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Need of Evaluation of the Present Status of Environmental Conditions of Completed River Valley Projects – Jayakwadi Project a Case Study

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Research Article

Abstract: Every dam causes partly temporary and partly permanent submergence of land in the upstream and displacement of resident persons and their property, along-with submergence of plant life and disruption to animal life. It is necessary to evaluate and monitor the post project impacts and whether the envisaged benefits are achieved. Hence it is essential to evaluate the impacts, adverse or beneficial in order to minimise the adverse impacts and maximise the beneficial impacts for equitable distribution of water resource. The effect of a project of this magnitude has never been studied. An in depth analysis will identify the long-term positive and negative impacts on environment, socio-economic development and on physical factors such as soil, water and air. This evaluation will also result in providing a measurement criteria and yardsticks for carrying out EIA for future water resources projects.

Introduction:

Humans are proud to be advanced in 21st century, along with the human population on the earth is also growing, in which the water is of prime importance. Water has always been an essential element for food, people and nature. Natural ecosystems have limited capacities to harvest and store water. For a long period in history, these natural capacities for storing water in aquifers, ponds, etc., had come to good use in satisfying the year round needs of human societies. With the growth in level of human economic activities, the capacities of such natural storage started to prove inadequate. Human societies enhance the availability of water with the help of additional harvesting mechanisms and artificially built storage capacities. Traditional technologies like harvesting in natural depressions in agriculture fields or the underground for supplementary irrigation or domestic supplies were used. However the scale of such traditional technologies was small and their utility limited to satisfying the domestic needs or irrigation needs. India ranks among the more important dam building nations in the world. Soon after independence, multipurpose river valley projects came to be regarded as essential for meeting the country's critical requirements of irrigation and agriculture, electricity for industries and flood control. Thus dams divert water, they retain it over long periods of time to use it effectively, attenuate floods and alleviate impacts of droughts. They relieve drainage congestion and provide for the timely and continuous supply of irrigation water needed to meet the demands of crops and livestock. Every dam causes partly temporary and partly permanent submergence of land in the upstream and displacement of resident persons and their property, along-with submergence of plant life and disruption to animal life. It is necessary to evaluate and monitor the post project impacts and whether the envisaged benefits are achieved. Hence it is essential to evaluate the impacts, adverse or beneficial in order to minimise the adverse impacts and maximise the beneficial impacts for equitable distribution of water resource. There are many projects in Maharashtra prior independence or after independence till awareness of environment from the various countries for sustainable development due to current signs of the environmental Degradation. For example the administrative approval for the Jayakwadi Project was granted in 1965. Which is prior to In India Environment Impact Assessment notification in 1994, Forest (Conservation) Act, 1980; Environment Protection Act, 1986; Maharashtra Project Affected Persons Rehabilitation Act, 1986; *etc*? Before these Acts and the 1994 notification came into force, environmental concerns were addressed in the form of obtaining No Objection Certificates from 14 departments on file. No impact assessment studies were carried out before commencement of the project. This led to implementation of the project without due regard to effect of impoundment of water, rehabilitation problems, catchment area treatment, etc. The effect of a project of this magnitude has never been studied. An in depth analysis will identify the ***long-term positive*** and ***negative impacts*** on environment, socio-economic development and on physical factors such as soil, water and air. This evaluation will also result in providing a measurement criteria and yardsticks for carrying out EIA for future

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water resources projects. Environmental evaluation is necessary for systematic identification of impacts - positive or negative on the environmental factors. This will help in defining the corrective actions in the form of an EMP to make the project more cost effective by ensuring that its intended benefits reach the desired developmental objectives without further prejudice to environment. Evaluation will provide critical information on project performance. The aim of the evaluation is to determine the efficiency, effectiveness, impact, sustainability and relevance of the project. Evaluation of completed water resource projects will help:

1. To measure progress as planned in the objectives of pre-project stage
2. To know the rehabilitation and resettlement status and changed (improved or otherwise) conditions of PAPs
3. To collect information and analyse it to understand the present status of environmental conditions in the project area, continuum of impacts paradigm. Such evaluation will help to improve planning of future projects
4. To find out possibilities of institutional restructuring and capacity building for better management of water resource projects
5. To compare the EIA carried out in pre-project stage and present scenario to define the need for better planning and implementation of EIA and EMP process
6. To develop a management information system to support improved water resource management, planning and decision-making
7. To develop participatory Monitoring and Evaluation Framework using social assessment methodology for future WRD projects.

