

## ISSUES OF ENVIRONMENTAL MANAGEMENT OF WATER RESOURCE DEVELOPMENT PROJECTS

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### 1. History of Environmental Management in Water Resources Projects

It is generally made to appear that concern for environmental degradation is rather a recent phenomenon and India has started the environmental conservation activities only from the beginning of the 1980s, As early as the 1830s Government officials in the Ganga Basin were aware of the strong correlation between water-logging and flooding due to poor irrigation management of design, even without understanding the epidemiology of malaria. The Governor General of India, Lord Ellenborough was concerned about environmental decay and disease brought about by irrigation projects and he therefore opposed the proposed Ganges Canal. In 1843 he instituted a Canal Committee composed of engineers and medical doctors to review the project. This Committee carried out its work conscientiously and made a series of suggestions to Cautley, the canal builder. Cautley accepted all of the Committee's recommendations even though they led to a 50% increase in the cost of the project.

The second case in point relates to the Some Canals Project implemented in Bihar during 1873- 1878, over a century back. Only after ten to twelve years of operations, there were complaints of environmental degradation caused by drainage congestion and perurbance in the indigenous system of irrigation comprising ahars, pynes and wells. Complaints of deterioration in health of the people in canal irrigated area and even loss of fertility of land irrigated by Some waters laden with sand were voiced. A committee was appointed to enquire into the administration of the Some Canals in November 1887. This Committee was asked to examine the working of the entire system of the Some canal administration with a view to providing remedies where possible for admitted defects, and to improve the rules, and if necessary, the law under which the system is administered. This committee inspected the project area and collected details from canal officers, irrigators, medical doctors and civil administration. Evidence of drainage congestion, water logging and increase in malaria was incontrovertible. The findings and views of the committee on drainage problem which had been substantiated in course of enquiry were summarized in these words:

**"We know that the important subject of drainage has not been neglected; but we venture to express a hope that in view of its paramount importance to the interests of the country affected it will in future receive more attention than it has in the past".**

To prevent supply of excessive water, the following remarks of Mr. Inglis on the subject was quoted:

**"It must never be lost sight of that to allow or encourage a thoughtless and needless use or rather issue of canal water is to run the risk of turning what might be a blessing into a curse. The danger is always before us of waterlogging the country. We often hear it that already the effect of the canals has been to make the cultivators lazy and careless. I look upon it therefore as of the utmost importance that the cultivators should be educated into using the canal water with the same care that they use the water thus raised from their wells. It is true that to use canal water in this manner joint action is required in**

**place of that of the individual but the cultivators are quite accustomed to this in respect of their arhurs, and I think they quite understand the principle of joint responsibility".**

Yet another example is that of Tribeni Canal Project implemented in North Bihar during 1897-98 and 1913-14. Mr. R. B. Buckley the then Secretary to the Government of Bengal, Irrigation Department while forwarding this project for approval of the Government of India vide his letter of 19th December 1899 stated that in Some Canals which was in operation since 1873-74 the restriction of the area in each village had been partly in order to distribute the advantages of the canals as widely as possible, and partly because it was thought that, on sanitary grounds it was not desirable to irrigate the country too lavishly. And, in this background he expressed the following opinion on Tribeni Canal Project:

**"In my opinion the sanitary aspect of the mater should not be ignored. The soil in Champaran (Tribeni Canal Command) is porous; the sub-soil water-level is high; excessive irrigation would not be advantageous to the health of the district".**

The last in the list of relatively older projects in the Eastern region that is the Damodar Valley Project very glaringly illustrates the point made above. This multi-purpose project implemented in 1950s did provide for most of the basic ingredients of environmental stability. Planned on the pattern of TVA in USA, it envisaged; besides other safeguards, a model Resettlement & Rehabilitation Plant, Soil conservation measures in the catchment areas and release of flushing doses from the reservoir to maintain river regime downstream of the Panchet and Maithon Dams. The DVC, as at present, has to its credit (a) Afforestation in about 1,48,835 hectares; (b) Soil conservation in 1,50,000 hectares and 27,000 hectares in agricultural land and wastelands respectively; (c) Maintenance of Deer parks; (d) Fishery and crocodile projects and (e) Other Research and Development activities aimed at Environmental stability and promotion.

