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Executive Summary

1. Introduction

Government of Maharashtra (GoM) is giving prime importance to develop irrigation projects to flourish the underutilized dry lands particularly in the draught prone areas. To harness the irrigation potential of Purna basin in the Vidarbha region Government of Maharashtra formed state government agency In year 1997 viz. Vidarbha Irrigation Development Corporation (VIDC). Purna Medium Project Division (PMPD), Achalpur is acting under Amravati Irrigation Circle which is subsidiary of VIDC.

PMPD has proposed construction of Waghadi Barrage Larger Minor Project on local nallah Waghadi which is a tributary of river Purna which in turn is a tributary of river Tapi. The project is situated near village Kalashi in taluka Daryapur of Amravati District. The geographical location of the project site is at Latitude 20^o51'59.61"N and Longitude 77^o24'12.81"E. The nearest major urban centre is Daryapur, which is a Taluka place and 10.26 Km away from the project site. District headquarter Amravati is 38 Km away. The nearest railway station Lakhpuri is 5.6 Km and Amravati Air Port is 33 Km away from the project site.

2. Need of the Project

The command area of this project consists of villages in Daryapur Tahsil of Amravati district. This area receives average rainfall of 817.40 mm. The maximum rainfall available is in the month of August and September, due to which some Kharif crops are only possible. Fertile soil is available in the command area, and if assured water is made available, crops with higher yield can be grown.

As per the observation of Central Ground Water Board, Central Region Nagpur Report it is observed that the **Daryapur taluka** falls under "Over-Exploited" category, therefore, further development of ground water resources is not recommended in these talukas. Thus future water conservation and artificial recharge structures needs to be prioritized in these parts of the district.

In addition to that the Ground water in the study area is highly saline in nature which cannot be utilized for the irrigation and therefore the irrigation should be available from the external water source.

3. Project Description

The project envisages construction of an earthen dam with top width 6.50 m and maximum height 11.64 m in the gorge portion. The length of dam is 1800 m to accommodate the gross storage of 5.5536 Mm³. Consisting of live storage of 5.477 Mm³ and dead storage of 0.076 Mm³. The gated spillway of 12X8.5 m size of 4 numbers is proposed to pass a peak discharge of Inglis flood i.e. 1340.24 Cumecs. The area under submergence would be 290.63 ha. The total catchment area upto dam site is 127.985 Sq.Km. The 50% dependable yield works out to 21.271Mm³. Land from following villages is going under submergence:

Sr. No.	Name of the village	Area under submergence (in Ha.)	Direction	Distance from main Dam
1.	Kalashi	198.00	W	0.35 Km
2.	Kalamgavhan	29.12	NE	3.5 Km
3.	Sujapur	24.94	SW	0.6 Km
4.	Elichpur	20.51	NE	3.75 Km

No Gaonthans are affected due to the project. No monuments of historical or archeological importance or temples, mosque etc. are going to be affected by the project. There will be right bank canal of 9.84 km and left bank canal of 3.42 km in length to irrigate 399 hectares of land in Daryapur tahsil of Amravati district and remaining 787 ha. area will be self lifted by cultivators with his own expenditure along submergence. The project command area falls under Daryapur Tahsil and the command area villages are Ichora, Kalashi, Bhujwada, Takali, Kukasa & Darkheda.

Proposed Cropping Pattern- As the irrigation facility will be available in the command area the rabi and summer season crops can be grown in addition to irrigated crops in kharif season. The cropping pattern is proposed based on the soil quality and climatic condition of the study area. The proposed crop in percentage is tabulated below.

