



कार्यालय वन मण्डलाधिकारी, सेंधवा (सा) वनमण्डल, सेंधवा जिला - बड़वानी (म.प्र.)

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क्रमांक/मा.चि./2025/332

सेंधवा, दिनांक / 1.6. / 01 / 2025

प्रति,

अपर प्रधान मुख्य वन संरक्षक,
(भू-प्रबंध)

द्वितीय तल, सी ब्लॉक, वन भवन
तुलसी नगर, भोपाल (म.प्र.)

विषय :- जिला बड़वानी एवं जिला खरगोन के अंतर्गत सोनखेड़ी तालाब योजना के निर्माण हेतु 49.320 हेक्टर (वनमंडल सेंधवा की 34.45 हेक्टर एवं वनमंडल खरगोन की 14.87 हेक्टर) वनभूमि जल संसाधन विभाग को उपयोग पर देने बाबत।

संदर्भ :- आपका पत्र क्रमांक/एफ-3/129 /378893/0017 दिनांक 13.12.2024।

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विषयांतर्गत निवेदन है कि संदर्भित पत्र के संलग्न प्राप्त भारत सरकार, पर्यावरण वन एवं जलवायु परिवर्तन मंत्रालय नई दिल्ली के पत्र दिनांक 11.12.2024 द्वारा विषयांकित योजना के प्रकरण में उठाई गई आपत्तियों का आवेदक विभाग से निराकरण कराया जाकर प्रतिवेदन इस पत्र के संलग्न अग्रिम कार्यवाही हेतु संलग्न प्रेषित है।

संलग्न:- यथोपरी।

(आई.एस.गाडरिया)

भा.व.से.

वनमंडलाधिकारी

वनमंडल सेंधवा (सामान्य)

सेंधवा, दिनांक / 1.6. / 01 / 2025

पृ.क्र./मा.चि./2025/ 233

प्रतिलिपि-

1. मुख्य वन संरक्षक, खण्डवा वृत्त, खण्डवा,
2. वनमंडलाधिकारी, खरगोन एवं
3. कार्यपालन यंत्री, जल संसाधन संभाग, बड़वानी

की ओर मय सहपत्रों के सूचनार्थ।

संलग्न:- यथोपरी।

(आई.एस.गाडरिया)

वनमंडलाधिकारी

वनमंडल सेंधवा (सामान्य)

बड़वानी, दिनांक 13/01/2025

पत्र क्रमांक 120/कार्य/सोनखेड़ी वन प्रकरण/2025
प्रति,

✓ वन मण्डलाधिकारी
सामान्य वन मण्डल सेंधवा
जिला बड़वानी (म.प्र.)

विषय :-

वन (संरक्षण एवं संवर्धन) अधिनियम, 1980 की धारा 2 (1) (ii) के अंतर्गत 49.320 हेक्टेयर आरक्षित वन भूमि के व्यपवर्तन हेतु केंद्र सरकार से पूर्व अनुमोदन प्राप्त करने का प्रस्ताव (सेंधवा वन प्रभाग में 34.45 हेक्टेयर और खरगोन वन प्रभाग में 14.87 हेक्टेयर) मध्य प्रदेश राज्य के बड़वानी जिले के अंतर्गत सोनखेड़ी टैंक परियोजना के निर्माण के लिए जल संसाधन विभाग के पक्ष में (ऑनलाइन क्रमांक FP/MP/IRRIG/155614/2022) - के संबंध में।

संदर्भ :-

आपका पत्र क्र./मा.चि./2024/4835/सेंधवा दिनांक 24.12.2024


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उपरोक्त संदर्भित पत्र के माध्यम से भारत सरकार वन एवं पर्यावरण मंत्रालय नई दिल्ली द्वारा सोनखेड़ी तालाब योजना में विभिन्न बिन्दुओं की अतिरिक्त जानकारी चाही गई है, जिसमें यूजर एजेंसी से संबंधित बिन्दुओं की जानकारी परिवेश पोर्टल पर अपलोड कर दी गई है।

