

Vidarbha Irrigation Development Corporation, Nagpur



Asolamendha Renovation Project

CATCHMENT AREA TREATMENT PLAN FOR ASOLAMENDHA PROJECT.

OCT-2023

Asolamendha Project Sub Division, Saoli

Asolamendha Project Renovation Division No.1, Mul

GOSIKHURD PROJECT CIRCLE, NAGPUR

GOSIKHURD PROJECT, W. R. D., NAGPUR

PREFACE

Asolamendha Project constructed in British Era was made part of Gosikhurd National Project in the original Administrative approval dated 31 March 1983, and it was proposed to raise the height of Asolamendha Dam by 2.70 m, thereby increasing the capacity of the dam from 67 TMC to 120 TMC and increasing the irrigation potential from 9919 Ha to 54879 Ha. Asolamendha Renovation Project is under construction on Pathari River in district Chandrapur of Maharashtra State. Pathari river is Tributary of The Wainganga River which is sub-basin of Godavari River. The project lies at Latitude 20° 13'45" N and longitude 79° 49' 0" E

The catchment area of this project 245.72 Square Kilometers. The gross storage is 120.568 Mm³ with proposed irrigation potential of 54849 hectors. This irrigation is proposed by main canals 41.37 KM, & Three Branch Canal.

The Central Government, the Ministry of Environment & Forest has accorded the Environmental clearance to this project subject to some conditions vide letter No. J 11016(7), dated 3.2.1988 for Gosikhurd Project and Asolamendha is part of it. The forest proposal for diversion of 315.74 ha of forest land under FC Act 1980 is submitted on 17.07.2019 and resubmitted after compliances on 15.06.2022. MOEF had raised EDS dated 1/12/2022 and 10/10/2022 and asked for submission of Catchment Areat Treatement plan for Asolamendha Dam. As a part of fulfilment of these conditions, a detailed report on Catchment Area Treatment Plan is prepared. the same submitted herewith.

The basic information required for preparation of this report is gathered in the month of July - August 2023 from various departments of Maharashtra Govt. like Revenue, Water Resources, Forest & Agriculture. After scrutiny of this information the CAT report is prepared in this Volume which consists of detailed Report and Drawings.

We heartfully acknowledge Chief Engineer Shri Vemulkonda Saheb and Shri R.G. Patil Saheb, Superintending Engineer for extending their valuable guidance for preparation of this report.

We also acknowledge all the Government officials from various Government Departments of Maharashtra State for extending their kind co-operation.

CHAPTER 1

Asolamendha Renovation Project

CATCHMENT AREA TREATMENT

SECTION 1: INTRODUCTION

Pathari river is one of the major tributary of River Wainganga which is sub basin of Godavari river and it runs through Chandrapur District of Vidarbha Region. Major portion of Vidarbha Region is covered by Pranhita Sub-Basin of Godavari river basin. The main tributaries which contribute to form Pranhita river are Penganga, Wardha and Wainganga. The three valleys cover about 74% of the gross area of Vidarbha Region, out which 31% accounted for by Wainganga river valley.

Pathari river rises at an approximate elevation of R.L. 265 m near Rajoli in Sindewahi District of the Maharashtra. From high level elevations all near its origin, the river flows down through the Dense Forest After emerging from the hill the river enters the plains and flows generally southwards.

The river then flows along the Taluka border between Sindewahi & Saoli Tahsil and enters in the Pombhurna Tahsil. Where it meets the Andhari river, after confluence the river is known as Andhari which flows on the border of Pombhurna tahsil and Chandrapur Tahsil and joins the Wainganga river near Ghatkul in Chandrapur district.

The catchment area upto dam site is 245.72 Km². A number of big tributaries contributes to the total flow of Wainganga river before its confluence with Wardha river.

The Nallas/ tributaries upto the dam proper on left & right side are as follows:

Sr.No.	Left Blank Nalla	Catchment Area	Right Blank Nalla	Catchment Area
1	4E8A4d1	11.86	4E8A4g4	14.643
2	4E8A4d2	13.61	4E8A4g3	9.643
3	4E8A4d3	14.34	4E8A4g2	11.753
4	4E8A4f3	8.13	4E8A4g1	5.303
5	4E8A4f5	8.62	4E8A4f9	11.243
6	4E8A4f8	7.05	4E8A4f7	9.173
7	4E8A4g5	10.24	4E8A4f6	7.403
8	4E8A4g6	12.58	4E8A4f4	6.623

9	4E8A4g7	9.6	4E8A4f2	9.683
10	4E8A4g8	10.34	4E8A4f1	9.723
11	---		4E8A4c9	8.053
12	----		4E8A4c7	10.431
13	---		4E8A4c4	9.553
			4E8A4c8	9.411
			4E8A4c3	6.712
Total		106.37		139.35

At the dam side the river has a Narrow fan shaped drainage area which has a large variation in respect of slope, soil and vegetation cover. The portion of the catchment area near the origin of various tributaries and in their early lengths are semi hilly with some agricultural and forest cover. After the tributaries leave the hill slopes they enter relatively plain and wide valleys.

The head work of this Project is a composite dam of 3.18 Km length inclusive of spillway of length of 250 m and Non over flow portion of 3 Km lengths on both flanks. The Main canal is 42 km long and have three Branch canal which will irrigate 43763 Ha. land in Chandrapur District . There is also a provision of supply of water for Drinking Purpose.

Climate:-

The climate surveyed area is characterised by semi-arid climate with hot summer and mild winter. The mean annual air temperature is 30° C for Chandrapur stations while May is the hottest month with maximum temperature of 46° C and minimum as 37° C. December is the coldest month with maximum temperature of 25.6° C and minimum of 5.2° C. The area receives rainfall mainly from South- West Monsoon winds.

The meteorological data presented in Table 1, 1 (a), 1 (b) indicates that the annual rainfall of the area ranges between 1119 to 1307 mm, averaged, of which nearly maximum is received during June to September.

The mean summer (June, July, August) and mean winter (December, January, February) air temperature vary in between 26.2° C to 29.2° C and 16.2° C to 21.7° C, respectively with a difference of 7.3°C to 10.0° C which is more than 5°C and hence can be classified in "Hyperthermic" temperature family.

Most of soils remain moist for above 120-140 days during the year.

SECTION 2: CATCHMENT AREA

The catchment area of Asolamendha Project is 245.72 km². The catchment lies in Saoli, Sidnewahi Talukas of Chandrapur district in Maharashtra State .

The portions of the catchment area near of origin of various tributaries in their early length are hilly and are covered with agricultural land and forests. After the tributaries leave the hill slopes they enter relatively plain. In view of these large variations, the catchment area was required to be divided into various zones. The break-up of catchment is as follows:

1) Chandrapur District of Maharashtra State 245.72 km²

The breakup of catchment area such as agriculture land, forest land and other land comes under Maharashtra state is available and is as below:-

- | | |
|---|--------------|
| 1) Agriculture Land | ---- 15.50 % |
| 2) Forest Land | ---- 73.57 % |
| 3) Other than cultivation and Forest Land | ---- 10.93 % |

The catchment area of the project is generally plain terrain with dense forest. The forest is mostly classified as A & C Class having Yen, Bija, Haldu, Khair, Hiwar, Apta, Arjun, Mahua, Dhawada, Teak, etc, and mostly shrubby grown and small bushes. The density of forest cover is varying from 0.2 to 0.6.

The forest presents good cover for prevention of soil erosion with the help of vegetation, bushes and concentration of trees of various varieties. In contrast, due to unplanned and unscientific felling of trees in recent years, it has resulted in fast deletions of forest cover, hence requires extensive afforestation treatment.

The proposed reservoir will submerge the total area of 9.44 km² land in Chandrapur-district. The details are as below:-

1) Forest land	180.79 Km ² (73.57 %)
2) Revenue land	26.85 Km ² (10.93 %)
3) Private land	30.08 Km ² (15.5 %)
Total	245.72 km ²

For afforestation about 315.74 Hectors of land which cultivable land owned by user Agency has been acquired and delineated for Compensatory afforestation The afforestation work on down stream of dam is proposed to carried out in some area. Efforts to start the afforestation work in the above land will be made after approval of forest proposal.

GREEN BELT ALONG RESERVIOIR PERIPHERY

It is proposed to carry out the afforestation along periphery of reservoir to compensate the forest land going under submergence of the Project. The total forest land of 315.74 Ha. is required for the Renovation of this project and 315.74 Ha. of land has been made available to the Forest Department for afforestation in Yavatmal district of Maharashtra.

In addition to the above provisions, already there is forest along periphery of reservoir on an area in between MWL and FRL in addition to that afforestation along periphery of reservoir can be thought of in due course of time. This effort certainly will be helpful to increase the area of green belt along reservoir periphery and will help to reduce the soil erosion.

SECTION 3: RIVER SYSTEM

In a drainage basin, presence of stream and channels are the important factors. Besides erosion they also serve as depositional agent for entire basin. The Andhari Sub basin with main river as Pathari and its tributaries upto dam site on 08 Nalla on River Left Bank and 09 Nalla on River Right Bank are the main source of supply originating from dense forest. Tributaries are non-perennial and are active only during rainy season and winter season.

The yield of the catchment area is generally affected due to human interference in the form of unauthorised felling of forest, change in Agriculture practices and increase in the area of cultivation resulting in decrease of natural precipitation. The rainfall in the catchment area is confined much during rainy season except for one or two post monsoon falls during November and December.

For the purpose of framing this scheme, the catchment areas upto dam site are divided into following water sheds.

Sr.No.	Left Blank Nalla	Catchment Area	Right Blank Nalla	Catchment Area
1	4E8A4d1	11.86	4E8A4g4	14.643
2	4E8A4d2	13.61	4E8A4g3	9.643
3	4E8A4d3	14.34	4E8A4g2	11.753
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7	4E8A4g5	10.24	4E8A4f6	7.403
8	4E8A4g6	12.58	4E8A4f4	6.623
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11	---		4E8A4c9	8.053
12	----		4E8A4c7	10.431
13	---		4E8A4c4	9.553
			4E8A4c8	9.411
			4E8A4c3	6.712
Total		106.37		139.35

Pathari River-Water Shed:-

The river originates in Chandrapur-district-of-Maharashtra and meets with the Andhari river at 70-km down stream. It originates near Rajoli in Chandrapur District. The river bed is not much steep and flows with raiswal height bank of 2 to 3 metre. The total Catchment area is 245.72 Km².