Proposed Cropping Pattern

S. No.	Name of Crop	Proposed crop Pattern
1.	Two Seasonal	
	L.S. Cotton	10%
	Chillies	3%
	Turmeric	2%
2.	Kharif Seasonal Irrigation	
	Hy. Jowar	5%
	Soybean	15%
	Vegetables	15%

3.	Kharif Seasonal Unirrigated	
	Pulses (Tur)	5%
	Cotton (Ordinary)	10%
	Hy. Jowar	10%
	Mung	25%
	Bajara	-
4.	Rabi Seasonal	
	Gram	15%
	Wheat	5%
	Sunflower	10%
	Safflower	3%
	Vegetables	20%
	Total	153%

(Source: Detailed Project Report)

After the implementation of Waghadi Barrage Larger Minor project the crop intensity will increase to 153%. Due to availability of water for irrigation there will be increase in two seasonal crop and rabi crop along with the seasonal irrigation in the Kharif season.

The Waghadi Barrage Larger Minor Project is proposed for water scarce zone. This area would be enriched by better cropping and greenery. Due to availability of water for irrigation in the scarcity period agriculture will flourish. This will in turn create the employment opportunity to farmers and agricultural labours. Skilled, semi-skilled and unskilled man power will be utilized during construction and operation phase. This will positively impact the economic condition of the study area.

Project Benefits -

- 1) Due to assured surface water irrigation facility in the drought prone area in addition to improvement in cropping pattern the quality of life of people will improve.
- 2) The area will be benefited by drinking water facility
- 3) Due to plantation of trees near the barrage site the aesthetic beauty of the area will improve. Greenery in the area will support the biodiversity of the area.
- 4) The ground water level of the study area will improve. Water logging is not anticipated.

Cost Economics-

- a) Total Estimated cost of the project : Rs. 4920.347 Lakhs
- b) Cost per Mm³ on storage 5.54 Mm³ : Rs. 885.98 Lakhs
- c) Cost per TCM on storage : Rs. 88598= <94470 weighted norm for storage & flow irrigation project
- d) Cost per Hectare of irrigable area : 4.15

As the Waghadi Barrage Larger Minor Project command area falls under the saline tract, the Benefit Cost Ratio is not applicable for the project.

4. Objectives of the Study

Waghadi Barrage Larger Minor Project is proposed for providing irrigation facility to 1186 ha; hence this requires environmental clearances from the Maharashtra State Environment Impact Assessment Authority (SEIAA). To fulfill the statutory requirements, EIA and EMP have been prepared. The Environmental impact assessment study has been carried out by M/s MITCON Consultancy & Engineering Services Ltd., Pune during post monsoon season *i.e.* in the month of December 2011 to February 2012 with the following objectives in view:-

- i. To assess the likely environmental and ecological impacts of the Waghadi Barrage Larger Minor Project.
- ii. To study existing socio-economic conditions of the affected people.
- iii. To study changes in physical parameters.

Two broad types of methodologies *viz.* Field Surveys Methodology and Impact Assessment Methodology were followed for the above studies. Further study is based on Collection of Secondary and Primary data, Focused Group Discussions, Sample survey of families and farmers likely to be affected by the project.

Villages in the study area are covered for the study of existing air, water, noise and soil quality and ecology of the study area. The sampling locations are tabulated below:

Sr. No.	Name of village	Air Quality	Water Quality (SW/GW)	Noise Quality	Soil Quality	Ecology
1.	Project site (Waghadi Barrage)		✓	✓	✓	
2.	Kalashi	✓		✓		
3.	Elichpur	✓	✓	✓	✓	✓
4.	Amla		✓		✓	✓
5.	Shelu Bazar		✓		✓	✓
6.	Gaywadi		✓		✓	
7.	Lakhpuri		✓			✓
8.	Sangvi		✓		✓	✓
9.	Durgwada	✓		✓		✓
10.	Bhujvada	✓				✓
11.	Thelori	✓		✓		✓
12.	Naygaon					✓
13.	Bramhi Khurd					✓

5. Description of the Environment

5.1 Geology and Topography

Geologically the project area falls in Quarternery stratigraphic sequence having canozoic age. The type of formation in the area is alluvial deposits. The alluvial plain is mainly composed of blackish, yellowish & brownish clay soil intercalated with bands of gravels & sand.