Case Study Project Note Jayakwadi project

Introduction:

Godavari River rises near Nasik in Maharashtra at an elevation of 1067 m and flows for a length of about 1465 km before outfalling into the Bay of Bengal. The principal tributaries of the river are the Parvara, the Purna, the Manjra, the Penganga, the Wardha, the Wainganga, the Indravati and the Kolab. Jayakwadi dam is situated in Maharashtra, on Godavari River. The administrative cost of the project is Rs. 38.48 Crores, the latest estimated cost is Rs. 789.87 Crores. The command area of the project is in five districts namely Aurangabad, Ahmednagar, Parbhani, Nanded and Beed respectively.

Salient Features of the Project

S. No	Item	Details
1	**Name of the project:**	Jayakawadi Stage I on Godvari (Maharashtra
2	**Basin/River:**	Godavari
3	**Approved Cost**:	38.48
4	**Year of approval**:	1965
5	***District Benefited***	Aurangabad, Ahmednagar, Parbhani, Nanded, Beed
6	**Type**:	Storage
7	**CCA (Th.Ha)**	
8	**Started in Plan**:	V
9	**Latest Estimated Cost (Rs. Crores)**:	789.87
10	**Expenditure upto 1996-97**:-	850.25
11	**Ultimate Irrigation Potential:-**	141.84
12	**Created upto 1996-97 Th.Ha):-**	141.84
13	**Utilisation upto 1996-97**	55.21

Cropping Pattern:

Following cropping pattern was proposed for the existing Jayakwadi project.

Particulars	%	P. L.B.C.	P. R.B.C.	M. R. B.	Total
Sugarcane	3	4,350	1250	2318	8,418
Other perennials	1 ½	2,140	625	1409	4,174
Rice	5	7,090	2085	4695	13,870
L.S.Cotton	37 ½	53,230	15,635	35210	1,04,075
Rabi	51	72,350	21,225	47,875	1,41,450
Hot Weather Seasonals	2	2,340	832	1,378	5,550
Total	100	1,42,000	41,652	93,885	2,77,337
			Say 2,78,000 Ha		

District wise I.C.A.

S.No	Name of District	P.L.B.C.	P.R.B.C.	M.R.B.C.	Total I.C.A. (Ha)
1	Aurangabad	38,100	1792	-	39,832
2	Parbhani	1,03,900	-	58,385	1,62,285
3	Ahmednagar	-	1690	-	1690
4	Beed	-	38,260	28,300	66,560
5	Nanded	-	-	7,200	7,200
	Total	`1,42,000	41,682	83,585	2,77,567
				Say	**2,78,000 Ha**

As per this large Irrigable command area statement benefits occur from the project seems to be very identical. But unfortunately this project storage at the FRL happens very few times after administrative approval. In addition to this Canal network is yet to complete as per planned project. However, due to this facts cannot be eliminated, therefore issue of Evaluation of the Environmental angle as per current notifications of Ministry of Environment and Forests New Delhi necessary. This evaluation will also result in providing a measurement criteria and yardsticks for carrying out EIA for future water resources projects.