District wise Predominant land use pattern of the catchment are in Maharashtra state is as follows.

Sr.No.	District	Catchment area in District km ²	Forest area in km ²	Other area not available for cultivation	Cultivable area in km ²
1	2	3	4	5	6
01	Chandrapur	245.72	180.79	26.85	38.08
	Total	245.72	180.79	26.85	38.08

SECTION 4 : GEOLOGY

Physiography :-

In the catchment area of Asolamendha Project, most of the area in Maharashtra is lying in the Plain area between elevations of 202 m. to 265 m above M.S.L. Catchment area in Maharashtra is fully plain.

It is Flat to the north east and west and has an average elevation of 230 m above M.S.L. The district lies both the north latitudes 20° 13' 45" and east latitudes 79° 45' and covers area of about 245.72 km². The elevation of the area ranges both 202 m and 265 m above M.S.L.

The total length of the river is about 54 km from its origin to confluence with Andhari River.

Geology :-

Geologically, Chandrapur district forms a part of Gondwana sedimentary basin. The Gondwana sedimentation took place in Wardha valley where Gondwana sediments have overlay the Archean rocks. Lithologically Chandrapur district presents a variety of stratigraphic units right from Archean to recent alluvium and laterites (Fig. 2). The Archean rocks comprise gneisses, quartzites, Banded Haematite Quartzites (BHQ), schists with basic intrusive rocks like pyroxenites, amphibolite, etc. The rocks are intruded by several dykes, trending NE–SW, are exposed in the eastern part of Chandrapur district. Iron ore series and Sakoli series are equivalent in age. Iron ore series constitutes the important iron deposits of Chandrapur district. The rocks are quartzite, BHQ, quartzite schist, phyllites, etc.

The Dharwars have been intruded on a very large scale and comprise of granites, granitoids and gneisses. The Vindhya's are represented mainly by flaggy and massive limestones, shale's and sandstones. The lenticular patches of breccia with angular fragments cemented by calcareous matrix are found at several places in limestones. The limestones are dolomitic at places. Sandstones and quartzities are hard compact and forms ridges.

Lower Gondwana includes hard quartzite, sandstones, grits, and conglomerates. The sandstones are finegrained whitish colored and calcareous in nature. The shales are of red colour and are found in small patches in the southeastern part of Chandrapur district. The Deccan trap lava formation covers small part of the district. The amygdaloidal softer variant varieties usually show calcite filling. In the district, Alluvium is mostly of fluvial origin and comprises sand, silt and clays. It is generally found along the banks of nallas and rivers. Its thickness varies from 8 to 35 m as observed along the Wardha river, the Erai and the Wainganga river courses. It also contains gravel along with sand, silt and clays at places.

SECTION - 5: METEOROLOGY

The catchment area of Asolamendha Project is influenced by the meteorological features of Chandrapur of Maharashtra -State. The climatological features in whole of the catchment area is almost same with slight variation. The climate in this region is dry and the temperature have large variation. The maximum and minimum temperatures recorded at Chandrapur are about 47° C in Summer and 5.2° C in winter.

The precipitation in the catchment area is mainly due to south-west monsoon. The monsoon precipitation generally commences in the last week of June and continues till September with occasional spell of late monsoon showers during in October. The average annual rainfall in the area is about 1300 mm; which is more or less assured but its distribution shows an erratic trend. Out of the total rainfall the precipitation of 95% is from June to October and remaining 5% is from post monsoon. The seasons of the year are broadly divided into three viz Winter, Summer and Rainy season.

Winter Season :-

The winter season generally occurs from November to February. December and January are the coldest months in winter period.

Summer Season :-

The summer season is from March to June extends upto the on-set of monsoon. During this season the maximum temperatures are mostly recorded during the month of May.

Rainy Season:-

The rainy season in this area occurs from last week of June and extends upto September with occasional spell of showers during the month of October. The maximum rainfall resulting in flooding of the river and streams of this area, have been observed during July and August. There have been some instances of flood in the month of September as well.

The nearest meteorological station for this project is located at Nagpur. At 00 G. M. T. the station show high percentage of relative humidity at the ground which is of the order of 92% in August. During June to September i.e. the monsoon period, air is more moist, the relative humidity is still higher during this period. At 12 G. M. T relative humidity is less compared to 00 G. M. T at Chandrapur station.

The mean surface wind speed at 00 G. M. T is generally high during the monsoon period and at 12 G. M. T strong surface wind area observed at Chandrapur station.

The mean surface relative humidity percentages observed at Chandrapur station at 00 G. M. T and 12 at G. M. T for the entire year are as given under :-

Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
a) (at 00 GMT)											
74	94	85	70	68	95	98	99	98	89	83	97
b) (at 12 GMT)											
24	19	15	17	17	28	46	49	49	33	30	31

The season wise temperature and relative humidity at Chandrapur are tabulated here under.

TABLE-1

METEOROLOGICAL DATA

Month	Precipitation (mm)	Humidity %	Temperature		
			Max.	Min.	Mean
January	2	48%	28.9 °C	15.8 °C	22.3 °C
February	7	42%	32.2 °C	18.8 °C	25.6 °C
March	12	34%	36.1 °C	22.3 °C	29.4 °C
April	10	29%	40 °C	26.5 °C	33.4 °C
May	17	28%	41.6 °C	29.9 °C	35.8 °C
June	204	54%	35.7 °C	27.5 °C	31.4 °C
July	376	78%	30.1 °C	24.8 °C	27.1 °C
August	325	81%	29.4 °C	24.3 °C	26.5 °C
September	203	79%	30.7 °C	24.1 °C	27 °C
October	62	65%	31.6 °C	22 °C	26.7 °C
November	14	55%	30.4 °C	18.8 °C	24.5 °C
December	3	50%	28.7 °C	16 °C	22.3 °C
Total	1235				

Source:- Meteorological Station Chandrapur.

Temperature Family:- Hyperthermic

Climatic Zone :- Tropical hot Climate

SECTION 6: IRRIGATION FACILITIES

Total catchment area of Asolamendha Project is 245.72 km². The break-up of catchment in Maharashtra State is as below:-

1) Maharashtra State :- 245.72 km²

Most portion of the catchment area lies in Plain area, having attitude of 202 m to 265 m above M. S. L. The area of remaining catchment is considerably flat. The break-up of Agriculture land, Forest land and Revenue land in the catchment of this project is as below:-

- 1) Forest land ... 18079 Ha..
- 2) Agriculture Land ... 3808 Ha
- 3) Revenue land ... 2685093 Ha.

The Agriculture land under catchment area is about 38.08% of total catchment area.

The following projects which are either completed or under construction or under planning are considered for upstream reservation in Maharashtra State.

Sr. No.	Name of Project	Utilisation
1)	Major Project	--
2)	Medium	--
3)	Minor & Local Sector	08 MCu.M
	Total	08 MCu.M

In addition to above the upstream reservation The existing irrigation in this area by wells, river and other sources is about 7% only, as compared to the I.C.A. of this project. This area under well irrigation is about 2000 Ha. only.

In the recent past due to felling of trees, erosion of soils, the environment has changed slightly. This can be controlled and counteracted by large scale afforestation and soil conservation programme, which will help to improve the water retention capability of the soil. This will moderate floods and stabilise the slopes. All these measures would stabilises the irrigation by adopting scientific irrigation practices and modified cropping pattern.

Project after completion will stride towards green revolution, will be helpful in Agricultural, Industrial and commercial developments of the area. The irrigation potential of the Asolamendha project which was 9919 ha since British Era will increase to 54879 ha benefitting 82 villages of Chandarpur district. Thus, it can very well be said that this project is really a 'Boon' to the people of Vidarbha in Maharashtra State.

Soil conservation and afforestation :-

To control the flow of sediment, measures such as land levelling, contour bunding etc. are being implemented by Agriculture Department of Maharashtra State in the catchment area and by command area development authority of Maharashtra State in the command area of project.

Alternative non-forest land is made available to the Forest Department for afforestation. In addition to above, plantation is also proposed in the degraded forest land under the catchment area of this project. Such type of plantation works are to be carried out by Forest Department as per State plan and proposed to be completed in time span of 5 years. This will definitely go a long way in stabilising sub- soil and surface cover in the catchment of the Project.

(There is also a scheme envisaged under social forestry plan to plant trees around the fringe of the reservoir)

SECTION-7: INHABITANTS & CULTURE

Most portion of the catchment area of Asolamendha Project lies in Plain area, having altitude of 202 m to 265m above M.S.L. The entire catchment consists number of small streams and nallahs which adds to the drainage area upto the dam site.

The Asolamendha Dam is situated near village Pathari, Tahsil saoli, District Chandrapur which is approachable by the shortest route from the District Head Quarter Chandrapur as stated below:-

Chandrapur to Mul (National Highway) – 40 Km

Mul to Saoli (National Highway) – 13 Km

Saoli to Pathari – 25 Km

Pathari to Asolamedha Project – 1.4 Km

The dam site is also approachable from Gadchiroli via Vyahad - virkhal –Pathari Road. The distance is about 26 km from Gadchiroli to Pathari. The dam site is also approachable by Nagpur via Umred- Bhiwapur - Nagbhir –Sindewahi- Pathari which is about 170 km. Railway line, also passing through the catchment area of this project. In addition to these, there are No. of districts and village road/cart tracks passing through the catchment and are well inter-linked with State Highways.

The small scale industries, (Rice Mill) are established in the area. However, the large portion of population is in Agriculture. As more than 70% of the catchment area is Forest area, the work of Agriculture can be considered as the main occupation of the inhabitants. Advantages of this fact can be taken by subjecting more area under Irrigation with advanced technology and scientific Irrigation facilities. The area in catchment is irrigated presently with facility of minor Irrigation Projects in Maharashtra State.

The inhabitants of the valley have their own culture. A large population of the region resides in rural areas and is dependent on the Agricultural productions. The main language of the area is Marathi & Gond, however Hindi is also spoken and understood. The Regional Head Quarter Nagpur is located on National Highway No. 6 and 170 km away from Dam site. The Divisional Head Quarter is located on State Highway 930 at Mul, which is about 35 km away from dam site, is well connected with other towns and villages. Almost all villages are electrified in this district Education facilities are also available in almost all villages.

