No : KNNL/GRBCC D-3/PB/GB/Forest/2023-24/ 321

Dt: [1 4 JUN 2023

To,
The Deputy Conservator of Forests,
Ghataprabha Forest Division,
Gokak.

Sub: Diversion of 575.0749 Ha of Forest land for the construction of dam across Markandeya River and ancillary infrastructure in forest lands of Gokak, Godachinamalki, Konnur and Mavanura villages in Gokak and Hukkeri Taluks, Belagavi District for storing 6 TMC of water under Ghatti-Basavanna Drinking Water Supply Project by KNNL, Govt of Karnataka (FP/KA/WATER/65437/2020) –reg.,

Ref: EDS raised by MOEF&CC vide Letter No. 8-07/2023-FC dated: 15.03.2023.

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Sir,

With reference to above cited subject, compliance to the Observations raised by the Ministry along with Annexures has been uploaded in Parivesh portal and hard copy of the same is also enclosed for your kind perusal and onward consideration of the proposal for issue of Stage-I Forest Clearance for the project.

Yours faithfully,

Executive Engineer,
KNNL, GRBCC Div No-3, Gokak.
13|6|2023

Diversion of 575.0749 Ha of Forest land for the construction of dam across Markandeya River and ancillary infrastructure in forest lands of Gokak, Godachinamalki, Konnur and Mavanura villages in Gokak and Hukkeri Taluks, Belagavi District for storing 6 TMC of water under Ghatti-Basavanna Drinking Water Supply Project by KNNL, Govt of Karnataka (FP/KA/WATER/65437/2020) .

COMPLIANCE TO OBSERVATIONS OF MoEF&CC Dated: 16.03.2023

Sl No.	Observations	Action Plan
1	The PCCF letter dt 06.03.2023 mentions about per para 2.4 (i) of comprehensive guidelines of this Ministry which states that the revenue land and all such category of land not under the management and/or administrative control of Forest Dept, on which the provision of FC Act 1980 is not applicable shall be considered for the purpose of CA. Therefore the State Govt. is requested clarify whether the CA land identified for the instant proposal i. e 689.1 ha is an Non-Forest land or its any land as per para 2.4 of this Ministry Comprehensive guidelines. If the land is as per para 2.4 of this Ministry Comprehensive guidelines then the state Govt. requires to provide double the extent of such kind of land for CA i.e. 1150.148 ha instead of 689.1 ha.	The identified CA land is a Government non forest land and hence para 2.4 (i) of Comprehensive guidelines of the Ministry is not applicable and the area of around 100 ha additionally identified as buffer for survey mismatch, land disputes, illegal encroachments during implementation of the project.
2	Detailed Compensatory Afforestation scheme has not been provided by the State Govt. The same may be submitted.	DCF, Ghataprabha Division, Gokak has to prepare the Compensatory Afforestation scheme.
3	The copy of CAT plan as submitted is not approved by the Principal CCF & HoFF or any other officer authorized by him for the purpose as prescribed under the Chapter-9 at para 9.2 (vi) of Comprehensive guideline Handbook, 2019. The same needs re-submission.	Catchment Area Treatment Plan is uploaded in Form-I under Additional Information in Parivesh Portal and also enclosed as **Annexure-1** and DCF, Ghataprabha Division, Gokak has to approve the CAT plan and forwarded to PCCF and HOFF for approval.
4	As per the landuse plan an area of 12.95 ha is proposed for Dam office & guest house (4.50 ha) and Dam view point (8.45 ha) which are non-site specific activity. In this regard appropriate justification and the details of alternative lands identified for the said purpose may be submitted.	Since the proposed dam is in the forest land and also the height of dam being very high, it is necessary to provide Dam Office and Guest house near dam considering Dam Safety Measures for continuous monitoring, operation and maintenance of the Dam including watch tower at higher elevation from where submergence and spillway portion can be watched continuously. On study of topo sheet,

Executive Engineer,
Karnataka Neeravari Nigam Ltd
G.R.B.C.C. Dn. No-3. GOKAK

Sl No.	Observations	Action Plan
		the highest land available is on the right flank where the above activity can be controlled. There is no alternative non forest land is available near Dam location on highest point for these activities which are very much essential for the project. Hence, Dam office, Guest House and Dam View Point is proposed near dam on highest point. Dam View Point is an open area with a watch tower for controlling the operations including early response as a part of disaster management. The Dam view point will be used for assembling the people during Disaster (Safe Assembly Point) and also for safe evacuation. During major disaster, people can't be shifted towards downstream since it will be under heavy floods and the evacuation has to be done to a higher elevation and hence this location has been selected.
5	As per the land use plan a component namely Utility is proposed for 1.054 ha. In this regard the State Govt. may clarify for what purpose the area is sought for.	Utility component comprising of approach road to Dam site and to negotiate with the ridge level near entry to the dam site, a curve has been proposed to turn around for the entry of vehicles.
6	Component wise area of the proposed forest land is submitted. However, Component-wise KML of 575.0749 Ha of proposed Forest land is not available on PARIVESH. The same requires submission.	Component wise KML is uploaded in Form-I under section 'C' of Parivesh Portal and also and enclosed in CD as **Annexure-2.**
7	It has been informed by PCCF (HoFF) that an area of 0.27 Ha of Nirvaneppa Temple located in Sy No. 410 of Gokak village and Taluk will be submerged after the project is completed. In this regard the measures taken for shifting the temple to another location may be furnished and the comments in this regard may be furnished by State Govt.	Nirvaneppa Temple is located in Sy No. 410 of Gokak village and Taluk and it will be submerged after the project is completed. Nirvaneppa Temple is a historic Temple which has developed sentiments with local population. Several devotees visit the Temple frequently. During the site inspection and interaction, it was informed to the project authorities that the relocation of Temple will not be permitted. Hence, project authorities have decided to keep the location at its original place with good accessibility without shifting the location to another location with suitable water retaining structure as constructed in 'Kudalasangama', Karnataka. The proposed arrangement is

Sl No.	Observations	Action Plan
		acceptable to the Temple Authorities including the devotees and hence the same has been proposed in the project. NOC obtained from the Tahsildar, Gokak Taluk is uploaded in Form-I under Additional Information in Parivesh Portal and also enclosed as **Annexure-3.**
8	As per the details provided in part-II certain schedule-I species have been reported in the area. In this regard comments and recommendation of CWLW Govt. of Karnataka on the likely impact of the project on the movement of wildlife and the applicability of NBWL Clearance is required.	The occurrence of Schedule-I species is rare and no confined habitat available in the proposed forest areas. Hence, NBWL approval is not required. However, mitigation measures as suggested by the Karnataka Forest Department will be implemented.
9	It is observed from the DSS analysis that Ghataprabha Bird sanctuary is located at an approx. aerial distance of 5.10 km from the proposed forest land. In this regard comments and recommendation of CWLW Govt. of Karnataka on the applicability of NBWL Clearance is required. The State Govt. may also provide the details (notification and KML files) of ESZ wrt Ghataprabha Bird sanctuary.	As per MOEFCC OM Dt: 17.05.2022, the project do not find place in the Schedule of EIA Notification, 2006 and its amendments and PA boundary at 3.10 Km and ESZ of Ghataprabha Bird Sanctuary is 2.94 Km away from the project site. Hence, NBWL recommendation is not required as per the aforementioned OM of MOEFCC.
10	Based on the observation on Google Earth agriculture land, settlement and road are visible in the proposed area for diversion. In this regard the State Govt. is requested to offer its comments whether any violation of FC Act 1980 had taken place or there are any encroachments reported.	No construction activities started at site and hence there is no violation of FC Act, 1980
11	The State govt. may also specify whether the dam to be constructed will be an earthen dam or otherwise.	The proposed dam is Concrete Gravity Dam
12	The plan with details for further distributing the water and involvement of forest land in the same may also be submitted.	The Project envisages the construction of water storage reservoir only. Doesn't involve any distribution network. However, water for the drinking purpose will be released to the river throughout the year through the river sluice gates proposed in the dam. Same will be tapped through the existing Jackwell points located along the downstream of the dam and will be supplied for drinking water after suitable water treatment through existing water supply distribution network of local bodies such as City Municipal Corporation, Karnataka Urban Water

Sl No.	Observations	Action Plan
		Supply and Drainage Board and Zilla Panchayath. No forest land is involved in distributing the water. Water Treatment Plant is proposed in private land (Non Forest Land).
13	Out of 575.074 ha of forest land involved 519.68 ha is going to get submerged however rest of the land is being taken for other activities. The State Govt. may clarify that whether these facilities may be constructed on non-forest land	The entire project lies in a forest land. Therefore there is very less non forest land is available near the dam and is already taken for possible activities. Because of unavoidable and dam safety point of view, some of the activities which are very much essential for the project need to be taken in forest land only.
14	Details of 3 identified alternatives sites with their KML files along with no. of trees proposed for felling against each alternate forest land may be submitted with appropriate justification for identifying the forest land for diversion.	As per the suggestion, details of 3 Alternative sites in PDF format are uploaded in Form-I Section 'D' of Parivesh Portal. KML files of Alternatives are enclosed in CD as **Annexure-4.** Tree enumeration for the alternatives will be calculated by DCF, Gokak.
15	As per the details in Part-I (form A) User Agency has requested for total period for which the forest land proposed to be diverted as 50 years but the PCCF(HoFF) & Nodal Officer has recommended for only 20 years. The State govt. may provide its comments in this regard.	PCCF, Karnataka Forest Department has to provide compliance
16	Ministry vide its guideline dated 6.01.2022 read with 28.03.2022 has revised the rates to NPV. The new rates are applicable in the instant proposal. In this regard, State Government is requested to submit the revised C:B ratio as per the new NPV rates.	Revised C:B Ratio considering recent NPV rates is uploaded in Form-I under Section 'G' in Parivesh Portal and also as **Annexure-5.**
17	The State govt. is requested to submit the approved DPR of the instant project.	Approved DPR is uploaded in Form-I under Additional Information in Parivesh Portal and also enclosed as **Annexure-6.**
18	The Ministry on 28.06.2022 has notified the Forest (Conservation) Rules, 2022 and The FC Rules 2022 is applicable in the instant proposal. In this regard as per this Ministry's guideline Dt 14.11.2022 the State Govt. is requested to submit the minutes of the meeting of Project Steering Committee w.r.t the instant proposal.	PCCF, Karnataka Forest Department has to convene a Project Steering Committee meeting.

Executive Engineer,
Karnataka Neeravari Nigam Ltd
G.R.B.C.C. Dn. No-3. GOKAK

Annexure 1

CATCHMENT AREA TREATMENT PLAN

Prepared for

GHATTI BASAVANNA DRINKING WATER PROJECT

"Construction of Ghatti Basavanna Dam across Markandeya River in Gokak Taluk, Belagavi District, Karnataka".

Project By

KARNATAKA NEERAVARI
NIGAM LTD.