1. Effects of Rehabilitation

The effects of rehabilitation and resettlement of the affected villages of the project shall be studied. It shall include the status of allotments land/plots of affected population including landless workers.

a. Details of rehabilitation sites where rehabilitation has been carried out.
b. Actual photographs of rehabilitation sites and houses and details thereof.
c. Environment and sanitation status
d. Details of amenities and infrastructure facilities provided to the rehabilitated families.
e. Progress of economic rehabilitation programmes.
f. Details of the occupational training programmes conducted for project affected persons.
g. Details about health status and health services in the project area.
h. Response of the oustees to the process of rehabilitation and constraints.
i. Status and living standards of the oustees at new location
j. and compare it to the pre-project baseline**.**

2. Socio economic impacts including changes in literacy, employment

a. Details of status of schools/ teaching staff, student turnover,
b. Improvement in male-female literacy, evaluation of adult education programmes, provided if any.
c. Response to education provisions and assessments of constraints.
d. List the post project occupational options that have arisen in the region and also make a statement what occupations are attributable to the project benefits,
e. List all the new educational, cultural, recreational, access and commercial (markets, banks, etc) that have come up in the post project situation and state how much of it is attributable to the project
f. Compare the incidence of some important diseases in post and pre- project situations
g. Compare the health care infrastructure in the post and pre project situation,
h. Compare the Human Development Index (to the extent that the data is available) in the post and pre project situation.

3. Effects on agriculture including

a. Improvement in Production
b. Changes in Cropping Pattern and improvement in cropping intensity due to economic rehabilitation programmes on agriculture/ horticulture/ animal husbandry
c. Improvement in Quality of livestock and poultry.
d. Assess agriculture cooperative and agriculture finance programmes if initiated.
e. Details of the steps taken to prevent contamination of ground and surface water due to fertilizers, pesticides run off, etc.
f. Development of industry in command area.
g. Overall development scenario in the command area.

4. Impacts on Ground water

a. Impacts on quality and quantity of ground water -
b. Changes in GW table in recharge zones

4.1 Impacts on drainage including identification of waterlogged or saline areas.

c. Increase in the waterlogged area and mapping of specific area.
d. Arriving at an understanding of how the water logging has increased.

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e. Estimation of increase in the salinity effected soils and mapping of the same.
f. Arriving at an understanding of how the salinity has increased.
g. Compare the drainage characteristics of pro and post project situations.

5. Impacts on archaeological monuments, economically important minerals, and places of worship

a. List the archaeological monuments and places of worship that are restored as a part of EMP, record their status and enlist reasons
b. List new places of worship and monuments that have come up during the post project period
c. List new recreational opportunities that have come up in post project situation.
d. List the pre project and post project status of economically important minerals and the means and activities of harnessing the same.

6. Impacts on forest including types of forests, forest cover, introduced species, changes in forest based livelihoods and list of endemic and endangered species if any

a. Assess changes in forest cover, forest types.
b. Assess changes in Importance Value Index (IVI), Shanon Diversity Index, relative abundance and density of key species.
c. Assess effectivity of forestry programmes, contribution to sustaining local population needs (in eco development perspective)
d. Contribution to economic activities related to medicinal plants in sustaining livelihoods of local population, if any.
e. Status of endemic and endangered species, and evaluation of conservation programmes if any.

7. Impacts on fauna including birds and aquatic life

a. List terrestrial, avi and aquatic fauna
b. Assess changes in terrestrial fauna and their migratory patterns, if any.
c. Assess changes in avifauna and their migratory patterns if any.
d. Assess fish life and aquatic ecology – benthic changes in terms of both macro benthos- micro benthos, primary productivity of reservoir
e. Status of endemic and endangered, and evaluation of conservation programmes if any
f. Assess effectivity of wildlife conservation programmes, pisciculture development programmes, other activities contributing to sustaining local population livelihoods.

8. Impacts on public health, drinking water supply, communications and quality of life in general

a. Study the occurrence of diseases such as typhoid, diarrhoea, malaria, jaundice and other water borne and water related diseases in pre and post project implementation scenario.
b. Ascertain impacts due to reservoir impoundment, water logging and spread of such diseases, if any
c. Improvements in water supply provisions in pre and post implementation scenario.
d. Improvements in communication and transportation facilities in post implementation scenario.
e. Contribution of development in terms of provisions of infrastructure, facilities, amenities, economic compensation packages, etc. in improving quality of life
f. Effective implementation of EMPs in maintaining and improving quality of life of local population.

9. Changes in land use pattern

a. Using image-processing carry out land use/ land cover, classification and map on GIS.
b. Using overlays identify new development triggering land use changes.
c. Conduct ascertaining of ground truths and physical implementation of validating such results.
d. Map changes in land use/ land cover before and after implementation of the project.

