कार्यालय उप संचालक,
वीरांगना दुर्गावती टाईगर रिजर्व, सागर (म.प्र.)

तिली रोड, फॉरेस्ट कैम्पस, सागर (म.प्र.)-470001, दूरभाष 07582-236887, e-mail - dfowlndehi@mp.gov.in

क्रमांक / मा.चि. / 2024 / 960 सागर, दिनांक -28/8/2024

प्रति,

प्रधान मुख्य वन संरक्षक,
(वन्य प्राणी),
म.प्र. भोपाल।

विषय :- कोपरा मध्यम सिंचाई परियोजना "Environment Impact Assessment of Flora, Fauna & Socio Econimic Status of local communities and action to be taken mitigate impace of kopra medium project in Nauradehi Wildlife Sanctuary, Sagar District (M.P.)" रिपोर्ट प्रस्तुत किये जाने बाबत्।

संदर्भ :-
1. आपका पत्र क्र. / व.प्रा. / तक-1 / Gen-192 / 3146 दिनांक 19.04.2024.
2. कार्यपालन यंत्री, जल संसाधन संभाग क्रमांक एक सागर का पत्र क्र. / 2706 / कार्य / 2024-25 दिनांक 07.08.2024.

---00---

उपरोक्त विषयांकित में निवेदन है कि कोपरा मध्यम सिंचाई परियोजना "Environment Impact Assessment of Flora, Fauna & Socio Econimic Status of local communities and action to be taken mitigate impace of kopra medium project in Nauradehi Wildlife Sanctuary, Sagar District (M.P.)" प्रकरण में आपके संदर्भित पत्र से लिये गये आक्षेपों की पूर्ति कर कार्यपालन यंत्री, जल संसाधन संभाग क्रमांक एक सागर से Mitigitation Measures की प्रति का परीक्षण उपरांत आपकी ओर अवलोकनार्थ एवं आवश्यक कार्यवाही हेतु ज्ञाप के साथ संलग्न सम्प्रेषित है।

संलग्न :- उपरोक्तानुसार।

(डॉ. प्र.ए.अंसारी) भा.व.से
उप संचालक,
वीरांगना दुर्गावती टाईगर रिजर्व,
सागर (म.प्र.)

पृ.क. / मा.चि. / 2024 / 961 सागर, दिनांक -28/8/2024

प्रतिलिपि :-
1. मुख्य वन संरक्षक, सागर वृत्त, सागर की ओर सूचनार्थ सम्प्रेषित।
2. कार्यपालन यंत्री, जल संसाधन संभाग क्रमांक एक सागर की ओर सूचनार्थ प्रेषित।

उप संचालक,
वीरांगना दुर्गावती टाईगर रिजर्व,
सागर (म.प्र.)

KOPRA MEDIUM IRRIGATION PROJECT

MITIGATION MEASURE OF IRRIGATION PROJECT & RISK ASSESSMENT & DISASTERMANAGEMENT

WATER RESOUCE DEPARTMENT

(State Government of Madhya Pradesh)

CONTENTS PAGE

1- INTRODUCTION-

Bundelkhand is a region of rolling hills and fertile valleys in the northern part of the state, which slopes down toward the Indo-Gangetic plain to the north. Gwalior is an historic center of the region. This region encompasses Gwalior, Sagar, Damoh, Panna, Chhatarpur and Tikamgarh Districts.

The Proposed dam site is located across river Kopra near village Bagaspura Tehsil Rehli, District Sagar of Madhya Pradesh. The site is located on topo sheet no 55 M/2 with latitude 23˚36'22" N and longitude 79˚10'13" E. The site is situated about 60 km away from Sagar district headquarters. River Kopra is a tributary of river Sonar ultimate part of KEN Sub Basin. The river Kopra originates near village Gopalpura of Tehsil Deori District Sagar. The catchment area up to the proposed Dam site is 231.80 sq km.

Kopra Medium Irrigation Scheme is a irrigation rises on Kopra River in the Block Rehli Forest area of South Sagar Division and Nouradehi (WL) Sagar Division in the Sagar district, of Madhya pardesh . Kopra River originates near village Gopalpura of Tehsil Deori District Sagar. Kopra River flows in a generally north flowing direction is tributary of river Sonar ultimate part of KEN Sub Basin. The forest area boundary in the catchment as per the forest proposal is about 200.08 Sq.KM & about 2.72 Sq. K.M is in the submergence.

The proposed project of Kopra Medium Irrigation Scheme diversion weir irrigation is predicted to bring both beneficial and adverse impacts on physical, biological and socio-cultural environment. Although the implementation of Nouradehi Wild Life Sanctuary and South Sagar Division diversion weir irrigation project has many benefits, obviously it will also bring a number of adverse impacts to the physical, biological andsocio-cultural environment.

Generally, the potential positive and negative impacts as well as the environmental mitigation measures of the irrigation project depend on: (a) nature and types of the proposed irrigation project,(b)environmental baseline condition of the project area i.e. the physical, biological and socio-cultural environment,(c)environmental health condition of the project area,(d)the technological option adopted,(e)the legal, institutional and policy framework ,and(f)the environmental condition of the downstream.

2- OBJECTIVES

The aim of this study is to assess Environment Impacts and their mitigation measures. Major positive and negative impacts of this project during construction and operation phases as well as possible mitigation measures are briefly included in this study. Therefore, the main objective of this paper is to present a simple and unified framework along with examples and applications so that it can be accessible to a broader audience in the field.

3-STUDY AREA

KEN Sub Basin. The river Kopra originates near village Gopalpura of Tehsil Deori District Sagar. which is found in the Easter part of Madhya Pradesh. The area has good potential water and land suitable for irrigation development. Dam is proposed with FRL 403.00 m, having design gross capacity 48.43 MCM, live capacity 41.29 MCM and dead storage 7.19 MCM. Though the Tank situated in down stream of ongoing Khatola Complex Tank, the replenishment of water in non-monsoon season is not considered. After construction of this dam, whereas the average elevation of the command area is 9990 Ha and it will be provided with the Rabi irrigation facility in drought prone land of Rehli tehsil of Sagar district will be irrigated through pressurized pipe irrigation system. The entire watershed lies in SWD5. The command area also lies within this. The small scale irrigation project is anticipated by diverting water from Kopra Stream which is a tributary of Sonar River that eventually drains to the Yamuna River. The catchment area of the Kopra Medium Irrigation watershed at the diversion site is 2.72 km^2. The maximum length of the river up to the diversion site is about 0.6 km. The elevation of the river center at the diversion site is 390 meter.

Name of villages coming under submergence with respective area - 13 nos

(i) Bandarchua - 66.72 Ha.

(ii) Chhirari – 93.70 Ha.

(iii) Hinoti – 26.28 Ha.

(iv) Motipar – 130.59 Ha.

(v) Madkheda – 89.12 Ha.

(vi) Khaikheda – 131.49 Ha.

(vii) Samnapur Barkheri – 87.86 Ha.

(viii) Hardua Baleh – 38.87 Ha.

(ix) Ghughri Khurd – 23.76

(x) Bhohari – 27.73 Ha.

(xi) Hardua Rehli – 49.96 Ha.

(xii) Salaiya – 7.73 Ha.

(xiii) Simariya Harrakheda – 1.32 Ha.

Rainfall is the sole source of natural recharge to ground water regime and rainfall pattern has an important impact on groundwater level in the phreatic aquifer. Rainfall in the state occurs during south-west monsoon season (mid June to September) and sometimes during winter (November to February). Most of the rainfall (more than 90%) occurs during the south-west monsoon season

4-BACKGROUND

Since, there is no major project are being constructed on Sonar River or its tributaries until date. The construction of this project would help in maximum utilization of water in concerned areas facing a high scarcity of water for irrigation, resulting in to the development of the area. This project will also provide water for drinking purpose to the rural area situated in nearby area and would promote in development of more industries in the nearby area.

Further, the command area identified under KOPRA MEDIUM PROJECT lies in the deep black cotton soils and is water scarce region of Ken Sub basin. This project will definitely bring economic prosperity to this area due to increased agricultural activities by fulfilling the demand of irrigation water required by farmers.

The project lies on the western periphery of Nauradehi Sanctuary Muhli range. So its importance for Nauradehi Sanctuary is wild life is rather more than the irrigation benefits of the project. The long spreaded Nauradehi Sanctuary area is facing severe scarcity of water for its wild life especially during summer. The construction of this project will provide assured water availability to Nauradehi wild life and a water wall between Sanctuary and peripheral civil habitation. The Ken basin specially known suitability for crocodiles, the Kopa reservoir may be used as a good breeding center and crocodil Sanctuary along with all other aquatic life.

Though not planned, many other incidental benefits like recharge of ground water in command area, development of agro based industries/food processing units, employment generation in construction phase and afterwards, development of tourist spots, etc. Will be benefitted from the project. This will result in upliftment of socio - economic condition of people living in water scarce areas of Rehli Tehsil of Sagar district of Madhya Pradesh State. This will provide annual irrigation to about 9990 Ha.

(i) BRIEF DESCRIPTION OF RIVER SUB BASIN

The Kopra River is a tributary of the Sonar River, which is a tributary of Ken River of Yamuna basin. This river originates from Gopalpura village in Deori Tehsil of Sagar district of Madhya Pradesh. After flowing about 142 km in Sagar and Damoh District of Madhya Pradesh, the river Kopra finally joins Sonar River near Madhkola Village of Damoh District.

(ii) PRESENT & PROPOSED PROJECTS

There is no existing storage reservoir on river Kopra in its 142 kms length from its origin near village Gopalpura of Deori Block District Sagar to its confluence with Sonar River near Village Madhkola in District Damoh. One ongoing minor tank Khatola Complex is under construction on river Kopra in the up stream region of proposed KOPRA MEDIUM PROJECT. The construction of KOPRA MEDIUM PROJECT will help in optimum utilisation of water in concerned areas facing a high scarcity of water for irrigation, thus helping in the development of the area. This project will also provide water for drinking purpose to the nearby rural areas.

(iii) SUMMARY OF THE PROJECT PROPOSAL

Administrative Boundaries Based on Location Details :

The KOPRA MEDIUM PROJECT is located near village Bagaspura of Rehli Tehsil of Sagar district in Madhya Pradesh on river Kopra having Latitude as 23˚36'22" N and Longitude as 79˚10'13" E. can be located on toposheet No. 55 M/2, the site is situated about 60 km away from Sagar districts headquarter. Dam site is approachable from Sagar upto village Chhirari 58 Km from Sagar on Sagar-Rehli-Jabalpur road, then upto village Bagaspura and Project site right side 2.00 Km through Chhirari Baleh Road.

Project Components : The project comprises of four main components namely Head works (Dam with side spillway & appurtenant works) Pump House, Distribution chamber and Pressurized Canal works.

Physical Features : The physical features include:

Dam: The KOPRA MEDIUM PROJECT envisages construction of an earthen dam with Side Spill Way, pump house on Submergence with rising main. The project constitutes the following:

(I) Construction of 1620.00 M long Dam with a maximum height of 23.81 M.

(II) The 82.50 M long Side Spillway & 30 m NOF including key wall (on both side) with 6 Nos radial gates (including 1 standby) of size 11.00 M x 6.00 M with a maximum discharging capacity of 1597.69 Cumecs. And there is no need to provide foundation gallery.

(III) The 1620.00 M long earthen bund inclusive of 112.50 mts of OF and NOF concrete Dam on right flank between RD 1380 M to 1520M.

(IV) Storage formed by the construction of Dam will have a Gross Storage 48.43 MCM live storage of 41.24 MCM, it will irrigate 9990 ha in rabi season with 5 MCM reserved for rural drinking water supply and 1 MCM for wild life consumptive use. 7.19 MCM will be kept as passive (dead) storage reserve for wild life and aquatic life in the sanctuary area and ace it all weather tourist point.

(V) Rehabilitation and Resettlement is required for one village being submerged namely Badrchua. FTL of project is marked at RL 403.00 M. On the other hand, total private land under submergence and other components is 734.00 Ha., Govt. land 0.00 Ha. In addition, forestland is 290.24 Ha.