1	The State Govt. has not submitted the detailed hydrological assessment report along with details of study(if any) carried out in the basin and details about the impact of the project on the flow of water downstream.	प्रस्तावित सोनखेड़ी तालाब परियोजना लघु सिंचाई योजना है, जो कि 25.03 वर्ग कि.मी. के पानी को ही रोके जाने हेतु प्रस्तावित है, जबकि मध्यप्रदेश की सीमा अन्तर्गत तहसील वरला का कुल भौगोलिक क्षेत्र 721 वर्ग कि.मी. है, जो कि कुल भौगोलिक क्षेत्र का 3.47 प्रतिशत ही है। उपरोक्त परियोजना के निर्माण से 03 ग्रामों की 535 हेक्टेयर सिंचाई प्रस्तावित है। योजना से प्रस्तावित प्रभावित वन डूब क्षेत्र 0.4932 वर्ग कि.मी. है, जो कि तहसील वरला के भौगोलिक क्षेत्र का 0.07 प्रतिशत है, जिसका इस वनक्षेत्र में पशु पक्षियों, अन्य वन्य जीवों एवं पर्यावरण पर विपरीत प्रभाव नगण्य होगा। इस परियोजना के निर्माण से 3.41 मि.घ.मी. जीवित जलभराव से उपरोक्त नाले के डाउन स्ट्रीम में लगभग 10 कि.मी. तक वर्षाकाल के पश्चात भी बांध से न्यूनतम सिपेज से वर्षभर नाले में जलप्रवाह बना रहेगा, जिससे डाउन स्ट्रीम में पशु पक्षियों, अन्य वन्य जीवों एवं सिंचाई हेतु पानी की सुविधा मिलेगी। इसके अतिरिक्त आस-पास के 5-7 कि.मी. के दायरे में भू-जल स्तर में वृद्धि होगी, जिससे कुएं एवं अन्य छोटे प्राकृतिक जल स्रोत ग्रीष्मऋतु में भी जीवित रहेगे।
2	The CAT plan submitted has not been approved as per the Chapter-9, Para 9.2 (vii) of the consolidated guidelines and clarifications issued under Van (Sanrakshan Evam Samvardhan), Adhiniyam, 1980. Therefore, the State Govt. shall ensure that an approved CAT plan invariably accompanied with all the characteristics as given in Para 9.2 (i to vi) of the consolidated guidelines and clarifications issued under Van (Sanrakshan Evam Samvardhan), Adhiniyam, 1980 shall be submitted.	कैट प्लान वन मण्डल स्तर से परीक्षण उपरांत वन विभाग के वरिष्ठ कार्यालय द्वारा अनुमोदन किया जाना है।

