PROFORMA FOR ADOPTION OF DRAFT INDIAN STANDARD

BUREAU OF INDIAN STANDARDS

Subject: Approval of Draft Indian Standard

Sl. No.	Doc. No.	TITLE
1	WRD/24/ 23488	Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) for River Valley and Hydroelectric Projects — Guidelines (IS 18884)

In accordance with Part II, sub-rule (2) of rule 22 of BIS Rules 2018, I enclose a copy of the draft Indian Standard mentioned above finalized by the Sectional Committee WRD 24 and its Chairperson, in the light of comments received from important stake holders.

It is requested that this note and its enclosures may be returned to this office as early as possible recording your approval of the above draft Indian Standard.

Encl.: As above.

30/8/24

Dushyant Prajapati
Scientist E/ Director and Head
(Water Resources Department)

दुष्यन्त प्रजापति/ DUSHYANT PRAJAPATI
वैज्ञानिक 'ई'/निदेशक एवं प्रमुख (जल संसाधन विभाग)
Sc. 'E'/Director & Head (Water Resources Deptt.)
भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
उपभोक्ता मामले, खाद्य एवं सार्वजनिक वितरण मंत्रालय
Ministry of Consumer Affairs, Food & Public Distribution
भारत सरकार/Government of India
9, बहादुरशाह ज़फर मार्ग, नई दिल्ली-110002
9, Bahadur Shah Zafar Marg, New Delhi-110002

Chairperson, Water Resources Division Council
BIS U.O. No. WRD 24/T- 06
Dated:

APPROVED

(Chairperson)
Water Resources Division Council

कुशविन्दर वोहरा/KUSHVINDER VOHRA
अध्यक्ष/Chairman
केन्द्रीय जल आयोग/Central Water Commission
जल शक्ति मंत्रालय/Ministry of Jal Shakti
जल संसाधन, नदी विकास और गंगा संरक्षण विभाग
Deptt. of Water Resources, RD & GR
भारत सरकार/Govt. of India
नई दिल्ली/New Delhi

भारतीय मानक
Indian Standard
IS 18884 : 2024
(Superseding IS 15845 : 2009)

नदी घाटी और हाइड्रोइलेक्ट्रिक परियोजनाओं के लिए पर्यावरण प्रभाव आंकलन (ईआईए) और पर्यावरण प्रबंधन योजना (ईएमपी) — दिशानिर्देश

Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) for River Valley and Hydroelectric Projects — Guidelines

ICS 13.020.30

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुर शाह ज़फर मार्ग, नई दिल्ली - 110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI - 110002
www.bis.gov.in www.standardsbis.in

September 2024 Price Group 9

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Environmental Assessment and Management of Water Resources Projects Sectional Committee had been approved by the Water Resources Division Council.

Sustainable development is built on three basic premises that is, economic growth, ecological sustainability and social progress. Economic growth achieved in a way that does not consider environmental concerns will not sustain in the long run. Therefore, sustainable development needs careful integration of environmental, economic, and societal needs to achieve both a higher standard of living in the short term and a net gain or maintaining equilibrium amongst human, natural and economic resources to support future generations in the long term. It is necessary to understand the interlinkage between environment and development to make choices for development that will be economically efficient, socially equitable and sustainable.

The green revolution brought about in the country during the post-independence period has been greatly supported by various river valley and hydroelectric projects. However, like any other developmental activity, the river valley and hydroelectric projects have had certain environmental impacts, both negative and positive. The environmental effects of water resources projects are being experienced and observed carefully in many developed as well as developing countries.

Sustainability of a river valley project activity can be achieved only through effective assessment procedures that integrate legal, techno-economic and environmental requirements within which the project has to function. In general, all water resources projects depending on their size/activity have impact on the environment whether locally, regionally or globally.

Environmental impact assessment (EIA) is a tool for assisting environmental management and for contributing to sustainable development. The purpose of EIA is to identify potential environmental impacts from major development proposals and to propose means to avoid or reduce the adverse impacts. It has increasingly become a key aspect of many large-scale planning applications. The objective of environmental impact assessment in the context of river valley projects is to assess both the positive and negative impacts of a project so that necessary environmental management measures can be adopted, wherever necessary, so as to minimize the adverse impacts while maximizing the benefits.

Environmental impact assessments (EIA) identify potential impacts and propose actions to avoid, compensate, reduce or mitigate them through environmental management plans (EMPs). The functions of an EIA are to:

a) Identify pre-project environmental status and project activities that may affect the environment and change in probable landscape due to the coming of the project;
b) Estimate the impacts due to proposed development;
c) Evaluate the consequences of impacts on human life, environment and landscape; and
d) Assess the need for alternative actions and mitigative measures.

The Ministry of Environment, Forest and Climate Change has notified the environmental impact assessment (EIA) notification, 2006 under the provisions of the *Environment (Protection) Act,* 1986, which regulates the development and expansion/modernization of river valley projects listed at Item 1 (c) in the schedule to the EIA notification, 2006. Project category has been defined based on power generation (in MW) for hydroelectric projects and culturable command area for irrigation projects as:

Sl No.	*Project Type*	*Category A*	*Category B1*	*Category B2*
(1)	(2)	(3)	(4)	(5)
i)	Hydroelectric projects	≥ 100 MW	≥ 25 MW and < 100 MW	
ii)	Irrigation projects		CCA ≥ 10 000 ha	2 000 ha ≤ CCA < 10 000 ha

(*Continued on third cover*)

Indian Standard

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) AND ENVIRONMENTAL MANAGEMENT PLAN (EMP) FOR RIVER VALLEY AND HYDROELECTRIC PROJECTS — GUIDELINES

1 SCOPE

This standard provides guidelines on the methodology and criteria for environmental impact assessment and environmental management plan for river valley and hydroelectric projects.

2 OBJECTIVES OF EIA

Objectives of EIA include the following:

a) To ensure that the environmental considerations are explicitly addressed and incorporated into the development and decision-making process;

b) To anticipate, avoid, compensate, minimize or offset the adverse biophysical, social and other impacts of development proposals;

c) To protect the ecological processes and maintain the productivity and carrying capacity of natural ecosystems; and

d) To promote development that is sustainable while optimizing natural resources and their management.

3 PROJECT AREA AND STUDY AREA

3.1 Project Area

It is the sum total of area [may it be agricultural, homestead, forest, grazing, fallow, Government or private land, community land, unclassified state forest (USF) etc, including water bodies and marshy lands] required for the construction of dam, powerhouse, switch yard and its minor components, canal works, township, colony and its approach roads including green belts, stores and workshop; for submergence, quarry, resettlement, muck disposal, water supply, explosive magazine etc.