A few cases cited above would prove beyond doubt that environmental protection measures appropriate to types of projects; their locations and status of developmental activities in directly related sectors, etc. were considered and made an integral part of the water resources development projects. In case of Some and Tribeni Canal Projects, overriding stress was laid on command area because they were fed by Diversion of river flows, that is without any conservation storage works on the rivers. In case of Damodar, a multi - reservoir system planned as a multi-purpose project, due attention was paid to the catchment, the river regime and the oustees. And, all these were done during the period when there was neither Environment Protection Act nor Acts on prevention & control of pollution of air and water; nor, Acts on protection of forests and wild life; etc. Hence, the question arises as to how and why the water resources projects with long and healthy traditions of environmental perspectives came to be regarded as the most dreaded enemy of the natural systems and environment. How is it that there is said to be an enormous backlog of work needed to correct the past damages? Is it only because the pace of water resources development was accelerated after Independence and due attention was not paid to protection and promotion of the natural systems and environmental quality? Or, is it due to backlash effect of subsequent accelerated industrial growth in the country? Or, is it due to both; or, is it due to lack of coordination in activities - interacting and/or interdependent? Equally important issues to be addressed are: Have environmental damages over time occurred due to lack of knowledge and perception on the part of planners; or, have the environmental aspects been either neglected or sidelines knowingly branding them of no consequence; or, has the environment in which the environmental safeguards are to be provided genuinely, not been conducive, particularly in the first three or four Plan periods?

## 2. ENACTMENTS

A list of some important Acts related to environment is in Table-A. It would be seen that till about two decades after Independence there existed only one Act, viz. The Indian Forest Act, 1927 and that also hardly referred to ecology as such. The next enactment was 40 years later in 1968 in the wake of Grow More Food Campaign or the Green Revolution, It was the Insecticides Act of 1968 with the object of regulating the use of insecticides in agriculture to prevent risks to human beings and animals, but, since 1972, there have been as many as eight enactments. All these legislative measures are attributed to growing awareness in the country of need for more systematic and scientific action for environmental protection, which, of course received fillip by the U.N.Declaration in Stockholm in 1972. Whatever might have prompted these legislations, their need was well-established, largely because the rapid growth in industrialization and water resources development had taken place since Independence and for reasons to be analysed later, the cause of natural systems and environment had suffered immensely.

**TABLE -A**  
**IMPORTANT ACTS ON POLLUTION CONTROL**  
**AND ENVIRONMENTAL PROTECTION**

SL. No.	Acts/Regulations	Objectives
1.	The Indian Forests Act, 1927 and various State Acts.	To protect the forests.
2.	The Insecticides Act, 1968	To regulate the use of insecticides to prevent risk to human beings or animals.
3.	The Wild Life(Protection) Act, 1972	This act provides for the protection of wild animals and birds and for establishing sanctuaries, National Parks, Game Reserves and closed areas.
4.	The Water (Prevention and Control of Pollution) Act	This act envisages establishment of Boards for Prevention and control of Water Pollution so as to maintain and restore wholesomeness of water.
5.	The Insecticides (Amendment) Act 1977.	To regulate the import manufacture sale, transport distribution and use of insecticides.
6.	The Water (Prevention and Control of Pollution) Cess Act, 1977	Act providing for collection of a cess on water from certain Industries so as to augment the cess of Central and State Boards for Prevention and Control of Pollution.
7.	The Forest (Conservation) Act, 1980	State Government has to take prior approval for forest lands for non-forest use from Government of India.
8.	The Air (Prevention & Control of Pollution) Act, 1981.	This act provides for prevention, control and abatement of air pollution through pollution Control Boards.
9.	The Environment (Protection) Act, 1986	It covers all matters relating to 1986. prevention, control and of environmental pollution; powers and functions of the Central Government & its officers in that regard and penalties for committing offences.