Domestic fuel (firewood) is made available from local market and Forest Department. The essential commodities are available in the Taluka places situated in vicinity of catchment and from local weekly markets.

The people of the area are now well aware of the fact that indiscriminate felling of the forest results imbalance in the environment. However, because of resources and adverse economic

conditions, the malpractice of cutting forest for fodder and fuel purposes are still persisting. Considering the above process and conservation it appears that an integrated scheme for further developments of the area by afforestation and soil conservation will surely pay dividends and improve the economic conditions of the inhabitants and counter-act the effect of imbalance environment.

SECTION 8:

STATUS OF ENVIRONMENT IN CATCHMENT AREA

General:

India ranks second most populous country in the world. It can be observed during the preceding years, the population is increasing at an accelerated rate. Hence, the need for accelerating the pace of developing the natural resources is also increasing. The country has resorted to planned development after independence, which has considerably increased the living standard of the people.

As a result of accelerated growth of population, it is necessary to have planned and accelerated development of natural resources. One such development is soil conservation and other is afforestation. The top layer of the soil plays the key role in the agricultural activities and forms the key for the vegetal growth.

The top layer of the earth crust interacts with nature and natural resources. The seepage through the surface soil adds to flows in the form of small or big streams. The surface flow plays key role in fertility of the local soil. Due to hilly track the rainfall being naturally more and the surface run-off increased due to steep slope resulting in enormous erosive effects. The rate of soil erosion of any area is due to several factors, out of which some are natural and others are man-made.

Natural Factor :-

The natural factor causing soil erosion is very slow process and most of these areas are non destructive.

Erodability of soil

The common feature of the basin is the rolling and undulating country, a series of ridges and valleys interspersed with low hill range. A large portion of it is covered with forests. There is a predominance of medium black soil except for a small portion in the north having shallow black soil. The soils in command area are mostly residual soil resulting from the decomposition of deccan traps. The command is rich in fertile black cotton and alluvial soils.

Sediment deposition computation by Empirical sediment distribution method have been made. Total proposed silt accumulation at the Asolamendha dam site will be about 25.90 Mm³. Considering annual silt inflow rate in 02 Mft³/year. Adopting a total accumulation of 12.1 Mm³ of sediment at 100 years in the reservoir, the sediment pattern has been worked out based on the Silt Survey carried out by Irrigation Department.

Seismicity :

The dam site lies in seismic zone II. Hence basic seismic coefficient (α) is taken as 0.02 g. since the height of the dam is less than 100 m, the seismic coefficient method, as recommended by IS 1893-1975 is adopted for deciding horizontal seismic coefficient in design of earth dam & concrete dam respectively to take care of any possible earthquakes in the area.

Intensity :-

The area in absence of vegetal growth face the direct impact of rain drops resulting in disturbance of soil structure. The beating action of the drops of rain disturbs the soil particles. The action is called splash erosion. The extent of such erosion depends upon intensity of rainfall also on vegetation cover. Once the surface soil particles are dislodged, they are carried away easily by surface runoff.

Surface slope :-

A major portion of precipitation during monsoon season flows along the earth surface in the form of surface run off. The velocity depends upon the natural gradients. The run-off is considerably more in hilly region, continuing forest, shrubs, grass, rocks etc. Even though high velocity created because of the steep slope of such terrain, results in less eroding in such catchment carrying the soil with it.

Man-made Factors :-

Due to accelerated growth of population the consumption of firewood and fodder have also increased, which in turns has increased in abnormal deforestation and successive grazing by cattle herd. This process remove the forest growth covering the land surface. In absence of which soil particles with the direct impact of the rain get disturbed, in long run resulting in erosion. This in turn imbalance the environment.

Human population :-

The largest factor adversely affecting the environment is the population pressure, which has almost doubled in last decades. Study reveals that the population of India in the last decades has increased by 27.%. Apart from mounting needs of the people, the demands for forest product like wood and other products has risen steeply in the area. This has resulted in heavy pressure over the forest area and their consequent depletion.

Animal population :-

Due to subjecting more and more area under plough, the area which were once feeding source to the animals is getting diminished, starving the animal population and also lessening of natural manure for Agricultural fields. This meant higher demand for fodder and grass while already diminished resources are incapable of providing extra fodder. The availability further goes down due to plantation of needle like leaves, in places of broad leaves which can not be eaten by animals. This can be prevented by growing and increasing of forest there by long range security in ecological balance.

Requirement of fuel :-

Another added factor aggravating the situation is the growing need of fire wood for the accelerated population. In the previous couple of decades due to non-availability of alternative fuel the whole burden of supply of fuel was to be met with the existing sources. As the forest property considered common to the community, everybody concern were extracting more and more without re- generation of the sources.

Deforestation :-

Forest products are generally required in various domestic and industrial uses. The inhabitants generally required fuel and other domestic requirement such as building and furniture pay no attentions towards re-plantation.

In addition to providing timber and fuel wood, the forest cover further helps in retention of moisture in the soil. The water of such retained flows through underground drains add to capacity of springs that feed the main river and supports various plants and animal life.

Unscientific Agricultural Practices :-

The non bunding of fields and un-planned cropping pattern results in losing the retentivity of soil as well as erosion of the surface.

Defence and Railway :-

Defence and Railways establishment in the past decades have consumed timber extensively for making sleepers, carriages and other necessities. However, the railways of late have replaced the wooden sleepers by steel and concrete one. This has some how reduced depletion of valuable forest.

Impact of Environmental Degradation :-

The degradation of the catchment area has given rise to problem such as degradation of low proportion of forest cover and low forest increased deposition of silt in the lower regions of reservoir and water ways. Due to excessive exploitation of the natural resources may face serious depletion in coming days. Thus the ecological balance get disturbed. This happens due to destruction of forest cover by human sources and consequent soil erosion taking place.

The Development Dilemma

Reconciling economic needs with those of maintaining biological productivity can be achieved through integrated approach to development, which takes in to account factors like ecological, economic, social, cultural and Government involved in functioning of the system.

The integrated development of the catchment area should account for:

- i) Massive afforestation programme with involvement of local community.
- ii) Pasture development and their rotation.
- iii) Prevention and control of natural and man-made fire.
- iv) Development of the fuel, fodder and timber.
- v) Soil conservation and increasing of water retention.

- vi) Restoration and preservation of environment.
- vii) Encouraging people to go for family planning to reduce the population pressure on natural resources.

SECTION 9

LAND USE AND SOIL EROSION

The general picture that emerges of the catchment area considering the degradation in environment, pertain to land, forest and water, which are the principal resources. Ecological imbalance occurred due to excessive exploitation of these resources. There objective can be best realised through comprehensive catchment area treatment resulting on optimum use of natural resources.

The catchment area treatment combination of Engineering and Biological measures. It covers all the three resources viz land, forest and water. The measures should involve essentially envisaged planned change in land use pattern, which is very vital for effective implementation and sustainability of project. Framing up to scheme involves classification of the catchment area according to various capabilities to produce crops, vegetation and forest. The data regarding land use contemplated to potentiality of the land and physical option available. The data for land use can be contemplated as such and supplemented with other parameters such as meteorological, economic and social factors for right planning. Since the catchment area treatment depends upon status of soil erosion, the other requisites of the planning pertains to erosion characteristics of the land.

Once the data regarding land use and erosion characteristics are known it would facilitate to restore the damaged and diminished forest, revised depleted land and augment water resources.

The entire catchment area for the purpose, has been classified as under :-

- 1) Cultivated land,
- 2) Forest Land,
- 3) Other area.

The area falling under each class has varying degree of soil erosion. To facilitate decision of extent of treatment to be provided for treatment and formulation of action plan and implementation of other scheme, the data of the land use has been presented.

In addition to above, the sedimentation of Asolamendha reservoir is considered. Sediment deposition as mentioned above. Considering the sedimentation rate of 0.2 Mft³/year. Total proposed silt accumulation at the Asolamendha Dam site will be about 25.90 Mm³. Adopting a total accumulation of 25.90 Mm³ of sediment in 100. years in the reservoir, the sediment pattern has been worked out.

The Geological features of the area and data considered for water balance study of Godawari Basin has been considered for land pattern.

In view of above, a scheme for integrated development of the entire catchment area has been prepared. the share of each activity in any area depend upon the attitude of the area, slopes, forest covers, susceptibility of the soil erosion and availability of material resources. For framing this project, the entire catchment area has been divided into mainly five categories viz Forest (Reserve/ Protected/Degraded), Culturable land, follow land, pasture land and other

land. Further for achieving maximum benefit of soil conservation and covering as much critical area as feasible in minimum possible time, the pocket of sediment contributing areas has been identified which require soil conservation measures on priority basis and accordingly a comprehensive plan to tackle these areas in order of the priority has been prepared. The total cost estimated as Rs. 617.54 lacks as a rough estimation for this purpose.

LAND USE CULTURABLE AREA :-

This area mainly belongs to private individuals being used for growing different type of crops. The total area under cultivation is about 38.08 Sq. km. (15.50%) Most of the forest area is reserved forest and protected forest under Maharashtra State. Some forest area are maintained as Zudupi forest. It is primarily used for the local people for their requirements of fuel and fodder. The total area under forest is about 180.79 sq. km. which is about 73.57% of the total catchment area.

OTHER AREA:

This area which is neither forest area nor area suitable for cultivation comprising of Revenue Land, fallow under water Abadi, road, rock out crop and blank area. The area of such type of land comes to about 26.85 sq. km. which is about 10.93 % of total area.

The break-up of land under catchment area of Gosikhurd Project is as under:

1) Forest Land :	180.78 Km ²
2) Cultivated land :-	38.08 Km ²
3) Other land :-	26.85 Km ²
Total	245.72 Km ²

SOIL EROSION:

Considering the Geological study of the area, the bunding of nallahs, fields, and streams and forest cover available, fodder cultivation, plantation to restore deforested area, the soil erosion will be very minimum. This can be further prevented by compensatory afforestation, command area development and soil conservation measures of catchment area, already taken in some area and to be taken in remaining area.

SECTION 10

PROJECT COMPONENTS

The catchment upto the Gosikhurd Dam is vast and well spread covering the area of six districts of Madhya Pradesh and two districts of Maharashtra State. The number of minor schemes have been constructed and are functioning properly. Many minor schemes are under construction and investigation and are anticipated to be completed in the near future.