KARNATAKA NEERAVARI NIGAM LIMITED

(A Government of Karnataka Undertaking)

MAY 2023

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1. Introduction

It is well established fact that reservoirs formed by diversion structures on rivers are subjected to sedimentation. The process of sedimentation embodies the sequential processes of erosion, entrainment, transportation, deposition and compaction of sediment. The study of erosion and sediment yield from catchments is of utmost importance as the deposition of sediment in reservoir reduces its capacity, and thus affects the water availability for the designated use. The eroded sediment from catchment when deposited on streambeds and banks causes braiding of river reach. The removal of top fertile soil from catchment adversely affects the agricultural production. Thus, a well- designed Catchment Area Treatment Plan is essential to ameliorate the above mentioned adverse process of soil erosion.

Soil erosion may be defined as the detachment and transportation of soil. Water is the major agent responsible for this erosion and it as to be studied as a part of catchment area treatment (CAT) Plan. The soil erosion leads to:

- Loss of production potential
- Reduction in infiltration rates
- Reduction in water holding capacity
- Reduction in water supply

The catchment area treatment plan highlights the management techniques to control erosion in the catchment area of a water resource project. The life span of a reservoir is greatly reduced due to erosion in the catchment area. Adequate preventative measures are thus needed for the treatment of catchment for its stabilization against future erosion[1].

2. Importance of Catchment area treatment

A healthy water catchment provides high-quality drinking water and supports livelihoods such as agriculture, recreational angling, and water

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[1] Draft EMP Report Par HEP of Catchment area treatment plan by KVK Par Power Pvt. Ltd.

sports. It also supports local ecosystems so plants, animals, fish, and insects that depend on having healthy water can thrive and flourish.

As per Chapter-9 (Page No. 80-81) of Handbook of guidelines for effective and transparent implementation of the provisions of Forest (Conservation) Act, 1980 issued by Ministry of Environment, Forest and Climate Change (MOEF&CC), Government of India, 2019, states that, "*the CAT plan is an important and essential plan for enhancing and maintaining the ecological health of the catchment area of the proposed irrigation/ hydroelectric project through site-specific biological and engineering measures for conservation of soil & moisture and management of water regime. Among other provisions, the measures should focus on arresting soil erosion, improving effective drainage in the area and rejuvenation of the degraded eco system in the catchment*"[2].

2.1 Objectives of the CAT

- Understanding the catchment and estimation of soil loss.
- Soil & water conservation by construction of check dams, gully plugging, gabion dams, contour trenches and vegetative structures.
- Plantation of local indigenous tree and shrub species, including rare/medicinal plants.
- Fodder development on the civil/ soyam forest or on revenue/private lands in order to meet the requirement of fodder/small timber/fire wood for the local population with a view to reduce pressure on the natural ecosystem.
- Socio-economic component like supply of CNG connections to the adjoining villagers to reduce burning of fuel wood.
- The infrastructure component like construction of Office buildings for forest staff and Vehicles to Forest Department for monitoring.

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[2] Handbook of guidelines for effective and transparent implementation of the provisions of Forest (Conservation) Act, 1980 issued by Ministry of Environment, Forest and Climate Change (MOEF&CC), Government of India, 2019

3. About the project

3.1 Ghatti Basavanna Drinking Water Project

The Ghatti Basavanna Drinking Water Project is a project undertaken by the Government of Karnataka to improve drinking water supply needs of Gokak town and surrounding villages including Hukkeri Taluk, Bhailahongla Taluk and Savadatti Taluk. The project also envisages filling up of MI tanks and providing water to industrial needs. The Ghatti Basavanna Drinking Water Project involves diversion of west flowing Markandeya River in Gokak by construction of diversion dam across the river. It is proposed to store 6 TMC of water during monsoon season. The project is exclusively proposed for providing drinking water facilities to Gokak town and surrounding villages including Hukkeri Taluk, Bhailahongla Taluk and Savadatti Taluk.

The project requires a total land of 638.08 Ha. Out of which, forest area is 575.07 Ha (including submergence) and Private area is 63.01 Ha. The private land will be acquired as per the Right to Fair Compensation and Transparency in Land Acquisition Act, 2013. Whereas, the forest land will be diverted as per the provisions of Forest (Conservation) Act, 1980. The total cost of the project is Rs. 990 Crores.

3.1.1 Objective of the project

Ghatti Basavanna Reservoir project will have a storage capacity of about 6.00 TMC. The proposed project is envisaged to address the following **Objectives:**

- To facilitate in creating storage to meet the Drinking water requirements of Gokak town and surrounding villages, taluks in the Ghataprabha Basin within Karnataka.
- To meet the industrial water requirement in and around Gokak Taluk.
- To feed selected tanks in and around Gokak town to facilitate sustaining livestock and recharging of ground water.
- To protect the Gokak town from inundation during peak floods in Markandeya River.

3.1.2 Need for the project

Gokak is a Taluk headquarters in the Belagavi District of Karnataka state, India. It is located around 70 Km from Belgaum at the confluence of two rivers, the Ghataprabha and the Markandeya. The population of the town according to 2011 census is approximately 135,773.

- Gokak town and its surrounding villages are facing acute drinking water shortage and mostly depended on bore wells to meet their requirements.
- Estimated population of the Gokak town and adjoining 3 towns as per census 2011-12 is 1, 35,715.
- Besides there are nearly 131 number of villages with an estimated population of 4, 76,448.
- Bhailahongla, Saudatti and Hukkeri taluks are also having acute drinking water problems.
- Considering the growth for next 40 years, the estimated drinking water needs will be 2.76 TMC, which includes livestock requirements.[3]

The only nearest source of surface water is Markandeya river. Unfortunately, the river is seasonal and the rainfall is erratic and hence cannot be considered for harnessing the same without storage. Hence construction of a Dam is inevitable to meet the long term objective of proving drinking water from an assured source.

3.2 Project Components

The project construction activities include seating of Dam, retaining wall, construction of dam office, guest office, view point, WTP, Colony, approach roads, steps, rehabilitation centre, etc. across Markandeya river.

Table 3.1 The Details of the Dam[3]

Sl. No.	Particulars	Details
1	Water levels (EL m.)	
	Maximum Water level (MWL)	618.00 m
	Full Reservoir level (FRL)	618.00 m
	Minimum Draw Down Level (MDDL)	566.00m
2	Others	566.00 m (River) sluice)
3	Dead Storage Level	566.00m (0.30 TMC)
4	Free Board (m)	3.00 m
5	Wave height (m)	0.94 m
6	Live Storage (M.cum)	5.74 TMC (162.50 MCM)
7	Capacity (M.cum)	
	Maximum Water Level	618.00 m
	Full Reservoir Level	618.00 m
	Minimum Draw Down Level	565.50 m
	Dead Storage Level	564.00 m

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[3] DPR Vol I Ghatti Basavanna Drinking Water Project Prepared By EI Technologies Pvt Ltd., June 2020.

4. Study Area

Fig 4.1 Catchment Area Map[4]

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[4] DPR Vol III Ghatti Basavanna Drinking Water Project Prepared By EI Technologies Pvt Ltd., June 2020.

4.1 The River Markandeya

Markandeya River (Tributary of Ghataprabha) originates in Bailur village of Khanapur Taluk at an elevation of 927.000 M above mean sea level, in the state of Karnataka (Western Ghats). The river enters Belagavi Taluk on northern side and further flows towards eastern side of the Belagavi city and it is a tributary of Ghataprabha River, Krishna Basin. Markandeya River has a Length 106 Km from origin till it joins Ghataprabha River. It runs for 72 Km in Belagavi Taluk, 21 Km length in Hukkeri Taluk and 13 Km length in Gokak Taluk.

Bellary Nala originates near Yellur village in Belgaum Taluk and is a tributary to Markandeya River. The length of the Nala up to its confluence with Markandeya river is 57 Km.

4.2 Catchment area

The catchment area of the river Markandeya from the origin to the present dam site is 1016.120 Sq. km.

In the present studies the Independent catchment area (i.e., 210 Sq. Km) is considered.

5. Characteristics of catchment

5.1 Soil

The description of Soil type in the catchment area is based upon the Soil map Fig 5.1. There are 4 types of soil observed in the study area i.e.,

1. Very deep, well drained cracking clay soils on slide slopes of plateau, valleys and undulating plains, with moderate erosion: associated with: moderately deep, well drained, clayey soils.

2. Very shallow, well drained, gravelly clay soils with very low AWC on gently sloping plains with moderate erosion: associated with: very deep, well drained, clayey soils.

3. Very shallow, well drained, loamy soil with very low AWC in valleys, with moderate erosion: associated with very deep, well drained, clayey soils.

4. Extremely shallow, excessively drained, loamy soils with stoniness on ridges, with severe erosion: associated with: moderately shallow, well drained, clayey soils with very low AWC.
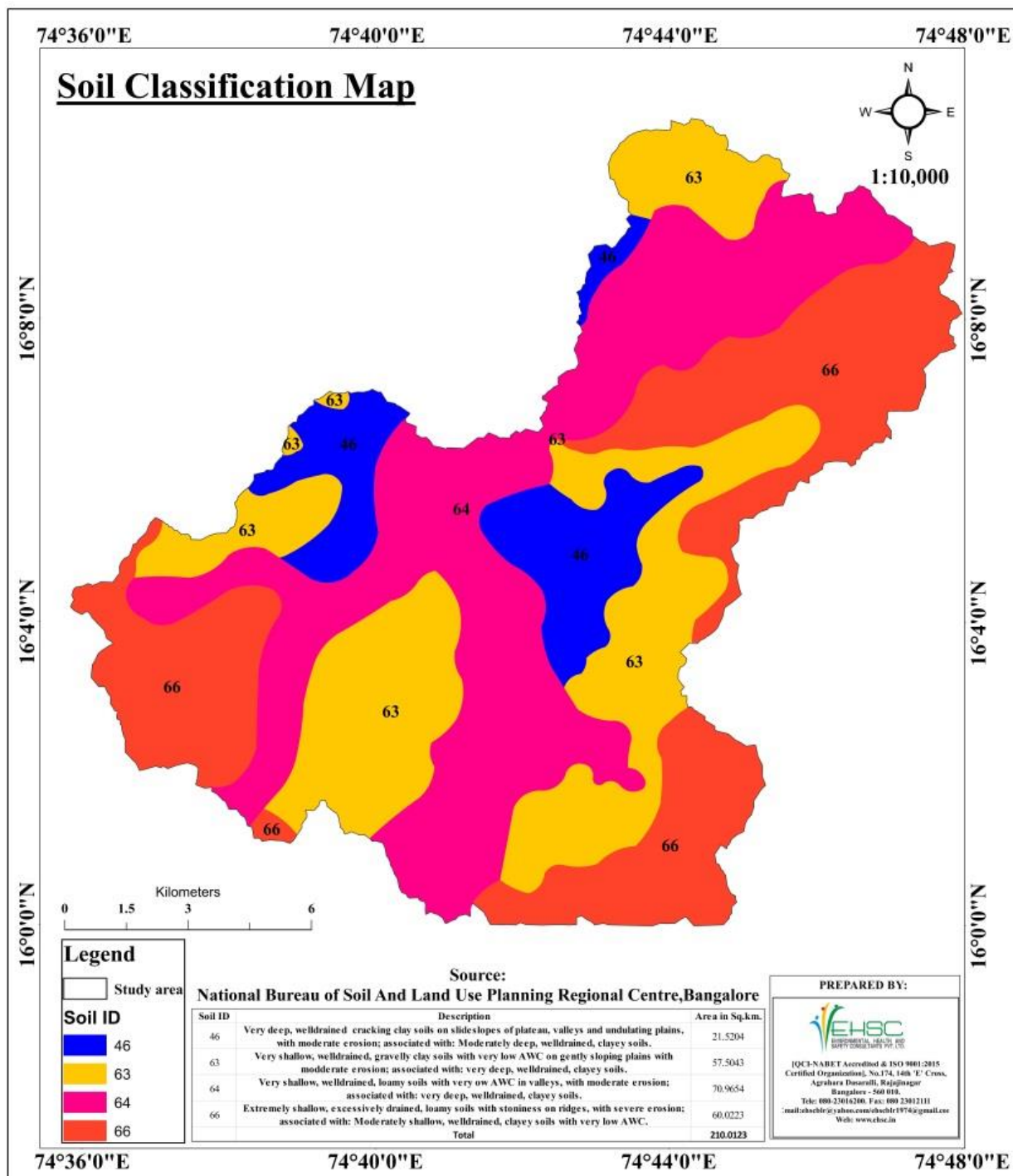
Fig 5.1 Soil Classification Map of the Catchment area