10.	The Forest (Conservation) Amendment Act, 1988.	This Act came into force w.e.f. 15th March, 1989.
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### 3. GUIDELINES

In addition to several Acts and Rules framed there under, three sets of Guidelines have been issued separately by Planning Commission, ministry of Water Resources through Central Water Commission, Ministry of Environment & Forest. Even a cursory look into these guidelines will show that put together almost everything in the world of environmental planning, programming, implementation and management have been compressed into them. Perhaps that is one main reason why the guidelines are not adhered to and environmental degradation continues unabated. A policy or the guidelines drafted for the implementation of this policy, cannot be judged by the loftiness of the ideal underlying it but by how far it can be implemented given the ground realities and the resources available for its implementation. The aforesaid guidelines ask for too much, lack objectivity, and ignore the resource capacity, both in respect of expertise and finance including constraints of time and availability of data. Further, these guidelines do not specify what is to be done essentially for pre-sanction appraisal, and what is to be done for comprehensive environmental management during and after execution of the project. Putting things into two separate phases or slices could have enabled the project authorities to prepare Environmental impact statements and Environmental management plans before and after sanction of the projects. Then, the guidelines should have been different for major and medium size projects. More importantly there was need for circulating a case study to be used as model for project planners in different regions and of varied nature of projects. In absence of these not only the backlog in clearance of projects from environmental angle is increasing, the backlog of work needed to remedy the damages that had occurred and that are occurring is also rising alarmingly. As a matter of fact, there is neither legislative measures nor clear-cut executive orders requiring environmental measures in projects implemented before the system of environmental clearance of new projects was enforced, though without proper legal support.

### 4. ENVIRONMENTAL MANAGEMENT IN DAMODAR BASIN

Before analyzing the continuing degradation of natural systems and Environmental quality, it appears prudent to have a look in this regard on Damodar River Basin which was planned for comprehensive and integrated development of the basin on T.VA pattern. I have listed some of the achievements of Damodar Valley Corporation before, and yet the fact that the Damodar is now one of the most polluted rivers of the country, has caused serious concern to the people who have been watching the performance of DVC. It is widely said and generally believed that since the DVC shifted its prime interest in thermal power generation, its interest in continuing measures of environmental management in the river basin progressively got more and more sidelined. The Central Board for Prevention and Control of Water Pollution in one of its reports (March, 1984) stated that the river Damodar and since become a constant agony from pollution viewpoint due to continued and uncontrolled discharge of toxic and hazardous effluents into it by as many as 43 industries located on its banks or in its vicinity particularly in the Bokaro-Dhanbad and Asansol-Durgapur regions of Jharkhand( formerly Bihar ) and West Bengal. This report seems to have concentrated on implementation of the Point-sources of pollution only in 43 industrial establishments (24 nos. in Jharkhand and 19 nos. in West Bengal). Though it was undoubtedly a step in right direction, it could at best be regarded as only a remedial measure and that also limited to some major Point-sources. The other factors responsible for pollution of Damodar Waters especially the major mining and manufacturing industries and overall

degradation of land caused by deforestation, small-scale mining and manufacturing industries dotted over the whole basin were not given serious consideration. In Damodar basin there are five thermal power stations (Bokaro Thermal Power Station - 457 MW, Bokaro Thermal Power Station 'B' - 630 MW, Mejia Thermal Power Station - 630 MW with 210 MW to be commissioned Chandrapura T.P.S. - 788 MW, Patratu T.P.S.- 840 MW, Durgapur T.P.S. - 350 MW, Santhaldih T.P.S, .) already in operation with their total installed capacity of Reportedly two more thermal power stations are being installed by D.v.C. at Maithon right bank and the Maithon left bank of 1000 MW each .One T.P.S. by Jharkhand at Tenughat of 420 MW is functioning with the further expansion work on 630 MW is going on. Generally for 1000 MW Thermal Power Station, approximately 5000 ha of coal mining, 1200 ha fork structures and roads, 200 ha for disposal of combustion wastes plus land for right of way for transmission lines are required. This shows the magnitude of problems on account of mining activities directly related to thermal power projects and impinging on quality of environment in the Damodar River Basin. Here it must also be kept in vie that the extent of coal mining is not confined to requirement of thermal power generation in Damodar basin alone. The requirement of coal for other uses as well as for thermal power stations located in other regions is a good deal more. These facts are brought in here to stress the point that the coal mining activities in Damodar basin is a major source of pollution of land, air and water, and unless adequate measures are taken for environmental protection in mining and transport of coal to respective thermal power stations, no amount of pollution control measures caused by burning of coal at thermal power stations would ensure prevention of pollution in the region and Damodar waters. More or less the situation in regard to treatment of degraded lands in Damodar basin is not less disappointing. Compared with the extent of degradation, the present scale of soil conservation and afforestation (about 5 to 6 thousand ha annually) is certainly very low. By 1984-85 about 6.6 lakh ha of land (about 2.0 lakh ha in forest land, about 3.35lakh ha in agricultural land, and about 1.25 lakh ha in waste land) had been found under degraded category (about 37.7% of the total Upper Damodar Catchment). By that time, DVC claimed to have treated 74.4% of forest land, 4.8% of agricultural land, and 21.8% of the wasteland. Thus in a period of thirty five years approximately the overall achievement was 49.5% with treatment of agricultural land being bare 4.8%.