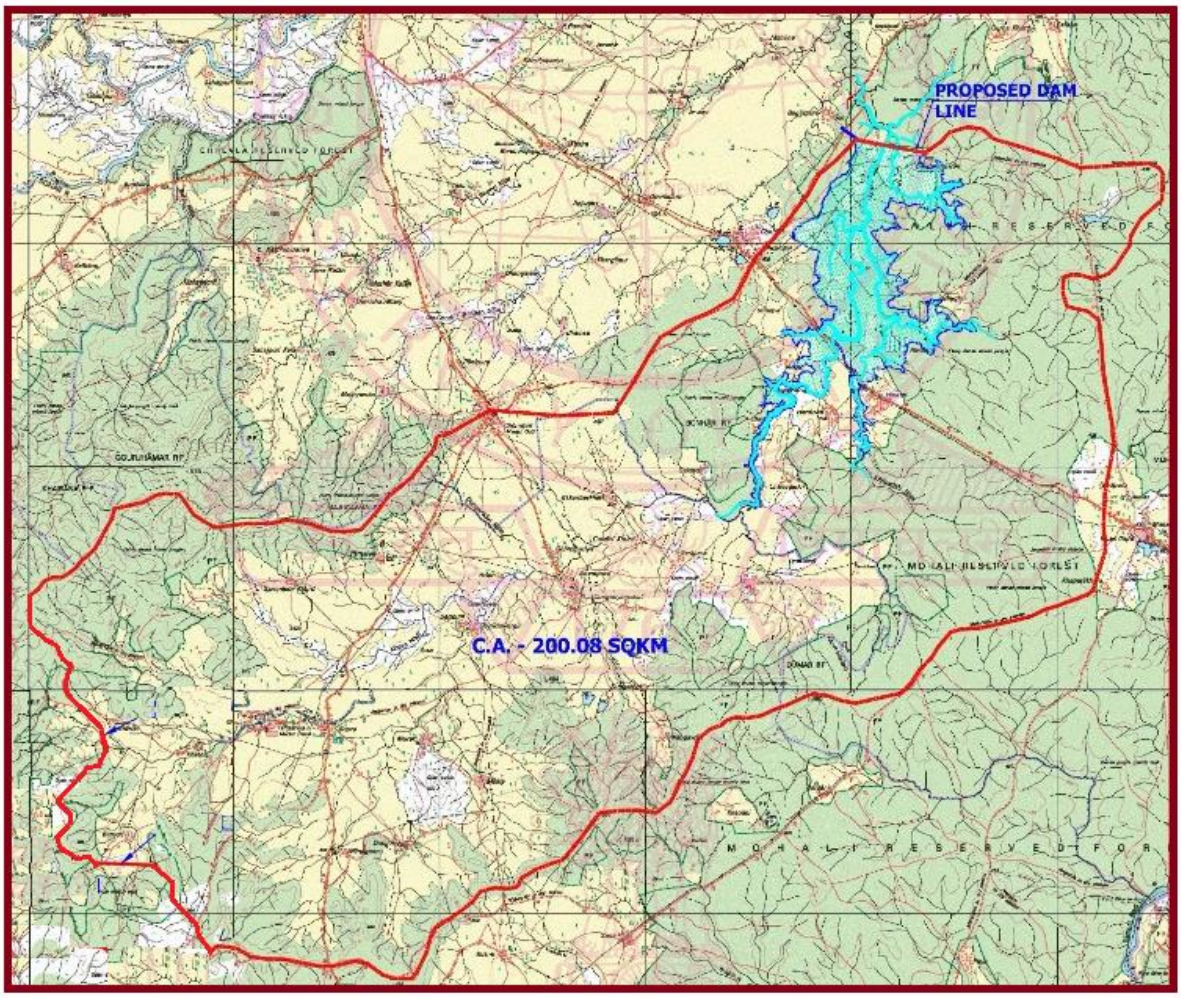
Canals :

It consists of a pressurized pipe system of approx 20 km. with micro network system to irrigate 9990 ha., In Rabi Season, Pipe canal system to irrigate 9990 Ha area of Sagar district, total 60 km network of rising main and gravity main with micro distribution network will be required for command area 1 and 2 to irrigate area of 6833 and 3157 ha. respectively.

SURVEY AND INVESTIGATION –

1.1. Topographic survey - The topographic survey for Basin, Submergence has been done. Sample survey for 5% of the command to worked out the extend of micro distribution network etc.; along with geological investigation and fixation boundary stone on FTL, FTL-2, FTL-4 lines etc will be done side by side.

Catchment Area of Kopra Medium Irrigation Project



9- METHODOLOGY OF THE STUDY

The methodology used in this assessment study was aimed at plainly defining and describing the environmental impact situation of the area and out lining the major environmental impacts and developing recommendations for implementation.

Primary and secondary data were collected from the NWRD development agents, farmers and agricultural and development office using checklists through group discussion and key informant interview positive environmental impacts, negative environmental impacts and their mitigation measures.

10- RESULTS AND DISCUSSIONS

(I) Potential positive impacts of Kopra Medium Irrigation project

Regardless of some adverse impacts, the project will have various positive impacts and benefits to the social, ecological and physical environment. The positive impacts that are assessed to be expected after the implementation of the Kopra Medium Irrigation Project Increase in agricultural yields and production, generating additional revenues directly from the project output.

- Crop diversification. The introduction of irrigation enables farmers to diversify their crops based on local markets demand and export.
- Employment opportunities: during the construction phase there will be improved employment opportunities for local people and new comers.
- The project will provide water for cultivation of crop, irrigated fodder development, domestic purpose, livestock etc.
- Food security further improved. In this case, the proposed small scale diversion weir irrigation will have a paramount importance in further improving the overall living conditions of the people residing in and around the project environment and will plays its own role in alleviating food shortage at the rural level.
- Improved forage varieties provided and increase animal productivity and production.
- Increase the opportunities to nursery site establishment, and forest seedling production and forest tree plantation.
- Mitigation of drought syndrome. Implementation of the project will be a means for drought syndrome.

(II) Impacts during construction phase and their Mitigation Measures

- **Biophysical Environment**

❖ Impacts on soil erosion

The main activities that will disturb the topsoil and subsoil, and exposed to erosion will be construction of canals, drains, headwork structures (diversion weir) and quarrying to obtain construction materials.

Main Canal and other canals construction aggravate soil erosion due to its effects in diverting and concentrating runoff water, and creating larger water harvesting areas. Soil erosion can be more serious along the main canal alignment where considerable cut and fill works are involved.

Specifically, construction of canals for this irrigation scheme will enhance soil erosion mainly due to:

- Cutting into the soils and rocks as well as clearing of the protective ground cover to construct the canal.
- Construction of cut off drains above the main canal to prevent from eroding the canal itself. Runoff flow collected from slopes and concentrating at the canals can cause remarkable soil erosion especially on hilly and undulated command areas especially if the rains commence before the accomplishment of the construction phase.
- Inappropriately disposed materials i.e. cutting of top soils is easily washed away by running water.

11- Soil Bund: Classification, Design & Construction | Soil Management

A soil bund is a structural measure with an embankment of soil or stones**,** or soil and stones, constructed along the contour and stabilized with vegetative measures, such as grass and fodder trees. The height of the bunds depends on the availability of stones.

The different types of bund used in practice are given as under:

1- Side Bunds – These bunds are formed at the extreme ends of the contour bund, running along the land slope.
2- Lateral Bunds – Lateral bunds are constructed between two side bunds along the slope for preventing the concentration of water at one side, and also to break the length of contour bund into convenient bits.
3- Supplemental Bunds – The bunds constructed between two contour bunds to limit the horizontal spacing by its maximum extent, are nomenclature as supplemental bunds.
4- Marginal Bund – These bunds are formed at the margin of the field, road, river etc., to demarcate their boundary.

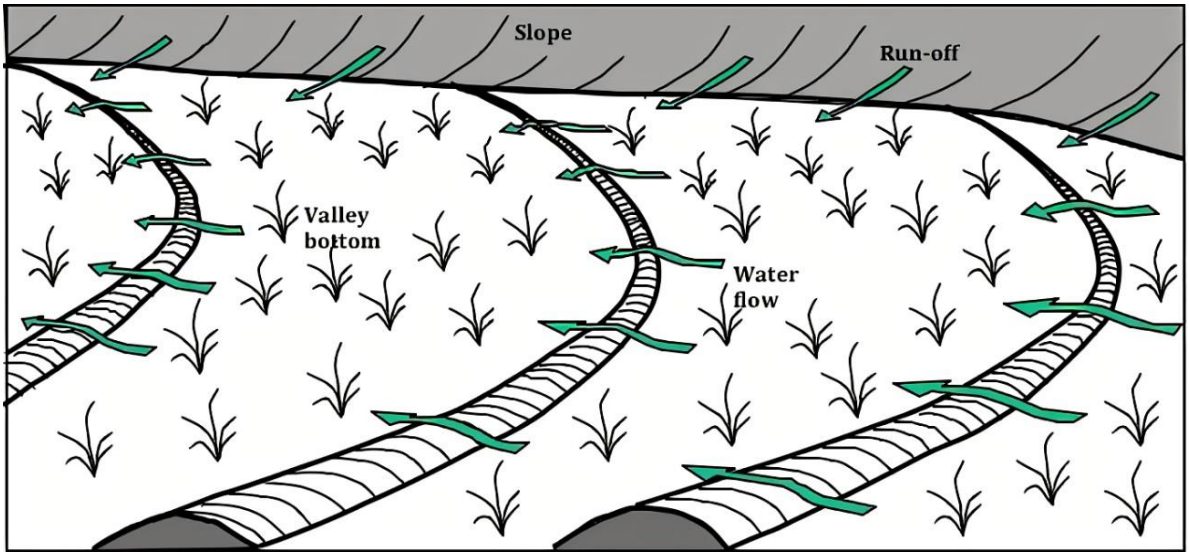


Figure **bund used for Soil erosion**

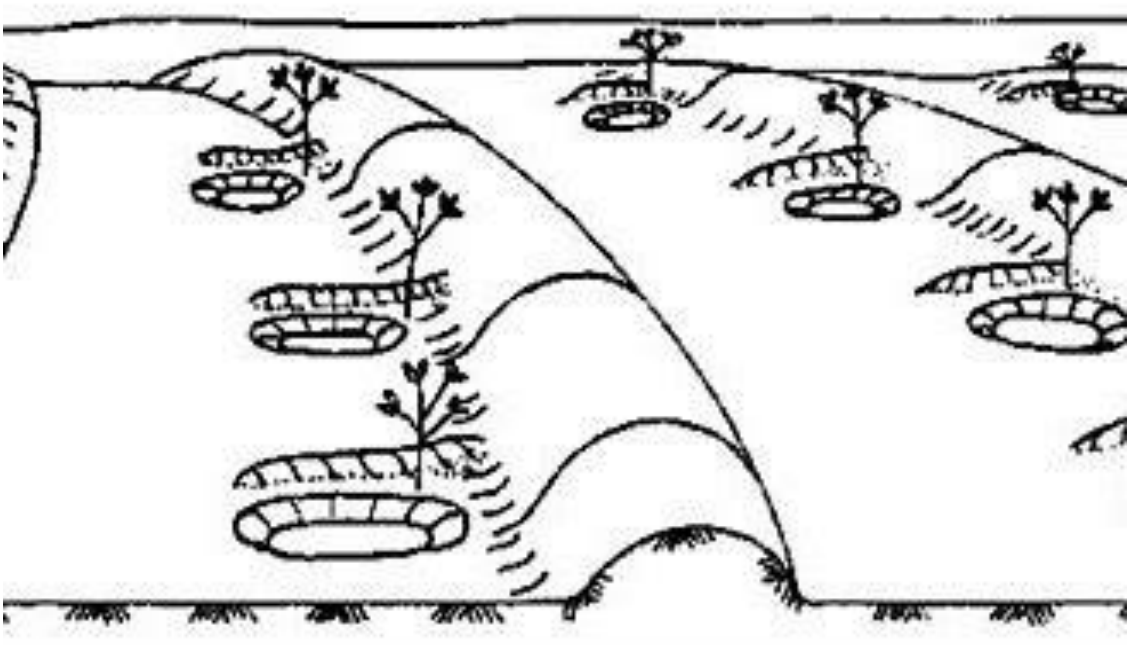


Figure- Soil Bunds

The design and construction of this irrigation project should integrate prevention and mitigation measures to reduce soil erosion and adverse impacts on soils. These are:

- Minimize the area of ground clearance i.e. land clearing for headwork and canal construction should be restricted to what is absolutely necessary for the headwork and canal construction. Clearance and cutting into the soil outside the cleared width and the selected material sites should be avoided as far as possible;
- Replanting right species of trees, shrubs and grasses in a right time on disturbed areas by headwork and canal construction, gullies, and erosion prone areas;
- Excavated top soils or loss soils cut-off from the canal and selected material sites should be collected and preserved for reuse particularly clay soils forlining of canals and others for filling of gullies, borrow and quarry sites;
- Control the volume, location and speed of water flows in the vicinity of exposed soils and slopes by providing with cut off drains to catch water before it reaches critical areas (gullies, and erosion), and diverting drains that can

avoid excessive concentration flow and energy dissipation structures designed to slow fast running storm water in drains and by doing this reduce its downstream erosive potential;

- Make allowance for seasonal climatic variations particularly rainfall and adjust the construction program accordingly. Cuts on erodible surface should be properly executed during dry season i.e. before thesummer rains commence.