3	The cost benefit analysis as submitted does not include habitation fragmentation cost and details as per prescribed format. The revised CB analysis has to be submitted by keeping all parameters in view.	संशोधित सी.बी. प्रस्तुत है।
4	The State Govt. has now informed that क्षतिपूर्ति वनीकरण हेतु उपलब्ध करायी गयी ग्राम फल्यापुर, सर्वे नं 164 रकबा 49.320 हे. गैर वनभूमि में पूर्व से 24320 पौधे होने के कारण शेष बचे 25000 पौधे रोपण की योजना वनमंडल संधवा के पश्चिमेत वारला की अवक्रमित वनभूमि कक्षा क्रमांक 404. However, the complete CA scheme of Non-Forest land & degraded Forest land along with KML file of degraded forest land proposed for CA has not been submitted/uploaded.	गैर वन राजस्व भूमि एवं बिगडे वन की संपूर्ण कार्ययोजना एवं के.एम.एल. फाईल वन मण्डल स्तर से अपलोड किया जाना है।
5	As per DSS analysis, the proposed forest land for diversion is located at a distance of 6.51 Km from Yawal Wildlife Sanctuary of Maharashtra State. Therefore the comments of CWLW with clear recommendations regarding impact of the project on the wildlife found in and around the area proposed for diversion needs submission.	स्पष्टीकरण स.क्र. 01 द्वारा प्रस्तुत है। प्रस्तावित संरचना स्थल पर डूब क्षेत्र में बहुत विशाल एवं पुराने पेड़ नहीं हैं, ना ही डूब क्षेत्र में पशु पक्षियों के पूर्णतः नष्ट या अस्तित्व खत्म होने जैसे पर्यावरण को दुषित या नष्ट हो जाने का खतरा नहीं है।
6	DSS analysis revealed that the instant project is located at a distance of 0.50 Km from the inter-state border of Maharashtra State and part of canal proposed over Non-forest land is falling in the State of Maharashtra. Since the proposed area is bordering the State of Maharashtra, and the project may have impact on the areas downstream, therefore the State of Madhya Pradesh shall seek the comments/NOC from the State of Maharashtra in this regard and submit the response.	परियोजना का मुख्य बांध स्थल महाराष्ट्र राज्य की सीमा से 1.80 कि.मी. एवं नहर का अंतिम छोर महाराष्ट्र राज्य की सीमा में नहीं अपितु सीमा से 0.50 कि.मी. की दूरी पर है। महाराष्ट्र राज्य की सीमा से गुजरने वाली अनेर नदी पर परियोजना निर्मित नहीं की जा रही है। अनेर नदी के महाराष्ट्र-मध्यप्रदेश बॉर्डर पर अनेर नदी का जलग्रहण क्षेत्रफल 968.084 वर्ग कि.मी. है, जबकि प्रस्तावित सिंचाई योजना जो कि मध्यप्रदेश के छोटे से नाले पर, बांध स्थल पर 25.03 वर्ग कि.मी. के पानी को रोका जाना प्रस्तावित है, जो कि महाराष्ट्र-मध्यप्रदेश बॉर्डर पर अनेर नदी का जलग्रहण क्षेत्रफल का मात्र 2.59 प्रतिशत है, जिससे बांध निर्माण से अनेर नदी के जल प्रवाह पर नगण्य प्रभाव होगा। इसके अतिरिक्त महाराष्ट्र की सीमा से लगी अनेर नदी पर मध्यप्रदेश शासन जल संसाधन विभाग द्वारा कोई भी पानी रोकने वाली सिंचाई योजना निर्मित/प्रस्तावित नहीं है।
7	Satellite Imagery shows the presence of Agricultural lands, Settlements, Plantation, Roads etc. within the proposed forest land for submergence as well as forest land proposed for Canal component. This needs clarification.	प्रस्तावित जलमग्न भूमि 0.4932 वर्ग कि.मी. जो आंशिक रूप से वन अधिकार अंतर्गत, पट्टाधारक कृषकों की भूमि एवं अचल सम्पत्ति, सड़क एवं बस्तियां इत्यादि मौजूद हैं, उन्हें मध्यप्रदेश सरकार द्वारा कलेक्टर गाईड लाईन का दोगुना (तहसील वरला योजना स्थल के नजदीकी राजस्व ग्राम) मुआवजा प्रदान किया जावेगा। चूंकि प्रस्तावित योजना लघु सिंचाई योजना है, जिसमें विभागीय मापदण्डानुसार पुर्नवास एवं पुर्नव्यवस्थापन की आवश्यकता नहीं है।
8	The State Govt. has proposed to establish a waste weir in the project. However the forest land in-between the waste weir and Dam line has not been included in the proposal. This needs clarification and the State Govt. shall ensure that the complete proposal shall be submitted.	बांध निर्माण हेतु वेस्ट वियर एवं डेम बॉडी के मध्य की भूमि का उपयोग योजना निर्माण में नहीं किया जावेगा। उपरोक्त स्थल पर लगे वृक्षों को किसी भी तरह से प्रभावित नहीं किया जावेगा। अतः उपरोक्त भूमि को प्रभावित भूमि में शामिल नहीं किया गया है।

वन प्रकरण में उपरोक्तानुसार चाही गई अतिरिक्त जानकारी आपकी ओर आवश्यक अग्रिम कार्यवाही हेतु प्रेषित हैं।
संलग्न :- उपरोक्तानुसार।


13/01/2025

(पारस परमार)

कार्यपालन यंत्री,

जल संसाधन संभाग, बड़वानी


जिला-बड़वानी (म.प्र.)