## 5. MANAGEMENT OPTIONS

Environmentalists have established beyond doubt that the extent of pollution of air and water is increasing fast and degradation of land is going on unabated even after aforesaid legislative measures, guidelines and nation-wide environmental concern. It has also been observed that even those environmental control measures which were prescribed while clearing projects were not being implemented in letter and spirit, and if and wherever implemented, the desired results are not perceptible. This way the environmental degradation continues unabated while more and more sophistication in environmental planning and appraisal by paper-tigers continues to be brought in, perhaps as fast as rate of increase in deterioration of land, air and water quality. In this background, the following few suggestions are being offered for due consideration of all those who genuinely care for protection and promotion of the natural systems and environmental quality.

### 5.1. FOREMOST ATTENTION TO PROJECTS IN OPERATION

The most urgent and important step towards abatement of environmental degradation should be to take up remedial measures in the projects under operation after very thorough and careful assessment of impacts that have occurred. In the process, the factors responsible for the degradation in land, air and water would be identified and measures for prevention of further deterioration would be suggested. This would require amendment in the Environment Protection Act and the methodologies adopted at present in pre-sanction appraisal of only new projects and that also on project-by-project basis. It is being suggested because most, rather all major water resources projects sanctioned and implemented during first five plan periods were not even

appraised from environmental angle; and these projects either completed or under end phase of implementation would cover areas much larger than those to come under near future projects.

## 5.2. NEED FOR RIVER BASIN OR REGIONAL PLANS

The physical environment is a dynamic, complex, and inter-connected system in which any action in one part affects the others. There is also the interdependence of living things and their relationships with land, air, and water. Obviously, environmental and natural systems management is a complex problem and deserves rational approach in planning, implementation and operation of water resources systems by a multi-disciplinary group of experts and under multi-sectoral scenario. Water resources management is envisaged as a system designed as a set of facilities, operating rules, and incentives (economics, regulatory, judicial, social pressure) applied to water and related land resources in their natural state, through an institutional arrangement involving a milieu of both water-related and no-water-related entities, public and private, and their rules and regulations. It is a process involving various stages beginning with planning, and continuing with design, construction, operation and maintenance. In some cases, utilization of water for the purpose for which it was not planned would also fall in the ambit of the aforesaid process. So, lack of comprehensive, coordinated and integrated river basin development planning leads to project-by-project approach, primarily to serve local and short-term interests. This is not conducive to multi-objective and multi-purpose planning for optimal development of available resources to achieve national goals and objectives. And, one of its major adverse consequences is its failure to undertake assessment and valuation of the impacts of the proposed project on NS & WQ in the project region or the river basin/sub-basin as a whole. Since most of the rivers in the country are inter-State, the present practice of planning by co-basin States on project-by-project basis in absence of a river basin plan poses potential threat to NS & WQ. Preparation of river basin plans addressing the issues relating to M & I supplies, irrigation and agriculture, flood control/protection, land conservation and management, water quality management, energy development, transportation, maintenance of in stream flows for fish and wildlife, outdoor recreation, environmental conservation, and enhancement of natural, historic and cultural heritage, etc. appears to be sine qua non for (a) realistic assessment or estimation of the backlog of work needed to remedy the past damages; (b) preparation of an environmental management plan incorporating remedial measures for past damages with compensatory, preventive, and protective measures for future projects; and (c) establishment of an inter-sectoral and interdisciplinary co-ordination body structures on the basis of objective assessment of the conditions in the concerned region or river basin and its competence to respond to the need and priorities.