3.2 Study Area

To know the present status of the environment in the area, baseline data with respect to environmental components air, water, noise, soil, land use and land cover, biology and biodiversity (flora and fauna), wildlife, socio-economic status, etc should be collected within 10 km radius of the main components of the project/site that is, dam/barrage/weir site and powerhouse site. The baseline studies should be collected for three seasons (that is, summer, monsoon, and winter). The study area should comprise the following:

a) Submergence area;

b) Project area or the direct impact area should comprise of area falling within 10 km radius from the periphery of reservoir, land coming under submergence and area downstream of dam up to the point where tail race tunnel (TRT) meets the river; and

c) Downstream up to 10 km from tip of the tail race tunnel (TRT).

3.3 Details of the Project and Site

3.3.1 Project description involves description of the project activities and infrastructure requirements. The anticipated time scales of construction and operation of the project should be given. The description should include its location, accessibility, the design and size of the developmental projects, salient features and land requirements for the project including ownership of land such as revenue, forest and private. The description should be illustrated by the use of maps and/or diagrams.

3.3.2 The details on project profile should include salient features of the project such as catchment area, submergence area, type and height of dam/barrage/weir, gross storage capacity, water conveyance system, surge shaft, pressure shaft, powerhouse, gross and net head, etc.

3.3.3 The geographical locations of the dam and submergence area such as village, taluka, district, state, latitude and longitude should be mentioned. The geographical extent of catchment area in terms of district and state should also be defined. Total area of the project including that of submergence and project parameters should be incorporated in EIA report. The breakup of existing land use and ownership of land (private, forest, Government, others (if any) proposed to be acquired or diverted (in the case of forest land) for various project parameters and submergence, should also be given.

3.3.4 The longitudinal profile of the river before and after the project be described in detail.

3.3.5 Remote sensing studies, interpretation of satellite imagery, topographic sheets along with ground verification shall be used to develop the land use/land cover pattern of the study area using overlaying mapping techniques namely, geographic information system (GIS) and false colour composite (FCC) generated from satellite data of project area.

3.3.6 Details of coarse/fine aggregates/clay etc. required for construction of the project and the rock /clay quarries/river shoal sites identified for the project should be included in the EIA report. This should also include the mode of transportation of the quarried material from the quarry sites and borrow sites, any material to be recycled from excavated material, etc in accordance with state norms, if any, to the temporary storage sites, with location maps.

4 ESTABLISHING BASELINE ENVIRONMENTAL STATUS

4.1 The performance of a project can be judged by the degree of deviation from the initial assessment for different environmental parameters of study area. Therefore, baseline data with reference to various environmental components like air, water, noise, soil, land use and land cover, flora and fauna like terrestrial and aquatic, socio-economic status, etc, should be collected from the study area. The air quality and noise levels are to be monitored at such locations in the study area which are likely to be impacted due to project construction and operation. The baseline data should be collected for three seasons (that is, summer, monsoon, and winter).

4.2 Methods of Collection of Baseline Data

The studies to establish baseline environmental status of water resources projects consist of a combination of desk studies (gathering existing documents, secondary data, referring to the earlier studies, etc) and field surveys to address key issues outlined during scoping. The data from secondary sources shall be obtained from authorized institutes/departments like ASI, BSI, CGWB, CWC, FSI, GSI, IMD, NEERI, CIFRI, SLUSI, ZSI, statistical department, state forest, fisheries, geology, mining departments, etc.

4.3 Environmental Setting

A description of the environmental setting should be provided in EIA report.

4.3.1 *Physical and Chemical Environment*

4.3.1.1 *Geological and geophysical aspects and seismo-tectonics*

a) Physical geology, topography and regional geological aspects;

b) Tectonics, seismicity and history of past earthquakes in the area. Landslide zone or area prone to landslide existing in the study area;

c) Presence of minerals deposit if any; and

d) Project alternatives considered and justification for present location.

4.3.1.2 *Meteorology, air and noise*

a) Meteorology (namely, temperature, precipitation, relative humidity, wind speed/direction, etc) to be collected from the nearest IMD station/available online data for one location in proximity to project site. Data should be collected for a one-month period in each season for 3 seasons namely, pre-monsoon, monsoon and lean/winter periods. The wind rose diagram for each month to be produced separately;

b) Ambient air quality with parameters namely particulate matter (PM_{10} and $PM_{2.5}$), sulphur dioxide (SO_2) and oxides of nitrogen (NOx) in the study area in at least 6 different locations, based on maximum ground level concentrations. Locations should be identified keeping in view the potential impact on ambient air quality due to project construction activities. Monitoring should be carried out twice a week for 4 weeks at each location in each season for three seasons. Each sample should be collected for 24 h continuously; and

c) Existing noise levels and traffic density in the study area to be monitored in at least 6 different locations coinciding with the AAQM locations. Noise levels and traffic density to be monitored for 24 h continuously at each location once per week for 4 weeks in each season. Noise levels to be monitored using hand-held sound level meter during day and night time, and equivalent levels as dB(A) are to be reported for each monitoring

day. Traffic density is to be monitored by counting the number and type of vehicles passing a location during 24 h and reported as PCUs (passenger car units) for each day of monitoring.

4.3.1.3 *Water quality*

Water quality assessment to be carried out by collecting grab samples for surface and groundwater in the study area. Locations need to be identified based on the impact potential on surface and groundwater sources due to project activities. At least 10 samples from each source (that is, surface and groundwater) should be collected to represent the study area. Samples should be collected once in each season for 3 seasons namely, summer, monsoon and winter for both surface water and groundwater for:

a) physical parameters (*p*H, temperature, electrical conductivity, TSS, turbidity, transparency);

b) chemical parameters (dissolved oxygen, alkalinity, hardness, BOD, COD, free CO_2, NH_4^+, NO_3, PO_4, Cl, SO_4, Na, K, Ca, Mg, silicate, oil and grease, phenolic compounds, residual sodium carbonate);

c) bacteriological parameter (E. coli and total coliform); and

d) heavy metals (Pb, As, Hg, Cd, total Cr, Cr^{+6}, Cu, Zn, Fe).

4.3.1.4 *Sites of archeological and religious importance*

The archaeological and religious sites/monuments, if any, in the record of the Government/local administration in the study area need to be identified and listed. Details such as name, area, age of construction, etc, be given in the report.

4.3.1.5 *Drought/Flood/Cyclone/Cloud bursts/ GLOF*

The frequencies of droughts, floods, cloud bursts, GLOF and cyclones, as applicable, should be collected and presented in EIA report.