Wainganga is one of the major tributary in Godavari basin. break-up of the catchment area in Maharashtra State is as follows:-

Chandrapur 245.72 Km²

The break-up of catchment area such as forest land, agriculture land, Revenue Land, follow land, pasture land and other land is as below:-

1) Forest Land :	180.78 Km ²
2) Cultivated land :-	38.08 Km ²
3) Other land :-	26.85 Km ²
Total	245.72 Km ²

The scheme for catchment area treatment of the valley involves works pertaining to different disciplines with varied nature. The execution of scheme is expedited in wide and scattered area in plain terrain and area of hilly terrain. The various aspects are classified as below :-

1) Forestry :-

The total area of forest in the catchment area is about 180.78 km² but out of this an area of about 26.85 km² falls under land free from Vegetation. Out of the this area, afforestation can be taken in the blank area in the different stages of development. The sequence in which areas are to be taken up for treatment depends upon susceptibility of land for soil erosion and location of the various project and requirement of manpower.

2) Wood plantation

This is the most important and high yielding item of the development programme and comprises of plantation of timer and fuel wood. The type of plants will depend on the altitude of the area, the need of the local people, commercial value and type of soil. It is better suited to plant local broad leafed species having more capacity to retain moisture and conservation of soil.

Birds while feeding themselves also act as scatterers of the seeds far and near and this helps in afforestation to some extent. Therefore such species on which birds feeds themselves should also be planted. Wild bushes should also be planted to increase water retention and soil

conservation capacity. Development of mixed variety of forest will help in protection of forest area against natural fire.

3) SOIL CONSERVATION:

Soil conservation comprises of protection of soil cover by biological measures of improvement of the eroding or eroded area by Engineering techniques. Series of measures under afforestation and horticulture will on the one hand yield more food, control soil erosion effectively by providing vegetal cover, over the area. This basic process of soil conservation is proposed to be supplemented by various engineering: techniques and measures. In the catchment of this project, the soil conservation department are paying lot of attention to soil conservation work. The soil conservation departments in district Chandrapur are executing lot of soil conservation works such as field drains, graded bunds, land levelling nallah training, nallah bunding at various places from their sanctioned funds allotted by the State Government.

Minor Irrigation Schemes:

There are various minor irrigation schemes for state and local sector. The details of which are as under:

No. of schemes :-	23 Lake
Catchment area	6.70 Km ²
Command Area:	38.08 km ²
Total Command Area	38.08 km ²

On completion of projects irrigation benefit will be provided to 38.08 km². Cultivated land under the catchment area of this project. Each project has its own catchment, submergence and command area. Obviously, the treatment to command area in respect of the project would be made. This has been done because of every project will have its own command area development authority and has to be treated independently. Hence the above command cultivated area of completed and ongoing irrigation schemes under the catchment area of this project need not be considered for treatment under this project.

SECTION 11

ACTION PLAN,

The successful implementation of the catchment upto the catchment area treatment scheme involves the following factors.

- 1) An Organisation to give proper shape to the scheme.
- 2) Adequate financial resources for funding of the scheme.
- 3) A phased implementation programme based on rational criteria to ensure optimum utilisation of resources.
- 4) Monitoring and evaluation to keep watch on the programme of work and to assess its impact and the updating of the scheme based on the feed back from the fields.

ALTERNATIVE ORGANISATION SET :

Preparation of guide lines for detailed planning, implementation and co-ordination of various sectional programme and assuming overall responsibility for several organisational set up have been considered and their function are as below :-

Catchment area authority:

An institution for implementation of the Asolamendha Project catchment area scheme is considered for setting up the authority. The authority can draw a major part of experts and technical work force from various existing departments and can recruit directly as per the requirement. Necessary consulting assistance can also be taken according to the needs, the authority should take the responsibility of planning, execution, monitoring and evaluation of work in the valley. The Divisional Commissioner may take charge the scheme or the experts with adequate knowledge and know how an of such scheme can be considered.

The departmental structure not proper co-ordination to function with adequate team spirit.

Various areas under forest land will have to be made available for working to the staff. This creates Administrative and procedural bottle-necks, which is another point for delay in implementation.

INTRODUCTION :-

The Central Government, the Ministry of Environment & Forest has accorded the environmental clearance to Gosikhurd Project (Asolamendha Project as its part) subject to some conditions vide letter No. J11016/(7), dated 3.2.1988. One of the conditions is to prepare phased catchment area treatment scheme before the filling up of the reservoir commences.

In order to prepare the phased CAT plan prioritization of subwatersheds for very high & high category of soils in catchment is a must, for this a letter was written to Soil Survey Officer, AISLUS, Nagpur vide reference No. 2873/PB-1/94, dated 19.8.94 for taking up the

survey work of the catchment for preparing CAT plan. Accordingly soil survey department carried out detailed survey work of catchment area and submitted its detailed report on prioritization of subwatersheds of 4E5 catchment (part) of Godavari basin. The details of this report is as under.

The rapid reconnaissance survey of the catchment area under Gosikhurd Irrigation Project was taken up by Nagpur Regional Centre, All India Soil & Land use survey at the request of the Maharashtra State Irrigation Department for providing the data base which could help in planning and execution of Soil Conservation measures in the Catchment Area. The objective of the survey has been to prioritize small hydrologic units within the Catchment Area with respect to their relative contribution towards sedimentation in the proposed Gosikhurd reservoir with ultimate objective of preventing soil erosion in the Catchment Area, reducing the sedimentation in the dam reservoir and thus eventually enhancing the life span of the dam. All round agricultural development of the Catchment Area is ultimately envisaged.

The catchment area treatment has been proposed mainly based on two disciplines i.e. Engineering and biological measures with some broad aspects of these two disciplines like, graded bunding, bench terracing gully plugging, afforestation, horticulture, farm. foresting etc. The nature of treatments are being given in this area as per the soil conditions. Data of degraded forest land and non forest land have been updated and degraded land has been identified where treatments are to be given and marked on the Index map appended. Similarly the area where soil conservation works have been done are identified and marked on the Index map. Out of 25 sub water sheds of 24572 ha, an area of 1621 ha. (6.59 %) fall under very high priority category and an area of 1186 ha (4.82 %) are categorized under high priority category. These very high and high priority category areas needs soil conservation treatment on priority basis for significant reduction in the sedimentation of reservoir.

The subwatersheds have been categorised by fixing the ranges of sediment yield Index Values for each of the categories. The subwatersheds having more than 1100 SYI value have been placed in very high priority category and those having SYI value between 1050- 1099 under High Priority Category. The ranges of other priority categories are: Medium Priority category (1000-1049), low priority category (950-999) and very low priority category (less than 950 SYI value).

These priority categories are primarily meant to indicate the relative severity of the problem in the different sub water sheds. Keeping in view, any local condition and conveniences, any sub water sheds within very high and high priority category could be selected, for implementing soil conservation programme in the first phase towards catchment area treatment.

There are 25 sub water sheds in the Catchment area of Asolamendha Project falling in Chandrapur District of Maharashtra, covering an area of 245.72 Sq.Km. Out of this 2807 Ha. (11.41%) fall under high and very high priority category which require this catchment area treatment on priority basis.

The priority-wise area distribution tables are depicted as under.

Sr.No.	Priority category	Sediment Yield Index	Area in ha.	Percentage
1	Very high	1100 and above	1621	6.59
2	High	1050-1099	1186	4.82
3	Medium	1000-1049	1121	4.56
4	Low	950-999	2766	11.26
5	Very Low	Below 950	17878	72.77
	TOTAL		24572 ha	100

WATER SHED MANAGEMENT ORGANISATION :-

This work pertains to various component scheme for implementation, degraded forest barren cultivable land and irrigation concerned Department the State Government. The second alternative be Organisation consisting experts the field may created to provide guidance, general administration and to co-ordinate the activities of the respective department. monitoring, evaluation and general administration will be carried out by the management itself. The following advantages have been observed as a result of above :-

- 1) The existing Organisation of various department mobilised quickly for implementation of the scheme
- 2) There will be least possibility of disturbance in the structure and function of various departments.
- 3) The monitoring, evaluation and funding are controlled by the organization resulting the effective control over the implementation and function be elastic.
- 4) Watershed management in the manner in a shorter scale is being carried out by the respective department in catchment area. This can be further strengthened adequately for expeditious implementation.

INDEPENDENT DEPARTMENTAL WORKING :-

The work can also implemented respective departments their own. The management allocate funds for various schemes of the Project' the disposal various departments. remaining funds can be made departments. evaluation updating be handed respective departments. Such Organisation may present problems such as -

The functioning of respective departments are isolated this affects the implementation of the scheme which require integrated efforts. Effective monitoring will not be possible.

Constant watch on the impact of the project and its updating on the basis of feedback from the field will be infeasible.

With a view to the above to implement the schemes in a large scale expeditiously the watershed management Organisation by the State Government is considered most appropriate in the prevailing circumstances and hence recommended for adoption.

FUNDING :

The sound implementation of the project through various disciplines have involved total cost of Rs. 617.54 lakhs. The cost of the scheme totally about Rs. 617.54 lakhs is proposed to be charged to Asolamendha Renovation Project.

The amount to be arranged for various disciplines are attached separately vide Annexure II. The details of yearwise requirement of funds for catchment area proposed for treatment of this project is appended vide Annexure II

IMPLEMENTATION/PROGRAMME:-

As mentioned earlier, on the basis of detailed soil survey report submitted by AISLUS this department has prepared a detailed phased CAT Scheme. This scheme is completely based on the report submitted by soil survey department.

In view of the various number of works of the disciplines, topography of the area, a period of 5 years has been proposed for implementation of the scheme. The period can be further divided in to one year span. At the end of each proposed span a review of implementation will be taken.

The scheme of implementation of the catchment area covers various disciplines. It is much advisable to take up work under each discipline simultaneously. The criteria for planning of the scheme is as follows.

The primary purpose of the scheme is to improve the environmental condition of the Region. Second important object is to minimise the adverse impact of silt load in water either completed, on going or proposed irrigation schemes. Thirdly, the most important factor of the scheme is afforestation.

The area contributing for maximum silt deposition into the stream are identified and taken up on priority. The treatment work will be taken from peak to lower levels.