बड़वानी, दिनांक / / 2025

पृ0 क्रमांक _____/कार्य/सोनखेडी वन प्रकरण/2025

प्रतिलिपि :-

- 1- प्रधान मुख्य संरक्षक (भू-प्रबंध) सतपुडा भवन भोपाल की ओर सादर सूचनार्थ प्रेषित।
- 2- मुख्य अभियंता, नर्मदा ताप्ती कछार, जल संसाधन विभाग इंदौर की ओर सूचनार्थ प्रेषित।
- 3- मुख्य वन संरक्षक खण्डवा वृत्त खण्डवा म.प्र. की ओर सादर सूचनार्थ प्रेषित।
- 4- अधीक्षण यंत्री, जल संसाधन मण्डल खरगोन की ओर सूचनार्थ प्रेषित।
- 5- कलेक्टर जिला बड़वानी की ओर सूचनार्थ प्रेषित।
- 6- वन मण्डलाधिकारी सामान्य वन मण्डल बड़वानी/खरगोन की ओर सूचनार्थ प्रेषित।
- 7- अनुविभागीय अधिकारी, जल संसाधन उपसंभाग सेंधवा की ओर सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित।



कार्यपालन यंत्री,

जल संसाधन संभाग, बड़वानी

जिला-बड़वानी (म.प्र.)

Cost Benefit Analysis for

SONKHEDI TANK PROJECT

BARWANI

On the basis of Guidelines for Forest Land Diversion 2017

Table-A Cases Under Which A Cost Benefit Analysis for Forest Diversion Area Required

S. No.	Nature of Proposal	Applicable / Not Applicable	Remarks
1	All categories of proposal involving forest land upto 20 Ha. in plains and upto 5 Ha. in hills.	Not applicable	
2	Proposal for defense installation purposes and oil prospecting (prospecting only)	Not applicable	
3	Habitation, establishment of industrial units, tourist lodges complex and other building construction.	Not applicable	
4	All other proposal 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 project, hydro projects, mining activity, railway lines, location specific installations like micro-wave station, auto repeater centers, TV towers etc.	Applicable	

Annexure-B Estimation of Cost of Forest Diversion

S. No.	Parameters	Remarks
1	Ecosystem services losses due to proposed forest diversion.	Ecosystem services due to diversion of forest land suggested by the forest classification report of proposed, Sonkhedi Tank Project (Minor Irrigation Tank) is Rs. 12.29 Lakhs/Ha. Cost of Land = $49.320 \times 12.29 = 606.14$ Lakhs Eco Class III consisting of tropical dry decidued forest dams.
2	Loss of animal husbandry productivity including cost of fodder.	As per the cost benefit guideline i.e. 10% of N.P.V. 1.229 Lakh per Ha. = $49.320 \times 1.229 = 60.61$ Lakhs
3	Cost Human Resettlement	There is no human settlement due to proposed Sonkhedi Tank Project (Minor Irrigation Tank) . Hence cost of human resettlement is nil.
4	Loss of public facilities and administrative infrastructure (road, building, schools, dispensaries, electric lines, railways etc.) on forest land if these facilities were diverted due to the project.	There is no loss of public facilities and administrative infrastructures of forest land due to construction of Sonkhedi Tank Project (Minor Irrigation Tank) . No cost has been added on this account.
5	Possession value of forest land diverted.	The possession value of forest land diverted is taken 30% of the N.P.V. due to loss of forest i.e. Rs. 3.687 Lakhs/Ha. = $49.320 \times 3.687 = 181.84$ Lakhs
6	Cost of suffering to oustees	Not Applicable.
7	Habitat fragmentation cost	Habitat fragmentation cost of forest land diverted is taken 50% of the N.P.V. due to loss of forest i.e. Rs. 6.145 Lakhs/Ha. = $49.320 \times 6.145 = 303.07$ Lakhs
8	Compensatory afforestation and soil and moisture conservation cost.	The cost @Rs 6.33 Lakhs per Ha. is taken for compensatory afforestation and soil moisture conservation. Hence amount will be = $49.320 \times 6.33 = 312.20$ Lakhs
9	Total cost due to forest land diversion	Total cost due to forest land diversion for Sonkhedi Tank Project (Minor Irrigation Tank) will be : = $606.14 + 60.61 + 181.84 + 303.07 + 312.20$ = 1463.86 Lakhs.