4.3.2 *Water Environment and Hydrology*

a) Runoff, discharge, water availability for the project, sedimentation rate, etc;

b) Basin characteristics;

c) Information on the 10 daily flow basis for the 90 percent or 75 percent dependable year, as applicable. The flow intercepted at the dam, the flow diverted to the powerhouse and the spill comprising the environmental flow and additional flow downstream of the dam for the project may be given; and

d) Precipitation (snowfall, rainfall), temperature, relative humidity, etc of the project area.

4.3.3 *Biological Environment*

Besides primary studies, the collection of secondary data/literature published for study area on flora and fauna, including RET species, shall be included in EIA/EMP report.

4.3.3.1 *Methodology for collection of biodiversity data*

a) The number of sampling locations should be adequately representative of the physical habitat such as pools/riffles, critical reaches on the breeding and resting habitats to get a reasonable idea of the diversity and other attributes of flora and fauna. The guiding principles should be the size of the study area (a larger area should have a larger number of sampling locations) and inherent diversity at the location, as known from secondary sources (for example, eastern Himalayan and low altitude sites should have a larger number of sampling locations owing to higher diversity);

b) The entire area should be divided into grids of 5 km × 5 km, preferably on a GIS domain. Thereafter, 25 percent of the grids should be randomly selected for sampling, of which half should be in the directly affected area (grids including project components such as reservoir, dam, powerhouse, tunnel, canal, etc) and the remaining in the rest of the area (areas of influence in 10 km radius from project components). At such locations, the size and number of sampling units (for example, quadrats in case of flora/transects in case of fauna) must be decided by species-area curves and the details of the same (graphs and cumulative number of species in a tabulated form) should be provided in the EIA report. Some of the grids on the edges may not be completely overlapping with the study area boundaries. However, these should be counted and considered for selecting 25 percent of the grids. The number of grids to be surveyed may come out as a decimal number (that is, it has an integral

and a fractional part) which should be rounded to the next whole number;

c) Presence of RET species should be ascertained from secondary sources by a proper literature survey for the said area. If need be, modern methods like camera trapping can be resorted to, particularly for areas in the eastern Himalayas and for secretive/nocturnal species. Listing of the literature referred to, for developing lists of RET species should be provided in the EIA reports; and

d) The RET species referred to in this point should include species listed in Schedule I and II of the *Wildlife (Protection) Act*, 1972 and those listed in the red data books (BSI, ZSI and IUCN).

4.3.3.2 *Flora*

a) Characterization of forest types (as per 'A Revised Survey of the Forest Types of India' by Champion and Seth (1968)) in the study area and extent of each forest type as per the forest working plan;

b) General vegetation profile and floral diversity covering all groups that is, angiosperm, gymnosperm, pteridophytes, bryophytes, lichens and orchids. A species-wise list may be provided;

c) Assessment of plant species with respect to dominance, density, frequency, abundance, diversity index, similarity index, importance value index (IVI), Shannon Weiner index, etc, of the species to be provided. The methodology used for calculating various diversity indices along with details of locations of quadrates, size of quadrates, etc to be reported within the study area in different ecosystems;

d) The existence of national park, sanctuary, biosphere reserve, etc in the study area, if any, should be detailed and mapped;

e) Economically important species like medicinal plants, timber, fuel wood etc;

f) Details of endemic species found in the project area; and

g) Flora under RET categories should be documented using International Union for the Conservation of Nature and Natural Resources (IUCN) criteria and botanical survey of India's Red Data list along with economic significance. Species diversity curve for RET species should be given.

4.3.3.3 *Terrestrial fauna*

a) Fauna study and inventorisation should be carried out for all groups of animals (that is, mammals, avifauna, herpeto-fauna) in the study area with their conservation status;

b) Information (authenticated) on avifauna and wildlife in the study area;

c) Habitat status of avifauna; resident/ migratory/passage migrants etc;

d) Documentation of butterflies (indicative species), if any, found in the area;

e) Details of endemic, and rare endangered and threatened (RET) species found in the project area;

f) RET species-voucher specimens should be collected (as far as possible) along with GPS readings to facilitate habitat conservation and management. RET faunal species to be classified as per the IUCN Red Data list and as per different schedules of *Indian Wildlife (Protection) Act*, 1972; and

g) Existence of barriers and corridors, if any, for wild animals within the project area/study area.

4.3.3.4 *Aquatic ecology*

a) Documentation of aquatic fauna like fish fauna, macro-invertebrates, zooplankton, phytoplanktons, periphyton, benthos etc;

b) Sampling for aquatic ecology including fish species diversity, migratory fish species, benthic communities, plankton communities, physical habitat and water quality parameters (dissolve oxygen, *p*H, alkalinity, temperature both air and water, salinity, TDS, conductivity) must be conducted during three seasons: pre-monsoon (summer), monsoon and lean/winter;

c) Fish and fisheries: fish diversity, conservation status, their migration pattern and identification of breeding and spawning grounds along the project site or in the vicinity, as far as possible;

d) Experimental fishing should be carried out with the help of different gears and at different habitats for different fish species to collect data on fish diversity. Fish species composition and sizes (length and weight) of important fish species need to be

collected for habitat conservation and estimation of environmental flow;

e) Fish-based environmental flows shall be estimated based on depth and velocity of keystone species; and

f) Status of commercial fishing: information must be collected from concerned fisheries department/forest department about licensed fishermen, fishing time and fishing patterns, livelihood of the fishermen dependent, and catch per unit effort (CPUE) in the project area.

4.3.4 *Land Environment*

EIA study should cover land use pattern of the study area and physical characteristics of soil in the study area.

4.3.4.1 *Land use pattern*

a) Land use/land cover should be derived for the study and catchment area using the latest satellite imageries and un-supervised and supervised classification techniques supported by ground truth verification;

b) Data to be used should be multi-spectral data with a spatial resolution of 30 m at least;

c) Steps involved shall comprise geo-referencing of satellite images, undertaking un-supervised classification, generating training sets with the help of ground truthing, using different interpretation techniques and various indices and available data sources like FSI maps, SOI toposheets, etc and then carrying out supervised classification classifying the images into different land use/land cover classes to be followed by an accuracy assessment; and

d) Generation of thematic maps namely, slope map, drainage map, soil map, land use and land cover map, etc. Based on these, thematic maps, an erosion intensity map should be prepared.

4.3.4.2 *Soil characteristics*

a) Soil taxonomic classification, physical parameters (namely, soil depth, texture, porosity, bulk density, drainage, permeability and water holding capacity) and chemical parameters (namely *p*H, electrical conductivity, exchangeable Ca^{++}, Mg^{++}, Na^{+} and K^{+}, sodium, potassium, organic carbon, available potassium, available phosphorus, SAR/ESP, cation exchange capacity, available nitrogen and salinity); and

b) For establishing soil characteristics, data collection and analysis should be carried out for two seasons (that is, pre-monsoon and post-monsoon) during the entire duration of the study. At least 6 locations spread over the study area should be covered for hydroelectric projects and additional locations depending upon the extent of command should be added for irrigation projects.