The catchment area of Asolamendha Project is 245.72 sq. km. This comprises of Pathari river some small streams & Nallas.

The treatment measure on the high and very high degraded area under net freely draining sub-water-sheds is considered for treatment measures and funded by this department. In the proposal of Gosikhurd Project enough silt trap has already been provided on the basis of the silt expected to be produced from the catchment. As the project has already bore the cost on account of the provision for the silt to be received from the general catchment of this project, the provision for de-sedimentation is not made to charge again to the cost of the general catchment treatment of the project.

The proposal of catchment area treatment in view of promoting the environmental consideration, a working phased action plan has been prepared. The details are narrated in the next chapter namely catchment area treatment and cost aspects.

SECTION 12

CATCHMENT AREA TREATMENT

PREAMBLE :-

The proposal for Environmental clearance of Gosikhurd Project (included Asolamendha) from Bhandara district of Maharashtra State including replies on questionnaire of ecological aspects, was submitted to the department of Environment, Government of India, New Delhi in the year June 1987 to obtain the clearance from Environmental angle..

The Central Government, the Ministry of Environment & Forest has accorded the environmental clearance to Gosikhurd Project subject to some conditions vide letter No. J 11016/(7), dated 3.2.1988.

On the basis of scrutiny of report submitted earlier, the Central Government; Ministry of Environmental and Forest has directed to revise the Environmental clearance report of Gosikhurd Project on the guidelines issue vide their letter No. 11016/7), dated 3 February 1988.

In the above letter the project Authorities were requested to prepare detailed Action Plan on the following aspects.

- 1) Rehabilitation Master Plan
- 2) Phased Catchment Area Treatment Scheme
- 3) Command Area Development
- 4) Compensatory afforestation
- 5) Flora and fauna
- 6) Health Aspect

However, the project was cleared from Environmental point subject to some conditions. In the light of above parameters, the phased catchment. area treatment scheme for Asolamendha Project hereby prepared. The complete detailed information on the above parameters is narrated in the following paragraphs.

2.0 CRITERIA ADOPTED FOR IDENTIFYING DEGRADED AND VULNERABLE AREA

Environmental includes soil, water, air and the socio economic conditions. Forests are directly connected with soil, water, air and the economic conditions of the Environment. The Agriculture & Forest Department are paying attention to soil conservation. The Irrigation Department (Project) had been paying attention only to revenue land and degraded area.

The check list furnished by the Department of Environment make the brief reference to the catchment area. Accordingly a report has already been narrated in the previous chapters, covering the themes of the river system, Geology and Soil, Metrology, Irrigation facilities, inhabitants and culture, land use and soil erosion, with special reference to forests/degraded forests and details of all type of land for the Asolamendha Project catchment.

The catchment area treatment has been proposed mainly based on two disciplines i.e. Engineering and biological measures with some... broad aspects of these two disciplines like Nallah bunding, Gully plugging Graded bunding, farm forestry and afforestation etc. The nature of treatments are being given in this area as per the soil conditions.

2.1 Methodology :-

The procedure outlined in the Technical bulletin on Methodology of priority delineation survey published by All India Soil & Land Use Survey (1991) was followed for prioritisation of subwatersheds in the Catchment Area. Field surveys of rapid reconnaissance intensity were carried out employing 1:50,000 scale base map drawn from Survey of India topo-maps, for acquisition of data on geomorphic factors, soil and land attributes, land cover and soil management factors. The mapping legend consists of a set of erosion intensity mapping units, each representing an assemblage of geomorphic, soil, land cover and management factors. The various steps involved in the procedure adopted are :

2.2 Framework of subwatersheds :-

The catchment area was subdivided into small hydrologic units six stages of hierarchical system of delineation and codification of subwatersheds following the approach described in the Watershed Atlas of India on 1:1 m Scale (All India Soil & Land Use Survey, 1988). The delineation and codification upto watershed level was taken base from the Watershed Atlas of India and watershed was further subdivided into smaller hydrologic units following the systematic approach and subsequently codified by suffixing the English alphabets to the watershed code. The Asolamendha Irrigation Project catchment area was represented by 4E8A4 sub-catchments. The above sub watersheds has been symbolized by an alphanumeric code indicative of the Water Resources Region, Basin, Catchment, Sub-catchment and watershed delineated on national level basis. The sub watershed codes symbolized by English alphabets represent further delineation within the watersheds.

2.3 Rapid Reconnaissance Surveys :-

Rapid reconnaissance survey was carried out, employing 1:50000 Scale base map, together information on the geomorphic, soil and land attributes, land cover, the existing erosion and soil management factors. Based on the broad variation in geology, geomorphology and stratigraphy, etc. the major landscapes were first delineated through rapid traverse in the area and tentative erosion intensity mapping units. was developed. The units were symbolized using alphanumeric codes based on geology and landform and the mapping legend was formulated. Subsequently the whole catchment area was mapped through rapid reconnaissance survey and the Erosion Intensity Map thus developed was used for computing sediment yield index values.

2.4 Assignment of weightage values and Delivery Ratios :

The composite erosion intensity mapping units were assigned relative erosivity values adjudged to be indicative of the combined effect of dynamic interrelationship of the parameters

composing the mapping units in terms of their active erosivity. A factor 'K' rated as an inertia factor signifying equilibrium between erosion and sedimentation was assigned a value of 10 and proportional additions or subtractions from this value were made assessing the relative effect of parameter.

The values of delivery ratios, employed as a measure of transportability of detached soil material to the reservoir site were assigned to various units assessing the combined effect of the parameters affecting suspension and mobility of suspended material.

2.5 Computation of Sediment Yield Index Values:

The area of each of the mapping units was computed planimetrically and sediment yield index was calculated using the following equation

$$SYI = \sum_{i=1}^n (A_i \times W_i \times D_i) \times 100 / A_w \quad i=1 \text{ to } n$$

Where,

SYI = Sediment Yield Index

A_i = Area of unit

W_i = Weightage value of ith mapping unit

D_i = Delivery ratio assigned to ith mapping unit

n = Number of mapping units

A_w = Area of subwatershed

3.0 PRIORITIZATION OF SUBWATERSHEDS

The ultimate objective of the survey is to demarcate the priority area in the catchment for development of soil and water conservation treatment plan in a phased manner. This task has been achieved by grading subwatersheds in accordance with sediment yield index. Higher value of the index suggested higher priority and vice versa.

The subwatersheds have been categorised by fixing the ranges of sediment Yield Index Value for each of the categories. The subwatersheds having more than 1100 SYI value have been placed in Very High priority category and those having SYI value between 1050-1099 under High priority category. The ranges of other priority categories are Medium priority category (1000-1049), low priority category (950-999) and Very low priority category (Less than 950 SYI value)

Under Brief summary of the distribution of different categories of priority is given below.

Sr.No.	Priority category	Sediment Yield Index	Area in ha.	Percentage
1	Very high	1100 and above	1621	6.59
2	High	1050-1099	1186	4.82
3	Medium	1000-1049	1121	4.56
4	Low	950-999	2766	11.26
5	Very Low	Below 950	17878	72.77
	TOTAL		24572 ha	100

Some of the important findings of the surveyed area of Asolamedha Irrigation Project are Summarised below.

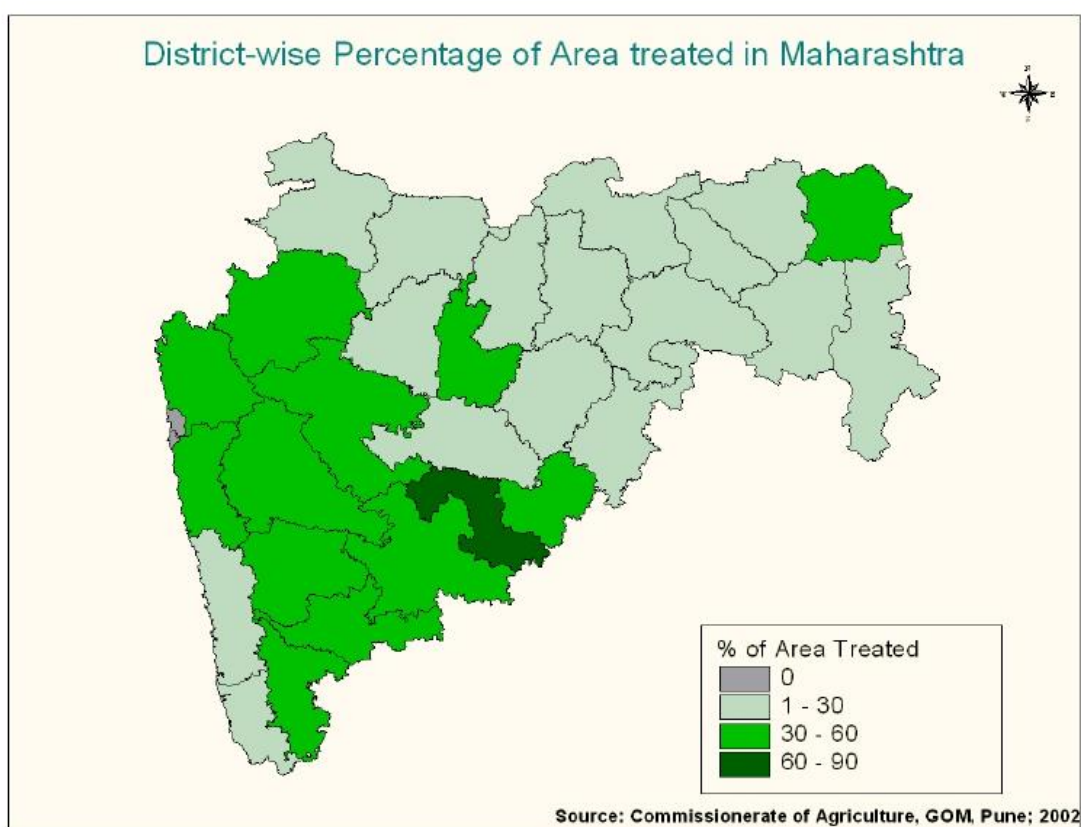
Out of 25 subwatersheds, an area of 1621 ha. (6.59%) fall under very-high priority category and an area of 1186 ha. (4.82%) are categorised under high priority category. These very high and high priority category areas need soil conservation treatment on priority basis for significant reduction in the sedimentation of reservoir.