5.2 Drainage

The drainage Pattern of the catchment area of the river Markandeya shows a total of 5 stream orders as shown in the fig 5.2.
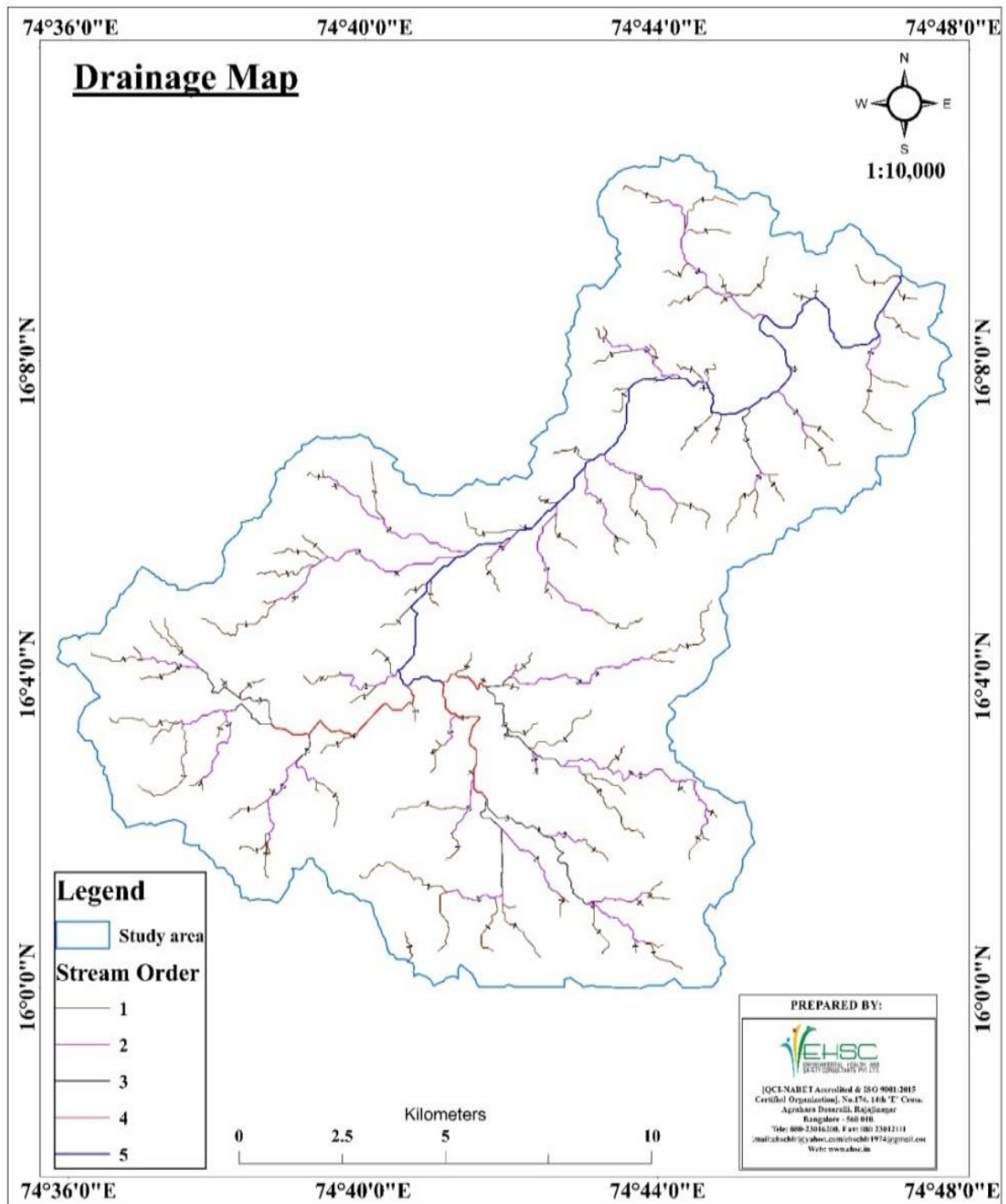
Fig 5.2 Drainage Map of the Catchment area of the Dam

5.3 Elevation

Elevation in the Catchment area ranges from El. 796 m to 1025 m above MSL. However, the Elevation in the Catchment area ranges from 473 to 717m as shown in the Fig 5.3
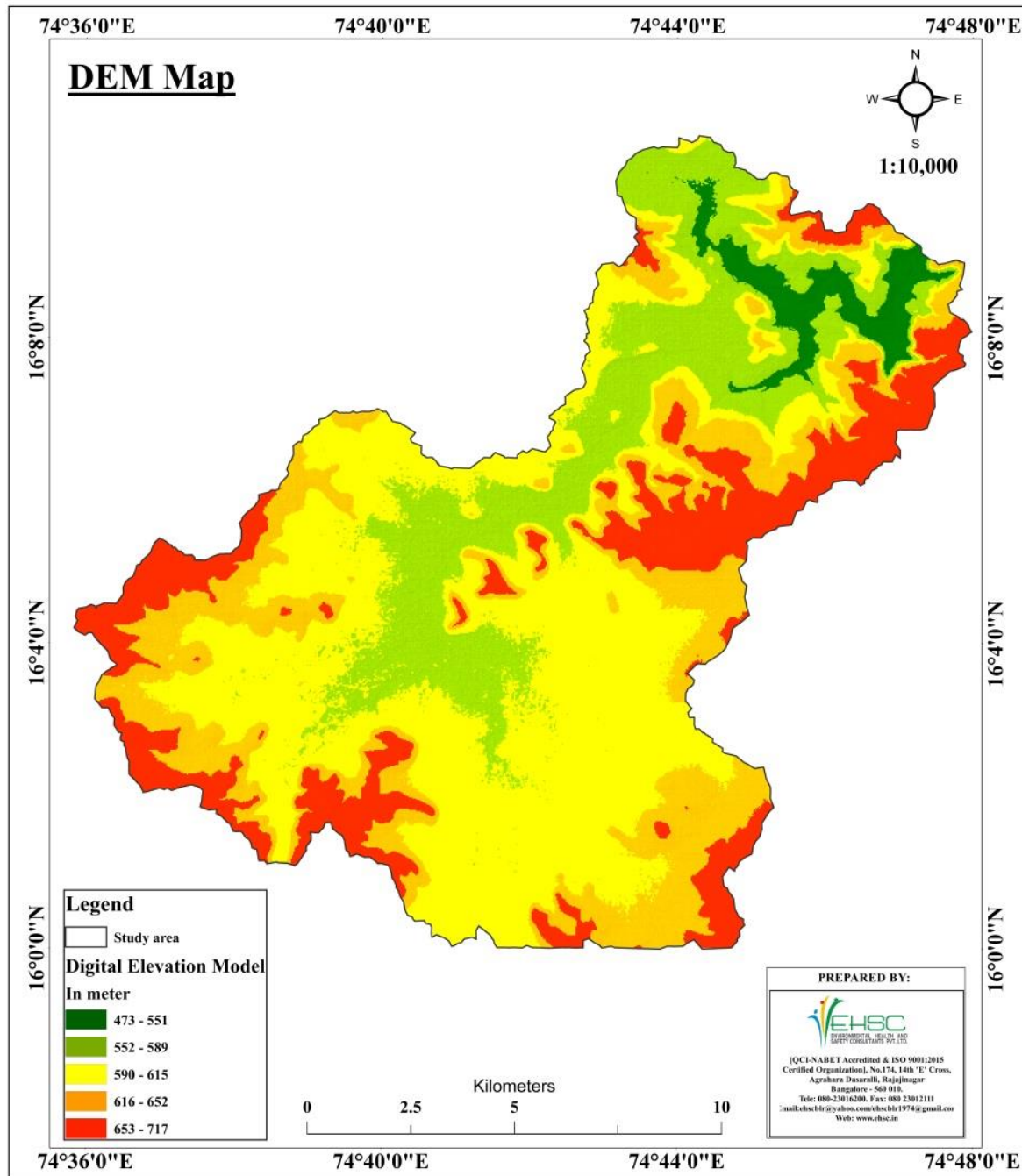
Fig 5.3 Elevation Map of the Catchment area