4.3.4.3 *Irrigation and cropping pattern*

a) cropping pattern and horticulture/ plantation in the study area;

b) Collection of primary data on crops, their productivity and irrigation facilities;

c) Facilities of drip irrigation and micro-irrigation; and

d) Details of conjunctive use of surface and groundwater.

4.3.5 *Socio-economic Environment*

Socio-economic status of the habitation in study area needs to be established from secondary data such as sourced from the census of India. Primary village level surveys should be conducted for directly impacted villages that is, the villages whose lands are to be acquired by the project, in consultation with the local community. The following aspects need to be covered:

a) Data on human settlements, health status of the community and existing infrastructure facilities including sources of livelihood, job opportunities, safety and security of workers and surrounding population;

b) Collection of information on sensitive habitats of historical, cultural, religious and ecological importance;

c) The socio-economic survey/profile within 10 km of the study area for demographic profile, ethnographic and economic structure, developmental profile, agricultural practices, infrastructure, education facilities, health and sanitation facilities, available communication network etc, from primary and secondary data;

d) Information on the dependence of the local people on minor forest produce and their cattle grazing rights in the forest land;

e) Special attention has to be given to vulnerable groups like women, especially disabled, aged and destitute persons, etc and to any ethnic/indigenous groups that are getting affected by the project;

f) Minutes of the village-level consultation along with photographs should form part of EIA; and

g) List of all the project affected families with their names, education, land holdings, other properties, occupation, source of income, land and other properties to be acquired, etc.

5 IMPACT ASSESSMENT AND PREDICTION

The negative impact of the proposed project should be assessed in order to formulate effective mitigation steps to abate these impacts. Both positive and negative impacts should also be discussed for the construction and operation phases of the project. Based on the surveyed data and interpretation, various impacts shall be enumerated both positive as well as negative.

5.1 Characteristics of Impacts

a) Nature (positive, negative, direct, indirect, cumulative, synergistic);

b) Magnitude;

c) Extent/Location (area/volume covered, distribution);

d) Duration (long-term, short-term);

e) Reversible/Irreversible;

f) Likelihood (risk, uncertainty); and

g) Significance.

5.2 Air Environment

a) Changes in ambient and ground level concentrations due to total emissions from point, line and area sources;

b) Effect on soil, material, vegetation and human health;

c) Impact of emissions from DG set used for power during the construction, if any, on-air environment;

d) Pollution due to fuel combustion in equipment and vehicles; and

e) Fugitive emissions from various sources.

5.3 Water Environment

a) Changes in surface and ground water quality;

b) Steps to develop pisciculture and recreational facilities;

c) Changes in the hydraulic regime and downstream flow;

d) Water pollution due to disposal of sewage; and

e) Water pollution from labour colonies/ camps and washing equipment.

5.4 Environmental Flow Assessment

A site-specific environmental flow assessment study shall be carried out using habitat simulation and hydraulic modeling methodology. From the long-term flow series, 90 percent or 75 percent dependable year, as applicable, discharge should be used in the modelling exercise as input flow data. The river cross-section for initial critical stretch from the diversion location should be used. Average discharge value for each season should be calculated namely, average of four leanest months (of 90, percent or 75 percent dependable year, as applicable), average of four monsoon months and average of remaining four months. These discharge values should be simulated for one-dimensional flow modelling to work out the water depth, waterway width and discharge velocity for different amount of releases that is, 10 percent, 15 percent, 20 percent, 25 percent, 30 percent, 40 percent, 50 percent and 100 percent. Discharge values meeting the habitat requirement should be discussed and environment flow recommendations justified. A minimum of 15 percent to 20 percent of the average lean season flow of that river should always be recommended.

5.5 Land Environment

a) Negative impact on land stability, soil erosion, reservoir sedimentation and natural springs, if any, due to:

   1) considerable road construction/ widening activity;
   2) interference of reservoir with the inflowing stream; and
   3) blasting for commissioning of HRT, TRT and some other structures.

b) Changes in land use/land cover and drainage pattern;

c) Erosion and siltation;

d) An analysis of the present sediment load of water entering the project area and the risk of siltation of canals and the reservoirs;

e) An assessment of erodibility, slope stability and scouring risk of the main soil types in the project area. A slope map indicating erosion-prone areas should be prepared;

f) Quarrying operation and muck disposal;

g) Changes in land quality including effects of waste disposal;

h) Reservoir periphery and its stability; and

j) Impact due to submergence.

5.6 Biological Environment

a) National parks, wildlife sanctuaries and other protected areas within the project area and the impacts of project construction thereon;

b) Deforestation and disturbance to wildlife, habitat fragmentation and wild animals' migratory corridors;

c) Impact on rare or endangered species of flora and fauna;

d) Impediments to wildlife movement and migratory avifauna;

e) Impact on fish migration and habitat degradation due to decreased flow of water;

f) Positive and negative effects on the aquatic birds;

g) Pressure on existing natural resources; and

h) Impact on breeding and nesting grounds of animals and fish, if any.

5.7 Socio-economic Aspects

Although, a detailed SIA (including formulation of R&R plan, tribal development plan, if applicable) shall be conducted separately as per *RFCTLARR Act,* 2013, it would be appropriate that a brief analysis on following points be evaluated during EIA process:

a) Impact on local community including demographic profile;

b) Impact on socio-economic status namely, basic infrastructure like roads, electricity etc, civic amenities namely, drinking water, health and education, banks, post offices, police stations, draining system etc;

c) Impact on economic status and quality of life;

d) Impact on human health due to water/vector borne and communicable diseases;

e) Impact due to increased traffic;

f) Impact on tourism and allied businesses;

g) Assessment of impacts on livestock population;

h) Positive and negative impacts likely to be accrued due to the project be listed;

j) Immigration of labour population and social impacts thereon; and

k) Historical and cultural monuments. An inventory should be made of historical and cultural monuments of regional, national and international importance which will be lost or affected by project activities and impoundment of water.

6 QUANTIFICATION OF IMPACTS

6.1 Quantification of the identified impacts should be done in order to describe the change in different environmental factors and the variables to measure the impacts. For this environmental matrix shall be prepared based on the Leopold matrix method.

6.2 Impacts should be discussed along with the mitigation/management measures for the construction and operation phase, respectively. It is not possible to quantify each impact, however, to understand the relative severity of each impact and effectiveness of mitigation and management measures, the matrix method based on Leopold et al. (1971), which quantifies each impact linked to a particular project activity based on its magnitude and significance should be adopted.