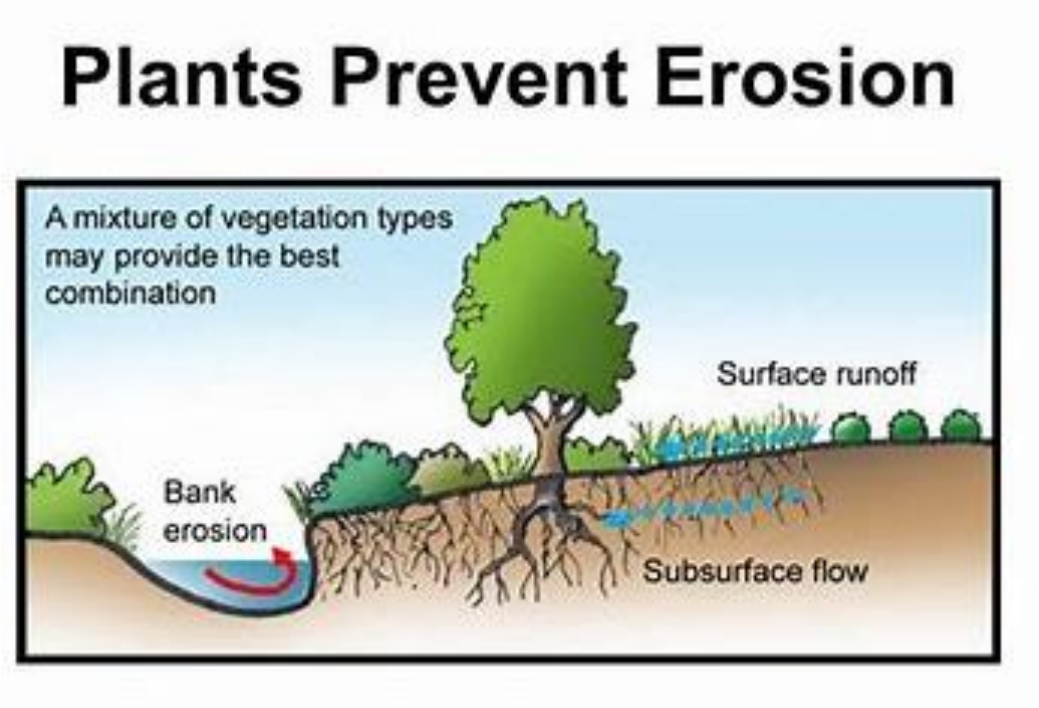


Figure 2 Soil Erosion Prevention

- ***Impacts on Water Resources***

The head work construction will modify the natural flow of the Kopra River. Depending on local conditions especially in mountains and hilly areas, these changes can contribute to stream bank erosion, flooding, channel modification and siltation of streams and rivers.

Apart from the modification of the natural flow, the existing and possible water pollution sources during the construction period are: (a) the excavation of the earth, (b) the handling of construction materials, especially the concrete and(c) Organic or toxic pollution, as a result of oil and oil products leakage.

Abstraction of water from rivers for irrigation project construction may affect the daily demand for animal and ecological services.

In summary, the possible preventive and mitigation measures to minimize water pollution and conflicting demands include:

- Carry out soil conservation measures;
- Run off from the vicinity of crushing plant, quarry and construction lay down area should be collected and treated as required;
- Avoid the risk of pollution to surface and groundwater.

❖ **Impacts on Flora and Fauna**

The proposed main canal alignment passes all through cultivated land, grazing land, shrub land and barren lands. The main canal alignment does not intersect with natural or plantation forest. Therefore, no large natural trees that will be affected by the main canal or the head work structures.

In general, the main canal alignment does not intersect a habitat that can provide protection for wild animals. During construction phase, apart from deforestation the operation of various construction equipments and vehicular movements are likely to generate noise. These activities will lead to some disturbance of wild life population. Since natural forest area ofthe watershed that rich in wild animals is located near to the headwork area and will be disturbed by noise and dusts generate from headwork construction activities. But in this case, so long as it is a small scale irrigation project, construction equipments that will generate maximum sound will not be utilized.

The design and construction of this irrigation project should integrate prevention and mitigation measures to reduce or avoid the impacts of flora and fauna. These are:

- ❖ Locate the project (the head work and canal construction) from environmentally sensitive areas such as priority(protected) forest and grazing lands(wetlands);
- ❖ Avoid the extraction of stone, sand, gravel etc from forest areas and river bottom;
- ❖ Minimize the area of ground clearance i.e. land clearing for headwork and canal construction should be restricted to what is absolutely necessary for the headwork and canal construction;

- Avoid the use of dynamite/explosive particularly at the headwork area since the natural forest at the watershed, the home of wild life, located above the headwork may be disturbed by the noise.

❖ **Impacts on Aquatic Environment**

Impacts to the aquatic environment from the construction phase will result from headwork structures (diversion weir) installation and diversion structures in bypassing river flow. Locally, this will result in some loss of aquatic habitat and organisms at the headwork structures (diversion weir).As no migratory fish species are present in the rivers project area, due to their location, no significant impacts to fishery aquatic resources are anticipated.

The dredging and deposition of dredged material is likely to affect the survival and propagation of micro benthic organisms. The macro-benthic life which remains attached to the stones, boulders etc. gets dislodged and is carried away downstream by turbulent flow. The areas where construction materials would be excavated, the benthic fauna will get destroyed. In due course, the area would however, get re- colonized, with benthic fauna. The density and diversity of benthic fauna, is however, much less than with the pre- dredging levels.

Mitigation measure to reduce impacts on aquatic environment:

- Minimize the dredging of materials (basaltic river blocks, boulders and cobbles) i.e. the amount of dredging materials should be restricted to what is absolutely necessary for head work structure.

❖ **Impacts on Air Quality and Noise**

The major effects on air quality and noise during the construction phase of this irrigation project will be impacts due to vehicular movement, an emission from various crushers, noise and vibration, and impacts due to operation of construction equipment.

During construction phases of this irrigation project, there will be vehicular movement for transportation of various construction materials to the project site. Large quantities of dust and traffic problem are likely to happen due to movements of vehicles. Noise from construction equipment and vehicular movement will affect nearby residents

and schools because the irrigation project site is nearby from settlement area. The operation of the crusher during the construction phase is likely to generate fugitive emission. In addition to these, during construction operations both mobile and stationary equipment such as grader, concrete mixers and air compressors can generate noise in excess of the above noted guideline.

Mitigation measure to minimize impacts on air quality and noise:

- Reduce noise at the source to minimize its effects on wildlife and people living along or around the project;
- Materials will be stored in appropriate places andcovered or sprayed to minimize dust
- Since it is a small scale irrigation project using hand hammer;
- Construction activities will be scheduled carefully to minimize noise impact from construction machinery. Night time & use of noisy machines will be prohibited.

- ***Impacts on Quarry and Borrow Pits***

Extraction of materials from quarries/borrow pits involve site clearance and movement of large construction materials from local sources to the construction sites, and will result in significant quantities of wastes or eroded materials, and possible changes in topography or ground surface relief features. In this project, the source of dimension stone and coarse aggregate is from the river bank. Additionally site soil compaction is selected. The site is a private farm land of four household. Thus, the impact would be to forgone the crop product obtained from the land, potential soil erosion and where the excavated pits are deep they present a risk to animals. Impacts of Quarry:

- The extent of each pit quarry should be clearly marked on the ground;
- Filling excavated top soils or loss soils cut-off from the canal and leveling of the exploited blocks before abounding the used quarry;
- To minimize the erosion effect, plantation of trees and grasses that provide anchoring effects againstwater runoff.

- In order to minimize the effect of flood and erosion the surface rainwater has to be diverted through appropriate ditches or channels above the quarry. It is recommended that, above the quarry, the ditches of about 0.7m wide and 0.6m deep has to be constructed and lined with clay in the points where erosion pressure is strong;

- **Impacts on Socio-Economic Environment**

Loss of Usable Lands

The main canal alignment from the headwork up to the end is cultivated lands used to grow different annual crops. Some cultivated, and shrub land will be taken up by the proposed irrigation project main canal alignment. Those shrub lands are usually communal properties as well as the owners are direct beneficiaries of the project and so long as the project is primarily for serving the local community, there will be no direct compensation for loss of cultivated land and shrub land. The farmers were also interested to forgone their pieces of land touched by the canals without any compensation.

- **Impacts on sites of cultural and religious values**

The construction of the proposed irrigation project will not cause adverse impact on cultural, religious and other environmentally sensitive areas.

- **Impacts on public health and sanitation**

Even if the size of the project is small; experiences from other construction sites indicate that a large work force dominated by single men will attract women to the area for several purposes. This can lead to the aggravation of the prevalence of sexually transmitted diseases (STDs).In this case, if the contractor employees migrant daily laborers, the spread ofsexually transmitted diseases will be high in the project area.

Some of the mitigation measures for impacts associated with health and sanitation following the construction of the project include:

- Employ the local people for labor work purpose
- Provision of health education including sex education

B. Environmental Impacts Forecast For Operation Phase andtheir Mitigation Measures

❖ **Impacts on Biophysical Environment**

▪ *Impacts on Soil resources*

This project may cause soil degradation particularly if the irrigation operations are non-conservation base. Acidification, organic depletion, compaction, nutrient depletion, chemical contamination, and erosion are all forms of soil degradation that can be brought about by inappropriate land use practices. As soil degradation develops, land productivity starts decline and in extreme cases it can stop nearly all plant growth.

As it was mentioned in the baseline condition of the project area (land degradation part), soil losses and land degradation were not a problem in the catchment since the population pressure is less as a result the catchment is still densely covered by forest. During the operation of this project, soil loss and land degradation problems will be aggravated at the command area. As it was indicated in the baseline condition, top (plough layer) of the soil has showed the indication of acidic soils. This problem would likely to be aggravated during irrigation operation.

Mitigation measures effective in reducing adverse impacts on soil resources are:

- Replanting right species of trees, shrubs and grasses in a right time on disturbed areas such as canals and cut off drains. It is proposed to develop plantation on both sides of the main canal. Thus, nursery should be developed one year ahead of the actual schedule of the plantation. Grass species and trees/shrubs up to a height 3m should be planted where canal passes through cultivated land.
- Biological and physical conservation measures. For the time being, naturally well treated. However, this should be kept sustainably. This will be achieved through local community participation and environmental protection committee.
- To reduce soil acidity, reduce the addition of artificial chemicals and adding alkaline substances like lime.
- Planting leguminous plants to improve soil structures and nutrient.
- To reduce stream bank erosion, leaving at least 20m buffer zones of undisturbed

vegetation between the site of the project (command area) and water body (River bank of Kopra).

- **Impacts on water resources**

During the operation of the project, the command area may have non-point sources of pollutants including nutrients (particularly nitrogen and phosphorous), sediment and pesticides on water sources. These crop farm pollutants may inter to the surface water through direct surface run off or through seepage to ground water. Moreover, sediments produced by farming induced erosion can often transport excess agricultural chemicals resulting in contaminated run off, which in turn affects aquatic habitat. The main source of excess nutrients in surface water from non-point sources of this project expected to be chemical fertilizers. Pesticides used for pest control in agricultural operations can also contaminate surface as well as ground water resources

12- CONCLUSION

This study was carried out to assess Environmental Impact Assessment and their mitigation measures. The proposed project of Kopra Medium Irrigation Project weir irrigation is predicted to bring both beneficial and adverse impacts on physical, biological and socio-cultural environment. Although the implementation of Kopra Medium Irrigation Project weir irrigation project has many benefits, obviously it will also bring a number of adverse impacts to the physical, biological and socio-cultural environment.

EIA certainly has a crucial role to play in addressing environmental issues surrounding project development and especially irrigation projects. The integration of environment into development planning is the most important tool in achieving sustainable development. Environmental protection and economic development must thus be dealt with in an integrated manner. EIA process is necessary in providing an anticipatory and preventive mechanism for environmental management and protection in any development. Several developing countries are still at the infancy stage of operationalization of their EIA processes. The need for capacity building for quality EIA is also eminent in these countries. Despite these small setbacks, environmental impact assessment has become an integral part of project planning one, which is continually being improved for posterity

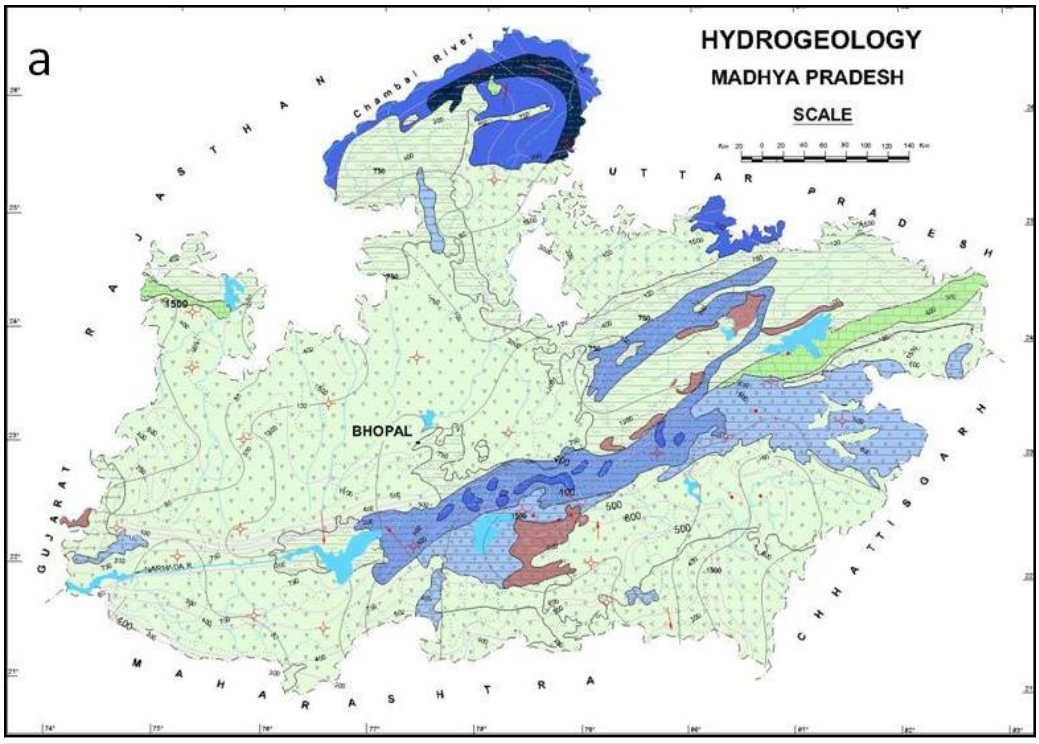
Generally, the potential positive and negative impacts as well as the environmental mitigation measures of the irrigation project depend on: (a) nature and types of the proposed irrigation project,(b) environmental baseline condition of the project area i.e. the physical, biological and socio-cultural environment,(c)environmental health condition of the project area,(d) the technological option adopted,(e) the legal, institutional and policy framework ,and (f) the environmental condition of the downstream.