5.4 Watershed

Based on the Watershed map, total 12 Micro- watersheds are observed in the Catchment area.
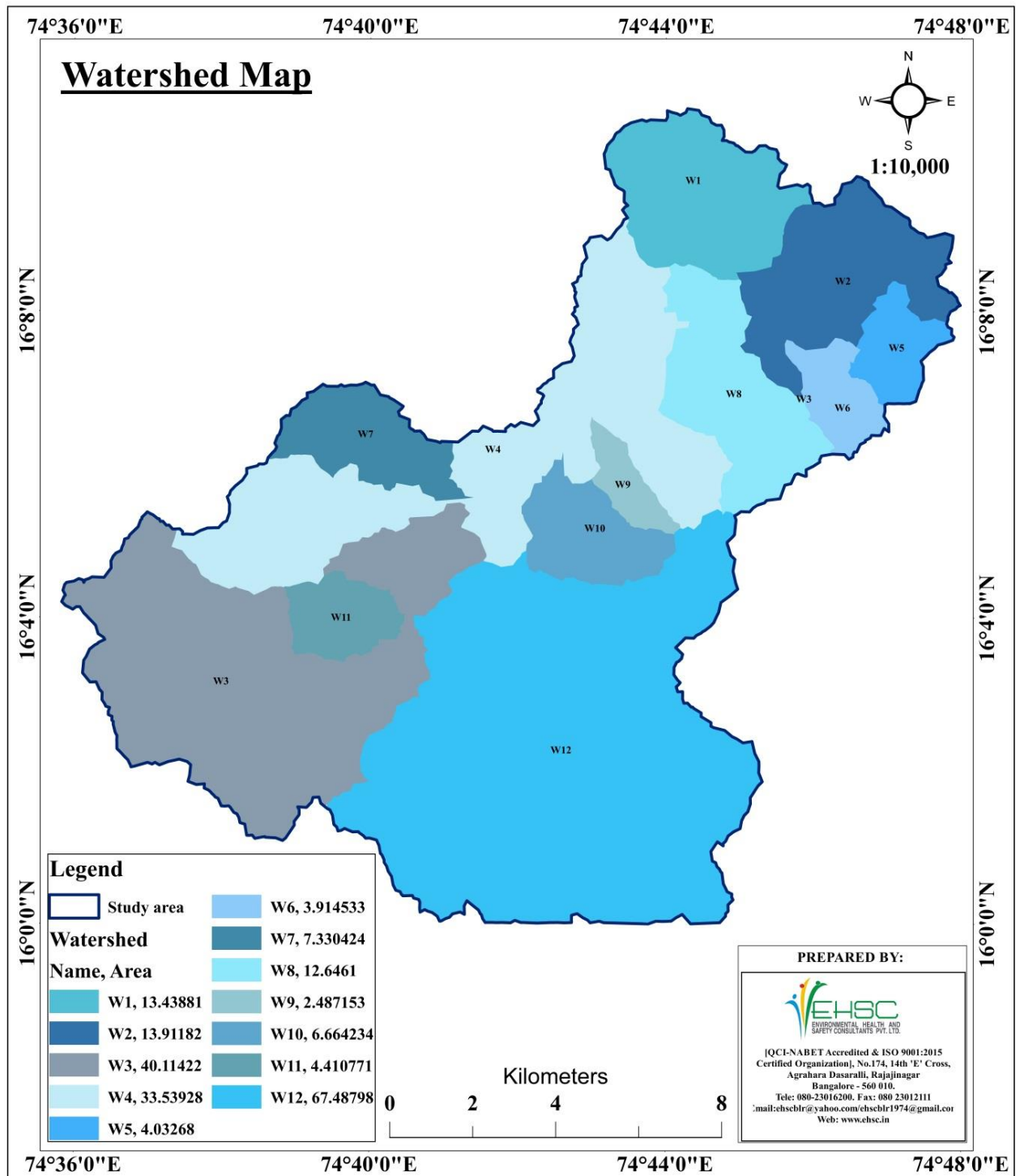
Fig 5.4 Watershed Map of the Catchment area

Table 5.1 Watershed area Details

Sl. No	Watershed Code	Watershed area (Sq. Km)
1	W1	13.43881
2	W2	13.91182
3	W3	40.11422
4	W4	33.53928
5	W5	4.03268
6	W6	3.914533
7	W7	7.330424
8	W8	12.6461
9	W9	2.487153
10	W10	6.664234
11	W11	4.410771
12	W12	67.48798
	Total	**209.978005**

5.5 Land Use and Land cover

The land use and land cover of the entire catchment area consisting of following classes agriculture land (43.58%), Reserve Forest(43.05 %), Sparse vegetation(5.14%), built up(3.29%), Fallow land (3.10 %) and waterbody (0.52%).
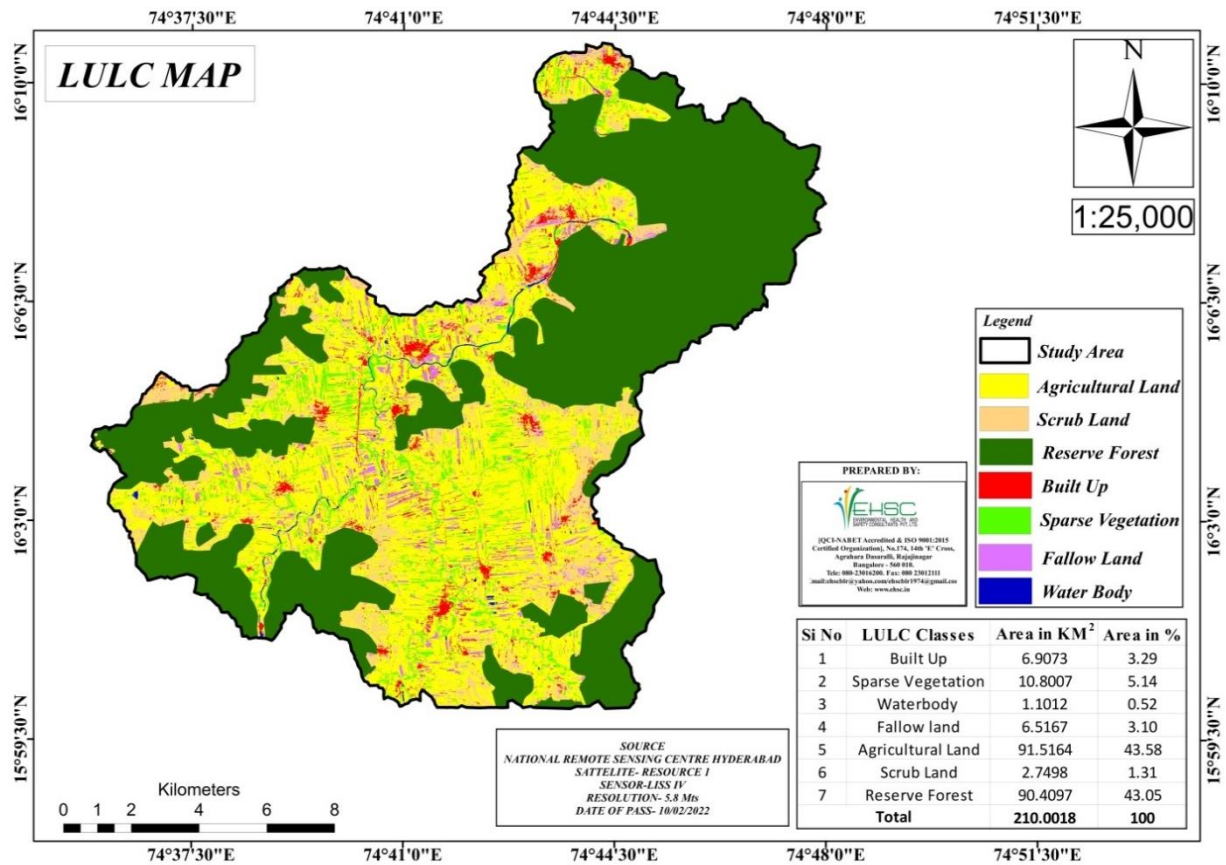
Fig 5.5 Land Use & Land Cover Map of the Catchment area

Table 5.2 Land use and Land cover classification

Sl. No.	LULC Class	Area in Sq. Km	Area in %
1	Built Up	6.9073	3.29
2	Sparse Vegetation	10.8007	5.14
3	Water body	1.1012	0.52
4	Fallow Land	6.5167	3.10
5	Agriculture Land	91.5164	43.58
6	Scrub Land	2.7498	1.31
7	Reserve Forest	90.4097	43.05
	Total	**210.0018**	**100**

6. Materials and methods

A catchment characteristic has been collected through secondary data and forest working plan. Estimation of soil loss in the catchment area has been calculated using Universal Soil Loss equation. Further, using the publications of All India Soil Survey and Land Use Board Watershed boundaries has been demarcated and based on the site conditions and

requirements of MOEF&CC, engineering and biological remedial measures were suggested. Detailed analysis of estimation of soil loss in the study area is given below;

6.1 Estimation of Soil Loss

A number of methods for assessing soil loss have been developed. They range from simple, qualitative models to elaborate watershed simulations. Qualitative models rely on subjective evaluation of a series of criteria. Watershed simulation models are often very theoretical. Several empirical models also are available and most models are best suited for estimating erosion from very large areas (more than 1 sq mile) and lack precision for use on small sites such as construction sites. The universal soil loss equation (USLE) is given by,

$$\textbf{A = RKLSCP --------- Eqn (1)}$$

Where,

- A = is computed Soil loss per unit area expressed in the units selected for K and for the period selected for R. In practice, these are usually so selected that they compute A in m tons /ha/year, but other units can be selected.
- R = the Rainfall erosivity, is the number of rainfall erosion index units for a particular location.
- K = the Soil erodability is the soil loss rate per erosion index unit for a specified soil as measured on a unit plot, which is defined as 21.13 mtr (72.6 ft.) length of uniform 9 percent of slope continuously in cleaned tilled fallow.
- L = The Slope Length factor, is the ratio of soil loss from the field slope length to that from 21.13 mtr (72,6 ft.) under identical conditions.
- S = the slope steepness factor, is the ratio of soil loss from field slope gradient to that from a 9 percent of slope under otherwise identical conditions.

- C = the Cover and management factor is the ratio of soil loss from an area with specified cover and management to that from an identical area in tilled continuous fallow.
- P = the support practice factor, is the ratio of soil loss with a support practice like contouring, strip cropping or terracing to that with straight row farming up and down the slope.

6.2 Erosion Index (EI30) Values on Storm Basis

The rainfall erosion index R is a measure of the erosive force and intensity of rain in a normal year. The two components of the factor are the total energy E and the maximum 30-minutes intensity (I_{30}) for all the storms in an area during an average year. Values of R have been computed for the various regions in India and abroad from rainfall records and probability statistics, and hence R should not be considered as a precise factor for any given year or location.

The energy of the rainstorm is a function of the amount of rain and all the storms component intensities. Median raindrop size increases with the rain intensity and terminal velocities of free falling water drops increases with increased drop size. Since the energy of the given mass in motion is proportional to velocity-squared, the rainfall energy is directly related to rain intensity. The relationship in metric units is expressed by the equation, where KE is the kinetic energy in metre tones / ha-cm and is the rainfall intensity in cm /hr.

The index values (EI_{30}), for each storm was determined. The product term EI was expressed as:

EI_{30} = (KE x I_{30}) / 100 ----------- Equation (2)

Where,

- EI30 = Erosion Index
- KE is Kinetic Energy of the storm
- I30 = maximum 30 minutes Rainfall intensity of the storm

For computing Kinetic Energy of Rain storm the equation proposed by Wishmeier (1959) is

KE=916+331 log I ------------------Equation (3)

Where,

- KE = Kinetic Energy of the storm in foot tons per acre inch and
- I = Rainfall intensity in inch per hour

The Equation (2) has been modified into metric units by Wishmeier & Mannering (1965) and Ranganath, et al., (1970) the equation in metric units is:

KE = 210.3 + 89 log I ---------- Eqn (4)

Where,

- EI30 is the erosion index
- KE is the total storm kinetic energy in tonnes – m/ha
- I30 is the maximum 30 minutes intensity of rainstorm.
- The monthly, seasonal and yearly EI values will be determined by adding the storm EI values for that length of period.