6.3 Magnitude is rated on a scale from 1 to 5 (*Min* to *Max*) and significance from - 2 to 2 (beneficial to detrimental; with zero value for insignificant impact). A product of magnitude and significance is the final rating for that particular activity's impact on the corresponding environmental component. The lower the value, the lesser the impact and a negative value will indicate a beneficial impact. Exercise should be done for two conditions namely:

a) without mitigation and management measures; and

b) with the implementation of management and mitigation measures.

6.4 Comparison of rating results will be useful to assess the effectiveness of EMP implementation.

Ratings for the significance and magnitude of each activity for its impact on the environmental component should be based on the collective rating given by the domain experts who have knowledge about the project and surrounding areas.

7 KEY ELEMENTS OF ENVIRONMENT MANAGEMENT PLAN

The following are the key elements of the environment management plan (EMP). The requirement of each will vary with the type of project and should be finalized with EAC/SEAC at the scoping stage.

a) Catchment area treatment (CAT) plan;
b) Compensatory afforestation;
c) Biodiversity and wildlife conservation and management plan;
d) Fisheries conservation and management plan;
e) Green belt development plan;
f) Reservoir rim treatment plan;
g) Muck disposal plan;
h) Restoration plan for quarry sites;
j) Dam break analysis and disaster management plan;
k) Water, air and noise management plans;
m) Public health delivery plan;
n) Sanitation and solid waste management plan;
p) Corporate environment responsibility;
q) Command area development plan for irrigation projects, if applicable;
r) Plan for restoration of cultural and archaeological heritage, if applicable;
s) Energy conservation measures;
t) Environmental monitoring programme; and
u) Provision for the fish passages such as natural bypass, fish pass, and fish lift shall be explored at the time of design of all water resources development projects like dams and barrages.

7.1 Catchment Area Treatment (CAT) Plan

a) CAT plan should be prepared for directly draining catchment, draining into the reservoir or free draining catchment area in case there are existing/proposed projects in upstream; and

b) The catchment area should be delineated into smaller hydrological units like sub-watersheds. Sub-watershed delineation and their coding should be as per the methodology given in the watershed atlas of India prepared by the Soil and Land Use Survey of India (SLUSI).

c) Estimation of soil loss should be made using revised universal soil loss equation (RUSLE) or composite erosion intensity mapping. Both the models use, integration of different data types such as soil, land use/land cover, slope, aspects, rainfall intensity and current management practices which could be derived from various data sources.

1) Based on the extent of soil loss, the area should be demarcated into different erosion intensity categories. Erosion intensity categories comprise of soil loss range in terms of tons/ha/annum that is, negligible (< 1), slight (1 to 5), very low (5 to 10), low (10 to 20), moderate (20 to 40), severe (40 to 80) and very severe (> 80);

2) Prioritization of hydrological units should be carried out using silt yield index (SYI) method conceptualized by Soil and Land Use Survey of India (SLUSI) for prioritization of delineated hydrological units;

3) Identification of treatable areas should be done using soil loss vulnerable areas under severe and very severe erosion intensity categories. Treatment measures shall comprise biological measures and/or engineering/ bio-engineering measures, or a combination of both;

4) Micro-plan with justification for adapting a particular soil conservation measure, both engineering and biological on consideration of land use, slope, soil type etc;

5) In order to ensure the efficacy of CAT plan, apart from biological and engineering measures other provisions should be included in CAT plan such as administrative charges with a budgetary provision at minimum 5 percent of cost, micro planning for marking of spatial location of specific treatment to be carried out in the study area with a budgetary provision for micro-planning at minimum 2 percent of cost, monitoring and evaluation with a budgetary provision at minimum 3 percent of cost and contingencies at minimum 10 percent

of cost required for implementing treatment measures;

6) CAT plan shall contain total costing and physical and financial phasing including phasing for a maximum of 10 years but should be in synchronization with the completion of project construction; and

7) Command area development (CAD) plan giving details of the implementation schedule.

7.2 Compensatory Afforestation Plan

The compensatory afforestation plan is covered under the *Forest* (*Conservation*) *Act*, 1980 and this plan is prepared in lieu of diversion of forestland for a project for non-forest use, if any. For projects requiring diversion of forest land, forest clearance is a mandatory requirement and is a parallel process with the environment clearance process. Extent of forest land to be diverted and compensatory afforestation land including status of application of diversion of forestland to be indicated in EIA report.

7.3 Biodiversity and Wildlife Conservation and Management Plan

a) EIA study establishes the presence of rare, endangered and threatened (RET) and endemic species and the impacts of the project activities thereon;

b) The plan should have specific provisions for the RET species if the presence of such species is established in EIA report;

c) Plan should focus on habitat improvement of endemic and RET flora and fauna with suitable and practical conservation techniques (in-situ/ex-situ);

d) Areas, where such conservation is proposed, will be marked on a project layout map;

e) Implementation period and budget should be proposed;

f) If some national park/sanctuary/biosphere reserve or other protected area is going to get affected directly or indirectly by construction of the project, then suitable conservation measures should be prepared in consultation with the State Forest Department and with the physical and financial details; and

g) Recommendation for biodiversity conservation as given in river basin study, if conducted, may also be considered during formulation of the plan.

7.4 Fisheries Conservation and Management Plan

a) The plan should explore the provision of fish pass/fish ladder/fish lift or natural by-pass based on the scientific investigation, particularly on the type of migratory fish species, location and period of migration;

b) The reservoir fishery development plan should be based on the type of indigenous fish species and production enhancement of fish species;

c) Reservoir fisheries plan should be prepared, preferably in consultation with the central institution, State Fisheries Department, keeping in view the available infrastructure in proximity such as hatchery, nursery, fish pond, etc;

d) Brood fish germplasm maintenance plan should be included;

e) The plan should explore the possibility of fish pass/fish ladder or reservoir fishery, based on type of species and type of diversion structure proposed;

f) Reservoir fisheries plan should be prepared, preferably in consultation with the State Fisheries Department, keeping in view the available infrastructure in proximity such as hatchery, nursery, fish pond, etc;

g) For several projects in cascade, possibility of common infrastructure should be explored;

h) Infrastructure requirement should be assessed and budgeted for as capital cost;

j) The plan will detail the number of hatcheries, nurseries, rearing ponds, etc, proposed under the plan with proper drawings;

k) Time of implementation should be proposed so that infrastructure establishment coincides with reservoir filling;

m) O and M expenses should be budgeted for the first five years of operation; and

n) Detail of environmental flow to be released along with a provision to be made in the diversion structure considering keystone fish species sustainability;

7.5 Green Belt Development Plan

a) Green belt should be proposed along the approach roads, colonies and other project components, wherever feasible;

b) The proposed plan should be shown on a layout map indicating the project components, approach roads, colonies, etc;

c) Reference should be given to raise local species for better survival so that the planted area is merged with the existing habitat; and

d) Budget should cover both the capital cost and maintenance cost for five years.