10. Assessment and evaluation of Implementation of Environmental Management Plan (EMP) if any

a. Assess and evaluate R & R, compensatory afforestation, green belt development, health systems, fish development, catchment area treatment, reservoir rim treatment, landscape restoration, muck disposal, ecological conservation, free fuel provision plans, etc in terms of
   i) Schedule of activities, manpower requirements and performance indicators
   ii) Financial arrangements and returns- Cost Benefit Analysis (CBA) and wherever Return on Investment (RoI) was identified
   iii) Institutional arrangements suggested.
b. Evaluate the outcomes of EMP, assess its conformance to anticipated outcomes, understand the departures if any.
c. Develop a modified EMP involving compensatory afforestation, green belt development, health systems, fish development, catchment area treatment, reservoir rim treatment, landscape restoration, muck disposal, ecological conservation, free fuel provision plans.

d. Suggest any modifications/ revisions to performance indicators and institutional measures.
e. Identify needs in revisions to financial arrangements.

11. Status of implementation of Catchment Area Treatment (CAT) Plan

a. Study the catchment area treatment measures suggested
b. Progress of bioengineering and civil works carried out so far.
c. Identify areas where soil erosion and sediment yield arrest has been successful.
d. Identify areas where soil erosion sediment yield arrest has not been successful, and thus evaluate and revise measures implemented to assess their effectivity in local conditions.
e. Assess CAT plan implementation expenditure and cost over runs, in non-functioning treatment measures.

The study has been divided into physical and natural, biological and socioeconomic and health aspects for ease of evaluation.

Method:

There are many methodologies of impact assessment. Checklist method is used for this comparison for ease of a comprehensive and objective comparison. The intensity of impacts is classified in terms of low, medium and severe on a scale of 1 to 3. The nature of impact is classified as positive, negative and no impact and these are used as mulipliers with respective values of +1, -1 and 0. The net result denotes the nature and magnitude of impacts.

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Impacts of River Valley Projects & Canals Using Checklist Method

Legends	*L*	**M**	**S**	**P**	**N**	**NI**	**NR**
	Low	Medium	Severe	Positive	Negative	No Impact	Net Result
	1	2	3	+1	-1	0	

Physical Parameters

Factors	**DURING CONSTRUCTION**							**DURING OPERATION**							**Remarks**
	L	**M**	**S**	**P**	**N**	**NI**	**NR**	**L**	**M**	**S**	**P**	**N**	**NI**	**NR**	
Alterations to Topography			3		-1		**-3**		2			-1		**-2**	The magnitude and duration of impacts will vary largely in these type of projects. The impacts of dams are localized and concentrated in one place for a long time. The debris generated in large dams voluminous and difficult to remove. The debris from canal is less and is used in embankment.
Alterations to natural drainage	1				-1		**-1**		2			-1		**-2**	
Quarrying & Mining			3		-1		**-3**						0	**0**	
Debris Generation			3		-1		**-3**						0	**0**	
Waste land			3		-1		**-3**		2		+ 1			**+2**	The land use in the project area under goes a sustainable change due to the dam & canal project. The most important contributors will be agriculture and forest. The net sown area will increase, wasteland (banjar/ desert land) will decrease and forest cover will increase.
Grazing			3		-1		**-3**		2		+ 1			**+2**	
Agricultural			3		-1		**-3**			3	+ 1			**+3**	
Forest			3		-1		**-3**		2		+ 1			**+2**	
Residential			3		-1		**-3**		2		+ 1			**+2**	
Industrial			3		-1		**-3**			3	+ 1			**+3**	
Ground Water						0	**0**		2		+ 1			**+2**	In both cases the impact may be positive or negative depending on water table depth. Places where depth of ground water table is 0 to 5 m water logging may occur, and in areas below 5 to 10 m the possibility of water logging is remote. Generally Dams are constructed on terrain with falling contours. Thus natural drainage exists. It also carries ground water away in a shorter time. In case of desert region, ground water level is very low but no natural drainage exists. The areas having hardpan upto 5 m pose danger of early water logging.
Siltation						0	**0**			3		-1		**-3**	
Water logging and Salinity						0	**0**			3		-1		**-3**	
Irrigation						0	**0**			3	+ 1			**+3**	
Environmental flow			3		-1		**-3**		2			-1		**-2**	Generally a large dam is constructed on single perennial river, whereas the canal also crosses seasonal rivers, A possibility of rejuvenation of these rivers and sustenance of downstream ecosystem also exists.
Air Quality			3		-1		**-3**						0	**0**	Effect of air and noise pollution will be more in dam construction as these are localized for large dams whereas canal construction is spread linearly, construction activity moves on hence the magnitude will be less
Noise			3		-1		**-3**						0	**0**	
							-37							**+7**	