Annexure-C Existing Guidelines for Estimating Benefits of Forest Diversion in CBA

S. No.	Parameters	Remarks
1	Increase in productivity attribute to the specific project.	The crop production benefit due to Sonkhedi Tank Project will be Rs. 3335 Lakhs in designed life of 50 years and water level will be increase economy growth of the project. Project also reserves the water for drinking purpose for adjacent villages.
2	Benefit to economy due to the specific project	Sonkhedi Tank Project will trigger economy development and also influence with irrigation facility to a land of 535 Ha. in the surrounding area. Irrigation is proposed by gravity flow system.
3	No. of population benefited due to specific project.	Project is located in backward area of the village. After completion of project 350 farmers benefited and 535 Ha. Irrigation area Cultivators will benefit, and water level will be increased in surrounding area. This project will also facilitate drinking water supply to adjacent villages.
4	Economic benefit due to direct and indirect employment due to the project.	The project will provide direct employment for approximate 6,000 people (24 months) during construction period.
5	Economic benefits due to compensatory afforestation.	An economic benefit due to compensatory afforestation has considered as per the benefit of C.A. guidelines of ministry for N.P.V. estimation.


Sub Divisional Officer
Water Resources Sub Division
Sendhwa


Executive Engineer
Water Resources Division
Barwani

SONKHEDI TANK PROJECT

District :- Barwani

Tehsile :- Varla

BENEFIT COST RATIO

A. BENEFITS

1.	(i) Value of total agriculture produce	:	Rs. 16865530.00
	Production before irrigation		
	(ii) Cost of cultivation to economy	:	Rs. 921090.00
	(iii) Net production before irrigation	:	Rs. 15944440.00
2.	(i) Value of agriculture production	:	Rs. 59420000.00
	after irrigation		
	(ii) Cost of cultivation of economy	:	Rs. 2384500.00
	(iii) Net production after irrigation	:	Rs. 57035500.00
	Net Benefit 2 (iii)-1(iii)	:	Rs. 41091060.00

B. ANNUAL COST

	5%	10%
i Interest on capital Rs. 1609.01 lacs	Rs. 8045050.00	Rs. 16090100.00
Production before irrigation		
ii Depreciation charges @2%	Rs. 3218020.00	Rs. 3218020.00
iii Administration expenses @500/- per Ha.	Rs. 267500.00	Rs. 267500.00
Total :-	Rs. 11530570.00	Rs. 19575620.00
Benefit Cost Ratio	<u>41091060</u> 11530570 3.56%	<u>41091060</u> 19575620 2.09%

Sub Divisional Officer
Water Resources Sub Division
Sendhwa

Executive Engineer
Water Resources Division
Barwani

SONKHEDI TANK PROJECT

Tehsile :- Varla

District :- Barwani

COST BENEFIT ANALYSIS

Total Cost Due To Forest Land	:	Rs. 1463.86 Lakh.
Total Benefit Due To Project	:	Rs. 4109.11 Lakh.
Benefit Ratio Of Project	:	0.35


Sub Divisional Officer
Water Resources Sub Division
Sendhwa


Executive Engineer
Water Resources Division
Barwani

SONKHEDI MINOR TANK PROJECT

Teh. Varla

Dist. Barwani

CATCHMENT AREA TREATMENT PLAN FOR FOREST AREA

13.1 NEED FOR CATCHMENT AREA TREATMENT

It is a well-established fact that reservoirs formed by dams on rivers area 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 affecting 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 grow plants thus, a well - designed catchment area treatment (CAT) 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 in many locations, winds, glaciers, etc. also cause soil erosion. In a hilly catchment area as in the present case erosion due to water is a common phenomenon and the same has been studied as a part of the catchment area treatment (CAT) plan.

The catchment area treatment (CAT) plan highlights the management techniques to control erosion in the catchment area life span of a reservoir in case of a seasonal storage dams is greatly reduced due to erosion in the catchment area. The catchment area considered for treatment of SONKHEDI Minor Irrigation project is 25.03 Sq.km. The sub watersheds in the catchment area of considered for the present study is given in Figure -A

In the present study Silt Yield Index' (SYI) method has been used. In this method, the terrain is subdivided into various watersheds and the credibility is determined on relative basis. SYI provides a comparative credibility criteria of catchment (low, moderate, high, etc.) and do not provide the absolute silt yield. SYI method is widely used mainly because of the fact that it is easy to use and has lesser data requirement Moreover, it can be applied to larger areas like sub watersheds, etc.

13.2 APPROACHES FOR THE STUDY

Various thematic maps have been used in preparation of the CAT plan. Due to the spatial variability of site parameters such as soils, topography land use and rainfall, not all areas contribute equally to the erosion problem. Several techniques like manual overlay of spatially index-mapped data have been used to estimate soil Erosion in complex landscape.