7.6 Reservoir Rim Treatment Plan

a) A reservoir rim treatment plan is prepared for the stabilization of landslide/landslip zones, if any, around the reservoir periphery;

b) The plan should discuss in detail geological investigations of the reservoir rim area and mark the identified landslide/landslip areas on the layout;

c) Treatment requirements of identified slip zones should be suggested as biological and engineering measures with justification;

d) If no treatment is needed/planned, it should be clearly justified in the plan;

e) Timelines should be proposed to complete the plan before filling of the reservoir;

f) Budgetary estimate to be prepared and included in the plan; and

g) The plan for reservoir rim treatment is to be marked on a layout map showing areas requiring necessary engineering and other requisite treatment interventions.

7.7 Muck Disposal Plan

a) The muck disposal plan should spell out a detailed estimate of muck to be generated from various activities;

b) The swell factor of excavated material should be established based on available data. In the absence of authentic data, a swell factor of 30 percent should be assumed;

c) Muck utilization in project construction should be considered and the final quantity required for disposal should be mentioned;

d) Muck disposal sites should be identified keeping in view the proximity to the source of generation, accessibility and route of transport, land use/land cover and topography of suitable identified sites;

e) All muck disposal sites should be located at least 30 m away along the slope from the highest flood level (HFL) of rivers in Himalayan terrain and 500 m away from the HFL of rivers in peninsular areas;

f) Consultation with the State Pollution Control Board and/or State Forest Department should be carried out while finalizing the muck disposal sites;

g) Details of each dumping site through area, capacity, the total quantity of muck that can be dumped, etc should be worked out and discussed in the plan;

h) The type and design of retaining structures for each site should be discussed in the plan;

j) L-section and cross-section of each disposal site should be included in the plan;

k) The plan should also cover the restoration of muck dumping sites by implementing engineering, bioengineering and biological measures;

m) The plan should discuss the timeline for each activity-muck generation from each location, temporary storage, period of dumping at each site, closure of each site and restoration of each site;

n) Restoration work of all the sites should be completed before the commissioning of the project;

p) Budgetary requirements covering capital and recurring costs for implementation of the entire plan should be estimated and included; and

q) Focus should be on re-utilization of muck generated to the extent possible.

7.8 Restoration Plan for Quarry Sites and Project Sites

a) A restoration plan for quarry sites should be prepared if there are identified quarry sites to meet the construction material requirement for the project;

b) Details of quarry sites including location, area, and type of quarry should be discussed;

c) Location of quarry sites and various project sites should be marked on the layout map with respect to project location;

d) Restoration of quarry sites should start immediately on completion of extraction and should be completed before operation of the project;

e) Restoration work of each project site: construction area, storage area, temporary plants, labour colony, etc, should be initiated on completion of work at that location;

f) Engineering, bio-engineering and biological measures required for restoration of sites should be discussed in detail, along with drawings; and

g) A detailed budget should be prepared for engineering, bioengineering and biological measures linked to the timeline of implementation.

7.9 Dam Break Analysis and Disaster Management Plan

a) Dam break analysis is to be carried out for dams, wherever applicable;

b) One-dimensional hydro dynamic modelling should be carried for the simulation of dam break flood assuming the hypothetical failure of a dam. Modelling can be carried by using any state of the art software such as MIKE 11 or HEC-RAS;

c) Modelling reach, that is, point up to which flood levels are calculated based on dam break analysis should be up to the point where dam break flood gets attenuated or the river meets a bigger river downstream eliminating the flood impact;

d) Model output shall consist of dam break flood wave profile of peak discharge, water depth and travel time for the entire downstream reach in tabulated form and same shall be used to prepare inundation map for the modelled downstream reach on existing maps or Survey of India topographical sheets marking all details;

e) Vulnerability of downstream area with respect to lives and property needs to be assessed using surveyed details of human population and inventory data of downstream reach;

f) A disaster management plan (DMP) shall be prepared based on vulnerability assessment as above and time available for rescue operations depending upon flood wave travel time. It shall consist of preventive and surveillance mechanisms, emergency preparedness and response systems, effective communication system and notification procedures and emergency action and evacuation plans which could be dovetailed with the existing district/state disaster management plan; and

g) Cost estimates for putting such a system in place shall be prepared.

7.10 Water, Air and Noise Management Plans

a) The plan should be prepared based on the impacts identified on air, water and noise environment during project construction and operation phase of a project;

b) For each identified impact, a specific mitigation plan should be prepared;

c) The mitigation plan should cover the location, time period of implementation and budget; and

d) The effectiveness of the plan should be established by monitoring environmental parameters.

7.11 Public Health Delivery Plan

a) Public health delivery plan should be focused on the project workforce – temporary as well as permanent;

b) Plan should cover an estimate of the labour force and their families to be temporarily settled in the area;

c) Plan should mention location(s) of worker's colony(ies), work location(s) and period of stay;

d) Plan should establish worker's health status for the entire duration of the project either through contractor or directly by the project proponent. This should cover pre-project health checkups of all the workforce in the Government hospital, to be followed by yearly health checkups till the completion of the project;

e) The plan should cover the provision of health care facility to the workers and their families in project area/surrounding either by fresh establishment or by augmenting existing health care facilities;

f) The plan should address the need of establishing/strengthening of medical infrastructure to cater the injured/affected persons at work, covering first-aid posts,

clinics, and ambulance(s) adequately based on the size of workforce; and

g) The plan should mention the time period of implementation with capital and recurring cost for the entire duration.

7.12 Sanitation and Solid Waste Management Plan

a) Sanitation and solid waste management plan should be focused on the project workforce – temporary as well as permanent;

b) Plan should cover an estimate of the labour force and their families to be temporarily settled in the area;

c) Plan should mention location(s) of worker's colony(ies), work location(s) and period of stay;

d) Based on the number of workers including family members, provisions of drinking water and water for other needs should be made;

e) Provisions of septic tanks/sewage treatment plans of adequate capacity should be made;

f) Solid waste segregation – biodegradable and non-biodegradable should be planned with provisions of collecting, transporting, recycling/reusing and landfilling. Location of landfills, etc. to be provided in the report;

g) A plan for restoration of the landfill site should be included; and

h) The plan should mention the time period of implementation with capital and recurring costs for the entire duration.