After assessing the environmental impact, the project is found to be environmentally non degradable, technically appropriate,economically viable and socially acceptable.

Ground Water Use pattern

Groundwater is the water present beneath Earth's surface in soil pore spaces and in the fractures of rockformations. It is stored in and moves slowly through geologic formations of soil, sand and rocks calledaquifers. The major land use type around the NW-1 is agriculture. The NW-1 area has a vast reservoirof groundwater, replenished every year at a very high rate. The conjunctive use of groundwater for irrigation, even within the canal command areas, not only ensures steady supply to the cultivated fields on time but also helps reduce water logging and Stalinization due to consequent downward movement of subsurface moisture.

Rainfall is the sole source of natural recharge to ground water regime and rainfall pattern has an important impact on groundwater level in the prelatic aquifer. Rainfall in the state occurs during south-west monsoon season (mid June to September) and sometimes during winter (November to February). Most of the rainfall (more than 90%) occurs during the south-west monsoon season



b

LEGEND

AGE	FORMATION	LITHOLOGY	AQUIFER CHARACTERISTICS
	UNCONSOLIDATED		**POROUS MEDIA**
Quaternary		Recent and Aeolian Alluvium, Clay, Silt, Sand, Pebble, Gravel, Calcareous	Thick and regionally extensive unconfined, semi-confined to confined aquifers
	SEMI-CONSOLIDATED		
Cenozoic Mesozoic & Upper Plaeozoic		Sandstone, Shale, Limestone including Conglomerate, Siltstone, Claystone	Thick and regionally extensive unconfinned, semi-confined to confined aquifers
	CONSOLIDATED		**FISSURED MEDIA**
Cenozoic to Mesozoic	i) Effusives	Basalt with or without intertrappean Sediments	Discontinuous unconfined, semi-confined aquifers restricted to weathered mantle
Cenozoic to Proterozoic	ii) Sedimentaries and Meta-sedimentaries	Shale, Quartzite, Slate, Sandstone, Phyllite, Schists	Discontinuous, unconfined to semi-confined aquifers down to a depth of 100 mbgl restricted to weathered mantle and fractures.
	iii) Meta-Sedimentaries	Limestone, Dolomite	Discontinuous, unconfined to semi-confined aquifers down to a depth of 100 mbgl restricted to weathered mantle, caverns and fractures.
Proterozoic Azoic	IV) Meta-Sedimentaries	Schist, Phyllite, Slate, Gneiss, Marble	Discontinuous, unconfined to semi-confined aquifers down to a depth of 200mbgl, restricted to weathered mantle and fractures
Azoic	v) Basal Crystallines	Granite-Gneiss Complex and asociated basic and ultrabasic intrusives	Discontinuous-unconfined to semi-confined aquifers down to a depth of 150 mbgl

STRUCTURE
- Axis of Syncline
- F — F Basement Fault

MAN MADE FEATURES
- Tubewell/Borewell

SURFACE HYDROLOGY
- Stream, River
- Surface water divide
- Reservoir

GROUND WATER HYDROLOGY
- Water table contour in metres above mean sea level
- Electrical conductivity (in µs / Cm at 25°C)
- Spring
- Directoin of ground water flow

Groundwater Potential
(Yield in litres / sec.)

1 - 5, 5 - 10	Aquifers with secondary intergranular porosity and fractures
< 10, 10-25, 25-40, >40	Aquifers with primary intergranular porosity
< 1	Regions generally with limited ground water, compact formations with less intergranular porosity and fractures

Figure Hydro geological Map of Madhya Pradesh

13- Flow Discharges

The South Asian monsoon system largely defines the climate and hydrology of the Sonar River. The monsoon brings heavy rains three months a year therefore, the Sonar River is characterized by high flows during the monsoon season, approximately from July until October, and low flows during the rest of the year. April and May are in general, the lowest flow months with negligible rainfall and a low base flow intothe system. Due to the climate variability the timing of the onset of the monsoon period is uncertain. Climate change predictions suggest that for the Rivers Sonar the monsoon discharges will increase in the future (ref).

14- Culvert

A small bridge may be of 3 to 4 spans with the length of span not more than 3 m is known as culvert. In case of highway where culverts are constructed to cross the small distributaries etc., the span length may be about 4.5 m. Similarly, in case of railway track the maximum span length can be about 6 m and should not exceed this limit. Culvert and bridge design involve safely passing floods and debris while minimizing instability and maintenance requirements. Culverts and bridges also have the potential **to** reduce wildlife-vehicle conflicts (WVC) by facilitating safe passage of wildlife beneath roadways**.** design culvert structure of canal or water supply passing through wild life area for reducing the accidental death of wildlife new babies.

Figure- Design culvert structure of canal or water supply passing through wild life area

15- DESIGN FLOOD STUDIES:-

The total area drained by Kopra river up to KOPRA MEDIUM PROJECT is 231.80 sq.km. The catchment area in the upper reaches is hilly and forestland with barren high lands and in the lower reaches area rich cultural land is available as per topographical map.

Design Flood Studies for Reservoir Estimation of design floods is an essential pre-requisite for rational and safe design of major hydraulic structures. According to IS-11223 (1985) selection of design flood is governed by the gross storage and hydraulic height of dam. Considering the proposed storage and height particulars of these structures, the following design floods are selected for design of the spillway and checking safety of dam against overtopping:

KOPRA MEDIUM PROJECT: 1597.69 Cumecs Standard Project Flood (SPF)

Database and Methodology

In the absence of data on observed flood hydrographs for rivers, synthetic unit hydrographs are derived making use of the relationships between unit hydrographs parameters and the physical parameters as given in CWC Flood Estimation Report for Betwa Sub- zone 1 (C). The estimates of probable maximum and standard project storms were obtained from CWC Dam Safety Assurance and Rehabilitation Project: Generalized Preparation of New PMP Atlas Ganga River Basin Volume I: Main Report (May 2013).

Physiographic Parameters For the design flood review studies, the Physiographic Parameters of the project catchment have been estimated by processing SRTM_52_08 digital elevation model data using Arc GIS.

Physiographic and UH Parameters for Banda Dam Project

Detail	Sub Basin Name
	KEN (Sonar- Kopra)
Physiographic parameters	
Catchment Area (Km^2)	231.80 Km^2

Longest Flow Path L (km)	36.95 km
Censorial Flow Path, Lc (Km)	---- Km
Equivalent Stream Slope, S (m/Km)	1.70 m/Km
UH Parameters	
Tp (hour)	6.5 hour
Q_p (cumec/sq. km)	0.29 cumec/sq. km
W50(hour)	7.20 hour
W75(hour)	1.36 hour
WR50(hour)	2.43 hour
WR75(hour)	1.36 hour
TB (hour)	27 hour
Tm (hour)	07 hour
Qp (cumec)	67.83 cumec

Estimated of PMS (Probable maximum storm)

The value of probable maximum storm rainfall depths were derived from data contained in the Generalized PMP ATLAS in respect of Betwa Basin. These are given in below:

Generalised PMP Values for Project Catchments

Dam Site	Catchment Area, km2	1 Day PMP Rainfall mm
KOPRA MEDIUM PROJECT	231.89	452.06

Design Flood Studies and Results

Total study is based on the Data obtained from New PMP ATLAS G BETWA River Basin Volume I: Main Report (May 2023). The project was designed for design flood at ther Dam Sites as 1597.69 cumec for KOPRA MEDIUM PROJECT Reservoir.

15-FLOOD CONTROL AND DAMAGE:-

a. The structure being Dam, no flood cushion has been provided in the proposed project with storage mainly allowed up to banks only and the waterway area has been kept wide enough to pass a SPF of 1597.69 cumec. Since topography of area is having mild slopes, drainage problem is not expected.

16- RESERVOIR & POWER :-

1.1.1. The gross storage capacity and principal levels of KOPRA MEDIUM PROJECT as summarized below:

Gross capacity:	48.43 MCM.
Live capacity:	41.24 MCM.
Dead Capacity:	07.19 MCM.
Top level of Dam:	406.80 mt.
Top level of gates of Dam:	403.00 mt.
Crest level of Dam:	397.00 mt.
Riverbed level:	383.99 mt.

Total water available at KOPRA MEDIUM PROJECT for Utilization:

= Live capacity

= 41.24 MCM

POWER: Total area irrigated by pressurized pipe canal system is 9990 Ha, which requires one pump house to lift from Basin and thus requires total power of 1.92 MW.

SUBMERGENCE DETAILS:

The water spread area at FRL of 462.90 M is 453.04 ha. The breakup of affected land is as under:

S.No	Particulars	Approval in 1st Revision	
1	No. of Villages Submerged	13	
3	Total Area in Hectare	1014.00 Ha.	

(a)	Private Land	734.00 Ha.	
(b)	Government / Revenue Land	00.00 Ha	
(c)	Forest Land	280.00 Ha.	

Thus, the submergence percentage is 7.35% for cultivated land to annual irrigation area. The total submergence percentage is 10.15% to annual irrigation area. Suitable provision has been made for private culturable & uncultivable land compensation. The compensation of land and Houses are calculated as per collector guideline 2017-18. The average cost of irrigated & Unirrigated land are respectively 5.70 Lakh per Ha. And 2.85 Lakh per Ha. Provision of 15 lakh per Ha, for forestland is taken. All the details are enclosed in the detailed estimate of B-Land.

(iv) AFFECTED POPULATION :

Due to construction of KOPRA MEDIUM PROJECT, 13 villages namely (i) Bandarchua, (ii) Chhirari, (iii) Hinoti, (iv) Motipar, (v) Madkheda, (vi) Khaikheda, (vii) Samnapur Barkheri,

(viii) Hardua Baleh, (ix) Ghughri, (x) Khurd, (xi) Bhohari, (xii) Hardua Rehli, (xiii) Salaiya, Simariya Harrakheda. Families affected in all such villages are approximately 897 Nos. The one village Badarchua being fully submerged another village Hardua Baleh being partially under submergence, the affected population is to be displace and rehabited. The Suitable provision for R&R of affecting families has been made & compensation for the land being submerged has been made as per provision of Resettelment & Rehabilitation act 2013. There is no observed data of silt rate in river Kopra river Dam site is available. Hence as per present practice, a silt rate of 0.75 Acre Ft/Sq.mile/ Year is considered to get the silt load to be deposited during the life of reservoir. Assuming the life of reservoir as 100 years and taking the independent C.A. of project as 200.08 sq.km the silt load comes out to be 7.14 MCM.

PRINCIPAL LEVELS OF THE DAM:-

1.	Top Level of Dam:	406.80 mt.
2.	Top level of Gates of Dam:	403.00 mt.
3.	Crest Level of Dam:	397.00 mt.
4.	River Bed Level:	383.99 mt.
5.	Top width of Dam:	6.00 mt.
6.	Height of Dam:	23.81 mt.
7.	Gross Storage:	48.43 MCM.
8.	Live Storage:	41.24 MCM.
9.	Dead Storage:	7.19 MCM.
10.	Total length of Dam:	1620.00 mt
11.	No. of Gates:	5 Nos & 1 Standby (11mt x6.00m)

a. AREA CAPACITY TABLE :-

Area Capacity Table2							
KOPARA MEDIUM PROJECT SAGAR (MP)							
H/3(A1+A2+√(A1XA2)							
S.NO.	**RL IN M.**	**Contour Interval**	**Contour Area in Sqm.**	**Cap. In cum**	**Cummuiative Capacity (in cum)**	**Capacity (in Mcum)**	**Remark**
1.00	384.25	0.00	0.00	0.00	0.00	0.00	NBL
2.00	384.50	0.25	78.95	6.58	6.58	0.00	
3.00	385.00	0.50	633.21	155.96	162.54	0.00	
4.00	385.50	0.50	1783.82	579.97	742.51	0.00	
5.00	386.00	0.50	3030.29	1189.85	1932.36	0.00	
6.00	386.50	0.50	7285.23	2502.35	4434.70	0.00	
7.00	387.00	0.50	9351.52	4148.45	8583.16	0.01	
8.00	387.50	0.50	32994.68	9985.30	18568.46	0.02	