The Waghadi Barrage project area falls under the alluvium region. The project falls under Daryapur tahsil showing water level 19.31 mbgl before monsoon, whereas the post monsoon level is 15.73 mbgl. The water level scenario and fluctuation data shows that the project area is having ground water level fluctuation in the range of 10-20 mbgl during pre and post monsoon season. However observing the long term trend there is a rise in water level 0.008 to 0.23 mbgl.

5.2 Meteorology

The project area exhibits extreme climate with hot summer and cold winters. The major rainfall takes place from June to September. The maximum average of rainfall seen is 196.99 mm during the month of August. The maximum annual rainfall received at Daryapur is 1219.6 mm in the year 2001.

5.3 Seismology

Project area falls in Seismic Zone III. It suggests that the area is a moderately affected Zone.

5.4 River System and Drainage

The Barrage is proposed to be constructed on local nallah- Waghadi. This nallah forms part of the Purna sub basin which in turn is a part of Tapi Basin. The project area follows dendritic drainage pattern.

5.5 Ground Water

The current water level in the project area ranges between 10 m to 20 m. below ground level. Therefore the command area is not subjected to water logging if the proper irrigation planning is carried out. However the ground water quality results show that water is highly saline in nature.

5.6 Soil Types

The soil type of the study area is Alluvial Heavy Clay which ranges in colour from light brown to yellowish brown.

5.7 Minerals

The only Major mineral found in district is Fireclay. It is found in Achalpur Tahsil. Any construction material is categorized into minor mineral e.g. Murrum, Stone, Sand. Other mineral found is limestone.

5.8 Ecological Status

Natural Flora- The prominent plant in the study area is *Prosopis juliflora*, which is found commonly near the nallahs and village wasteland. Parthenium was a common weed growing in wasteland and in agricultural field. *Acacia arabica* and *Acacia nilotica* was a common tree near the villages and on the hedge of agricultural field. The commonly found trees are *Cassia fistula*, *Phyllanthus emblica*, *Ficus bengalensis*, *Aegle marmelos*, *Zizypus mauritiana*, *Tamarindus indica*, *Syzigium cumini*, *Pongamia pinnata*, *Acacia catechu*, *Holarrhena antidysenterica*, *Limonia acidissima*, *Madhuka longifolia*, *Azadiracta indica*, *Ficus religiosa*, *Tectona grandis*, *Terminalia alata*, *Delbergia sissoo*, *Anona squamosa*, *Diospyros melanoxylon*, *Ficus racemosa*, *Mangifera indica*, *Butea monosperma*, *Acacia leucophloea* etc.

Natural Fauna- No forest area comes under the study area. The Mammals found in the study area are Five Striped palm squirrel, Common / Indian Mongoose, Common Indian Hare, Bonnet monkey, Indian Field Mouse, House mouse, House Shrew. Some reptiles like cobra, water snakes, monitor lizards and common lizards were also observed near village boundary. The dominant birds in the study area are grey pond heron, little egret, Cormorant, Bramhani duck.

5.9 Socio-economic Aspects observed in the Study Area

5.9.1 Socioeconomic status in study villages

The socioeconomic status of the study area as per the census 2001 is tabulated below:

Sr. No.	Component	Details
1.	Average size of household	4.4
2.	Sex Ratio	931-1038
3.	Children below 6 years	14%
4.	SC Population	25%
5.	ST Population	32.5%
6.	Literacy	74%

7.	Work Force	Ranges in different villages from 28.7-67%
8.	Education Facility	Primary Education in all villages, secondary education in some villages
9.	Medical Facility	Community Health Facility only
10.	Drinking Water sources	Tap water (However use of ground water is not prominently observed)
11.	Post and telegraph Facility	Post office only
12.	Communication Facility	Bus in all villages & railway in some villages
13.	Banking Facility	Non agriculture credit societies
14.	Recreational and cultural facility	No modern recreational facilities like stadium, auditorium or cinema hall
15.	Approach road	Paved road /Mud road
16.	Power Supply	power supply available for all purposes including domestic, agriculture and other
17.	Landuse	Maximum agriculture is unirrigated followed by the non cultivable area and gauchar land.
18.	Source of irrigation	no surface or ground water facility is available for the irrigation

5.9.2 Prevailing Socioeconomic status of household of Project affected population

For carrying out the household survey for project affected families, the villages affected by the project are identified and marked on the toposheet. The sample population from project affected families are surveyed for household level study for establishing the socio-economic profiles of area. The following aspects are covered in the survey.