These priority categories are primarily meant to indicate the relative severity of the problems in the different subwatersheds. Keeping in view, any local conditions and conveniences, any subwatersheds within very high and high priority category could be selected for implementing soil conservation programme in the first phase towards catchment area treatment.

The major part of the survey area is as under good vegetal cover and it also susceptible to moderate to slight erosion (87.98 %) area hazards resulting the under low and very low priority category. It, thus indicates the moderate problems of erosion hazards in relative sense and with reference to sedimentation of Asolamendha Irrigation Project.

The district wise distribution of area under

District	Geographical Area in ha	Area available for Watershed	Completed Watershed	Total treated area including incomplete watershed	Balanace area for watershed development	Expenditure incurred in lakhs
Maharashtra	30758300	20737620	8127	6115376	14622244	225176
Chandrapur	1091800	556940	202	105943	450997	6640



The Division wise priority wise categories in Maharashtra is shown below. Respectively.

Division	Total no of Water shed		Dark and grey Watershed		DPAP watersheds		Triable Watersheds		Other area watersheds	
	No of incomplete watershed	% of remaining area	No of incomplete watershed	% of remaining area	No of incomplete watershed	% of remaining area	No of incomplete watershed	% of remaining area	No of incomplete watershed	% of remaining area
Nagpur Region	1627	39	79	35	844	38	65	58	639	39
Maharashtra	16678	46	1344	39	3060	48	7681	46	4593	45

It is seen that about 3.3% of the area falling in Maharashtra under very high and high category of priority and needs immediate soil conservation treatment. However during scrutiny and detailed study of the catchment area it is observed that after deduction of the area which comes under the catchment of other project on upstream of Asolamendha Dam the net area under free drainage works out to 24572 ha.

Out of this 24572 ha, net area proposed for treatment from Agriculture & Forest Department is 21887 ha. Hence it is 0.89% as compared to the total catchment area in Maharashtra State i.e. 20737620 ha.

Map showing critically degraded area requiring engineering biological treatment on the basis of the recent field survey is enclosed separately vide page No. 3 of Volume II. Details of engineering & biological measures proposed to be carried out as a time bound programme.

The task of forest conservation tree plantation and development of fallow land simultaneously are the national property. For this purpose the Waste Land Development Board and Social Forestry Department will be joined together under the charge of C.C.F. and to be continued the scheme from own sources. The problem Government related with funds for new schemes. Final shape being given to proposal for securing special assistance from the Central Government. As their time framed would depend the need of fund and choice of implementing by the various Department, these measures considered supplemental only. (However the details engineering and biological measures proposed to carried over very high and highly degraded land under the catchment area AsolamendhaProject are narrated as under.)

4.1 CATCHMENT AREA TREATMENT PLAN

4.2 CATCHMENT AREA

Pathari River is one of the major tributary of Andhari basin, runs through Vidarbha Region. It rises at approximate elevation of R. L 265 m near Rajoli in Chandrapur District of Maharashtra State. The total length of the river is 38 km from its origin to Asolamendha Dam site, situated near village pathari in Saoli Tahsil of Chandrapur District in Maharashtra State.

There are 17 major Nalla or steam, which contribute major flow of the Pathari river upto the dam site are as follows:-

Small streams and Local Nallah 245.72 sq. km.

The total catchment area of Asolamendha Project is 245.72 sq. of Maharashtra State viz Chandrapur.

4.3 LAND USE PATTERN:

The land user pattern of the catchment area upto dam site is mainly divided as follows

Type of land	Area in km ²	Percentage
1) Forest Land	180.79	73.57
2) Cultivated land	38.08	15.50
3) Other land	26.85	10.93
Total	245.72	100

The proposed reservoir will submerge a total area 9.54 km². The break-up of submergence area is as

Type of land	Area in km ²	Percentage
1) Forest Land	2.43	25.47
2) Cultivated land	4.77	50.00
3) Other land	2.34	25.53
Total	9.54	100

4.4 DETAILS OF CATCHMENT AREA AND AREA OF TREATMENT PROPOSED:

The total catchment area of this project is 245.72 sq. km. After deducting the submergence area of the reservoir, the catchment area of completed, on-going schemes, on upstream of the dam site area and area of soil conservation treatment in different village which has already been provided and is under progress, the free drainage area of the project works out to 57.77 sq. km. The details of such area are as below:-

1) Total catchment area	245.72 km ²
2) Deduction:	
a) Existing Reservoir Area	18.60 km ²
b) Additional submergence area	9.54 km ²
c) Total Lake/Pond area of completed and on-going schemes on U/S of the Dam.	6.69 km ²
d) Gaothan area	1.55 km ²
e) Deduct Dense Forest	151.58 km ²
Net free drainage area	57.77 km ²

4.5 CAT PLAN:-

CATCHMENT AREA TREATMENT OF VERY HIGH AND HIGH PRIORITY CATEGORY UNDER THE NET FREELY DRAINAGE AREA OF ASOLAMENDHA PROJECT

Soil conservation is an integrated approach of mainly two disciplines viz engineering and biological. Sources of the broad aspects of these two disciplines are given as under :-

- a) Engineering:- Check dams, Contour bunding, trenches, bench terracing, Gully plugging and bank protection etc.
- b) Biological –
 - i) Agronomic : Contour farming, strip cropping and crop rotation.
 - ii) Forestry :- Forest conservancy of degraded forest, control of grazing and afforestation.
 - iii) Grass cover: Pasture development and protection by vegetation including grass cover.

The type of the catchment area treatment depends on the actual site conditions. According to the site conditions, and Considering the works set out by the "All India Soil and Land Use Survey Organisation" (AIS & LUSO) under the ministry of Agriculture, Government of India, communicated vide Report No. AGRI/1174 May 1999. The Sub-water-sheds have been categorised by fixing the sediment yield index values for each of the category. The Sub-water-sheds having more than 1100 SYI value have been placed in "very high priority" category and those having SYI value between 1050 to 1099 under "high. priority" category.

Out of 25 Sub-water-sheds, an area of 1621 Ha. fall under very high priority category and an area of 1186 Ha. are categories under high priority category. These very high and high

priority category areas of about 2807 Ha. (M. S.) needs soil conservation treatment on priority basis. As per the statement on page No. 60, the areas which falls in Maharashtra State under high & very high category are $(1621+1186) = 2807$ ha.

In Maharashtra State No. of irrigation projects are completed on the upstream of Asolamendha Project. The catchment area in high & very high priority area is only 2807 ha, considered for deduction. Thus free drainage area works out to 57.77 Km^2 for 25 sub-catchments which is considered for treatment. As stated above theout of 5777 ha of free drainage area, high and very high priority area of this project comes about 2807 Ha.

The addition to above, it is necessary to consider the treatment works on acquired land on D/S of Dam, land scaping on quarry areas, plantation along reservoir periphery (between FRL & MWL) compensating afforestation on double forest land going under submergence of this project.

4.6.0 TREATMENT OF NET FREELY DRAINAGE UNDER CATCHMENT AREA:

As stated above facts and circumstances it is proposed to carryout various Engineering and Biological measures for treatment of total 5777 Ha which falls under drainage of this project.

The break-up of various types of land proposed for various treatment is given as under :-

i)	Degraded Forest...	2921 ha (29.21 Km ²)
	(A) Total	2921 ha.
ii)	Cultivated land	2856 ha
	(B) Total	2856 ha
	(A) + (B) Total	5777 ha

4.6.1 MEASURES ADOPTED FOR TREATMENT

4.6.1.1 BIOLOGICAL

Engineering and Biological measures are to be adopted for treatment of degraded area under the catchment of Gosikhurd Project. Soil conservation essentially consist of protection of soil by biological measures and improvement of the eroding/ eroded area by Engineering technique.

The various measures afforestation, Horticulture, farm forestry and vegetative barriers proposed under this disciplines. This will on one hand yield more wood, food, fuel fodder conserve water and other hand will control erosion effectively providing vegetation cover the degraded.

The salient aspects works proposed under different disciplines as described below

a) AFFORESTATION:

Total forest land including revenue forest the catchment Asolamendha Project 245.72 sq. km

The details forest are as under

I	Reserve forest & Protected Forest	180.79 km ²
Ii	Revenue Forest	
Iii	Degraded forest	
	Total	180.79 km²

For compensatory afforestation between FRL MWL considered afforestation different stages development. is planned to phase afforestation for a period of 5 Years it is proposed be implemented through Forest Department of respective States. Forest Conservation Plan has been submitted by Forest Department in Wild life Proposal.

b) HORTICULTURE:

The total quarry area which needs treatment is 5.3 Ha. Development fruit trees which is 1.90% out of 280 Ha. The catchment of this region suitable for orange trees. Hence horticulture has a scope in the region, if forest plantation is carried out and people are encouraged to switch over to horticulture in their Culturable land not suited for agriculture. The requirement of plants shall be made available from the existing network of Forest Department and Agriculture Department. The work will be carried out by Agriculture Department.

c) FARM FORESTRY: -

The work proposed under this sub-head is 280 ha Land of total land, which works out to be 10% of total area to be treated. Under this components of development scheme, plants will be distributed to the farmers free of cost near Gaothan. The farmers may use these plants on home stead, bank of streams, boundaries of fields and fallow area according to availability of area and their convenience. The work will be carried out by Agriculture Department as well as by farmers at their convenience under the guidance of Agriculture Department.

4.6.1.2 ENGINEERING MEASURES

The works in respect of engineering treatment are mostly proposed such as, graded bunding, bench terracing, gully plugging in cultivated lands under this discipline, which prevents erosion and check the siltation problems. The salient aspects of works proposed under different disciplines are as described below

Cultivated land /Contour Trenching :-

Since last some years, the various soil conservation works have been carried out by the State Soil Conservation Department in different villages in the catchment area of Asolamendha Project and adjoining to the catchment area of project.

The net degraded forest land under freely drainage area is worked out to 285 km² including waste land (Padit land) where various treatments are to be provided.

b) Graded Bunding Nalla Bunding:-

The small bunds are proposed to be constructed on a failing or graded contour providing with a channel on the U/s side to break the slope for diverting run-off safely. Under this sub-head treatment is proposed on 1684 Ha land as shown vide ANNEXURE II .

c) Gully Plugging:

This treatment involves the construction of gully control structure by loose boulders and masonry in the eroded channels to reduce the slope of the water flowing therein during high stage and also the resulting velocity thereby preventing excessive scour and erosion. This will also be use to retain. silt and debris. Provision for nallah plugging has been made on 280 Ha. arca @ 1 No./100 Ha. land which works out 3 Nos.

d) Pasture Land: Grazing Land :-

One of the chief cause of soil deterioration in pasture land is the loss of plant cover, due to over grazing and poor management practices that expose the ground to wind and rains.