## 5.3. INTEGRATION OF SECTORAL POLICIES

Environment covers many of the consequences of the development in different sectors, such as, agriculture, industries, mining, forest, transportation, public health in urban and rural areas, education and energy, etc; and hence Environment is not a sector in itself and by itself. Therefore, the policies in planning, implementation and operation of energy, water, agriculture, industry, transport, housing and municipal, forest and mining, etc; should necessarily be compatible to the environmental policy. Also, these policies should be implemented in a coordinated manner through an inter-sectoral coordination committee with adequate powers and a sound mechanism for its effective functioning. Unfortunately, it is lacking at present. Even the DV.C. is not in a position to effectively coordinate, not to speak of regulating, the various activities in the Damodar basin.

#### 5.4. INSTITUTIONAL CHANGES

Though new water resources development projects now undergo the ritual of pre-sanction appraisal by an Environmental Appraisal Committee, till now it has not created any favourable impact to be proud of. One of the reasons for such apathy is probably lack of legislative or statutory sanction. All that is heard about is the action taken in regard to problems and/or delay in transfer of forest land for non-forest use by Ministry of Environment & Forest, GOI. This happens because there is the Forest (Conservation) Act, 1980 (amended to make it more rigorous in 1988). Thus, in practice the environment has become analogous to forest (or, perhaps forest land) with its wildlife and other species. All other aspects, such as watershed management in catchment area, river regime, land and water quality, receded into background once the decision on transfer of forest land is conveyed to the project authorities. The problem as far as it pertains to water resources projects is no doubt very complex and is difficult as its impacts are both On- Site and Off-Site and pollution occurs in the project region both from Point Sources and Non-Point Sources. Methodologies have no doubt been upgraded from time to time to conduct Environmental Impact Assessment Studies, to present Environmental Impact Statements, and to evolve Environmental Management Plans for each project. But ironically it, more or less, ends at that because of the complex nature of the problem, lack of proper institutional framework, and absence of back up legislative measures (as in the case of Forests). As at present there is no law that defines the accountability of authorities in-charge government sponsored water resources development projects if he or they fail to prepare or got prepared Environmental Impact Statements in time and implement the environmental stability measures stipulated as pre- condition to execution of the projects and/or embodied in the Environmental Management Plans on the basis of which the projects were cleared. Therefore, there is draw up a comprehensive Environment Code. Air, water and land including forest resources are the basic components of the biosphere which sustains life on this planet; and as such, our aim should be to prevent environmental degradation through sound environmental management plans in projects selected to cause minimum adverse effects.

#### 5.5. INTERNALISING COSTS OF ENVIRONMENTAL CONTROL MEASURES IN THE PROJECT

For the reasons briefly stated above there is need for (i) internalizing the costs of residual damages and the costs on adequate environmental protection measures in all water resources projects; and (ii) for evolving appropriate criteria and methodologies to test the economic viability of the projects incorporating all direct and indirect costs and benefits. The important aspects to be incorporated and is being discussed in subsequent para.