6.3 Soil Erodibility Factor (K)

The soil Erodibility factor K is a measure of the susceptibility of soil particle detachment and transport by rainfall and runoff. Texture is the principal factor affecting K, but structure, organic matter and permeability also contribute K values ranging from 0.45 to 0.59.

6.4 Nomograph Method

The United States Department of Agriculture (1978) has suggested a Nomograph and the following equation for the determination of soil erodability for soils containing less than 70% silt and very fine sand:

100K = 2.1M1.14 x 10-4 (12-a) +3.25 (b-2) +2.5(c-3) -------- Eqn (5)

Where,
- K is the soil erodability factor,

- M is the particle size parameter which is equal to: (percent silt + very fine sand) / (100% clay),
- 'a' is the percentage of organic matter content,
- 'b' is the soil structure and
- 'c' is the profile permeability class.

The preferred method for determining K values is the Nomograph method. Use of the Nomograph requires a particle size. The soil samples collected from the field were characterizes carefully for estimating, the K values.

6.5 Determination of LS

Since the LS factor has a considerable effect on predicted erosion, care in figuring values for the factor is warranted. In particular, results of the soil loss calculation will be more accurate if the USLE is individually applied to portions of a site with similar slopes (similar gradient and length) and summing the individual soil loss estimates. Slope gradient is the field or segment slopes, usually expressed as percentage. The topographic component, LS, was evaluated by using the contour length method for large watersheds.

LS was calculated based on the following equation

$$LS = (L)m / 22.1(0.065 + 0.0454S + 0.0065 S2) \text{ --------- Eqn (6)}$$

Where,
- LS = Average length slope component
- L = Slope length in meters
- S = Average watershed slope in percent and
- m = Exponent (m= 0.2 if slope < 1%)

6.6 Evaluation of Cropping Management Factor (C)

The cover factor C is defined as the ratio of soil loss from land under specified crop or mulch conditions to the corresponding loss from tilled, bare soil. In the USLE, the C factor reduces the soil loss estimate according to the effectiveness of vegetation and mulch at preventing detachment and transport of soil particles. On activity sites, recommended control practices

include the seeding of grasses and the use of mulches. These measures are often considered "temporary" -they are designed to control erosion primarily during the activity period. Permanent landscaping may be added later, or temporary erosion control plants may be left as a permanent cover. Any product that reduces the amount of soil exposed to raindrop impact will reduce erosion.

The cropping management factor, C is computed as follows:

C= Σn Ci Ai / A ------- Eqn (7)

Where,
- C is the cropping management factor for the watershed
- Ci is the cropping management factor for crop i,
- Ai is the drainage basin area growing crop i with a particular management level,
- n is the number of land use areas in the watershed, and
- A is total watershed area.
- Evaluation of Support Practice Factor (P)

The erosion control practice factor P is defined as the ratio of soil loss with a given surface condition to soil loss with up and down hill ploughing. Practices that reduce the velocity of runoff and the tendency of runoff to flow directly down slope reduce the P factor. In agricultural uses of the USLE, P is used to describe ploughing and tillage practices.

In activity site applications, P reflects the roughening of the soil surface by tractor treads or by rough grading. In computing the P factor, land cover conditions are considered depending upon the cultivated and uncultivated area of the watershed. In addition, slope is also considered as a key factor in assigning the value. For the study area, a P factor considered is 0.6 for terraced agricultural land having slope less than 2% and for the rest of the land having a slope more than 2%, a value of 0.5 is assigned.

7 Results and Discussions

7.1 Slope Map

The slope map of the study area is given in Fig 7.1. As seen from the map and table nearly 54.16 % of the study area is Very Gentle sloping, 28.29 % of gentle sloping and 10.73 % of moderate sloping of the total area catchment area.

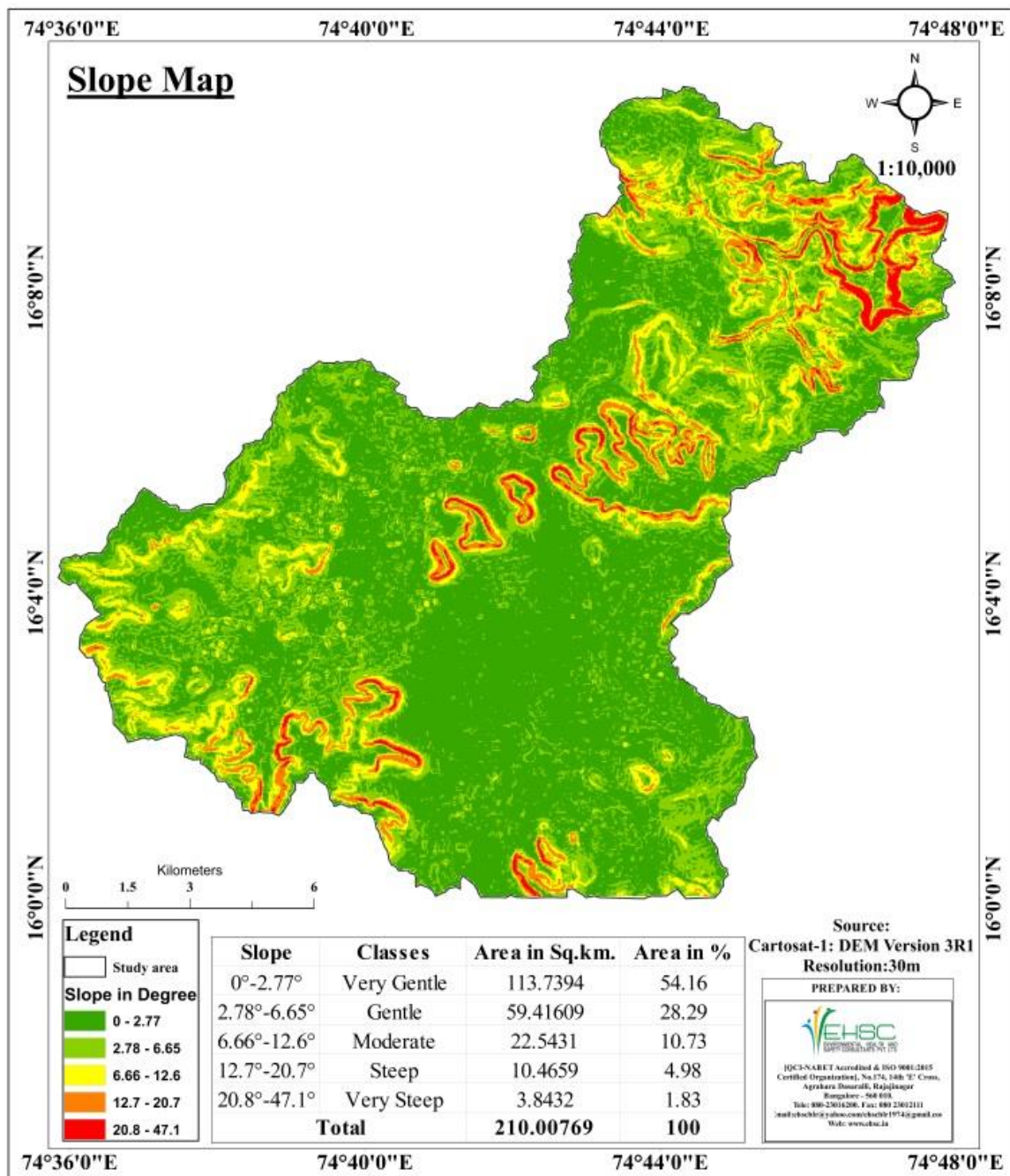| Slope	Classes	Area in Sq.km.	Area in %
0°-2.77°	Very Gentle	113.7394	54.16
2.78°-6.65°	Gentle	59.41609	28.29
6.66°-12.6°	Moderate	22.5431	10.73
12.7°-20.7°	Steep	10.4659	4.98
20.8°-47.1°	Very Steep	3.8432	1.83
	Total	210.00769	100

Fig 7.1 Slope Map of the Catchment area

19

7.2 Soil erosion

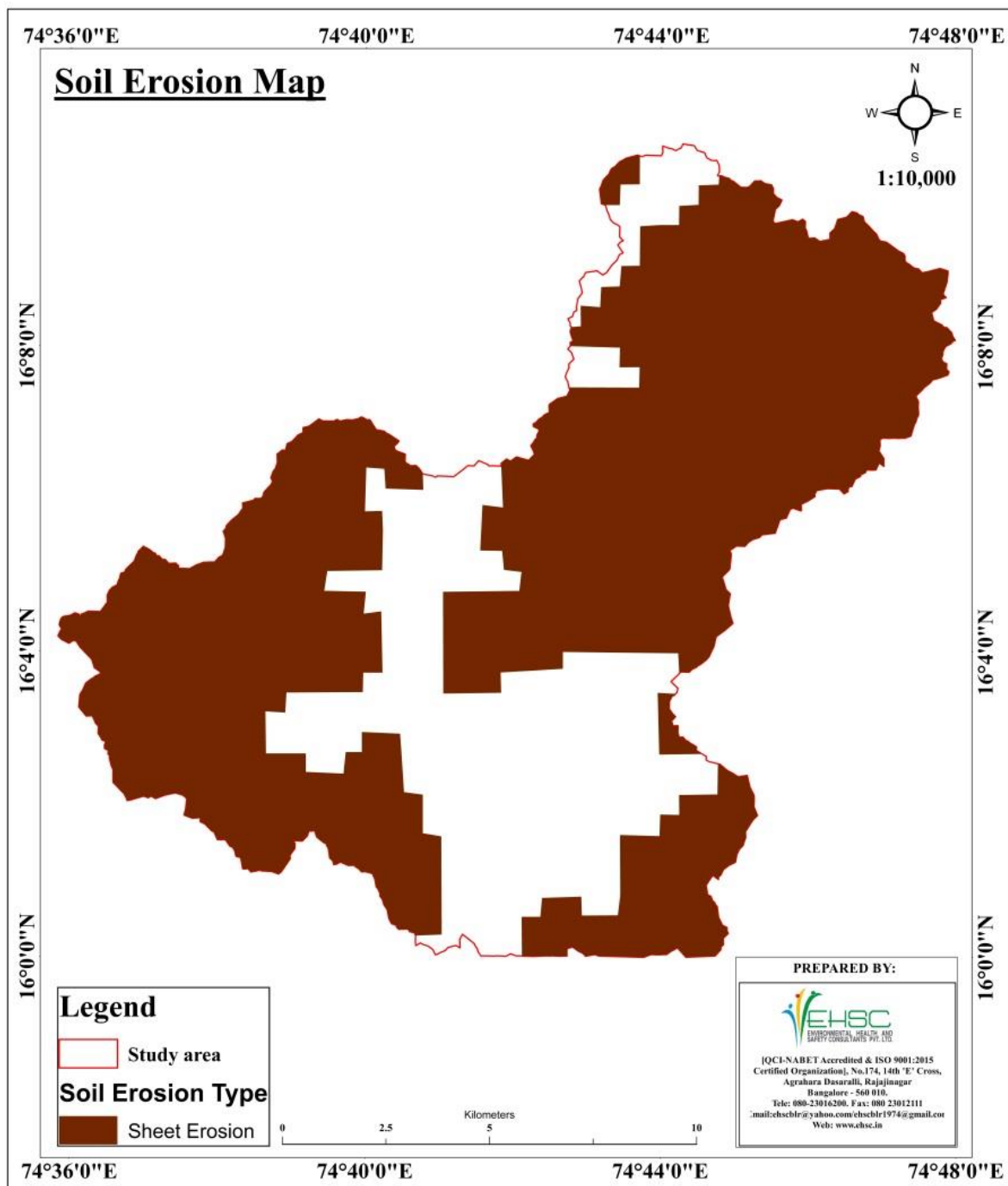Based on the soil erosion map, the study area is prone to 'Sheet Erosion' type.