The total pasture land in the freely drainage area under catchment of this project works to about 283 ha. For achieving maximum conservation, 60% of the benefit of soil net pasture development and 40 % for grass land development land with shrubs protections are considered which comes to 170 Ha. and 112 Ha. respectively.

4.7.0 ACTION PLAN FOR BIOLOGICAL AND ENGINEERING MEASURES OF CATCHMENT AREA OF GOSIKHURD PROJECT.:

4.7.1 BIOLOGICAL TREATMENT:

4.7.1.1AFFORESTATION :-

In the catchment area of Project the forest land which comes under freely drainage area which, are to be treated has been identified as shown in Drawing .

The afforestation work is proposed to be carried out over an area of 20 Ha. land including revenue forest land between FRL & HFL .

Rate as per guidelines for new generation watershed development projects (wdc-pmkxy 2.0)
Rs. 22000/ Ha

Maharashtra State

Total Area under high and very high priority = 2807 ha.
Cost of treatment - 2807 Ha X 26400 = 6,17,54,000/-
Say Rs. 617.54 Lakhs.

The work is proposed to be carried out and completed within 2 years. The details of yearwise planning of afforestation including requirement of funds for treatment are given as below. This planning is based on the completion of Dam and Waste weir work which is proposed to be completed by March 2025 .

Year	Percentage Area Proposed	Area in ha.	Amount in Rs. Lakhs
1 st Year March 2024	40	1123	247.02
1 st Year March 2025	60	1684	370.52
Total	100	2807	617.54

4.7.1.2 FARM FORESTRY AND HORTICULTURE -

For farm forestry and horticulture, the requirement of plants shall be met out from the existing network of forest and Agriculture Department for implementing the programme.

The farm forestry and works are proposed to be carried out over (10 % area of Total) 280 Ha area of fallow land under the freely drainage area of this project. The district wise of land proposed under treatment is given as under:

a) FARM FORESTRY

Total Area of treatment = 280 Ha.

Rate/ Ha. = Rs. 22000/-

Total cost of treatment Rs. 61,60,000 /

The work is proposed to be carried out and completed within 2 years. The details of year-wise planning of form foresting works including year-wise requirement of funds for treatment are given as under

Year	Percentage Area Proposed	Area in ha.	Amount in Rs. Lakhs
1 st Year March 2024	40	112	24.64
1 st Year March 2025	60	168	36.96
Total	100	280	61.60

b) HORTICULATURE

Total Area of treatment = 280 Ha.

Rate/ Hector Rs. 22000/-

Total cost of treatment Rs. 61,60,000 /-

The work is proposed to be carried out and completed within 2 years. The details of year-wise planning of horticulture works including year-wise requirement of funds for treatment are given as under

Year	Percentage Area Proposed	Area in ha.	Amount in Rs. Lakhs
1 st Year March 2024	40	112	24.64
1 st Year March 2025	60	168	36.96
Total	100	280	61.60

Thus the total cost of Biological measures comes to Rs 123.20 Lakhs for treatment of 560 ha land in this catchment of this project.

2.7.2 ENGINEERING MEASURES

4.7.2.1 CULTURABLE LAND:

In the catchment area of this project, the culturable land, which are to be treated has been identified to the tune of about 3808 ha. as shown vide ANNEXURE II.

The district-wise breakup of cultivated land proposed under treatment is given as under and proposed for treatment under various discipline as below:-

Chandrapur - 3808 Ha.

Total -3808 Ha

a) GRADED BUNDING/CONTOUR TREACHING & NALLA BUNDING

The graded /contour bunding treatment is proposed to be freely under vide above carried out in 1684 ha culturable land shown drainage of this project, ANNEXURE II.

Maharashtra State

Total Area of treatment = 1684 Ha.

Rate/ Hector Rs. 22000/-

Total cost of treatment Rs. 370,48,000 /-

The work is proposed to be carried out and completed within 2 years. The details of year-wise planning of form bunding works including year-wise requirement of funds for treatment are given as under-

Year	Percentage Area Proposed	Area in ha.	Amount in Rs. Lakhs
1 st Year March 2024	40	674	148.19
1 st Year March 2025	60	1010	222.29
Total	100	1684	370.48

GULLY PLUGGING

The gully plugging/nallah bunding works are proposed to be carried out over 280 Ha area of land under the freely drainage area of this project. The district wise breakup of land proposed under treatment is given as

Maharashtra State

Total Area of treatment = 280 Ha.

Rate/ Hector Rs. 22000/-

Total cost of treatment Rs. 61,60,000 /-

The work is proposed to be carried out and completed within 2 years. The details of year-wise planning of form bunding works including year-wise requirement of funds for treatment are given as under

Year	Percentage Area Proposed	Area in ha.	Amount in Rs. Lakhs
1 st Year March 2024	40	112	24.64
1 st Year March 2025	60	168	36.96
Total	100	280	61.60

2.7.2.2 PASTURE LAND (Grazing Land):

The pasture land development works are carried out over 282 Ha grazing land under the freely drainage area of this project. The district wise breakup of land proposed under treatment is given as under:

Maharashtra State

Total Area of treatment = 283 Ha.

Rate/ Hector Rs. 22000/-

Total cost of treatment Rs. 6226000 /-

The work is proposed to be carried out and completed within 5 years. The year-wise planning of treatment on pasture land development including requirement of funds are given as under-

Year	Percentage Area Proposed	Area in ha.	Amount in Rs. Lakhs
1 st Year March 2024	40	113	24.90
1 st Year March 2025	60	170	37.22
Total	100	283	62.26

Thus the total cost of catchment area treatment on Engineering measures works out to Rs. 617.54 Lakhs for treatment of 2807 ha land under the catchment area of this project.


In this way the total cost of catchment area treatment Action Plan including Engineering and Biological measures on very high and highly degraded land under the freely drainage area of Asolamendha Project works out of Rs. 617.54 Lakhs for the treatment over 2807 Ha are.

The detailed requirement of yearwise funds and yearwise work programme of Engineering and Biological measures under Maharashtra State are given as under:

Year of Programme	Percentage Area Proposed	Area of Treatment (Ha)	Cost of Treatment (Rs Lakhs)
1 st Year	40	1123	247.02
1 st Year	60	1684	370.52
Total	100	2807	617.54

This expenditure is proposed to be incurred in a span of 2 years as has been elucidated in above mentioned chapters and paras.


Junior
Engineer


Sub Divisional Engineer
Asolamendha Project Renovation
Division, Saoli


Executive Engineer
Asolamendha Project Renovation
Division No. 1 Mul

**GOSIKHURD (INDIRA SAGAR) PROJECT.
ASOLAMENDHA RENOVATION PROJECT**

SALIENT FEATURES

Sr. No.	Description	As per 3 rd R. AA Proposal
1	2	3
1	Location of Dam	
	State	: Maharashtra
	Tahsil	: Sindhewahi
	District	: Chandrapur
	Village	: Pathari
	Latitude	: 20° 13' 45" N
	Longitude	: 79°-49'-0" E
	Topo Sheet No.	: 55 P/16
2	Name of river	: Wainganga River / Human / Pathari
	Name of Basin	: Godavari
3	(i) Catchment Area	:
	(Sq. km)	: 245.53 Sq. Km.
4	Average annual rainfall in the catchment	: 1320.80 mm.
5	Average monsoon rainfall in the catchment	: 1278 mm.
6	Water Availability	:
	i) 75% dependable masoon yield	: 282 Mm³
	ii) Post monsoon Yield (4.7%)	: 1.24 Mm³
	iii) Total annual yield	: 283.24 Mm³
	iv) Up stream reservation for minor, medium & major projects.	: Nil
	v) Balance Available for use at dam site	: 283.24 Mm³
	vi) Feeding from Gosikhurd Dam	: 94 Mm³
	vii) Total yield for planning	: 377.24 Mm³
7	Utilisation (75% dependable year)	:
	i) Irrigation utilisation	:
	ii) Evaporation Losses	:
	Annual Total	: 282 Mm³
8	Storage Planning	:
		:

	i) Gross Storage	:	120.568 Mm³
	iii) Dead storage	:	28.50 Mm⁴
	iv) Live storage	:	92.068 Mm⁵
		:	
9	Controlling Levels	:	
	i) T. B. L.	:	R. L. 220.00 m.
	ii) M. W. L.	:	R. L. 217.52 m.
	iii) F. R. L.	:	R. L. 216.50 m.
	iv) Crest of Spillway	:	R. L. 216.50 m.
	v) M. D. D. L.	:	R. L. 211.60 m.
	vi) Out let sill level (RBC)	:	R. L. 208.18 m
	vii) C. B. L. (RBC)	:	R. L. 208.00 m
	ix) River Bed Level	:	R. L. 202.08 m.
10	Submergence details	:	
	i)Area Under Submergence at (F. R. L.)	:	2315 ha.
	ii)Submergence ratio w.r.t. I.C.A.	:	5.50%
	iii) Land Under Submergence at F. R. L.	:	
	a) Private Land	:	2117 Ha
	b) Govt. Land (Existing 2117 Ha)	:	0 Ha
	c) Forst Land	:	198 Ha
	Total	:	2315 Ha
	iv) Total villages affected	:	
	Partly and Fully	:	Chandrapur
	Fully	:	2
	Partly	:	11
	Total	:	13
11	DAM :	:	
	i) Type of Dm	:	Rolled filled earthen dam
	ii) Length of Dam	:	3180 m
	iii) Maximum Ht of Dam	:	18 m
	iv) Free Board over M. W. L.	:	2.0 m
	over F. R. L.	:	3.5 m
12	Spillway	:	
	i) Type of Spillway	:	PKW Type Spillway

	ii) Length of Spillway	:	250 m
	iii) Maximum Height above river Bed	:	14.42
	iv) Crest Level	:	R. L. 216.50 m
	v) Design Flood	:	2744 cumecs
	vi) Flood routing at F. R. L.	:	2741.62 cumecs
	at M. W. L.	:	
	vii) No. of gates	:	Ungated
	viii) Size of gate	:	NA
13	Outlets	:	
	i) Location	:	RD 30 m(R.B.)
	ii) Discharge	:	62.756 cumecs
	iii) Outlet sill	:	208.00
	iv) C. B. L. of start	:	208.00 m
	vii) Bed gradient	:	1:100
14	Canal	:	R. B. C.
	i) Type of Canal	:	Lined Canal
	ii) Bed Width	:	18.10
	iii) F. S. D.	:	3.05 m
	iv) Free Board	:	0.95 m
	v) Side Slope	:	2:1
	vi) Bed gradient at start	:	1: 10000
	vii) Discharge	:	62.756
	viii) Length	:	41.37 km
15	Command area in Ha.	:	R. B.
	IP	:	54879
	G.C.A	:	57050
	C.C.A	:	43763.00
	I.C.A	:	41575.00