7.13 Local Area Development Plan

a) Local area development plan should be prepared co-terminus with the construction activities;

b) The plan should be prepared in line with the MoEF & CC's OM dated 01 May 2018 regarding corporate environment responsibility (CER) or in line with the local area development policy/plan of the concerned state and budgeted for;

c) The focus should be on the improvement of the quality of life of project-affected families and other project area populations;

d) The plan should suggest specific schemes to be implemented based on the output of the public hearing meeting(s) and local needs established during EIA study; and

e) The plan should be implemented in consultation with village panchayats and local authorities.

7.14 Energy Conservation Measures

a) Energy conservation measures are planned to meet the energy needs of construction workers so as to reduce their dependence on fuel wood;

b) Measures such as solar lanterns, solar cookers, common area solar lighting, supply of subsidized fuel – kerosene/LPG etc should be considered; and

c) The plan should mention the time period of implementation with capital and recurring costs for the entire duration.

8 MONITORING AND ESTABLISHING EFFECTIVENESS OF EMP

a) Mechanism of construction phase monitoring and operation phase monitoring should be established during the EIA study;

b) Monitoring of all the components of EMP should form part of the monitoring program to establish the effectiveness of EMP;

c) The monitoring mechanism should address the parameters to be monitored, the frequency of monitoring and responsibility;

d) Monitoring should not be limited to environmental parameters such as ambient air quality, water quality or noise levels. It should cover all the components of EMP such as the implementation of worker's safety needs, energy conservation measures, sanitation and solid waste management, etc;

e) A six-monthly report should be generated under the signature of the authorized person/project head. The report should compare the status with baseline/pre-project conditions and evaluate the effectiveness of EMP; and

f) A post-construction environmental and social impact assessment study is to be conducted on completion of 5 years of project commissioning.

8.1 Institutional Mechanism

a) Implementation and monitoring mechanism for EMP should be established at EIA stage. A committee be formulated including experts and other stakeholders from Government and non-Government agencies and academia who can monitor the implementation of all management plans at regular intervals so that realistic execution can be ensured;

b) For each component of EMP, the mechanism should mention the responsible person/agency for implementation and responsible person/agency for checking/monitoring;

c) Project head will be overall responsible for ensuring implementation of EMP; and

d) Dedicated manpower requirement for EMP implementation or creation of Environment Management Cell should be planned and budgeted for the entire period of construction and first 3 years of project operation.

9 BUDGET AND TIMEFRAME

A summary of cost estimates for all the environmental management plans along with the time lines, which should be in synchronization with the project construction.

10 LIST OF ABBREVIATIONS

AAQMS	:	Ambient Air Quality Monitoring Standards
As	:	Arsenic
ASI	:	Archaeological Survey of India
BOD	:	Biochemical Oxygen Demand
BSI	:	Botanical Survey of India
Ca	:	Calcium
CAT	:	Catchment Area Treatment
CCA	:	Culturable Command Area
Cd	:	Cadmium
CER	:	Corporate Environmental Responsibility
CGWB	:	Central Ground Water Board
CWC	:	Central Water Commission
Cl	:	Chlorine
COD	:	Chemical Oxygen Demand
Cr	:	Chromium
Cu	:	Copper
dBA	:	A-weighted decibel Scale
DG	:	Diesel Generator
DMP	:	Disaster Management Plan
EAC	:	Expert Appraisal Committee
EIA	:	Environmental Impact Assessment
EMP	:	Environmental Management Plan
FCC	:	False Colour Composite
Fe	:	Iron
FSI	:	Forest Survey of India
GIS	:	Geographic Information System
GLOF	:	Glacial Lake Outburst Flood
GSI	:	Geological Survey of India
ha	:	Hectare
HFL	:	Highest Flood Level
HEC-RAS	:	Hydrologic Engineering Center – River Analysis System
Hg	:	Mercury
HRT	:	Head Race Tunnel
IMD	:	India Meteorological Department
IUCN	:	International Union for Conservation of Nature
IVI	:	Importance Value Index
K	:	Potassium
LPG	:	Liquefied Petroleum Gas
Mg	:	Magnesium
MoEF&CC	:	Ministry of Environment, Forest & Climate Change
MW	:	Mega Watt
Na	:	Sodium
NO_3	:	Nitrate
O&M	:	Operation & Maintenance
Pb	:	Lead
PCUs	:	Passenger Car Units
$PM_{2.5}$	:	Particulate Matter (size less than 2.5 μ)
PM_{10}	:	Particulate Matter (size 10 μ to 2.5 μ)

PO_4	:	Phosphate
RET	:	Rare Endangered Threatened
R&R	:	Rehabilitation & Resettlement
RFCTLARR	:	Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation & Resettlement
RUSLE	:	Revised Universal Soil Loss Equation
SAR	:	Sodium Adsorption Ratio
SEAC	:	State Expert Appraisal Committee
SEIAA	:	State Environment Impact Assessment Authority
SLUSI	:	Soil and Land Use Survey of India
SO_2	:	Sulphur Dioxide
SO_4	:	Sulphates
SOI	:	Survey of India
SYI	:	Silt Yield Index
Cr	:	Chromium
TRC	:	Tail Race Channel
TRT	:	Tail Race Tunnel
TSS	:	Total Suspended Solids
Zn	:	Zinc
ZSI	:	Zoological Survey of India

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Environmental Assessment and Management of Water Resources Projects Sectional Committee, WRD 24

Organization	*Representative(s)*
Central Water Commission, New Delhi	SHRI RISHI SRIVASTAVA **(*Chairperson*)**
All India Institute of Medical Science, Rishikesh	DR SUREKHA KISHORE
Central Board of Irrigation and Power, New Delhi	SHRI K. K. SINGH SHRI KAMAL KUMAR (*Alternate*)
Central Electricity Authority, New Delhi	SHRI RAJEEV VARSHNEY ASHISH KUMAR LOHIYA (*Alternate*)
Central Ground Water Board, Faridabad	DR A. ASOKAN DR G. PRAVEEN KUMAR (*Alternate*)
Central Pollution Control Board, New Delhi	SHRI VISHAL GANDHI SHRI P. K. MISHRA (*Alternate*)
Central Water Commission, New Delhi	SHRI ALOK PAUL KAISI SHRI ABHISHEK SINHA (*Alternate*)
Cetus Consulting Solutions Services Private Limited, New Delhi	DR AJAY PRADHAN DR VIVEK KUMAR SINGH (*Alternate*)
Forest Survey of India, Dehradun	SHRI SHAILENDRA KUMAR SINGH SHRIMATI EKTA SINGH (*Alternate*)
Geological Survey of India, New Delhi	SHRIMATI NEETU CHAUHAN SHRI DHARMENDRA KUMAR (*Alternate*)
Guru Gobind Singh Indraprastha University, New Delhi	DR DEEKSHA NARULA KATYAL
Hydro and Renewal Energy Department (IIT Roorkee), Roorkee	PROF S. K. MISHRA PROF M. K. SINGHAL (*Alternate*)
ICAR - Central Inland Fisheries Research Institute, Kolkata	DR B. K. DAS
India Water Partnership, New Delhi	DR VEENA KHANDURI
Indian Institute of Technology Roorkee, Roorkee	PROF BRIJESH KUMAR
Indian Space Research Organization, Bengaluru	DR S. BANDOPADHYAY
Maharashtra Engineering Research Institute, Nashik	SUPERINTENDING ENGINEER EXECUTIVE ENGINEER (*Alternate*)
Maulana Azad Medical College, New Delhi	DR NANDINI SHARMA
Ministry of Environment, Forest and Climate Change, New Delhi	SHRI MUNNA KUMAR SHAH DR SAURABH UPADHYAY (*Alternate*)