Geographic information System (GIS) is a computerized resource data base system, which is referenced some geographic coordinate system. In the present study real coordinate system has been used. The GIS is a tool to store, analyse and display various spatial data. In addition, GIS because of its special hardware and software characteristics. Has a capacity to perform numerous function and operations on the various spatial data layers residing in the database. GIS provides the capability to analyse large amounts of data in relation to a set of established criteria. In order to ensure that latest and accurate data is used for the analysis, satellite data has been used for deriving land use data and ground truth studies too have been conducted.

The various steps covered in the study are as follows:

- Data acquisition
- Data preparation
- Output presentation

The above mentioned steps are briefly described in the following paragraphs,

13.2.1 DATA ACQUISITION

The requirement of the study was first defined and the outputs expected were noted. The various data layers of the catchment area used for the study are as follows:

- Slope Map
- Soil Map
- Land use Classification Map
- Current Management Practices
- Catchment Area Map.

13.2.2 DATA PREPARATION

The data available from various sources was collected. The ground maps, contour information etc. were scanned, digitized and registered as per the requirement. Data was prepared depending on the level of. accuracy required and any corrections required were made. All the layers were geo-referenced brought to a common scale (real coordinates) so that overlay could be performed. A computer programmed was used to estimate the soil loss. The formats of outputs from each layer were firm up to match the formats of inputs in the program. The grid size to be used was also decided to match the level of accuracy required the data availability and the software and time limitations. The format of output was finalized. Ground trothing and data collection was also included in the procedure.

For the present study IRS IC-LISS III digital satellite data was used for interpretation & classification the classified land use map of the catchment area of various dams considered for the study are shown in Figure-B. The land use pattern of the catchment area is summarized in Table-13.1.

TABLE- 13.1:- LAND USE PATTERN OF THE CATCHMENT AREA

Category	Area (ha)	Area (%)
Vegetation	349	13.94
Scrubs/ Grass Land	262	10.45
Agricultural Land	942	37.63
Barren Land	880	35.19
River	44	1.74
Settlements	26	1.05
Total	2503	100.00

Digitized contours from toposheets were used for preparation of Digital Elevation Model (DEM) of the catchment area and to prepare a slope map. The first step in generation of slope map is to create surface using the elevation values stored in the form of contours or points. After marking the catchment area, all the contours on the toposheets were digitized (100 m interval). The output of the digitization procedure was the contours as well as points contours in form of x, y & z points (x,y location and their elevation) All this information was in real world coordinates (latitude, longitude and height in meters above sea level.)

A Digital Terrain Model (DTM) of the area was then prepared, which was used to derive a slope map.

Various layers thus prepared were used for modelling Software was prepared to calculate the soil loss using input from all the layers

13.2.3 OUTPUT PRESENTATION

The result of the modelling was interpreted in pictorial form to identify the areas with high soil erosion rates. The primary and secondary data collected as a part of the field studies were used as an input for the model.

13.3 ESTIMATION OF SOIL LOSS USING SILT YIELD INDEX (SYI) METHOD.

The Silt Yield Index Model (SYI), considering sedimentation as product of erosivity, credibility and arial extent was conceptualized in the All India Soil and Land Use Survey (AISLUS) as early as 1969 and has been in operational use since then to meet the requirement of prioritization of smaller hydrologic units.

The erosivity determinants are the climatic have direct or reciprocal bearing on the relationship can be expressed as factors and soil and land attributes that unit of the detached soil material. The relationship can be expressed as :

Soil erosivity = 1 (Climate, physiographic, Slope, soil parameters, land use / land cover, soil management)

The Silt Yield Index (SYI) is defined as the Yield per unit area and SYI value for hydrologic unit is obtained by taking the weighted arithmetic mean over the entire area of the hydrologic unit by using suitable empirical equation.

Prioritization of Watersheds / Sub water heads:

The prioritization of smaller hydrologic units within the vast catchments are based on the Silt Yiled Indices (SYI) of the smaller units, the boundary values or range of SYI values for different priority categories are arrived at by studying the frequency distribution of SYI values and locating the suitable breaking points. The watersheds/ Sub-watersheds are subsequently rated into various categories corresponding to their respective SYI values.