Biological Parameters

Factors	DURING CONSTRUCTION							DURING OPERATION							Remarks
	L	M	S	P	N	NI	NR	L	M	S	P	N	NI	NR	
Forest			3		-1		**-3**		2		+1			**+2**	During construction of large dams submerge large area of dense forest involving large number of species of flora and fauna. However, during operation of the project no additional land required. Effect on migratory route is lesser due to localized construction activity With canal water the forest will benefit. The loss of forests is more in dam submergence. The time required to regenerate the forest in compensatory land offered for forestation, requires longer time. Sustained localized construction activity of dam disturbs fauna.
Wildlife		2			-1		**-2**		2		+1			**+2**	During construction of the project impacts on wildlife and endangered species etc are Severe but after completion the project, positive impacts are happen due to availability of water
Rare & endangered species			3		-1		**-3**		2		+1			**+2**	
Mammals			3		-1		**-3**		2		+1			**+2**	
Reptiles & Amphibians			3		-1		**-3**		2		+1			**+2**	
Fish & fisheries			3		-1		**-3**		2		+1			**+2**	
Avifauna			3		-1		**-3**		2		+1			**+2**	
Migratory paths			3		-1		**-3**			3		-1		**-3**	
Rare & endemic species			3		-1		**-3**		2		+1			**+2**	
Common species		2			-1		**-2**			3	+1			**+3**	
							-28							**+16**	

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Socio-Economic Status

	CONSTRUCTION PHASE							OPERATION PHASE							
Factors	**L**	**M**	**S**	**P**	**N**	**NI**	**NR**	**L**	**M**	**S**	**P**	**N**	**NI**	**NR**	
Population															
Employment		2		+1			**+2**			3	+1			**+3**	During construction large number of migrant labours is employed. Disease spread (malaria, etc) & contamination of downstream water will occur due to *Ecoli.* etc. Large displacement and resettlement of people. Population density in project area is low, canal can avoid populated areas so displacement is nil & large benefits occur during operation phase. Livestock population is not affected by the construction of both projects in both phases. Larger increase in live stock carrying capacity due to water provided in operation phase.
Migrant Labour			3		-1		**-3**	1				-1		**-1**	
Displacement of Villagers/ Tribals/ Fishermen			3		-1		**-3**						0	**0**	
Resettlement			3		-1		**-3**						0	**0**	
Livestock						0	**0**		2		+1			**+2**	
Health			3		-1		**-3**		2		+1			**+2**	Canal can ensure minimum flow rate (>0.6 mtrs/sec), Dam back waters may encourage vector borne diseases. Residual migrant labour can be carriers of new vectors. Construction of large dam will impound all the infrastructure as compared to the link canal construction where over bridges can be provided.
Roadways			3		-1		**-3**						0	**0**	
Bridges			3		-1		**-3**						0	**0**	
Transmission lines			3		-1		**-3**						0	**0**	
Archaeological sites		2			-1		**-2**						0	0	Large dams being very site specific avoidance of archaeological sites in submergence becomes difficult. In case of canal project, canal alignment can be diverted and archaeological sites can be saved.
Aesthetics			3		-1		**-3**			3	+1			+3	Overall aesthetics of the environment losses during construction and gain during operation.
							-24							**+9**	

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