Component	Details
Type of Family	Joint families about 70% Nuclear families 30 %
Family Size	An average family size (the number of persons per family) is 5.0 in the study area.
Sex Composition	Sex ratio (number of females per 1000 males) of 960
Literacy Levels and Educational Institutions	85% of the covered population are literates. Out of which Primary education works out to 12%. Secondary education works out to be 50%. Higher education at graduation level works out to 15%

Religious Groups	93% Hindus followed by 7% Muslims.
Occupational Structure	The major occupation of the households is agriculture. The major crops grown in the area are Cotton, Jowar, Tur, Mug and Chana.
Income Pattern of Households	The income group of below Rs. 12000 per annum is of 23.8 % of households. Income group of Rs. 12001 -25000 per annum constitute 49.2% households 19% of household have income ranging from 25001-50000 However 8% household have income more than 50000 per annum
Land Holding Pattern	Farmers in the project affected village are having the land below 2 Ha. which shows the presence of higher percentage of marginal farmers.
Housing Pattern	Consisting of 2 or 3 rooms & livestock shelter. Houses mainly of two types brick houses and mud houses. The roofs are mainly asbestos type or thatched roof.
Drinking Water Supply	About 69 % households are having tap water facility in house premises and about 31 % of population rely on community taps.
Sanitary Conditions and Facilities	53.3% of households with in-house latrines facility and remaining houses use public latrines
Irrigation Pattern	In the project affected area the well water is highly saline and unsuitable for irrigation. Therefore the agriculture is rainfed.
Cropping Pattern	Cotton is major crop followed by Chana, Jowar, Mung, whereas some farmers are also growing Wheat, Tur, Soybean and Kardi.
Livestock and animal Husbandry	Major Livestock noted is Cow, followed by Buffalo and Ox. 28.6 % families are not owning any livestock.
People's Perception about the Project	Most of the respondents welcomed the project subject to the provision of facilities like good roads, sanitation facility, infrastructure and employment opportunities etc. Needs of the Villagers and their Expectations- People in the study area asked for the basic facilities like higher education, Dispensaries, cooking gas, pucca road, better transport facility & loan facility.

6. Environmental Impact Assessment

6.1 Impacts on Air Environment

Construction Phase- During construction phase the emission of Particulate Matter (PM10& PM2.5), Carbon Monoxide (CO), and Sulphur Dioxide (SO₂) will be increased due to activities like infrastructure development and vehicle movement. This will give rise to increase in dust and air pollution. ***This will be low negative impact for temporary phase.***

Operation phase- Sources will include emissions from movement of inspection and service vehicles. During the operation phase of the project, the following pollutants are anticipated to be emitted viz. Nitrogen oxides (NO_x), PM10 & PM2.5), Sulphur dioxide (SO₂ and CO from vehicle exhaust within the Project site. This will be in a very minor quantity ***This will be permanent low negative impact.***

6.2 Impact on Noise Environment

As determined from the Site Specific Noise Monitoring Survey, during day time and night time. Noise levels are within permissible limit of NAAQ standard.

Construction Phase- During construction phase the activities like infrastructure development and vehicle movement will increase the noise level. This may give rise to noise pollution. ***This will be low negative impact for temporary phase.***

Operational phase- During operation phase the noise level may increase due to machinery, vehicles on the barrage site and colony, Traffic and transportation and the local human activities. This will be in a very minor quantity. ***This will be no impact.***

6.3 Impact on Water Resource

The ground water monitoring report shows that the ground water found in study area is highly saline in nature. The water exceeds the limit of IS: 10500 for drinking water *w.r.t.* TDS, Hardness, Chloride, Nitrate, alkalinity. Therefore water is not potable. However the level of sodium is high and SAR exceeds the limit of water required for irrigation.