9.00	388.00	0.50	39866.69	18188.28	36756.73	0.04	
10.00	388.50	0.50	102011.41	34275.00	71031.74	0.07	
11.00	389.00	0.50	121030.92	55692.88	126724.62	0.13	
12.00	389.50	0.50	139823.91	65157.22	191881.84	0.19	
13.00	390.00	0.50	157928.89	74392.29	266274.13	0.27	
14.00	390.50	0.50	231271.87	96719.10	362993.23	0.36	
15.00	391.00	0.50	293945.17	130991.53	493984.76	0.49	
16.00	391.50	0.50	423052.33	178272.73	672257.49	0.67	
17.00	392.00	0.50	558550.45	244617.62	916875.11	0.92	
18.00	392.50	0.50	713992.84	317341.71	1234216.82	1.23	
19.00	393.00	0.50	906201.16	404095.04	1638311.86	1.64	
20.00	393.50	0.50	1067395.80	492849.75	2131161.61	2.13	
21.00	394.00	0.50	1465397.45	630576.12	2761737.73	2.76	
22.00	394.50	0.50	1644697.29	777092.63	3538830.36	3.54	
23.00	395.00	0.50	1857710.26	875061.59	4413891.95	4.41	
24.00	395.50	0.50	2139678.61	998517.45	5412409.40	5.41	
25.00	396.00	0.50	2419466.73	1139070.23	6551479.63	6.55	
26.00	396.25					7.19	LSL
27.00	396.50	0.50	2733615.58	1287471.85	7838951.49	7.84	
28.00	397.00	0.50	3107779.46	1459349.12	9298300.61	9.30	
29.00	397.50	0.50	3477649.96	1645491.10	10943791.71	10.94	
30.00	398.00	0.50	4157504.64	1906261.29	12850053.00	12.85	
31.00	398.50	0.50	4696137.34	2212043.85	15062096.85	15.06	
32.00	399.00	0.50	5211525.237	2475797.80	17537894.65	17.54	
33.00	399.50	0.50	5765249.592	2743029.10	20280923.76	20.28	
34.00	400.00	0.50	6371056.917	3032815.84	23313739.60	23.31	
35.00	400.50	0.50	7306722.553	3416774.79	26730514.39	26.73	
36.00	401.00	0.50	7805784.092	3777439.78	30507954.18	30.51	
37.00	401.50	0.50	8355211.212	4039470.31	34547424.49	34.55	
38.00	402.00	0.50	8972993.093	4331133.07	38878557.56	38.88	
39.00	402.50	0.50	9544431.443	4628621.20	43507178.76	43.51	
40.00	403.00	0.50	10141643.27	4920763.61	48427942.37	48.43	FTL

(v) IRRIGATION PLANNING:

a. The scheme will irrigate the area of the Wheat OLV–3100 Ha, Gram 6890 Ha. Total Rabi of 9990 Ha and Kharif 0 ha and so Annual Irrigation as 9990 Ha. Intensity as 100%.

11. COMMAND AREA

S No.	Type of Crop	Name of Crop	Area (Ha)	Intensity of Irrigation (% of CCA)	Method of Irrigation
2	Rabi	Wheat OLV	3100	31.05%	By Gravity Pressure/ Sprinkler
3	Rabi	Gram	6890	68.97%	By Gravity Pressure/ Sprinkler
	Grand Total		9990	100.00%	

(i) Gross Command Area 11989 Ha

(ii) Irrigable Command Area 9990 Ha

(iii) Proposed Rabi Area 9990 Ha.

(iv) Proposed Kharif Area 0 Ha

(v) Annual Irrigation 9990 Ha

(vi) CANAL SYSTEM:

It consists of a pressurized pipe system of approx 60.00 km. to irrigate 9990 ha area of Sagar district.

Climate of Command Area

(a) Average annual rainfall (weighted) - 1100 mm

(b) Seasonal distribution (i) Monsoon

(c) Temperature - 35^0 C.

(d) Humidity - 17 %

(d) Evapo-transpiration (annual)

(vii) ESTIMATE:

The estimate prepared based on U.C.S.R. of M.P. Water Resources Department in force since 01.09.2017 Total cost works out to Rs 292.37 crore, 12 % GST & 3% Establishment charges has been included in the estimates.

Unit-I:

The cost of head works of KOPRA MEDIUM PROJECT including spillway, outlet works, gates, energy dissipation devices, regulator including intake structures, Pump Houses, cost of pumps, motors & electromechanical work, land acquisition & construction of the all components, etc. have been worked out under this head and estimated as **Rs. 191.36 crore** at USR - 2017 (including 12% GST & 3% Establishment charges)

1. FLOOD CONTROL

The dam proposed on Kopra River near village Apchand (Resi). Standrad Project flood (SPF) at dam site is comes out to be 1596.69 Cumecs. Five no. of gates of 11M X 6.00 M has been provided to pass the flood, which is sufficient for safe operation.

CONSTRUCTION PROGRAMME AND MAN POWER AND PLANT PLANNIG

The stipulated time of completion of the project is 36 months. The detail construction programmer will be prepared during fixation of the agency.

2. ENVIRONMENT, ECOLOGY AND FOREST ASPECT OF THE PROJECT

The water resources department Govt. of M.P. shall obtain all required statutory clearances from the ministry of Environment and Forest and ministry of Social Justice and empowerment like environmental clearances, and for rehabilitation and resettlement plan and all other clearances have been made in the project estimates.

3. ESTIMATE:

The estimate prepared based on U.C.S.R. of M.P. Water Resources Department in force since 01.09.2017 Total cost works out to Rs 292.37 crore, 12 % GST & 3% Establishment charges has been included in the estimates.

Unit-I:

The cost of head works of KOPRA MEDIUM PROJECT including spillway, outlet works, gates, energy dissipation devices, regulator including intake structures, Pump Houses, cost of pumps, motors & electromechanical work, land acquisition & construction of the all components, etc. have been worked out under this head and estimated as **Rs. 191.36 crore** at USR - 2017 (including 12% GST & 3% Establishment charges)

Unit-II:

The cost of proposed main telescopic pipe canal network, piped distribution network, micro irrigation works inclusive of all pucca works, drainage works etc. has been worked out and is estimated as **Rs. 101.01 crore** at USR - 2017 price level. (Including 12% GST & 3% Establishment charges)

4. FINANCIAL RESOURCES

Total cost of the scheme is worked out to Rs 292.37 crore for 9990 hectare CCA irrigation area. The cost per hectare works out to Rs. 2.93 Lakh per ha.

5. REVENUES

Irrigation : The water rates for per hectare of irrigation is Rs.350.00 and irrigation Cess is Rs.25.00 per Ha for rabi irrigation, The total Rabi irrigation of the project after completion will be 9990.00 Ha.

6. BENEFIT COST RATIO

B.C. Ratio of the project is - 2.17

7. FUTURE UTILISATION OF FACILITIES CREATED.

Depending on the schedule of construction various facilities and assets ,as required in the project, will be developed in different phases .During the planning stage a judicial planning will be done as per the requirements so as to avoid wasteful expenditure and thus maximum utilization of the resources.

8. RECOMMENDATION:

The KOPRA MEDIUM PROJECT is located in Sagar tehsil of Sagar district. The Dam is proposed on Kopra river which is tributary of Sonar River of Ken sub basin. The river originates from Kishanpura village of Sagar Tehsil of Sagar District and after traversing a distance of 37 km, dam site is located. The water available at proposed site is about 52.00 Mcm out of which the upstream ongoing minor Khatola Complex Tank intercepts 9.011 Mcm. Net available 75% yield 52.00 - 9.011 = 42.989 Mcm is being fully stored in KOPRA MEDIUM PROJECT. Therefore full utilization of available water is being made through this project.

The proposed command covers villages of Rehli & Garhakota Tehsil of Rehli assembly constituency Sagar District. The cultivators of the command area, presently facing acute shortage of water for irrigation and their daily need. They have to depend on the monsoon and also the topography of the area is almost hilly and undulated so that there is no other source of irrigation facility because the average level of cultivable area is much higher than the Sonar river flow level and ground water is insufficient to irrigate the command area. This project shall provide a modern method of irrigation by means of sprinkler and drip irrigation by storing water in the Dam upto a suitable level and then lifting the water to a highest available ground level so that the irrigation through pressurized pipe can be provided to the cultivators. It will generate employment during the construction period. The project also includes provision of water for domestic use.

17-DISASTERMANAGEMENT

While occurrence of natural disaster cannot be prevented altogether, their adverse impact can be reduced substantially by undertaking various preparedness and mitigation measures. Minimizing the loss of precious human life is the first priority in disaster management. It is important therefore, to prepare for such a crisis. It has been realized that preparedness is essential for proper and timely execution of post-disaster operations.

This chapter discusses various aspects concerning preparedness to face disasters with a view to minimizing losses to men and material besides measures to mitigate the impact of

disaster. It attempts to focus the various issues specially pertaining to disasters like fire and breakdown of the dam, unprecedented floods and other hazards identifiedunder disaster assessment, besides recommending necessary measures. The study stresses the need for all efforts in this direction. In the following pages we shall look in greater detail at some of the measures and rationale underlying their adoption indisaster situations. Before taking up the risk of various disasters likely in Ken-Betwa Link Project Phase-I area and their management an attempt has been made in this chapter to describe the distinction between disaster prevention and preparedness.

Planners and decision makers have recognized a need for better understanding the social consequence of projects, programs and policies. An attempt is also made in this chapter to undertake Social Impact Assessment of the project. An attempt is also made in this Chapter to narrate the process of Public Consultation and document the outcomeof such Public Consultation. Thus, this Chapter is divided in to three sections. They areas follows:

- ❖ Risk Assessment and Disaster Management Plan;
- ❖ Social Impact Assessment of the Project and R&R Action Plan; and
- ❖ Process and Outcome of Public Consultation

1- RISK ASSESSMENT AND DISASTER MANAGEMENT PLAN

In this section an attempt is made to give details regarding disaster preparedness and prevention, identification of various types of disaster likely to occur in the project area and prepare a disaster management plan for preparedness and mitigation of after effects of a disaster.

2 Disaster Preparedness and Prevention

The UN Disaster Relief Office (UNDRO) uses the following definition of the two terms viz., disaster preparedness and prevention.

“Disaster Preparedness may be described as measures to organize and facilitate timely and effective response, relief, and rehabilitation operations in cases of disaster. Measures of

preparedness include, among others, setting up disaster relief machinery, formulation of emergency plans, training of specific groups with responsibility for response and relief, stockpiling supplies and earmarking funds for relief operations. Prevention and mitigation are used as synonyms. Mitigation means to reduce the severity of the human and material damage caused by the disaster. Prevention is to ensure the human action or natural phenomena do not result in disaster and emergence. The objective of disaster prevention is to avoid such situations as far as possible".

In general, therefore, prevention is concerned with long-term aspects, policies, and programs to prevent or eliminate the occurrence of disasters. Preparedness, on the other hand, covers the short-term aspects and is designed to include the action necessary during the approach of a possible disaster, during the existence of a disaster situationand in the ensuing period devoted to relief and rehabilitation. One is concerned with risk elimination, the other with risk mitigation. Disaster Prevention depends on the application of science and technology to prevent disasters whereas preparedness is concerned and conceived of in short-term, organizational and technical terms. From a practical standpoint the distinction is very important; for, the essential logistical and organizational measures that constitute disaster preparedness can be undertaken in a relatively short span of time. Prevention measures often involve weighty decisions and measures of public policy such as resettlement of whole communities, or legislation on zoning.

From the point of view of disaster preparedness, it is useful to classify disasters according to their predictability. The more predictable a disaster the easier it is to plan safety and precautionary measures. Some disasters are not predictable at all.Earthquakes and tornadoes fall in this category. The best that can be done in such circumstances is to arrange rescue, relief, and rehabilitation measures speedily following their occurrence. Cyclones can be predicted with a reasonable degree of accuracy about 24 to 48 hours before they hit the coast.

A major constraint in relief operations is finance. Since the Second Finance Commission, every state has been annually earmarked a specific amount for funds known as the 'Margin Money' for meeting the immediate requirements of relief. The Tenth Finance Commission recommends the constitution of a Calamity Relief Funds (CRF), with contribution of Centre and States in the proportion of 75 and 25 per cent respectively. The Commission also suggested that in addition to CILFs for states, on National Fund for Calamity Relief (NFCR) should be created to which the centre and states would subscribe and which will be managed by a national calamity relief

8.2.1 Likely Disasters in Project Area

The main hazards in the Kopra Medium Irrigation Project Phase-I area may occur due to dam break and catching of fires because of explosions, chemicals or gasses. The objective of the major emergency or disaster management plan is to make use of the combined resources of the project proponents and the outside services to achieve the following tasks:

- Effect the rescue and medical treatment of causalities;
- Safeguard other people;
- Minimize damage to property and the environment;
- Initially contain and ultimately bring the incident under control;
- Identify any causalities;
- Provide the need of relatives ;
- Provide authoritative information to the news media;
- Secure the safe rehabilitation of affected area;
- Preserve relevant records and equipment for the subsequent enquiry into thecause & circumstances of the emergency.

This likely disasters and necessary preventive measures to control disasters in the project area are discussed in the following paragraphs.

8.2.2 Dam Break Analysis and Disaster Management

Dam break analysis has been prepared based on the report provided by the National Institute of Hydrology, Rourkee. Dam failures are often caused by overtopping of the dam due to inadequate spillway capacity during large inflow to the reservoir from heavy precipitation generated runoff. Dam failures may also be caused by seepage or piping through the dam or along internal conduits, slope embankment slides, earthquake damage and liquefaction of earthen dams from earthquake and land slide generated waves in the reservoir. Usually the response time available for warning is much shorter than for precipitation –runoff floods. The protection and evacuation of the public from the consequences of dam failures has taken an increasing importance as population has concentrated in areas vulnerable to dam break disasters.