##### 5.5.1 CATCHMENT CONTROL MEASURES IN WATER RESOURCES PROJECTS

The projects engineers show their reluctance to its inclusion mainly because they look at it from the viewpoint of sedimentation against which they make provision in the reservoirs. That, ' of course, is a lopsided approach. Even in terms of economic costs and benefits, the catchment control measures, if planned and implemented properly, should invariably prove viable economic propositions in themselves. Then, it is seldom realized that the sediments are one of the major causes of water pollution. It is now established that sediment can directly affect aquatic habitat and fish spawning areas and indirectly affect water temperature and turbidity. Chemicals from pesticides, fertilizers, mining non-point sources and other sources also get attached to sediment which cause further water quality problems. The message that environmental planning should be seen as coordinating and controlling land use and development in order to minimize impacts which may be harmful to the environment, whilst maximizing the benefits of development to individuals and the community, both in the catchment and command areas, needs to be conveyed emphatically to all concerned. It must be realized that catchment management involves

responsibility, not only for land and water management, but also for the long-term viability of ecosystem such as forests and wild habitats. In short, it forms an integral component of the overall management of natural resources. Therefore, it should be incumbent on the water resources planners to display the costs and benefits of catchment control measures, allocate costs to different sectoral benefits; analyse the impact of its inclusion on the economics of the project proper, and submit plans and programmes of their implementation through agencies in and funds from related sectors.

### 5.5.2 LINKED ACTIVITIES IN COAL-BASED THERMAL POWER PROJECTS

In case of hydropower projects, more or less, all aspects dealing with water resources development projects need to be considered and environmental costs internalized appropriately. For coal-based thermal power projects, the need for incorporating the costs on exploration and mining, reclamation of mined lands, transportation of coal and stacking, treatment of coal wherever required, etc. are to be displayed in the cost of coal and eventually in the cost of generation along with On-Site environmental measures including waste handling. It is to be noted that approximately 4.0 million tones of coal is needed for 1000 MW coal-based thermal power plant, and hence mere provision of an Electro-Static Precipitators (ESP) and some small measures for mitigating only ON-SITE effects would not and should not suffice. Meta-planners And Management Consultants recently conducted a study sponsored by the Department of Non-Conventional Energy Sources on Cost of Electricity Generation & Environmental Aspects, Percentage increase in the cost of electricity generation due to inclusion of Environmental Costs given in Table - B will show that the increase in coal-based thermal power generation is not too high to be accommodated in the project cost without sacrificing economic viability.

This study further indicated that the increase in capital costs of coal-based thermal power stations increase substantially by including environmental costs which had so far been neglected at the cost of environmental quality. It is true that the capital cost on coal-based thermal power projects would increase by about 8 to 10% due to inclusion of environmental cost directly attributable to power projects, and by about 30% by including additionally the environmental costs on mining and transport of coal, but when viewed from the likely costs to be incurred now to remedy the damages already caused, the savings due to exclusion of necessary safeguards would be found to be insignificant.

**TABLE-B**

**INCREASE (%) IN COST OF GENERATION DUE TO INCLUSION OF ENVIRONMENTAL COSTS**

Sl No.	Electricity Generations Sources	Percentage Increase in Cost of generation
1	2	3
1	Hydropower backed by Single-purpose Dam	20.81
2	Hydropower backed by Multi-purpose Dam	17.45
3.	Coal-based Thermal Power Stations : i) Located in Forest Land 11.00 ii) Located outside Forest 7.00	11.00 7.00
4.	Combined Cycle Gas-based	5.00
5.	Run-of-the-river plants (major)	4.00 to 7.00

6.	Solar Thermal Power	3.00 to 4.00
7.	i) Small Hydropower plants in forest ii) Small Hydropower plants outside forest	3.00 Negligible
8.	Wood-based Biomass Gasifiers	Negligible
9.	Wind Generators	Negligible
10.	Solar Photovoltaics	Negligible
11.	Agro-Waste based Gasifiers	Negligible

