 countries in the world. An estimated 90% of the country's water resources are polluted affecting about 200 million people. About 1.5 million children under the age of five die every year from water-borne disease.

3 In 1993 the Indian Constitution was amended by the 73rd and 74th amendments to define democratic decentralisation in terms of administrative and financial devolution of powers to enable a localization of governance. The 73rd amendment addresses the rural areas and the Panchayat Raj system and assigns subjects of administrative and financial responsibility in its Article 243-G (Schedule XI). The 74th amendment covers urban areas and the Municipalities for the same in its Article 243-W (Schedule XII).

4 Total Economic Value (TEV) is a valuation applied usually for environmental assets and protected areas and includes their use-values and non-use values. Use-values are further differentiated into direct, indirect and option value and non-use values are segregated as bequest values and existence values.

5 Novotny and Chesters describe non-point as against point-source pollution to mean pollution generated by diffused sources where the sources of pollution and their pathways, transferring discharge or emission to natural receptors cannot be easily identified or held responsible for creating their component pollution in the receptor. As per the Policy Statement on Abatement of Pollution, in the early 1990s in India, three-fourths by volume of wastewater was from municipal sources and for all Class-I cities of the country less than five percent of the total wastewater generated was collected and less than one-fourth of this was treated. Parikh and Parikh and the Central Pollution Control Board record that ninety-percent of water pollution in India in the 1980s and seventy-five percent in 2000, has been of a domestic-commercial and non-point character.

6 The Water Quality Monitoring Programme of the Central Pollution Control Board covers 1245 monitoring stations throughout the country assessing 250 rivers, 78 lakes, 6 tanks, 26 ponds, 8 creeks, 19 canals, 19 drains and 382 wells. The stations are located at 695 points on rivers, 86 on lakes, 19 on drains, 19 on canals, 6 on tanks, 12 on creeks, 26 on ponds and 382 on groundwater stations. Observation samples are collected on a monthly or quarterly basis in surface waters and biannually in groundwater.

7 Choudhary, Himanshu. A short note on the Polluter Pays Principle. Editor's Pick. Indlaw.com: the definitive guide to Indian Law. March 4 (2008). Also see Enviro-Legal Action vs Union of India, Supreme Court of India. JT 2 196 (1996). The Court inter alia ruled " Once the activity carried on is hazardous……the person carrying on such activity is liable to make good the loss caused to any other person by his activity irrespective of the fact whether he took reasonable care while carrying on his activity….And in Kamalnath's case. Supreme Court of India. ISCC 388 (1997). The court ruled,

" …..it is thus settled by this court that one who pollutes the environment must pay to reverse the damage caused by his acts…."

8 The Section 10 of the Indian Water (Prevention and Control of Pollution) Act 1974 and Section 12 of the Air (Prevention and Control of Pollution) Act 1981, read with the delegation of environmental responsibilities and duties to rural and urban elected local bodies in the 73rd and 74th Constitutional Amendments facilitate delegation of local environmental monitoring and management.

9 The NEP 2006 accepts these recommendations of the Committee on Reforming Investment Approval and Implementation Procedures which identified delays in environmental and forest clearances as the largest source of delays in grounding development projects in India.

10 By HDI India's rank in 2005 was 128 below Equatorial Guinea in a list of 177 countries-----from the Human Development Report 2007/2008, UNDP (2007). By Gross Domestic Purchasing Power Parity India ranks 4th below Japan in a list of 193 countries----from The World Factbook, USCIA. January (2008). World Economic Outlook Database. IMF. October (2007).

11 A case in point is the underground water harvesting structures at the runways of the Hyderabad International Airport (GHIAL), Shamsabad, India.

12 This basic production function exercise is used in case of a polluted urban lake and detailed in the author's PhD thesis *Economic Management of non-point water pollution*. Chapters IV and V. Pages 109-173. Hyderabad Central University. Hyderabad. December (2007).

13 The Andhra Pradesh zoning study is reported in the *Environmental Zoning of districts in Andhra Pradesh.* Report sponsored by the AP Pollution Control Board and prepared by the Indian Resources Information and Management Technologies, Private Limited (INRIMT). APPCB database and Records. Hyderabad. (2003).

14 The regulatory standards prescribed in India for water quality are pollutant concentration based expressed in milligrams of a pollutant in a litre of water. Load based standard would imply that these pollutant wise concentrations are multiplied by the volume of flows to give the pollutant quantity in Kilolitres or other weight units. Load standards are receptor water quality based and more realistic. These are also easier to target in terms of reduction over a period of time whereas concentration limits are useful for outlet based prevention standards.

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