The impact on the water resources during the construction and operation phase is as follows:

Construction Phase- Construction activities for the proposed development may have impact on hydrology and ground water quality and surface water due to soil runoff from the site particularly during rainy season, disposal of construction debris, domestic wastewater from temporary labor camps etc. This can be termed as ***High negative impact for temporary phase.***

Operation Phase- The existing ground water quality is highly saline in nature. Due to availability of assured water, it may also improve the water level and ground water quality. The impact on water environment will be positive.

The major source of water pollution during project operation phase could be the wastewater from the antropogenic activities during the inspection and maintenance of barrage. Proper sanitation facility can minimize this negative impact. However overall this impact can be termed as ***Permanent High Positive impact***.

6.4 Impacts on Land Use

Construction Phase- The Barrage is proposed on the local nallah Waghadi. The construction area involves agriculture land mainly rainfed agriculture land. Which will not be affected by the construction of the project. Project area does not involve the forest area. Therefore this can be termed as ***Temporary Low negative impact***.

Operation Phase- The project will involve the construction of Barrage. The site area will be developed by greenery and open space. Land will be used for various purposes like permanent structures, roads and other infrastructures, green areas, etc. Due to availability of assured water the cropping patter in the command area will be improved.

The change in aesthetics and visual appeal of the region will be positive, wherein existing un-planned development will give way to a planned, environment friendly and sustainable urban habitat. Therefore this will be a ***Permanent High positive impact***.

6.5 Impacts on Soil

Construction Phase- Mixing of construction debris with soil and reduction in the pervious area may lead to reduced infiltration rate, decreased permeability and increased runoff. Excavation of different layers of soil and subsequent mixing of different layers would lead to disruption of soil structure. Pollution of soil would be on account of spillage of oil from vehicles used for transportation of construction material. However, this impact will be ***Temporary Low negative impact***.

Several environmental management measures will be implemented to minimize the soil erosion, increase infiltration rate of rainwater and other impacts.

Operation Phase- During the operation phase, landscapes and green belt areas will be carefully designed and developed and maintained. No significant impact is expected on the soils on and around the site. Hence, ***Permanent High positive impact*** on soil quality in the study area is expected due to the project activities.

6.6 Impacts due to construction waste

Construction Phase- During the construction phase, solid waste generated will include debris from land clearing activities, excavation of earth and rock, waste from the labour camp and construction waste. However, the soil excavated will be reused within the site for backfilling, landscapes, etc. This will be **Temporary Negative impact**.

Operation Phase- Construction waste will be cleared and utilized before the operation of the project. Therefore there will be **no impact** due to this parameter.

6.7 Impacts on Ecological Environment

Construction Phase - The area under submergence is mostly agricultural, with low vegetation structure and low diversity of animals. No endangered or endemic plant was recorded from study area Thus biodiversity or plant and animals would not be adversely affected from the proposed project. Thus there will be **Temporary Low negative impact**.

Operation Phase - During operation phase green belts proposed would be designed in order to gel with the existing and surrounding ecology. This will enrich the habitats and create new niches for fauna of the area.

This will be **Permanent High positive impact**.

6.8 Impacts on Socio-economic Environment

◇ Employment Generation

During construction and operation phases, the local community will be benefited due to more jobs opportunities in the agricultural field and agro based industries. Jobs would be created for unskilled, semi skilled and skilled labor categories for which local people would be given preference. This will be **Permanent High positive impact**.

◇ Health Profile

Due to incorporation of more health care centers equipped with the modern facilities, quality water supply and sanitation services, the health profile of the study area would improve. This will be **Permanent medium positive impact**.