Fig 7.2 Soil Erosion map of the Catchment area

7.3 Watershed details

Table 7.1 Sub catchment/Watershed of the Catchment area

Sl. No	Watershed Name	Watershed Code
1	Markandeya	4D5D6

Table 7.2 Watershed classification of study area

Region	Basin	Catchment	Sub catchment	Watershed	Sub Watershed	Micro watershed
Bay of Bengal (4)	Krishna (4D)	Meet Krishna above confluences with Bhima(4D5)	Ghataprabha (4D5D)	Markandeya (4D5D6)	4D5D6t	4D5D6t1
						4D5D6t2
					4D5D6b	4D5D6b3
						4D5D6b4
					4D5D6a	4D5D6a2
						4D5D6a3
						4D5D6a4
					4D5D6c	4D5D6c3
					4D5D6n	4D5D6n1
						4D5D6n2
						4D5D6n3
						4D5D6n4

Upon considering the above classification data, soil loss has been estimated as give below:

Table 7.3 Estimation of soil loss in Watersheds in the proposed study area

Sl. No	Watershed	R	K	LS	C	P	A(Tons/ha)
1	4D5D6t1	1.62	0.47	0.461	0.192	0.7	0.047
2	4D5D6t2	1.42	0.49	0.491	0.232	0.6	0.048
3	4D5D6b3	1.52	0.43	0.458	0.212	0.56	0.036
4	4D5D6b4	1.43	0.42	0.4	0.186	0.8	0.036
5	4D5D6a2	1.62	0.62	1.523	0.381	0.6	0.350
6	4D5D6a3	1.96	0.32	0.523	0.173	0.75	0.043
7	4D5D6a4	2.18	0.53	0.133	0.173	0.8	0.021
8	4D5D6c3	1.84	0.46	0.447	0.23	0.75	0.065
9	4D5D6n1	1.86	0.41	0.272	0.22	0.6	0.027

Sl. No	Watershed	R	K	LS	C	P	A(Tons/ha)
10	4D5D6n2	1.48	0.42	0.182	0.26	0.55	0.016
11	4D5D6n3	1.72	0.48	0.481	0.252	0.63	0.063
12	4D5D6n4	1.49	0.46	0.63	0.21	0.75	0.068

Table 7.4 Errodibility Index

Sl. No	Watershed	R	K	LS	Erodibility Index (R x K x LS) / T
1	4D5D6t1	1.62	0.47	0.461	7.47
2	4D5D6t2	1.42	0.49	0.491	7.27
3	4D5D6b3	1.52	0.43	0.458	6.37
4	4D5D6b4	1.43	0.42	0.4	5.11
5	4D5D6a2	1.62	0.62	1.523	4.35
6	4D5D6a3	1.96	0.32	0.523	6.98
7	4D5D6a4	2.18	0.53	0.133	3.27
8	4D5D6c3	1.84	0.46	0.447	8.05
9	4D5D6n1	1.86	0.41	0.272	4.41
10	4D5D6n2	1.48	0.42	0.182	2.41
11	4D5D6n3	1.72	0.48	0.481	8.45
12	4D5D6n4	1.49	0.46	0.63	9.19
				Average loss	**6.11**

Estimated potential soil erodability in the study area is 6.11 which is less than 8 and therefore it is inferred that this is a moderately erodible land.

8. Catchment area Treatment Plan

8.1 Soil and Water Conservation

Soil and Water are the two most important Natural resources which have a direct bearing on agricultural production. These resources have to be used judiciously to obtain optimum yield of crops. Therefore, utmost care has to be exercised in management of these resources, not only to prevent soil degradation but also to improve the productivity of the soil for sustained agricultural development. Measures to conserve soil *in-situ,* allow more infiltrations opportunity time for rain water and safe disposal of runoff water from arable lands are of prime concern in rain fed areas, since they directly affect soil erosion rates and consequent crop productivity. Some of the methods suggested for soil conservation for catchment area are engineering methods and Biological methods.

8.1.1 Engineering methods

Mechanical measures or engineering structures are designed to modify the land slope, to convey runoff water safely to the waterways, to reduce sedimentation and runoff velocity, and to improve water quality. These measures are either used alone or integrated with biological measures to improve the performance and sustainability of the control measures. In highly eroded and sloppy landscape biological measures should be supplemented by mechanical structures.

Some of the engineering/mechanical methods recommended for the treatment plan include,

- Brushwood Check Dams
- Dry Stone Masonry Check Dams
- Gabion Check Dams

8.1.1 (A) Brushwood Check Dams

Brushwood check dams are constructed with the help of locally available wooden poles and brushwood. Wooden poles are driven into the ground in a single or double row across the Nala and brushwood is packed on the

upstream face of the check dam. Brushwood check dams are very feasible where vegetative material for construction is abundant. Brushwood check dams can only be constructed in small gullies not deeper than 1m depth. As material required for construction of these types
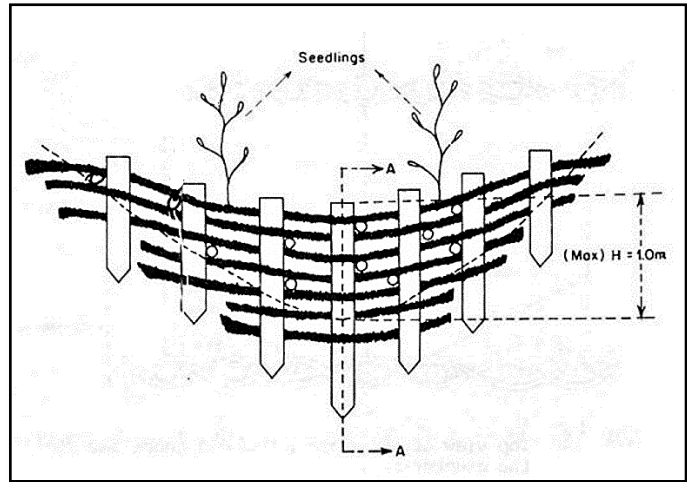

of dam is available locally these can be constructed faster and in very short span of time thereby effectively reducing the erosion in early phase of Project.

The numbers of check dams are estimated using number of first order streams in an area under severe and very severe erosion intensity, and constructed at an interval of 100 m. In the study area, 272 number of first order streams are identified and hence, brushwood check dams are proposed in the 272 locations within the catchment area.

8.1.1 (B) Dry Stone Masonry Check Dams

These types of check dams are used for checking runoff velocity in steep and broad gullies where good size of stones is available in abundance. Dry stone check dams have longer life and usually require less maintenance as compared to brushwood check dam.
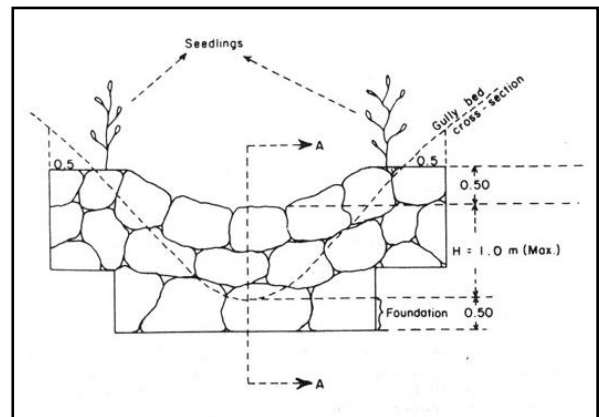
In the study area, 60 number of second order streams are identified and hence, Dry Stone Masonry Check Dams are proposed in the 60 locations within the catchment area.

8.1.1 (C) Gabion Check Dams

If dry stone masonry check dams are considered not to be stable in a particular reach of the stream, Gabion structure can be installed. This is not very much encouraged therefore with proper judgment about the site conditions these structures may be installed[5].

In the study area, 16 number of third order streams are identified and hence, Gabion Check Dams are proposed in the 16 locations within the catchment area.

8.1.1 (D) Contour Bunding

Contour bunding is used for retaining the water by creating obstruction to control erosion. It consists of constructing narrow based trapezoidal bunds on contours to improve runoff rainwater in such a manner that it percolates and recharges the root profile on either side of the bunds. Bunds are simply embankments like structures, constructed across the land slope.[6]

8.1.2 Biological Methods

It is always better to undertake preventive measures than to mitigate the factors that ultimately leads to soil erosion. Such preventive measures will indirectly help to conserve soil in the long run, keeping in view the importance of integrating eco-restoration strategy with socio-economic needs of the local community wherein both ecology and economics are developed[7].

Some of the Biological methods recommended for the treatment plan are

- Afforestation
- Pasture Development
- Nursery development

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[5] Catchment area treatment plan for Gond major irrigation Project in Madhya Pradesh and Chhattisgarh by RS Envirolink Technologies Pvt. Ltd.

[6] Catchment area treatment plan, EMP Report Rahi Kyoung HEP for Sikkim Engineering Private Limited by RS Envirolink Technologies Pvt. Ltd.

[7]http://forestsclearance.nic.in/writereaddata/FormA/CTLetter/4111612581213IWDMLMa goCATPlan.pdf

8.1.2 (A) Afforestation

The trees and vegetation cover play an important role in the conservation of soil and ecology. Afforestation programme would be taken up in such forest areas that contain large patches of barren grassy slopes and are generally devoid of trees. In critically degraded areas, plantation of locally useful, diverse and indigenous plant species would be undertaken. 1,100 plants per hectare will be planted under this method. Planting will be done in pits. Earth work will be done well in advance. Plants should be healthy with strong stems. Planting will be done in monsoon. RCC fence posts with 4 strand barbed wire fencing, interlaced with thorny bushes will be done in the plantation areas. Provision is also made for five years maintenance of afforestation undertaken as part of the catchment area treatment. Plantation is proposed in 110 Ha in the study area (considering 279 ha of open scrub land and 1080 ha of sparse vegetation).