The application of SYI model of prioritization of sub watersheds in the catchment areas involves the evaluation of :

- a) Climatic factors comprising total precipitation, its frequency and intensity.
- b) Geomorphic, factors comprising land forms, physiography, slope and drainage characteristics.
- c) Surface cover factors governing the flow hydraulics and
- d) Management factors.

The data on climatic factors can be obtained for different locations in the catchment area from the meteorological stations whereas the filed investigations area required for estimating the other attributes.

The various steps involved in the application of model are :

- Preparation of a framework of sub-watershed through systematic delineation.
- Rapid reconnaissance surveys on 1:50,000 scale leading to the generation of a map indicating erosion - intensity mapping units'
- Assignment of weight age value of various mapping units based on relative silt yield potential.
- Computing Silt Yield Index for individual watersheds / Sub watersheds.
- Grading of watersheds/ sub watersheds into very high, high medium. low and very low priority categories.

The area of each of the mapping units is computed and silt yield indices of individual sub watersheds area calculated using the following equations.

a Silt Yield Index

$$SYI = \frac{\sum (A_i \times W_i)}{A_w} \times 100 \text{ where } i=L \text{ to } n$$

A_i = Area of ith unit (EIMU)

W_i = Weightage Value of ith mapping unit

n = No. of mapping units

A_w = Total area of sub watershed.

The SYI values for classification of various categories of erosion intensity rates are given in.

TABLE - 13.2 CRITERIA FOR EROSION INTENSITY RATE

Priority Categories	SYI Values
Very high	>1300
High	1200-1299
Medium	1100-1199
Low	1000-1099
Very Low	<1000

13.4 WATERSHED MANAGEMENT - AVAILABLE TECHNIQUES

Watershed management is the optimal use of soil and water resources within a given geographical area so as to enable sustainable production. It implies changes in land use, vegetative cover, and other structural and non-structural action that are taken in a watershed to achieve specific watershed management objectives. The overall objectives of watershed management programme are to:

- increase infiltration into soil
- Control excessive runoff;
- Manage & utilize runoff for useful purpose

Following Engineering and Biological measures have been suggested for the catchment area treatment .

1. Engineering measures

- Nallaha Bunding
- Contour Bunding
- Angle iron barbed wire fencing

2. Biological measures

- Development of nurseries
- Plantation / afforestation
- Pasture development
- Social forestry

The basis of site selection for different biological and engineering treatment measures under CAT are given in Table-13.3.

TABLE - 13.3: BASIS FOR SELECTION OF CATCHMENT AREA TREATMENT MEASURES

Treatment measure	Basis for selection
Social forestry, fuel wood and fodder grass development	Near settlements to control tree felling
Contour Bunding	Control of soil erosion from agricultural fields.
Pasture Development	Open canopy, barren land, degraded surface
Afforestation	Open canopy, degraded surface, high soil erosion, gentle to moderate slope
Barbed wire fencing	In the vicinity of afforestation work to protect is from grazing etc.
Nallah Bunding	Nalla bunding work consists of constructing bunds of suitable dimensions across the nalla or gullies to hold the maximum runoff water to create flooding of the upstream area temporarily for some days or weeks, with Surplussing arrangements at suitable intervals to drain the water.
Nursery	Centrally located points for better supervision of proposed afforestation, minimize cost of transportation of seedling and ensure better survival.

13.5 CATCHMENT AREA TREATMENT METASURES

The erosion category of sub-watersheds in the catchment area as per a SYI index is given in Table-13.4. The details are shown in Figure-C. The area under different erosion categories is given in Table-13.5.

TABLE-13.4: EROSION INTENSITY CATEGORIZATION AS PER SYI CLASSIFICATION

SWS	Area (ha)	SYI	Erosion Category
W1	133	1230	High
W2	131	1150	Medium
W3	132	1160	Medium
W4	140	1180	Medium
W5	110	1150	Medium
W6	121	1210	High
W7	132	1190	Medium
W8	125	1180	Medium

SWS	Area (ha)	SYI	Erosion Category
W9	144	1220	High
W10	151	1210	High
W11	133	1230	High
W12	152	1240	High
W13	132	1240	High
W14	140	1220	High
W15	130	1210	High
W16	120	1170	Medium
W17	132	1180	Medium
W18	112	1210	High
W19	133	1280	High
Total :-	2503		

TABLE - 13.5 : AREA UNDER DIFFERENT EROSION CATEGORIES

Category	Area (ha)	Percentage
Very low	-	-
Low	-	-
Medium	1022	40.83
High	1481	59.17
Very High	-	-
Total :-	2503	100.00

The objective of the SYI method is to prioritize sub- watersheds in a catchment area for treatment. The total area under high erosion category in various dams is to be treated as a part of the project cost. The various measures suggested for catchment area treatment are depicted in Figure -D.