◇ **Economic Condition of the study area**

This project will increase the economic activities around the area, creating avenues for direct/indirect employment in the post project period. This will improve overall economic condition of the study area. This will be ***Permanent High positive impact.***

◇ **Aesthetics Environment**

The creation of the reservoir would create a large water surface, water body surrounded by plantation and water birds. This will lead to increase in the recreation potential of the project area. Aesthetic look of the command area of the project is likely to increase due to green fields and local plantation. This will be ***Permanent High positive impact.***

◇ **Resettlement and rehabilitation issues**

The land is being acquired from 4 villages viz. Kalashi, Kalamgavhan, Sujapur & Elichpur excluding existing settlements. Proper compensation package is planned and provided to the project affected population. Therefore, this impact will be ***Temporary Low negative impact.***

◇ **Impact on Historical, Archeological and Architectural Sites**

There is no listed heritage/ archaeological site within the site and the buffer zone. Some historical and pilgrimage sites on the periphery will benefit with improved infrastructure. Hence, there will be ***no impact.***

7. Environmental Management Plan

7.1 Compensation for the Project Affected Population

Project proponent has planned the proper compensation for the farmers and in case of land acquired the rate is given to the farmers as per the prevailing market rates.

7.2 Water logging and salinization problem

The current water level in the project area ranges between 10 m to 20 m. Below ground level. Therefore the command area is not subjected to water logging if the proper irrigation planning is carried out.

Though the soil in command area is non saline in nature, but ground water shows high salinity. Due to availability of surface water irrigation source it will recharge the ground water and ground water salinity may also be reduced.

7.3 Green Belt Plantation along canal

To protect the embankments of canal and to safeguard atmosphere along the canal, plantation programme is recommended.

7.4 Restoration plan for dumping sites and borrow areas

Restoration of construction area including borrow area and dumping site should be ensured by levelling, filling and landscaping *etc.* The area should be properly afforested with suitable plantation.

7.5 Occupational Health and safety measures during construction

During the period of construction the impact on air, water and noise pollution will prevail. Provision of protective gear to labours during construction phase is suggested. Personal Protective Equipments (PPE) like helmets, gloves, goggles, safety shoes, masks, *etc.* should be provided during construction as per the job requirement.

The workers should be provided with the safe drinking water. All the outside labourers to be engaged for construction works should be thoroughly examined by health personnel and adequately treated before issuing the work permit.

7.6 Free fuel provision/subsidized fuel supply scheme for workforce

To meet the demand of fuel supply for labour work force during construction of project, subsidized or free fuel needs to be made available to them. Fuel depot may be established at the site to provide the fuel (kerosene/ LPG) so as to ensure regular fuel supply.

7.7 Command Area Development Plan

Command area development plan is suggested for development of water resources, proper water distribution and scientific irrigation practices which will be accomplished by the following-

- Measures to avoid water logging and salinity by providing efficient surface drainage for removal of excess water which may occur due to heavy rains/ seepage from canals or excessive irrigation and providing efficient sub soil drainage.
- Distribution of seeds and fertilizer to get the better yield
- Crop Planning based on the soil quality, water availability and climatic conditions of the area
- Conjunctive use of surface and ground water

7.8 Health Management Plan during operation phase

Proper sanitation arrangements, as well as safe drinking water source by physical method like filtration and/or by adding disinfectants should be done. Periodical checking of the physico-chemical and microbial parameters for the quality control of drinking water should be done. In addition to that, if the design velocity of the proposed canal is maintained more than 0.6m/sec spreading of vector of malaria can be controlled.

7.9 Catchment Area Treatment Plan

The total catchment area of the project is 127.985 Sq. Km. This catchment area is partly hilly and covered with thin forest, particularly in the upstream reaches, as longitudinal and cross slopes. The area available in open patches is recommended for afforestation. Due to the construction of this minor irrigation tank an area of 290.63 ha. to be submerged.