**Note:** The relatively high percentage in serial 5 is largely due to inclusion of the cost on Catchment treatment.

## 5.6. NEED FOR CHANGE IN METHODOLOGY OF ECONOMIC ANALYSIS AND CRITERIA OF VIABILITY

The value of residual damages and the costs of environmental control measures are generally not included or only partially included in the project costs for one reason or the other. Arguments on inclusion of costs of catchment treatment, compensatory afforestation on non-forest land in preference to degraded forests, and water quality maintenance, etc. continue unabated. Then, each project authority defends his reluctance to undertake compensatory and preventive or protective measures on the plea that the likely impacts of their project would be too small to be of any consequence without realizing that adverse effects of all such present and future projects, big and small, when integrated could be catastrophic in some cases. The other plea, largely on account of misplaced fear, is regarding the economic of the project. To an extent there is some cause of concern on the part of project planners who do not want the economic viability of their project getting adversely affected due to inclusion of costs, which in their opinion, are not legitimate charge on the project. All these are there because Government have not yet modified the criteria governing economic viability of the project taking into account all direct and indirect, tangible and intangible, stemming from and induced by, social costs and employment benefits, etc. As long as the present methodology of benefit-cost analysis based on Direct Costs and Direct benefits continue, the prevailing atmosphere charged with reluctance, even defiance, to inclusion of costs (without valuation of benefits there from) will, in all probability continue even after legislative measures.

## 5.7. OTHER ENVIRONMENTAL CONTROL MEASURES

### 5.7.1 Management To Control Water Pollution In Catchment

The principle - **Prevention is better than Cure** - needs to be applied to the maximum extent possible. For this

(i) **planning controls and management practices which minimize the generation of pollutants and limit their transport to surface and ground water;**

(ii) **ensuring the adoption of land use practices designed to minimize soil erosion, land degradation and runoff;**

(iii) **co-ordinating efforts to control non-point pollution with measures for pollution control from point sources;**  
and

(iv) **maximizing the recovery and recycling of waste, etc. are extremely important.**

All these could be accomplished only when there is one high-powered Apex Body for each region or river basin in overall control of monitoring and regulating all related activities. There are, no doubt, some river basin and regional development agencies/authorities but the existing Environment (Protection) Act, 1986 does not bestow powers on them to regulate resource development and management projects with due consideration of all environmental aspects.

### 5.7.2 MANAGEMENT OF FOREST

Without disputing the validity of the current slogan - Protect Forest Or Perish - and the strictness with which the restrictions on transfer of forest land for non-forest use is being exercised by the over-zealous Forest Officers, the experience shows that there is no improvement in the situation, that is, in ultimate transfer of forest land for non-forest use, as urgent socio-economic developments cannot be altogether shelved just for sake of a few hundred hectares of forests when there are compensatory and protective measures available for that. All the same, without entering further into arguments on this, it appears prudent to draw the attention of authorities concerned towards the following aspects which unless addressed adequately and urgently, forests will continue to degrade and diminish on one hand, and socio-economic development works will continue to languish for long on the other:

- a) **It is necessary to reclassify the forests on the basis of the degree of degradation, present productivity, and the importance of the ecological functions of the forest; and declassify the forests which have degraded beyond restoration.**
- b) **To prevent further increase in pressure of population on land, compensatory afforestation should invariably be permitted on degraded forest lands. This is permissible as per Guidelines contained in 108-1(ii) issued by the Ministry of Environment & Forests.**
- c) **The extent of forest denudation has been so alarming, and hence the efforts both in shape of labour and capital needed to ameliorate them are so astounding that Government through the Forest Department cannot cope with it. The sooner this harsh truth is realized and suitable amendments in the Forest Act effected to open forest boundaries to some others for afforestation, reforestation, soil conservation, and land treatment, etc., the better. Such labour intensive works to be done by local people, particularly the forest dwellers and the other dwellers in headwater region and in the vicinity will be the most effective, economical, beneficial and socially desirable programme of improving the forest and the ecology.**

### 5.7.3 NEED FOR EQUITY BETWEEN CATCHMENT & COMMAND

Since 1973 -74 there has been increasing stress on command area development in irrigation projects. In undivided Bihar alone over 1200 million rupees have been spent by Command Area Development Agencies of the State; and it is reported that not more than 15 to 20% of the works envisaged in their programme has yet been executed. So far environmental protection is concerned not even proper environmental impact assessment studies have been got conducted. As against this massive investment over and above the capital outlay on the project proper in limited command areas; the public investments in the catchment of the rivers has been next to nothing. These measures were primarily aimed at increasing efficiency of the projects leading to increase in agricultural production. But what failed to attract attention of the policy makers was the relevance of the trade-off analysis in capital constraint situations between incremental investments in one reasonable protected and developed part of the drainage basin; and another part inhabited by relatively weaker sections of people, growing poorer and poorer due to continuing neglect of land, forests and water. In other words, equity was sacrificed on the plea of efficiency,