Organization	*Representative(s)*
Mu Gamma Consultants Private. Limited, Gurugram	DR GIRIJA K. BHARAT SHRIMATI AVANTI ROY BASU (*Alternate*)
Narmada Control Authority, Indore	SHRIMATI USHA DWIVEDI
Narmada Water Resources, Water Supply Department, Gandhinagar	SHRI N. R. MAKWANA SHRI V. R. RATHWA (*Alternate*)
National Hydroelectric Power Corporation, Faridabad	DR AVINASH KUMAR SHRI RAJEEV RANJAN PRASAD (ALTERNATE I) SHRIMATI SHREYA (*Alternate* II)
National Institute of Hydrology, Roorkee	DR C. K. JAIN DR PRADEEP KUMAR (*Alternate*)
National Remote Sensing Centre, Hyderabad	DR P. V. RAJU DR V. M. CHOWDARY (*Alternate*)
National Thermal Power Corporation Limited, New Delhi	DR VIJAY PRAKASH SHRI HIMAT DESUR GOJIYA (*Alternate*)
National Water Development Agency, New Delhi	SHRI R. K. JAIN SHRI S. C. AWASTHI (*Alternate*)
North Eastern Regional Institute of Water and Land Management, Tezpur	DR AMULYA CHANDRA DEBNATH DR UZZAL MANI HAZARIKA (*Alternate*)
Soil and Land Use Survey of India, Delhi	SHRI MILIND WADODKAR SHRI RANG LAL MEENA (*Alternate*)
Tehri Hydro Development Corporation India Limited, Rishikesh	DR D. L. BHATT SHRI SURAJ AGRAWAL (*Alternate*)
TERI School of Advanced Studies, New Delhi	DR VINAY SHANKAR PRASAD SINHA SHRIMATI RANJANA RAY CHAUDHARI (*Alternate*)
Water and Power Consultancy Services Limited, New Delhi	DR AMAN SHARMA SHRI A. STEPHEN LEO (*Alternate*)
In Personal Capacity (*A 66, Vrindavan Apts, Sector 6, Plot No. 1, Dwarka New Delhi - 110075*)	SHRI R. K. KHANNA
In Personal Capacity (*25/42, Vindhya Vashini Villa, Sant Vinoba Marg, New Colony, Deoria - 27400*)	DR A. K. TRIPATHY
BIS Directorate General	SHRI DUSHYANT PRAJAPATI, SCIENTIST 'E'/DIRECTOR AND HEAD (WATER RESOURCES) [REPRESENTING DIRECTOR GENERAL]

Member Secretary
SHRI VAIBHAV JINDAL
SCIENTIST 'B'/ASSISTANT DIRECTOR
(WATER RESOURCES), BIS

Preparation of Guidelines for Environmental Impact Assessment and Environmental Management Plan for Water Resources Projects Panel

Organization	*Representative(s)*
In Personal Capacity (*A 66, Vrindavan Apts, Sector 6, Plot No. 1, Dwarka New Delhi - 110075*)	SHRI R. K. KHANNA **(*Convenor*)**
In Personal Capacity (*25/42, Vindhya Vashini Villa, Sant Vinoba Marg, New Colony, Deoria - 274001*)	DR A. K. TRIPATHY
National Hydroelectric Power Corporation, Faridabad	SHRI GAURAV KUMAR
Central Board of Irrigation and Power, New Delhi	SHRI G. P. PATEL
Central Water Commission, New Delhi	SHRI N. N. RAI
Ministry of Environment, Forest and Climate Change, New Delhi	SHRI Y. P. SINGH
M/s R S Envirolink Technologies Private Limited, Gurugram	SHRI RAVINDER P. S. BHATIA

(*Continued on third cover*)

Categorization and appraisal of the projects shall be as per the procedures envisaged in the EIA notification, 2006 and its subsequent amendments.

This standard comprehensively covers the scope of IS 15845 : 2009 'Environment management plan for hydropower/irrigation/flood control/multipurpose river valley projects 'and therefore, supersedes IS 15845 : 2009.

The composition of the Committee responsible for formulation of this standard is given in Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 2016 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the website-www.bis.gov.in or www.standardsbis.in.

This Indian Standard has been developed from Doc No.: WRD 24 (23488).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones: 2323 0131, 2323 3375, 2323 9402 *Website*: www.bis.gov.in

Regional Offices: *Telephones*

Central : 601/A, Konnectus Tower -1, 6th Floor, DMRC Building, Bhavbhuti Marg, New Delhi 110002 — 2323 7617

Eastern : 8th Floor, Plot No 7/7 & 7/8, CP Block, Sector V, Salt Lake, Kolkata, West Bengal 700091 — 2367 0012, 2320 9474

Northern : Plot No. 4-A, Sector 27-B, Madhya Marg, Chandigarh 160019 — 265 9930

Southern : C.I.T. Campus, IV Cross Road, Taramani, Chennai 600113 — 2254 1442, 2254 1216

Western : 5th Floor/MTNL CETTM, Technology Street, Hiranandani Gardens, Powai Mumbai 400076 — 2570 0030, 2570 2715

Branches : AHMEDABAD, BENGALURU, BHOPAL, BHUBANESHWAR, CHANDIGARH, CHENNAI, COIMBATORE, DEHRADUN, DELHI, FARIDABAD, GHAZIABAD, GUWAHATI, HARYANA (CHANDIGARH), HUBLI, HYDERABAD, JAIPUR, JAMMU, JAMSHEDPUR, KOCHI, KOLKATA, LUCKNOW, MADURAI, MUMBAI, NAGPUR, NOIDA, PARWANOO, PATNA, PUNE, RAIPUR, RAJKOT, SURAT, VIJAYAWADA.

Published by BIS, New Delhi