Occurrence of a series of dam failures has increasingly focused attention of scientific workers on the need for developing generally applicable models and methods to evaluate flash floods due to dam failure and for routing them through downstream areas, susceptible to heavy losses, so that potential hazards might be evaluated. Using these methods, inundated areas, flow depths and flow velocities can be estimated for different hypothetical dam failure situations. With the help of such studies, it could be possible to issue warnings to the downstream public and prepare strategies for disaster management when there is a failure of dam. The main difficulty in using such mathematical models is the failure description adopted in the model. Under these circumstances, a suitable assumption with regard to the adjustment of actual failure mode to suit the model failure mode is necessary.

Table 8.1: Summary of Dam Break Flood Characteristics

Location (mileage)	Maximum discharge(cumec)	Time of Maximum Discharge after failure of dam (hrs)	Maximum water surface elevation (m)
Dam site (11.4 km)	85415	0.00	288.96
25.98 km d/s of dam	76958	2.50	216.11
At Madla 31.49 km	76355	3.75	210.03
42.95 km d/s of dam	75693	5.55	202.91
AT Banda 157 km	75596	28.35	82.27
Source : Computed on the basis of data from NIH Study			

The computed maximum water surface elevations in all the cases closely followed the trend of river bed profile. The water surface elevations reached in Case 1 were the highest of all the three cases, as it represented the worst case of dam break flood. The water surface elevations reached in PMF wave propagation were the lowest of all at all the cross-sections in the whole reach.

A qualitative analysis for river morphology suggested that the river reach is of hard bed-rock not amenable to degradation due to short-term high river flows. Furthermore, since the river in most part of the reach is confined by stable banks, its banks are not amenable to shifting to exhibit meandering. The input data used for the three cases under study is given Annexure VIII.1.

8.2.3.1 Inundation and Flood Damage (vulnerability) Mapping

A chance of the river meandering due to dam break is not there as the river is confined by stable banks. At 25.98 km downstream side of the dam the maximum water elevation is 216.11 (m) which occurs in a time of 2.50 hrs. About 77 villages need evacuation within 30 minutes after the dam break. Detailed list of Villages situated along the Right Bank Downstream of Ken Project in Proposed Inundation Area Based on Dam Break Analysis is presented in Table 8.2.

8.2.3 Disaster Management Plan

The emergency planning for dam break scenario consists of 'hardware' aspects such as provision of evacuation pathways, setting up on alarms and warning systems, establishing communication systems besides the 'software' aspects concerning human behavior, procedures to be followed, roles and responsibilities, leadership, guidance and provision of information. Both hardware and software aspects need to be integrated into the design of emergency management. Following guidelines are provided forpreparing a contingency plan or disaster management plan in the event of dam failure. It may be noted that this plan

would serve as a reference document consisting of salient information indicating the actions to be taken at the time of disaster and hence, it has to be made as comprehensive as possible and it needs to be tested and updated periodically. The suggested format of the disaster management plan is outlined in this chapter.

8.2.4.1 Purpose of the Plan

In order to delineate the tasks and needed response, it is essential to identify and characterize the vulnerable zones through inundation maps, the nature of damage potential and the characteristics of populations and structures on the downstream areas. Based on the characteristics of each hazard zone, the needed response could be delineated in the Disaster Management Plan. Hence the objectives of the plan could be provided for:

- Timely warning and alerts
- Assess the damage potential
- Delineate emergency organization and first response / action teams
- Define roles and responsibilities
- Delineate procedures for mitigation and control of incident
- Delineate access routes and safe locations
- Delineate emergency action
- Training the personnel
- Providing public information

8.2.4 Emergency Response Organization

The Emergency Response organization must have a Chief Emergency Coordinator (CEC), who will be overall in-charge of planning, execution and coordination of all activities of Disaster Management Plan. His alternate member is also to be notified for

Chief Emergency Coordinator is to be assisted by an Emergency Planning Group (EPG) constituted for the purpose of decision making and planning the emergency effort under the plan. This group involves all the Heads of Departments of Irrigation, Revenue, Health, Police and Public representative. To assist this group with technical information and advice, and Advisory Team consisting of various experts on dam safety and related issues need to be constituted.

A local level, preferably a Tehsil/settlement level, Emergency Action Groups (EAGs) need to be constituted for pooling, mobilizing and responding to the inundation situations. These groups essentially should consists of a local volunteer, engineering support group, rescue/evacuation team, medical / health volunteer, a police representative.

The CEC needs to report and coordinate with District collector on the disaster situation and should seek any further assistance / help from district Emergency Authorities. Alternate persons for all the constituents of groups are necessarily be identified and included in the plan.

a) *Functions of Chief Emergency Coordinator*

The following functions are delineated for the Chief Emergence Coordinator. He is expected to take various emergency decisions by convening the immediate meeting of Emergency Planning Group. Together, they are responsible for the following:

- Formulation and implementation of the plan
- Guidance/decision on matters of basic policy
- Activation of the emergency control centre and convening the emergencymeeting
- Declaring the emergency zones with the help of technical personnel and experts
- Control on emergency operational preparedness of emergency machinery
- Holding periodic mock/ training exercises to ensure optimum preparedness at
- operational levels
- Development and updating hazard scenarios and cascading effects from time to
- time
- Mobilizing organizations, financial and human resources for the plan
- Liaison with external/ Govt. agencies and assessment of whether any public
- assistance is required
- Furnishing information on the incident to District, State and National level
- authorities and if needed competent bodies may be called for assistance
- Liaison with press/media, to report the emergency
- Declaring rehabilitation centers in case of evacuation, if called for

Monitoring post emergency situation in terms of health care, first aid,

b) *Functions of Emergency Action Group (EAG)*

Emergency Action Group carries out frontline activities at the time of disaster. Preferably as many local teams as possible are formulated for the purpose. The main activities of EAG are:

- Rush to the emergency zone;
- Make systematic assessment of hazard;
- Liaise with Chief Emergency Coordinator;
- Carryout evacuation, if necessary;
- Carryout emergency actions Extend relief, first aid, human assistance; and
- Organize rehabilitation centers

8.2.5.1 Emergency Response System

The overall emergency response system needs to integrate various functional sub- systems essentially designed to generate speedy response action in terms of warnings, communications, fire fighting, medical and first aid. It is essential to delineate these systems and plan their locations and operating procedures, besides training the personnel well in advance before any emergency. Following response systems are needed for the purpose of disaster management plan.

a) *Emergency Control Centre (ECC)*

Emergency Control Centre will be the focal point in case of an emergency from where the operations to handle the emergency the directed and coordinated. The centre will have to be equipped with adequate resources to receive and transmit information and directions from the Chief Emergency Coordinator. Besides equipping the centre, prior arrangements should be made so as to ensure that the centre would start activatingother systems immediately, once the hazard is declared.

An emergency control centre should therefore contain a well-designed communication system consisting of:

- At least two external telephones (one incoming and the other one out going
- fitted with simultaneous/selective broadcasting systems) with a PABX.
- Wireless/Radio equipment (VHF / walkie talkie/ pager/mobile)
- Inundation/ vulnerability maps indicating risk zones, assembly points, alternate
- evacuation routes, safe areas, rehabilitation centres, etc
- Telephone directory of emergency response system
- List of all emergency equipment and personnel for evacuation, personnel
- List of ambulances, base medical facilities, hospitals, rehabilitation centres, etc
- Reference books/chemical dossiers
- Copies of Disaster management Plan

b) *Communication System*

An efficient and reliable communication system is required for the success of disaster management plan. The proposed communication systems must essentially integrate the following into an Emergency Communication System:

- An Alert System
- A warning or control system
- An Emergency communication system

Emergency Alert System:

An emergency alert is to be provided to the public immediately after sensing the hazard, based on the first response (FR) received from any source. Chief Emergency Coordinator should activate emergency Control Centre, and the Emergency alert may be disseminated. Initially, attempts should be made to control or localize the event in the first instance by looking into all technical aspects of the hazard and if necessary activate the needed

emergency action groups to localize theevent as a first response measure. If it is not possible to control the emergency, on –siteemergency be declared and response action be initiated n accordance with the plan.

Emergency Warning and Control System:

Based on the report of Emergency Alert, the emergency is to be notified. If the Chief Emergency Coordinator determines that the dam break is inevitable and affects health emergency plan.

The medical response plan has to cater for immediate pooling of all available medical resources and provide emergency medical treatment to the victims of the incident. A coordinated utilization of all available local medical resources in the incident areas as well as the additional resources should be mobilized under the overall charge of the one-site plan.

c) *Training the Personnel*

A Disaster Management Plan, no matter how carefully prepared, cannot be effective unless accompanied by training program that include periodic exercises and drills. The objectives of training in emergency preparedness are related to the following:

- Familiarize personnel with the content of the plan and its manner of
- implementation
- Train specific response personnel and new personnel in particular duties requiring special skills.
- Introduce personnel to new equipment, techniques, and concepts of
- operation
- Keep personnel to new equipment, techniques, and concepts of operation
- Test the preparedness of response personnel
- Test the validity, effectiveness, timing, and content of the plan and Implementing procedures
- Test emergency equipment
- Update and modify the plan on the basis of the experience acquired through exercises and drills

- Maintain cooperative capability within first response team and with other response/mutual aid and agencies
- Maintain good emergency response capability

d) Training Schemes for first Response Team

Every member of first response team needs initial training followed by periodic refresher courses. Members of emergency response organization would also benefit from this training, improve communication procedures, and provide an opportunity for adversely the public in downstream areas; he triggers the Emergency control centre and activates emergency response under on-site plan. He notifies accordingly with District Collector.

Thus in the process of notification, the concerned regulatory authorities are alerted and public are to be alerted by appropriate warning systems such as sirens, alarms and broadcasts.

Each type of emergency has to be given a code for easy identification of the type of emergency as also for notifying and seeking the support from various agencies. Suggested warning systems of sirens are as follows:

Disaster Warning: High pitched continuous wailing siren

All Clear: Long continuous note

These alarms/ sirens should be deployed such that the all hazard zones are covered. Radio, Walkie-talkie and paging system are very supportive and useful for communications during emergency, for which predetermined codes need to be developed.

e) Emergency Communication System

Besides developing alert and warning systems, emergency communication systems need to be established for effective communications within the identified hazard zones.

An up-to-date telephone directory of key personnel concerned with the emergency should be prepared and made available to all concerned. In order to coordinate efficiently various communications, a communication coordinator 9skilled telephone operator or PA) may be appointed at the time of emergency for maintaining a log book for the message received

in/out and actions taken. Standby power arrangements and maintenance of communication equipment should be given utmost importance. As a backup to data processing and record keeping of communications, a personal computer may be employed.

f) Health and Medical Response System

Health personnel including doctors, surgeons; hospitals and ambulances have a viral part to play in the event of a major hazard. They form an integral part of medical and responders to become familiar with areas of hazards where they could be called to assist.

8.2.5.2 Mock Drills and Demonstration Exercises

Drills and exercise are vital to emergency preparedness. They involve enactment, under conditions of a mock scenario, of the implementation of the response actions performed during an emergency. Development and conduct of following two types of exercises are recommended for implementation according to the needs:

- Tabletop drills or exercises are useful for orientation purpose, while gathered around a table; the emergency response organization is presented with a situation to be resolved.
- Exercises are more comprehensive and test the entire response organization up to and including communication with all response functionaries.

All the above type of exercises is strongly recommended to be conducted at least once in a year, wherein member of first response team could actively involve. Deficiencies that may be discovered during an exercise of the plan and procedures should be corrected immediately.

8.2.5.3 Public Information System

During a crisis following an accident, the affected people, public and media representatives would like to know about the situation from time to time and the response of the emergency authority to the crisis. It is important to give timely information to the public in order to prevent panic and rumors. The emergency public information could be carried out in three phases.