Table 8.1 List of Tree species recommended for Plantation[8]

Sl. No	Scientific name	Common Name	Family	Uses
1	*Senegalia catechu*	Kaggali	Fabaceae	Edible & Medicinal
2	*Senegalia ferruginea*	Banni	Fabaceae	Timber
3	*Acacia leucophloea*	Beala	Fabaceae	Medicinal
4	*Aegle marmelos*	Bilwapatre	Rutaceae	Medicinal & traditional
5	*Albizia amara*	Chigure	Fabaceae	Fodder, fuel wood
6	*Albizia lebbeck*	Bagge	Fabaceae	Timber
7	*Artocarpus heterophyllus*	Halasu	Moraceae	Edible & Medicinal
8	*Azadirachta indica*	Bevu	Meliaceae	Medicinal, edible
9	*Bombax ceiba*	Kempu Buruga	Malvaceae	Edible and Medicinal
10	*Cassia fistula*	Kakke mara	Fabaceae	Ornamental
11	*Dalbergia sissoo*	Agara	Fabaceae	Timber
12	*Emblica officinalis*	Nelli	Euphorbiaceae	Medicinal
13	*Ficus racemosa*	Attimara	Moraceae	Medicinal
14	*Mangifera indica*	Mavina mara	Anacardiaceae	Edible and Fuel wood
15	*Syzygium cumini*	Jambunerale	Myrtaceae	Edible and Medicinal
16	*Tamarindus indica*	Hunase mara	Fabaceae	Edible and medicinal
17	*Terminalia arjuna*	Arjuna mara	Combretaceae	Edible and medicinal
19	*Terminalia bellirica*	Thare Mara	Combretaceae	Medicinal
20	*Terminalia chebula*	Alalekaayi	Combretaceae	Medicinal

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[8] Working Plan of Ghataprabha Forest Division, Gokak for the period of 2012 -13 to 2021-22 by Anil Kumar Ratan, IFS, Conservator of Forest, Working plans and Forest Survey Belagavi, Karnataka

8.1.2 (B) Nursery Development

Proper development of nursery and allied services, like drip irrigation or micro irrigation, will be crucial for successful execution of CAT plan. It will be important to prepare a stock of plant material for the supply of saplings for afforestation programme and various other activities.

8.3 CAT Plan monitoring

Monitoring and evaluation will be undertaken as a part of project management. A process of self-evaluation at specified intervals of time will ensure the field level verification of suggested treatment measures and efficacy of the CAT plan. The year-wise areas requiring treatment measures have been suggested but have not been marked. The spatial location of specific treatment to be carried out in the catchment area would require extensive detailing during the implementation of CAT and a provision for micro-planning has been made in the total CAT financial allocation. Thereafter, annual work plan would be prepared well in advance after undertaking initial ground surveys during micro-planning, specifying physical and financial targets, sites, locations and beneficiaries of each component of the project activity. Month-wise work schedule of various items of each component for the financial year would also be prepared in advance and its timely implementation would be ensured. Monthly progress report on all activities would be submitted by the Range Officers to Divisional Forest Officer. The monitoring committee shall be constituted at the project level for this purpose which too would monitor on a regular basis the quality and quantity of works being carried out under the CAT plan area.

Regular monitoring is essential for effective implementation of CAT Plan. The Chief project officer of the user agency must be associated in implementation as well as monitoring of the progress of Cat Plan. For this, a committee with fallowing composition may be constituted at state level for

quarterly review of progress of implementation of various CAT plans and take immediate steps to ensure the same[9]:

1	PCCF & HoFF	Chairman
2	Secretary (Agriculture) or his representative	Member
3	Secretary (Animal Husbandry) or his representative	Member
4	Project Officer- User agency	Member
5	Concerned Deputy Conservator of Forests	Member
6	Nodal officer (FC) o/o PCCF	Member Secretary

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[9] Handbook of guidelines for effective and transparent implementation of the provisions of Forest (Conservation) Act, 1980 issued by Ministry of Environment, Forest and Climate Change (MOEF&CC), Government of India, 2019

9. Cost estimates for the implementation of CAT Plan

The total estimated cost for the implementation of Catchment area treatment plan is 3.268 Crores.

Sl. No.	Item	Rate (Rs)	Unit	Target Physical	Financial
I Engineering Measures[10]					
1	Brushwood Check Dams	26,704	No	272	72,63,488
2	Dry Stone Masonry Check Dam	31,142	No	60	18,68,520
3	Gabion Check Dams	41,165	No	16	6,58,640
4	Contour Bunding	23,199	Ha.	100	23,19,917
				Sub-Total (A)	**1,21,10,565**
II Biological Measures					
1	Afforestation[11]				
	a. Creation	1,23,750	Ha.	110	1,36,12,500
	b. Maintenance for 5 years	63,250	Ha.	110	69,57,500
				Sub-Total (B)	**2,05,70,000**
				Grand Total (A+B)	**3,26,80,565**
Three crore twenty six lakhs eighty thousand five hundred and sixty five					

[10] Common Sanctioned Schedule of Rates by Forest/Horticulture/Watershed Department, Government of Karnataka for the year 2022-23

[11] Rates- Cumulative cost Estimation for Raising and maintenance of Compensatory Afforestation as part of Compliance of Conditions of Stage-I approval by Deputy Conservator of Forest, Ghataprabha Division, Gokak.

ಕರ್ನಾಟಕ ಸರಕಾರ

(ಕಂದಾಯ ಇಲಾಖೆ)

Office of the Tahashildar & Taluka Executive Magistrate Gokak

ತಹಶೀಲ್ದಾರ ಹಾಗೂ ತಾಲೂಕಾ ಕಾರ್ಯಾನಿರ್ವಾಹಕ ದಂಡಾಧಿಕಾರಿಗಳ ಕಾರ್ಯಾಲಯ, ಗೋಕಾಕ

ದೂರವಾಣಿ/Fax:225073

Email:tahashildargkk@gmail.com.

ಕ್ರ:ಗಟ್ಟಿಬಸವಣ್ಣ/ವಿವ–01/2023–24

ಗೋಕಾಕ ದಿ:23-05–2023

TO,
EXECUTIVE ENGINEER
KNNL , GRBC C DIV.
NO. 03 GOKAK
DIST-BELGAVI

Sir,

Sub: Diversion of 575.0749 Ha of Forest land for the construction of dam across Markandeya River and ancillary infrastructure in forest lands of Gokak, Godachinamalki, Konnur and Mavanura villages in Gokak and Hukkeri Taluks, Belagavi District for storing 6 TMC of water under Ghatti-Basavanna Drinking Water Supply Project by KNNL, Govt of Karnataka. –Submission of request letter for the issue of NOC towards construction of water retaining structures for Nirvanappa Temple at its existing location - reg.,

Ref: 1) Executive Engineer, KNNL, GRBCC Division No.3 Gokak office Letter No. KNNL/GRBCC D-3/PB/GB/Forest/2023-24/60 Dated: 18.04.2023.
2) Revenue Inspector Gokak Report No.RIG/CR-131/2023-24 Dated :20.05.2023

*****

With reference to the above cited subject, Ghatti Basavanna Drinking Water supply project envisages the construction of dam across Markandeya River near Gokak to store 6 TMC of water for providing drinking water to Gokak town and other surrounding villages deprived of drinking water facilities.

As reported by the project authorities, the proposed Ghatti Basavanna Drinking water supply project involves the submergence 519.675 Ha. (FRL-618 m) of Forest land which includes Nirvanappa Temple located in Sy No. 410 of Gokak village and Taluk. Nirvanappa Temple is a historic Temple Located at an elevation of 613m has developed sentiments with local population. Several devotees visit the Temple frequently. The project authorities have decided to retain the temple at its original place with good accessibility without shifting the temple to another location with suitable water retaining structure similar to that of the renowned Kudalasangama Shrine located at Bagalkot District. The proposed arrangement is

acceptable to the Temple Authorities including the devotees and hence the same has been proposed in the project.

Under cited reference (2), as reported by the Revenue Inspector, during his site inspection, the statement of villagers along with Panchanama is taken for agreeing to retain the temple at its original place with good accessibility without shifting the temple to another location with suitable water retaining structure similar to that of the renowned Kudalasangama Shrine located at Bagalkot District. The proposed arrangement is acceptable to the Temple Authorities including the devotees and hence the same may be proposed in the project. Hence in view of this, NOC is issued for the same to retain the temple at its original place with good accessibility without shifting the temple to another location with suitable water retaining structure.

Yours faithfully,

Tahasildar, Gokak

GHATTI BASAVANNA DRINKING WATER SUPPLY SCHEME

Sl No.	Component	Alternative-3(FRL-618m) 500m from the Existing Barrage		Alternative-1(FRL-620m) On the Existing Barrage.		Alternative-2(FRL-618m) 150m from the Existing Barrage	
		Forest	Non- Forest	Forest	Non- Forest	Forest	Non- Forest
1	Submergence	519.675019	55.349256	570.62	65.49	534.42	60.08
2	Dam Seating	2.784951	0.568977	3.39	-	3.13	0
3	Impounding Reserviour	18.097837	0.838644	-	-	8.22	0
4	Dam Office and Guest House	4.495351	-	4.49	-	4.50	0
5	Dam View point	8.449366	-	8.45	-	8.45	0
6	Water Treatment Plant and Colony	-	3.079445	-	2.49	0	3.18
7	Approach Roads	18.105315	3.178264	16.44	5.13	17.84	3.39
8	Retaining Wall	0.161670	-	-	-	0.03	0
9	Steps	0.817165	-	0.55	-	0.54	0
10	Utility	1.054058	-	1.05	-	1.05	0
11	Landing	0.655874	-	0.65	-	0.63	0
12	Foot Bridge	0.778318	-	0.75	-	0.78	0
	Total	**575.074924**	**63.014586**	**606.398000**	**73.110000**	**579.585900**	**66.653000**

Executive Engineer,
Karnataka Neeravari Nigam Ltd
G.R.B.C.C. Dn. No-3.GOKAK

Map showing the Alternatives of Ghatti-Basavanna Drinking Water Supply Project.

Map showing the Alternatives of Ghatti-Basavanna Drinking Water Supply Project.