13.6 COST ESTIMATE FOR CAT PLAN

The cost required for Catchment Area Treatment is Rs. 6.94 Lakh. The details are given in Tables - 13.6 and 13.7

TABLE . 13.5 : COST ESTIMATE FOR CATCHMENT AREA TREATMENT OF SONKHEDI DAM .

BIOLOGICAL MEASURES

S.No.	Item	Rate/Unit (Rs.) (including maintenance cost)	Target	
			Physical	Financial (Rs. millions)
1	Gap Plantation	186800/ha	9 ha	1.681
2	Pasture Development	97500/ ha	5 ha	0.488
3	Social forestry	70000/ha	3 ha	0.210
4	Nursery development	120000 /No.	1 No.	0.120
5	Maintenance of nursery	125000/ No.	1 No.	0.125
6	Barbed wire fencing	50000/km	1.00	0.05
7	Watch and ward for 3 years for 5 persons	7500/ man- month	man- month	1.369
	Total (A)			4.043

TABLE = 13.7 : COST ESTIMATE FOR CATCHMENT AREA TREATMENT OF SONKHEDI DAM - ENGINEERING MEASURES

S.No.	Item	Rate (Rs.)	Unit	Target	
				Physical	Financial (Rs. millions)
1	Contour Bunding	15000/ha	Ha.	10 Ha.	1.500
2	Nallah Bunding	100,000	No.	01 No.	0.100
	Total :-				1.600

Total cost for Biological and Engineering measure = Rs. 4.043 Lakh (A)

Administrative expenditure

-	Government Expenditure 3% of A (including O&M)	Rs. 0.121 million
-	Establishment cost 8% of A	Rs. 0.323 million
-	Contingency 5% of A	Rs. 0.202 million
	Total :-	Rs. 0.646 million

13.5 (B) COST ESTIMATES OF CAT PLAN FOR FOREST AREA

The Total Catchment Area of SONKHEDI Dam is 535 I-hectares out of this 49.320 Hectares Forest Land. The cost required for Catchment Area treatment of Forest is Rs. 62.89 Lakh. The details are given in Tables-8 and 9.

TABLE-7 : COST ESTIMATE FOR TREATMENT OF CATCHMENT AREA IN FOREST AREA OF SONKHEDI DAM.BIOLOGICAL MEASURES

S.No.	Item	Rate/Unit (Rs.) (including maintenance cost)	Target	
			Physical	Financial (Rs. millions)
1	Gap Plantation	186800/ha	9 ha	1.681
2	Pasture Development	97500/ ha	5 ha	0.488
3	Social forestry	70000/ha	3 ha	0.210
4	Nursery development	120000 /No.	1 No.	0.120
5	Maintenance of nursery	125000/ No.	1 No.	0.125
6	Barbed wire fencing	50000/km	1.00	0.05
7	Watch and ward for 3 years for 2 persons	7500/ man-month	man- month	1.369
	Total (A)			4.043

TABLE.8 : COST ESTIMATE FOR TREATMENT OF CATCHMENT AREA IN FOREST AREA OF SONKHEDI DAM ENGINEERING MEASURES

S.No.	Item	Rate (Rs.)	Unit	Target	
				Physical	Financial (Rs. millions)
1	Contour Bunding	15000/ha	Ha.	10 Ha.	1.500
2	Nallah Bunding	100,000	No.	01 No.	0.100
	Total :-				1.600

Total cost for Biological and Engineering measure = Rs. 4.043 Lakh (A)

Administrative expenditure

-	Government Expenditure 3% of A (including O&M)	Rs. 0.121 million
-	Establishment cost 8% of A	Rs. 0.323 million
-	Contingency 5% of A	Rs. 0.202 million
Total :-		Rs. 0.646 million

Total Cost for Catchment Area Treatment for Forest Area of SONKHEDI Dam = 6.289 million.