Extent of degraded land requiring the treatment

Total directly draining area – 100% area

Total critically degraded area – 20% of the catchment area

Areas with minimal degradation – 80% of the directly draining area

Therefore, critically degraded directly draining area – 20% of the total area

A suitable Catchment Area Treatment Plan is proposed to reduce the rate of runoff and for soil and water conservation.

7.10 Fisheries Management Plan

Waghadi nalla flows only in rainy season and no commercial fishery activity is carried out. When adequate water will be available in the nalla fish will be exploited to a beneficial extent and varieties such as minor carps and several other species of lesser importance will be reared. The commonly found fishes in the study area are Catla, Mrugal and Rohu.

8. EMP Cost

This will include the cost of the factors required for the Environmental management.

EMP Cost Summarized

Sr. No.	Particulars	Cost (Rs. lakhs)
1.	Compensation Package for Project Affected population	376.807
2.	Greenbelt Development Plan	16.75
3.	Environmental Monitoring	10.00
4.	Catchment Area Treatment Plan	281.39
5.	Aquaculture Development	15.00

9. Environmental Monitoring

Environmental Monitoring is a tool to check the implementation of the Environmental Management Plan. It involves formation of a committee involving experts in various fields as well as Govt. officials for checking the implementation of the environmental management plan. The following monitoring plan is suggested for the project.

Environmental Monitoring Plan

Sr. No.	Type	Locations	Parameters	Period and Frequency
1.	Water Quality Monitoring of Surface and ground water	<ul style="list-style-type: none"> Project site One sample in each command area village 	Drinking water parameters as per IS 10500.	Quarterly
2.	Monitoring the Ground water level	<ul style="list-style-type: none"> Ground water source near Project site One sample in each command area village 	Ground water level in mbgl	Pre monsoon Post monsoon
3.	Soil Quality monitoring in command area	<ul style="list-style-type: none"> One sample in each command area village 	Organic matter, C, H, N, P, K, Alkalinity, Acidity, heavy metals and trace metal. Alkalinity, Acidity.	Quarterly

4.	Ambient air quality monitoring	<ul style="list-style-type: none"> • Project Site • One Upwind Direction • One downwind Direction • One sample in each command area village 	Criteria Pollutants: SO ₂ , NO _x , PM _{2.5} , PM ₁₀ , CO	24-hr average samples every quarter during construction and operation phase.
5.	Noise quality monitoring	<ul style="list-style-type: none"> • Project site • Two samples in Surrounding area • One sample in each command area village 	dB (A) levels	Hourly Day and Night time Leq levels every quarter during construction phase and every quarter during operation phase.
6.	Monitoring in change in ecology	<ul style="list-style-type: none"> • Project site • Observation in each command area village 	Density and diversity of trees	Yearly
7.	Monitoring in change in cropping pattern	<ul style="list-style-type: none"> • Observation in each command area village 	<ul style="list-style-type: none"> • Change in crop type • Cropping intensity 	Yearly

10. Conclusion

Environmental Impact Assessment studies as worked out by Checklist method by considering all the concerned aspects show that the impacts on environment during the construction phase is showing the negative impact on air, noise, water quality, soil and the land and impact due to construction waste and land acquisition process. However these will be for the short time. Whereas during operation phase due to availability of assured water supply the positive impacts will be on socioeconomic condition, landuse and water quality and will be for the long term.

To minimize the negative impacts control measures will be applied during construction and operation phase. The proposed measures will bring in following benefits.

- There will be significant reduction in the adverse impact on air quality and noise quality
- There will be significant reduction in the adverse impact on water quality and soil quality
- There will be an overall beneficial impact on socioeconomic condition and quality of life.

After implementation of the project, agricultural production will increase in the command area of this project, thus improving the present financial status of the people living in the area. Due to supply of irrigation water, drinking water, the economy of the area and quality of life in the study area will improve.

The B.C. ratio is not applicable for Waghadi Barrage Larger Minor Project as the project falls under saline tract. In turn this project will benefit the saline tract by providing the irrigation water in scarcity period. This will increase the cropping intensity in the study area.