which has hardly been achieved, albeit this has helped the rich and owning class getting benefits capitalized in land values. Once it is realised with the sincerity and seriousness the perspective deserves that India has to sustain 16% of world's population with only 2% land surface, there shall be no hesitation in appreciating the importance and urgency of total catchment development; and embarking on projects aimed at checking degradation and improving capability of land through well-planned soil and water conservation measure in the headwater regions. The constraint of finance could be removed by augmenting the present provision by transferring whole or part of the present allocations for command area development Obviously, it requires major shift in policy decisions of Government There is bound to be stiff resistance to it from the powerful and highly subsidized special interest groups of people. But if such an imbalance between the land and the people inhabiting the catchment and the command is not corrected urgently, not only social tension would increase and economy of the headwater region would deteriorate but the resultant environmental degradation would cause serious problems for the command also through siltation of reservoirs, deterioration of river regime, pollution of water, and loss of fertility in the command. Past developmental policies have resulted in bifurcation of the drainage basin in two distinct regions of catchment and command; and most certainly the catchment had become more deserving than the command from the viewpoints of environmental protection, inter-regional and interpersonal equity.

#### 5.7.4 PRIORITISATION OF ENVIRONMENTAL CONSERVATION MEASURES

The environmental protection or conservation measures include measure for

- (a) Avoidance or Minimization**
- (b) Preventive or Protectives or Mitigative, and**
- (c) Compensatory,**
- (d) Remedial.**

They are no doubt identified separately but that should not lead to conclusion that they do not form components of an interrelated package of measures relevant to almost all projects. The categorization only signifies the relevance to various phases of the project, viz. exercises on avoidance or minimization at project formulation stage; provision of preventive and compensatory measures during implementation stage; and execution of remedial measures during operation state of the projects. Perhaps, there could be no project in which attention to all such measures at appropriate stage(s) would not be warranted because it must be accepted as hard facts that almost all economic development measures draw upon the natural resources, and in their stride they invariably cause some adverse effects even under most favourable conditions. It is sincerely hoped that with the overriding emphasis being laid on environmental safeguards now, due attention would be paid to projects under implementation and projects under planning. But perhaps the most urgent and important task should be to undertake remedial measures in the projects under operation because (a) the pace of environmental degradation would accelerate with time; (b) the risk of reaching irreversible stage in some aspects cannot be ruled; (c) identification of the favourable and unfavourable impacts in real world situation would provide insight into future environmental problems and perspectives, and (d) the benefits likely to accrue from measures to be implemented in new projects would not be offset or ultimately negated by increasing degradation through older projects making Environmentalists acrobating "The Monkey And The Greasy Pole" story. Things have come to such a pass that along with the Remedial Measures to be undertaken on massive scale, there is need for urgent attention on all categories of measures in current and future projects. But this is difficult to be effected without a comprehensive legislation and rules including statements on priority problems to be tackled on river basin or identified regional basis.

## 6. The Role of Damodar Valley Corporation to be critical In Environment Management

Damodar Valley Corporation is perhaps the only agency of its type which was set up with the objective of developing the Damodar basin through a comprehensive and integrated plan of action. It could be a model for the country, if it rises to the occasion after self-introspection and implements programmes needed for preservation and promotion of the natural systems and environmental quality in the Damodar basin as an integral component of its plans of economic development. It has the advantage of cutting across State boundaries and has to its credit the experience of over three decades, which is more than adequate for assessing the environmental impacts identifying the defects and deficiencies in the present system; and for planning, programming and implementing environment protection measures after removing the constraints: legal and executive; institutional and organizational; financial and operational; monopolistic and individualistic; and, as also, real and imaginary. Some of the major factors presently being cited to justify indifference and helplessness would prove only imaginary when sincere efforts are made to implement a well planned comprehensive and integrated plan for development of water and related land resources in the basin with due attention to natural systems and environmental quality.

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