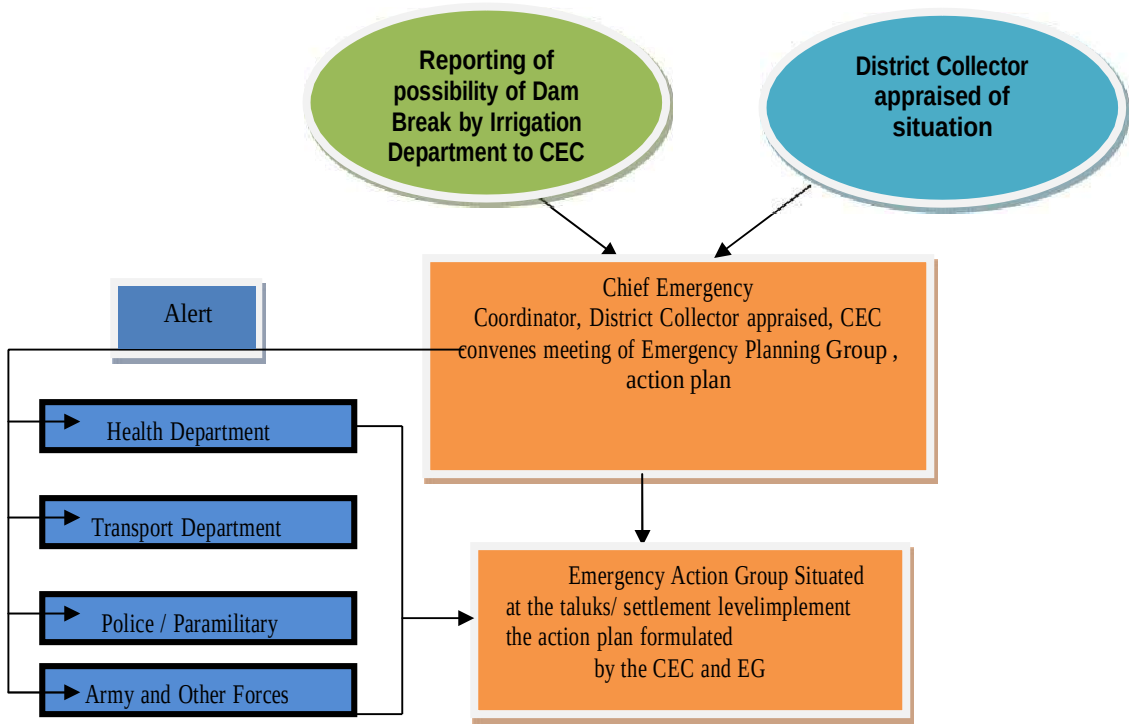
a) Before the Crisis

This will include the safety procedure to be followed during an emergency through posters, talks and mass media in local language. Leaflets containing do's/don'ts should be circulated to educate the affected population

b) During the Crisis

Dissemination of information about the nature of the incident, actions taken and instructions to the public about protective measures to be taken, evacuation, etc. are the important steps during this phase. A notification flow chart is a schematic representation of the hierarchy for notification in an emergency situation, including who is to be notified, by whom and in what priority. A suggestive notification flow chart had been prepared under the disaster management plan and the same is presented as Chart 7.1.

Notification Flowchart for DMP of Kopra Dam



c) After the crisis

Attention should be focused on information concerning restoration of essential services, movement/restrictions, etc. Various tasks of the public information system would include: Quick dissemination of emergency instructions to the personnel and public

- To receive all calls from medical public regarding emergency situations and response meticulously
- Obtain current information from the Central Control Room
- Prepare news release
- Brief visitors/ media
- Maintain contact with hospitals and get information about the casualties

8.2.5.4 Dissemination of Public Information

Any emergency preparedness plan, however efficiently it is outlined, cannot succeed if the participation of involved community is not planned. To make the local community an active participant, community awareness along with Emergency Preparedness has to be implemented, so that it can foster understanding in the people and help in controlling emergency situations.

The target audience of warning system is public and personnel who are not trained about hazards, warning signals and protective actions. People tend to seek confirmation of the hazard from neighborhood and the media, which takes time. For a publicwarning system, to be effective, it must serve only as a trigger to initiate preplanned protective action by the public. Through community awareness efforts conducted by local planning committees, the public must be made aware of protective options which include sheltering within their work places and evacuation.

The community should be made aware of the following evacuation.

- The likely hazards that can occur in their vicinity
- The type of warning system employed to alert them, in case of a disaster
- The protective action that should be adapted in different situations of emergency
- Knowledge of the escape routes and assembly points, in case of evacuation from disaster zones.

8.2.5 Other Risks and Management Plan

The power generation units under the project may have the following types risk factors;

- Turbine Generator Explosion;
- Fires in Cable Galleries;
- Transformer Hazards;
- Sub-station Hazards;
- Fuel oil handling system Hazards;
- Storage / Warehouses – hazards

The details of the hazards are explained in the following paragraphs.

Turbine Generator Explosion: H2 gas explosion is a possible hazard in Generator. However, the Generator is designed to withstand explosion. Seal oil system is also provided for the Generator to prevent the leakage of H2 gas. And also the H2 purity is continuously monitored and maintained always above 98%. All the H2 cylinders are checked for high purity.

Fires in Cable Galleries: The main hazard in cable galleries is fires. To control fires, heat sensors and smoke detectors are provided in the cable galleries to detect the fires at the inception stage itself. Also fire resistance barriers are provided at the cable intersections, intermittent places on cable trays, cable raisers and cable entry points.

Transformer Hazards: To take care of all the possible hazards an adequate protection system are available as per Engineering and in case of failure emulsifier system is provided to quench fires.

Sub-station Hazards: To take care of the problems relating to short circuits, supporting insulators, etc the following precautions are to be taken:

- Plugging of cable gland plates and breaker inspection plates againstreptile entry and earthling to the cable gland.
- Periodical inspection / testing of switchgear equipment.
- Providing proper nomenclature of switchgear equipment with regards to voltage level, feeder description and panel numbering to avoid wrong identification.

Fuel oil handling system hazards: The main hazard in fuel oil section is fires and storage tank explosion. However, to contain the chances of fires / explosions due to spillover, dyke walls are provided all around the fuel oil storage tanks. Apart from this, foam flooding system and MV water spray systems are provided on all Fuel Oil tanks. The level gauges and temperature monitors are also provided on the fuel oil tanks.

Storage / Warehouses – hazards: The main hazard in stores/warehouses is fire and explosion due to stored gas cylinders. However to prevent the chances of fires and explosions, gas cylinders and flammable materials are to be stored safely with utmost care and precautions. Fire hydrant / portable fire extinguishers systems are to be made available all around the materials storage.

8.2.6 Fire Fighting

The above analysis indicates that fire is one of the major disasters in project area. The following measures will be included to constrain the fire accident. The plant shall be protected against fire hazards and shall be equipped with minimum fire protection systems. Main source of water supply for firefighting is raw water which is drawn through pumps from reservoir. The nearest fire station is situated at Khajuraho about 40 km from the project site. The fire station shall be made well equipped to meet any contingency. Minimum requirement of firefighting equipment such as CO2, foam and DCP may be maintained at the project location.

Fixed Fire Detection and Protection systems: The systems for protection and detection shall be kept at the project site as given Table 8.4.

Table 8.4: Fixed Fire Detection and Protection System in Project Area

Sl. No	Type & Nomenclature	Approximate capacity	Premises
1	Water sprinkler system and Emulsifier	5 kgs pressure	On all transformers
2	Foam pourer	5 kgs pressure	On all fuel oil tanks
3	Medium velocity water spraysystem	5 kgs pressure	At LDO tanks
4	Smoke detectors	5 kgs pressure	At all control rooms switch gear rooms, cablegalleries, etc.

Portable Fire Extinguishers: In addition to above fire fighting equipments, portable and mobile fire extinguishers have to be installed at all locations of the plant including Main Plants, Control rooms, Switch Gear rooms, Laboratories, Off sites, Administration building etc. Details are tabulated below:

Details of Portable Fire Extinguishers		
Sl. No.	Type of Extinguishers	Capacity
1	CO_2 Type	6.8 kg
		22.5 kg
2	Foam type	9.0 Lts
		50 Lts
3	DCP type	5 kg
		75 kg
4	ABC Power Type	5 kg

Hospital Facility: Dispensary is proposed at the camp colony situated at village with fully equipped separate disaster ward and burns ward shall be madeavailable. First Aid centre also be made available inside the project premises and manned round the clock. Ambulance facility may also be provided at the projectdispensary.

8.2.7 Cost Estimates

The budget for different activities required to be carried out for mitigation and prevention of dam break hazard and other hazards are given in Table 8.4. Cost estimates for the implementation of disaster management plan, is assed to be Rs. **12 lakh.**

Budget for Different Activities for Disaster Management in Project Area

Sl. No	Particulars	Amount inRs Lakhs.
1	Installation of alert systems, setting up control room etc	**9.00**
2	Setting up of communication system	**3.00**
3	Setting up of Emergency Response organization	**3.00**
4	Public Information System	**2.00**
5	Installation of Fire Fighting Equipment	**4.50**
6	Training & Miscellaneous	**2.50**
	Total	**24.00**
Source : Estimated by AFC team		

8.2-9 Cost Estimates

The budget for required to be purchases and installation of Trap Camera carried out for mitigation and prevention/monitoring of Wildlife.

Budget for purchases and installation in Project Area

Sl. No	Particulars	Amount inRs Lakhs.
1	Purchasing & Installation of Trap Camera Each cost Rs 40000/- (100 Units)	**40.00**
	Total	**40.00**
Source : Estimated by AFC team		

8-2-10

The budget for required to be purchases Vehicle for tracking mitigation and monitoring of Wildlife.
Budget for purchases Vehicle

Sl. No	Particulars	Amount inRs Lakhs.
1	Purchasing Vehicle	**15.00**
	Total	**15.00**
Source : Estimated by Market price		

18 Cost estimation for Mitigation Measures comes under Catchment Area
Name of The Forest Division- Virangna Durgawati Tiger Reserve Sagar Dist.Sagar
Daily Wages Rate:- Rs. 425/- (Year 2024-25)
(Estimate is prepared on basis of approved estimate of Kopra Medium Irrigation)
Cost Abstract for Mitigation
Measure estimate of Kopra Medium Irrigation project

Sr. No.	Description of Work	Unit	Qty.	Rate in Rs Mandays per unit	Total Amount (Rs. In Lakh)
1	Installation of alert systems, setting up control room etc	–	1	LS	9.00
2	Setting up of communication system	–	1	LS	6.00
3	Setting up of Emergency Response organization	–	1	LS	3.00
4	Public Information System	–	1	LS	2.00
5	Installation of Fire Fighting Equipment	–	1	LS	4.50
6	Installation of alert systems, setting up control room etc	–	1	LS	2.50
7	Purchasing Installation of Trap cameras	–	100.00	40000.00	40.00
8	Purchasing of vehicle	–	1.00	1500000.00	15.00
9	Culvert as per design sanction by PWD for Passing wild life	–	5.00	800000.00	40.00
10	Collection of grass seeds from forest	4kgs./Hact	150.00	800/- per Kg.	4.80
11	construction of water tank /reservior/stopdam	–	2.00	1500000.00	30.00
12	Petrolling camp/Watch tower	–	1	LS	15.00
13	Water Monitoring & Cleaning	–	LS	LS	10.00
14	Motor boat	–	1	LS	6.00
15	Other Miscellaneous Exp.	–	LS	LS	5.00
			Total		192.80
16	Miscellaneous Administration and Monitoring Expenses			2% of Total cost	3.86
17	Escalation cost unforeseen expenditure			20% of Total cost	38.6
		Grand Total			235.22

Total Expenditure for required for Mitigation Measure- 235.22 lakhs

(आर. एस. दुबे)
कार्यपालन यंत्री

वीरांगना दुर्गावती टाईगर रिजर्व
सागर (म. प्र.)

10 years - yearly based expenditure planning of budget

Sr. No.	Descript ion of Work	Total Amount (Rs. In Lakh)	Years									
			1	2	3	4	5	6	7	8	9	10
1	Installation of alert systems, setting up control room etc	9.00	9.00	–	–	–	–	–	–	–	–	–
2	Setting up of communication system	6.00	3.00	2.00	1.00	–	–	–	–	–	–	–
3	Setting up of Emergency Response organization	3.00	3.00	–	–	–	–	–	–	–	–	–
4	Public Information System	2.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
5	Installation of Fire Fighting Equipment	4.50	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
6	Installation of alert systems, setting up control room etc	2.50	2.50	–	–	–	–	–	–	–	–	–
7	Purchasing Installation of Trap cameras	40.00	8.00	8.00	8.00	8.00	8.00	–	–	–	–	–
8	Purchasing of vehicle	15.00	15.00	–	–	–	–	–	–	–	–	–
9	Culvert as per design sanction by PWD for Passing wild life	40.00	16.00	16.00	8.00	–	–	–	–	–	–	–
10	Collection of grass seeds from forest	4.80	1.00	1.00	1.00	1.00	0.80	–	–	–	–	–
11	construction of water tank /reservior/stopdam	30.00	15.00	15.00	–	–	–	–	–	–	–	–
12	Petrolling camp/Watch tower	15.00	15.00	–	–	–	–	–	–	–	–	–
13	Water Monitoring & Cleaning	10.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
14	Motor Boat	6.00	6.00	–	–	–	–	–	–	–	–	–
15	Other Miscellaneous Exp.	5.00	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50

Total Expenditure for required for Mitigation Measure- 235.22 lakhs

निदेश गोस्वामी
अनुविभागीय अधिकारी
जल संसाधन उप मंडल सं. 3
नरसिंहपुर, जिला सागर (म.प्र.)

(आर. एस. मुखे)
कार्यपालन यंत्री
जल संसाधन संभाग क्रं.1
सागर (म.प्र.)

उपसंचालक
वीरांगना दुर्गावती टाईगर रिजर्व
सागर (म. प्र.)

OFFICE OF THE EXECUTIVE ENGINEER,

WATER RESOURCES DIVISION NO. 1 SAGAR (M.P.)

Near Civil Court Sagar Ph. 07582-223809 E-mail:eewrdno1sgr@gmail.com

UNDERTAKING

User agency undertakes to comply with the mitigation measures as mentioned in *"Environment Impact Assessment of Flora, Fauna & Socio Economic Status of local Communities and action to be taken to mitigate impact of Kopra Medium Project in Nauradehi Wildlife Sanctuary, Sagar District (M.P.) Report, Chapter-8 titled PROPOSED MITIGATION MEASURES ON VARIOUS IMPACTS"* submitted to user agency by the office of the Director State Forest Research Institute Jabalpur (M.P.) via letter no. क्र/ईको/1922 dated 04.08.2023.

User agency also undertakes that the cost of implementing the aformentioned mitigation measures shall be borne out of the funds of Kopra Medium Project.