1:11,000

Submergence

Submergence

Submergence

Submergence

Submergence

Submergence

Approach Road

Approach Road

Approach Road

Approach Road

Approach Road

Water Treatment Plant

Alternative-1 Dam Site

Alternative-2 Dam Site

Alternative-3 Dam Site

Dam Office Guest House

Impounding Reservior

Steps

Utility

Dam View Point

Foot Bridge
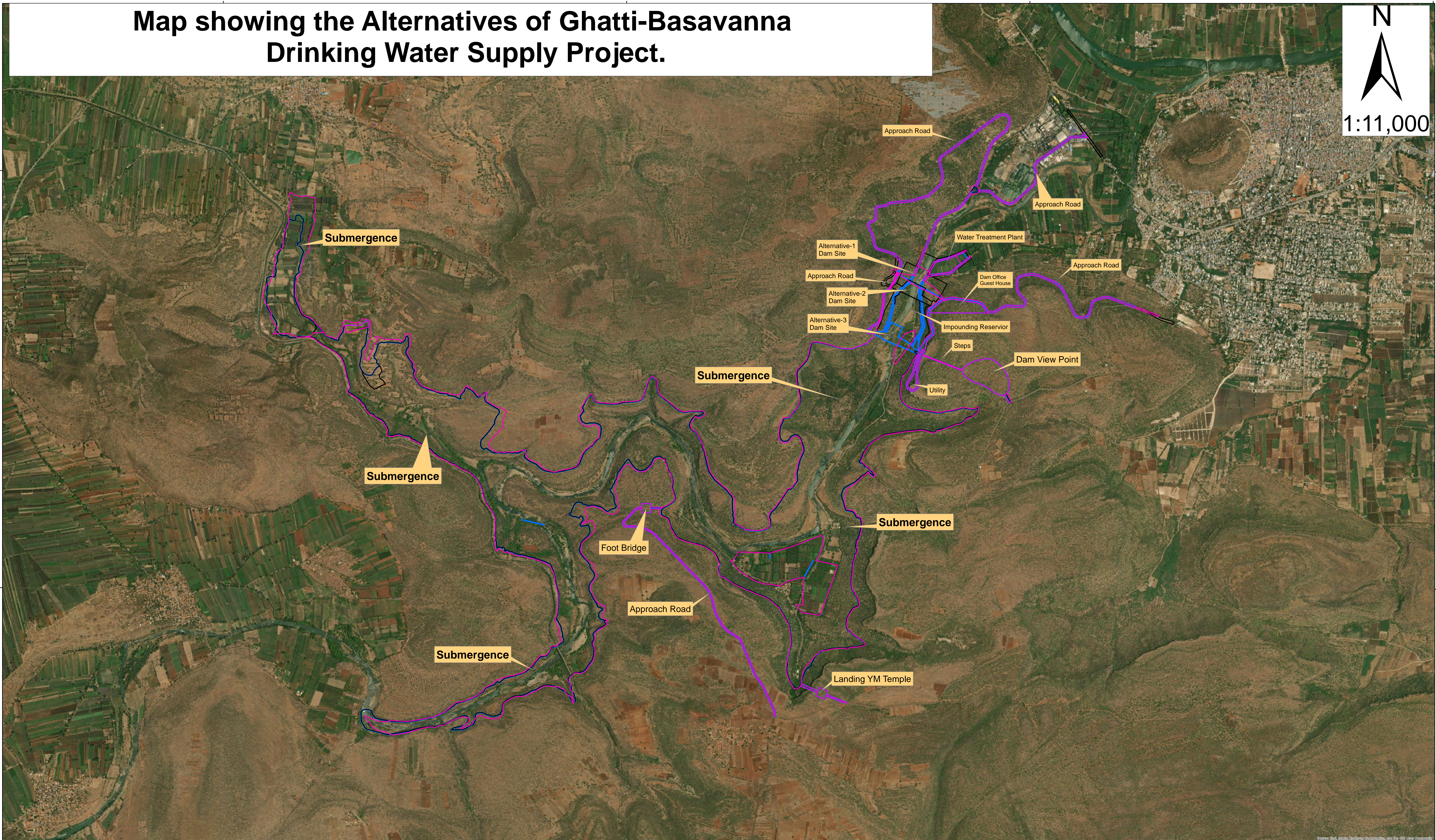
Landing YM Temple

Legend

Gattibasavanna_Alternative_1_FRL-620m

Gattibasavanna_Alternative_2_FRL-618m

Gattibasavanna_Alternative_3_FRL-618m

Authorised Signature

Executive Engineer,
Karnataka Neeravari Nigam Ltd
G.R.B.C.C. Dn. No-3, GOKAK

PREPARED BY:

EHSC
ENVIRONMENTAL HEALTH AND
SAFETY CONSULTANTS PVT. LTD.

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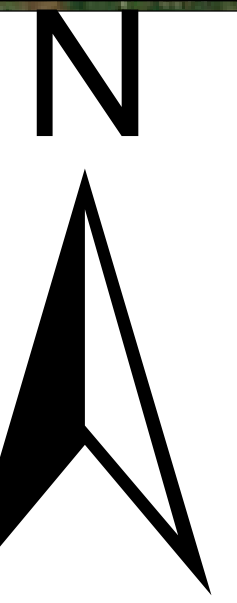Email:ehscblr@yahoo.com/ehscblr1974@gmail.com
Web: www.ehsc.in

Cost-Benefit analysis

Name of the project: Diversion of 575.07 ha Forest land for construction of dam across Markandeya River and ancillary infrastructure in Forest lands of Gokak, Godachinamalki, Konnur and Mavanura Villages in Gokak and Hukkeri Taluks, Belagavi District for storing 6 TMC of Water under Ghatti-Basavanna Drinking water supply Project by Karnataka Neeravari Nigam, Govt. of Karnataka.

Table A: Category of proposals for which Cost Benefit Analysis are applicable

Sl.No.	Nature of proposal	Applicable/ Not applicable	Remarks
1	All categories of proposals involving forest land up to 20 Ha in Plains and up to 5 Ha in hills.	Not Applicable	Nil
2	Proposals for defense installation purposes and oil prospecting (Prospecting only)	Not applicable	Nil
3	Habitation, establishment of industrial units, tourist lodges/complex and other building constructions.	Not applicable	Nil
4	All other proposals involving forest land more than 20 Ha in plain and more than 5 Ha in hills including roads, transmission lines, minor medium and major irrigation projects, hydel projects, mining activities, Railway lines, location specific installation like Micro-wave station, auto repeater center, TV towers, etc.	Applicable	These are cases where a cost benefit analysis is necessary to determine whether diverting the forest land to non-forest use is in the overall public interests.
5	Proposal for renewal of Mining Lease for forest land.	Not Applicable	Nil

Executive Engineer,
Karnataka Neeravari Nigam Ltd
G.R.B.C.C. Dn. No-3.GOKAK

Table-B: Calculation of the cost

(Parameters for Evaluation of Loss of Forests)

Name of the Project: Diversion of 575.07 ha Forest land for construction of dam across Markandeya River and ancillary infrastructure in Forest lands of Gokak, Godachinamalki, Konnur and Mavanura Villages in Gokak and Hukkeri Taluks, Belagavi District for storing 6 TMC of Water under Ghatti-Basavanna Drinking water supply Project by Karnataka Neeravari Nigam, Govt. of Karnataka.
Quantum of Forest applied for: 575.07 Ha.
Life of Project: 50 years.
Division: KNNL, GRBCC Div. No. 3, Gokak.

Sl. No	Parameter	Criteria	Cost per Year (lakhs)	Cost for 50 years (lakhs)
1	Ecosystem services losses due to proposed forest diversion	Economic Value of loss of eco-system services due to diversion of forest shall be the Net Present Value (NPV) of the forest land being diverted as prescribed by the Central Government (MoEF&CC). Present NPV for 1 Ha of forest land = 9,57,780 (Tropical Dry deciduous Forest- Open Type) Present NPV for 575.07 Ha forest land = 575.07 X 9,57,780 = 55,07,90,544.6/-	5,507.90	2,75,395
2	Loss of animal Husbandry Productivity, Including loss of Fodder.	10% of the NPV	550.79	27,539.50
3	Cost of Human resettlement	As per the Detailed project report	1,770	
4	Loss of public facilities and administrative infrastructure (roads, building, schools, dispensary, electric lines, railways, etc)	No loss public facilities involved in the project	-	-
5	Possession Value of Forest land Diverted	30% of the NPV	1,652.37	82,618.50
6	Cost of suffering to oustees	The Social Cost of rehabilitation of oustees @3,50,000 p.a. X 70 Families X 1.5 times	367.5	18,375
7	Habitat Fragmentation Cost	50% of the NPV	2,753.95	1,37,697.5
8	Compensatory afforestation and Soil & moisture conservation cost	Rate of C.A. for 1 Ha of forest land = 18,36,000 (As per Karnataka Forest Dept. SR for the year 2022-23) Value of C.A. for 689.1 Ha forest land x 18,36,000 = 1,26,51,87,600/-	12,651.88	6,32,594
		Total	**25,254.39**	**11,75,989.5**

Table-C: Calculation of the Benefits

(Parameters for Evaluation of Benefits)

(Not withstanding loss of forest)

Sl. No	Parameter	Criteria	Cost per Year (lakhs)	Cost for 50 years (lakhs)
1	Increase in Productivity attribute to the Specific project	Not Applicable for Drinking water projects	-	-
2	Benefits to economy due to the Specific project	Not Applicable for Drinking water projects	-	-
3	No of Population Benefited due to specific project	In Gokak Taluk villages as per 2011 Census	6,12,163	
4	Economic benefits due to of direct and indirect employment due to this project	Total employment =3,00,000 (Per day wages as per minimum wages notifications 2021-2022)	-	
		36,000 skilled employees X Rs. 734/- (per day) X 30 days X 12 months = Rs. 9,51,26,40,000/-p.a.	95,126	47,56,300.00
		2,64,000 unskilled employees X Rs. 553/- (per day) X 30 days X 12 months = Rs. 52,55,71,20,000/- p.a.	5,25,571	2,62,78,550.00
5	Economic benefits due to Compensatory afforestation	*Value of Carbon sequestration per Ha/year = Rs. 1,150/- (per Ha/Yr) X 689.1 Ha = Rs. 7,92,465/-	7.92	396.00
		#Value of Bio-Prospecting per Ha/year =Rs.25,553/- (per Ha/Yr) X 689.1 Ha = Rs. 1,76,08,572.3/-	176.08	8,804.00
		#Value of NTFP Ha/year=Rs.7,631/-(per Ha/Yr) X 689.1 Ha = Rs. 52,58,522.1/-	52.58	2,629.00
		#Value of Eco-tourism Ha/year =Rs.65,113/-(per Ha/Yr) x 689.1 Ha = Rs. 4,48,69,368.3/-	448.69	22,434.50
		*Value of fodder Ha/year =Rs.12,535/- (per Ha/Yr) X 689.1 Ha =Rs. 86,37,868.5/-	86.37	4,318.50
		#Value of Flagship species Ha/year=Rs.2,58,400/- (per Ha/Yr) X 689.1 Ha = Rs.17,80,63,440/-	1780.63	89,031.50
		#Value of Ecological services of forests per Ha/Year=Rs.1,44,332/- (per Ha/Yr) X 689.1 Ha =Rs. 9,94,59,181.2/-	994.59	49,729.50
		Total	**6,24,244**	**3,12,12,193**

Note-*Revision of Rates of NPV Applicable For Different Class/Category of Forests, November 2014, Forest Survey of India.

Supplementary report in IA No. 826 in IA No. 566 regarding Calculation of Net present Value (NPV) payable on use of Forest land of Different types for Non forest purposes, January 2007 By Central Empowered Committee.

Calculation of Benefit/Cost Ratio

Total Benefits (As per II calculations) = Rs. 3,12,12,193 Lakhs

Total Losses (As per I calculations) = Rs. 11,75,989.5 Lakhs

Hence, Benefit/Cost Ratio —————— = 26.54

Thus, the project gives positive Benefit/Cost Ratio with minimal environmental losses.

Executive Engineer,
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G.R.B.C.C. Dn. No-3. GOKAK