(R.S. Dhurve)
Executive Engineer
Water Resources Division No. 1
Sagar (M.P.)

निशेष गोस्वामी
कार्यपालनीय अधिकारी

कार्यालय प्रधान मुख्य वन संरक्षक (वन्यजीव) एवं मुख्य वन्यजीव अभिरक्षक, मध्य प्रदेश

भू–तल, सी–ब्लॉक, वन भवन, लिंक रोड़ नं.–2, तुलसी नगर, भोपाल–462003
दूरभाष : 0755–2674248, 2524275, फैक्स : 0755–2674206 E-mail : pccfwl@mp.gov.in

क्रमांक / व.प्रा. / तक.–1 / GEN.-192 / 10260 भोपाल, दिनांक 18-11-2024

प्रति,

कार्यपालन यंत्री,
जल संसाधन संभाग क्रमांक–1,(सिविल कोर्ट के पास)
सागर (म.प्र.)–470001 (E-mail: eewrdno1.sgr@gmail.com)

विषय :– **कोपरा मध्यम सिंचाई परियोजना "Environment Impact Assessment of Flora, Fauna & Socio Economic Status of local Communities and action to be taken mitigate Impact of kopra medium project in Nauradehi Wildlife Sanctuary, Sagar District (M.P.)" रिपोर्ट प्रस्तुत किये जाने बाबत्।**

संदर्भ :– आपका पत्र क्रमांक 2833 / कार्य / 2023–24 दिनांक 11 / 08 / 2023 एवं उप संचालक, वीरांगना दुर्गावती टाइगर रिजर्व, सागर का पत्र क्रमांक / मा.चि. / 2024 / 960 दिनांक 28.08.2024

उपरोक्त विषयांतर्गत आपके द्वारा संदर्भित पत्र से कोपरा मध्यम सिंचाई परियोजना के संबंध में राज्य वन अनुसंधान, जबलपुर द्वारा मई 2023 में तैयार की गई "Environment Impact Assessment of Flora, Fauna & Socio Economic Status of local Communities and action to be taken mitigate Impact of Kopra medium project in Nauradehi Wildlife Sanctuary, Sagar District (M.P.)" की रिपोर्ट आवश्यक कार्यवाही हेतु संलग्न कर प्रेषित की गई थी। उप संचालक, वीरांगना दुर्गावती टाइगर रिजर्व, सागर द्वारा उक्त रिपोर्ट का सूक्ष्म परीक्षण कर संदर्भित पत्र दिनांक 28.08.2024 से अनुमोदन हेतु इस कार्यालय को प्रेषित की गई है।

उप संचालक, वीरांगना दुर्गावती टाइगर रिजर्व, सागर द्वारा उक्त क्षेत्र में पाये जाने वाले फ्लोरा–फॉना के संरक्षण एवं सवर्धन हेतु 10 वर्षों के लिए तैयार की गई वन्यप्राणी संरक्षण योजना में राशि रूपये 235.26 लाख का प्रावधान किया गया है, जिसके मुख्य घटक निम्नानुसार है:–

Sr. No.	Description of work	Total Amount (Rs. In Lakh)	Years (Amount in lakh Rs.)									
			1	2	3	4	5	6	7	8	9	10
1	Installation of alert systems, setting up control room etc	9	9	-	-	-	-	-	-	-	-	-
2	Setting up of communicatio n system	6	3	2	1	-	-	-	-	-	-	-
3	Setting up of Emergency Response organization	3	3	-	-	-	-	-	-	-	-	-
4	Public Information System	2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
5	Installation of Fire Fighting Equipment	4.5	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45

10 years - yearly based expenditure planning of budget

Sr. No.	Descript ion of Work	Total Amount (Rs. In Lakh)	Years 1	2	3	4	5	6	7	8	9	10
1	Installation of alert systems, setting up control room etc	9.00	9.00	-	-	-	-	-	-	-	-	-
2	Setting up of communication system	6.00	3.00	2.00	1.00	-	-	-	-	-	-	-
3	Setting up of Emergency Response organization	3.00	3.00	-	-	-	-	-	-	-	-	-
4	Public Information System	2.00	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
5	Installation of Fire Fighting Equipment	4.50	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
6	Installation of alert systems, setting up control room etc	2.50	2.50	-	-	-	-	-	-	-	-	-
7	Purchasing Installation of Trap cameras	40.00	8.00	8.00	8.00	8.00	8.00	-	-	-	-	-
8	Purchasing of vehicle	15.00	15.00	-	-	-	-	-	-	-	-	-
9	Culvert as per design sanction by PWD for Passing wild life	40.00	16.00	16.00	8.00	-	-	-	-	-	-	-
10	Collection of grass seeds from forest	4.20	1.00	1.00	1.00	1.00	0.20	-	-	-	-	-
11	construction of water tank /reservior/stop/dam	30.00	15.00	15.00	-	-	-	-	-	-	-	-
12	Petrolling camp/Watch tower	15.00	15.00	-	-	-	-	-	-	-	-	-
13	Water Monitoring & Cleaning	10.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
14	Motor Boat	6.00	6.00	-	-	-	-	-	-	-	-	-
15	Other Miscellaneous Exp.	5.00	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50

Total Expenditure for required for Mitigation Measure- 235.22 lakhs

95.65

(डी. एन. अम्बाड़े) भा.व.से.
प्रधान मुख्य वन संरक्षक (वन्यजीव) एवं
मुख्य वन्यजीव अभिरक्षक, मध्यप्रदेश

[illegible]

(आर. एस. भूरे)

उपमहाप्रबंधक
वीरांगना दुर्गावती टाईगर रिजर्व
सागर (म. प्र.)

Cost estimation for Mitigation Measures comes under Catchment Area
Name of The Forest Division- Virangna Durgawati Tiger Reserve Sagar Dist Sagar
Daily Wages Rate- Rs 425/- (Year 2024-25)
(Estimate is prepared on basis of approved estimate of Kopra Medium Irrigation)
Cost Abstract for Mitigation
Master estimate of Kopra Medium Irrigation project

Sr. No.	Description of Work	Unit	Qty.	Rate in Rs Mandays per unit	Total Amount (Rs. In Lakh)
1	Installation of alert systems, setting up control room etc	-	1	LS	9.00
2	Setting up of communication system	-	1	LS	6.00
3	Setting up of Emergency Response organization	-	1	LS	3.00
4	Public Information System	-	1	LS	2.00
5	Installation of Fire Fighting Equipment	-	1	LS	4.50
6	Installation of alert systems, setting up control room etc	-	1	LS	2.50
7	Purchasing Installation of Trap cameras	-	100.00	40000.00	40.00
8	Purchasing of vehicle	-	1.00	1500000.00	15.00
9	Culvert as per design sanction by PWD for Passing wild life	-	5.00	800000.00	40.00
10	Collection of grass seeds from forest	4kgs./Hact	150.00	800/- per Kg	4.80
11	construction of water tank /reservior/stopdam	-	2.00	1500000.00	30.00
12	Patrolling camp/Watch tower	-	1	LS	15.00
13	Water Monitoring & Cleaning	-	LS	LS	10.00
14	Motor boat	-	1	LS	6.00
15	Other Miscellaneous Exp.	-	LS	LS	5.00
			Total		192.80
16	Miscellaneous Administration and Monitoring Expenses			2% of Total cost	3.86
17	Escalation cost unforeseen expenditure			20% of Total cost	38.6
		Grand Total			235.22

Total Expenditure for required for Mitigation Measure- 235.22 lakhs

Approved for Rs 235.22 Lakhs

(डी. एन. अम्बाडे) भा.व.से.
प्रधान मुख्य वन संरक्षक (वन्यजीव) एवं
मुख्य वन्यजीव अभिरक्षक, मध्यप्रदेश

(आर. एस. दुबे)

उप संचालक, वीरांगना दुर्गावती टाइगर रिजर्व, सागर द्वारा अनुशंसित वन्यप्राणी संरक्षण योजना के पृष्ठ क्रमांक 52 से 55 पर क्षेत्र में पाये जाने वाले फ्लोरा–फौना के संरक्षण, संवर्धन एव प्रबंधन हेतु दर्शाये गये कार्यों के लिए रूपये 235.26 लाख की 10 वर्षों की वन्यप्राणी संरक्षण योजना का अनुमोदन किया जाता है। उक्त अनुमोदित वन्यप्राणी संरक्षण योजना की एक प्रति मुख्य वन संरक्षक, सागर वृत्त एवं एक प्रति उप संचालक, वीरांगना दुर्गावती टाइगर रिजर्व, सागर को उपलब्ध करायें।

प्रकरण में भारत सरकार/राज्य शासन की अंतिम स्वीकृति उपरांत समय–सीमा में वन्यप्राणी संरक्षण योजना में वन्यप्राणी प्रबंधन हेतु वन विभाग द्वारा कराये जाने वाले प्रावधानित कार्यो हेतु योजना में प्रावधानित राशि रूपये 235.26 लाख (रूपये दो सौ पैंतीस लाख छब्बीस हजार मात्र) एक मुश्त कैम्पा मद में जमा करायी जाकर उप संचालक, वीरांगना दुर्गावती टाइगर रिजर्व, सागर एवं इस कार्यालय को अवगत कराना सुनिश्चित करेंगे तथा आपके द्वारा कराये जाने वाले कार्यो को समय–सीमा में पूर्ण करायेगें।

संलग्न :–उपरोक्तानुसार।

13/11/2024

(व्ही.एन. अम्बाड़े)
प्रधान मुख्य वन संरक्षक (वन्यजीव) एवं
मुख्य वन्यजीव अभिरक्षक, म.प्र.
भोपाल, दिनांक 18-11-2024

पृ0 क्रमांक/व.प्रा./वतअ.–1/GEN.-192/10201

प्रतिलिपि :–

1. अपर प्रधान मुख्य वन संरक्षक (भू–प्रबंध) वन भवन, भोपाल की ओर सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित। उपरोक्त प्रकरण में वन (संरक्षण एवं संवर्धन) अधिनियम, 1980 के अंतर्गत आपके स्तर से जारी अंतिम अनुमति में अनुमोदित वन्यप्राणी संरक्षण योजना में प्रावधानित राशि रूपये 235.26 लाख आवेदक संस्था द्वारा कैम्पा मद में जमा कराकर उप संचालक, वीरांगना दुर्गावती टाइगर रिजर्व, सागर को एक मुश्त उपलब्ध कराने एवं कार्य समय–सीमा में पूर्ण कराये जाने की शर्त अधिरोपित करने का कष्ट करें।
2. मुख्य वन संरक्षक, सागर वृत्त सागर की ओर अनुमोदित वन्यप्राणी संरक्षण योजना की एक प्रति सहित सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित।
3. उप संचालक, वीरांगना दुर्गावती टाइगर रिजर्व, सागर की ओर उक्त अनुमोदित वन्यप्राणी संरक्षण योजना की एक प्रति सहित सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित है। प्रकरण में भारत सरकार/राज्य शासन की अंतिम स्वीकृति के उपरांत परियोजना प्रारंभ होने के पूर्व वन्यप्राणी संरक्षण योजना में वन विभाग द्वारा कराये जाने वाले कार्यों के लिए प्रावधानित राशि एक मुश्त आवेदक संस्था से प्राप्त कर प्रावधानित कार्यो का समय सीमा में क्रियान्वयन किया जाना सुनिश्चित करें तथा तत्संबंध में की गई कार्यवाही से इस कार्यालय को अवगत कराया जावे।

18/11/2024

प्रधान मुख्य वन संरक्षक (वन्यजीव) एवं
मुख्य वन्यजीव अभिरक्षक, म.प्र.

	Description of work	Total Amount (Rs. In Lakh)	Years (Amount in lakh Rs.)									
			1	2	3	4	5	6	7	8	9	10
6	Installation of alert system, setting up control room etc	2.5	2.5	-	-	-	-	-	-	-	-	-
7	Purchasing Installation of Trap cameras	40	8	8	8	8	8	-	-	-	-	-
8	Purchasing of vehicle	15	15	-	-	-	-	-	-	-	-	-
9	Culvert as per design sanction by PWD for Passing wild life	40	16	16	8	-	-	-	-	-	-	-
10	Collection of grass seeds from forest	4.8	1	1	1	1	0.8	-	-	-	-	-
11	construction of water tank /reservoir/stop dam	30	15	15	-	-	-	-	-	-	-	-
12	Patrolling camp/Watch tower	15	15	-	-	-	-	-	-	-	-	-
13	Water Monitoring & Cleaning	10	1	1	1	1	1	1	1	1	1	1
14	Motor Boat	6	6	-	-	-	-	-	-	-	-	-
15	Other Miscellaneous Exp.	5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	Total	**192.8**	**95.65**	**44.15**	**20.15**	**11.15**	**10.95**	**2.15**	**2.15**	**2.15**	**2.15**	**2.15**
16	Miscellaneous Administrative & Monitoring Expenses (2% of project cost)	3.86	-	-	-	-	-	-	-	-	-	-
17	Escalation Cost & Unforeseen (20% of project cost)	38.6	-	-	-	-	-	-	-	-	-	-
	Grand total	**235.26**	**95.65**	**44.15**	**20.15**	**11.15**	**10.95**	**2.15**	**2.15**	**2.15**	**2.15**	**2.15**