CROP PATTERN (PROPOSED)

Sr. No.	Crops	%	-	-
	<u>KHARIF :</u>			
01)	H.Y.V. Paddy	60		
02)	Drilled Paddy	5		
03)	Ground-nut	2		
04)	Sugarcane	2		
05)	Chillies	5		
06)	Vegetables	3		
07)	Horticulture crop	3		
08)	Green manuring	5		
09)	Pulses (U.I.)	15		
	<u>RABI</u>			
10)	Wheat	30		
11)	Jawar Hybrid	5		
12)	Peas/ Gram	5		
13)	Vegetable / Onions	5		
14)	Ultra pulses	8		
15)	Summer Paddy	5		
16)	Green Fodder	2		

18)	<u>ECOLOGICAL ASPECTS :</u>			
18.0	<u>CATCHMENT AREA TREATMENT</u>			
18.1	CATCHMENT AREA	:	245.72	Sq. km.
	b) Maharashtra State	:	245.72	Sq. km.
18.2	<u>LAND USE PATTERN IN CATCHMENT AREA</u>			
		Area in km ²		Percentage
1)	Forest Land	180.79		15.50
2)	Cultivated Land	38.08		73.57
3)	Fallow Land	26.85		10.93
4)	Lfallow Land under water			
5)	Rock and Outcrop			
6)	Grazing land			
7)	Other land (Road, Abadi etc.)			
	Total			

NET AREA CALCULATION FOR CATCHMENT AREA TREATMENT

(High & Very High Priority)

Annexure I

Sr. No.	Name of Sub catchment	Gross area of S.C. in ha	Area not available for treatment	Area available for treatment (3-4)	Area under catchment of other project		Net area available for treatment	Remarks
					Area	Name of Project		
1	2	3	4	5	6	7	8	9
1	4E8A4d1	1186	1186	0	0	--	0	
2	4E8A4d2	1361	1215	146	17	Local Lake	129	
3	4E8A4d3	1434	1147	287	10	Local Lake	277	
4	4E8A4f3	813	774	39	12	Local Lake	27	
5	4E8A4f5	862	728	134	33	Local Lake	101	
6	4E8A4f8	705	603	102	10	Local Lake	92	
7	4E8A4g5	1024	820	204	50	Local Lake	154	
8	4E8A4g6	1258	1047.7	210.3	80	Local Lake	130.3	
9	4E8A4g7	960	614	346	17	Local Lake	329	
10	4E8A4g8	1034	820	214	50	Local Lake	164	
11	4E8A4g4	1464.3	1395	69.3	30	Local Lake	39.3	
12	4E8A4g3	964.3	750	214.3	50	Local Lake	164.3	
13	4E8A4g2	1175.3	965	210.3	22	Local Lake	188.3	
14	4E8A4g1	530.3	450	80.3	22	Local Lake	58.3	
15	4E8A4f9	1124.3	1020	104.3	65	Local Lake	39.3	
16	4E8A4f7	917.3	650	267.3	170	Local Lake	97.3	
17	4E8A4f6	740.3	680	60.3	0	--	60.3	
18	4E8A4f4	662.3	555	107.3	29	Local Lake	78.3	
19	4E8A4f2	968.3	785	183.3	38	Local Lake	145.3	
20	4E8A4f1	972.3	800	172.3	13	Local Lake	159.3	
21	4E8A4c9	805.3	620	185.3	120	Local Lake	65.3	
22	4E8A4c7	1043.1	901	142.1	0	--	142.1	
23	4E8A4c4	955.3	789	166.3	0	--	166.3	
24	4E8A4c8	941.1	790	151.1	1	Local Lake	150.1	
25	4E8A4c3	671.2	505	166.2	2	Local Lake	164.2	
	Total	22959.7	19314.7	3645	838		2807	

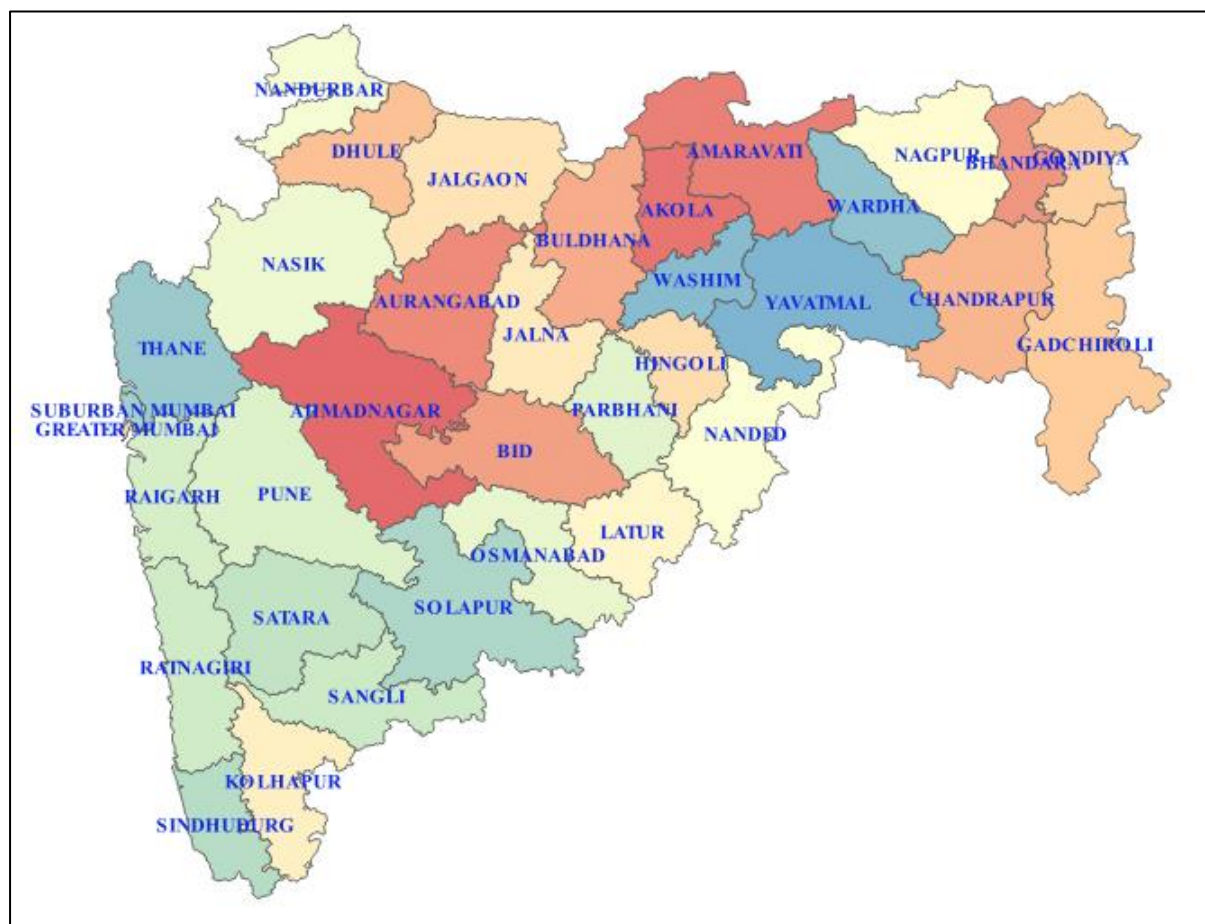
TABLE - ANNEXURE - II

SPECIFIC PROBLEM & PROPOSED TREATMENT FOR SOIL PROTECTION

Sr. No.	Specific problems	Erosion intensity mapping units	Total area in Ha.	Treatment Proposed				
				<u>Graded bunding</u> Nalla bunding	Gully Plugging	Horticulture	Plantation/ forest	Pasture land grazing
1)	A - Deep to Very Deep Soils							
	1) Very gentle slope, slight to moderate erosion	--	--	--	--	--	--	--
	2) Gentle to moderate slope with moderate to severe erosion.	--	--	--	--	--	--	--
	2) Very gentle to gentle slope with moderate severe erosio.	--	--	--	--	--	--	--
2)	B - Moderately Deep to deep							
	1) Gentle to moderate slope with moderate erosion.	--	--	--	--	--	--	--
3)	C - Shallows to Moderately Deep soils							
	1) Gentle to moderate slope with slight to moderate erosion & stony rocky phase.	4E8A4d1, 4E8A4d2, 4E8A4d3, 4E8A4f3, 4E8A4f5, 4E8A4f8, 4E8A4g5, 4E8A4g6, 4E8A4f6,	510	150	40	40	280	--
	2) Very gentle to gentle slope with moderate severe erosio.	4E8A4g7, 4E8A4g8, 4E8A4g4, 4E8A4g3, 4E8A4g2, 4E8A4g1, 4E8A4f9, 4E8A4f7, 4E8A4C7, 4E8A4C4,	1997	1433	89	192	0	283
	3) Steep to very steep slope, moderate erosion & slightly stony and rocky phases	4E8A4f4, 4E8A4f2, 4E8A 4f1, 4E8A4c9, 4E8A4c8, 4E8A4c3	300	101	151	48	--	--
4)	D- Very Shallow to Shallow soils							

	1) Gentle to moderate slope, moderate to severe erosion, with slight stony & rocky phase.		--	--	--	--	--	--
	2) Strong to moderate to severe erosion with slightly stony & rocky phase.		--	--	--	--	--	--
	3) Steep to very steep slope, moderate to severe erosion with stony and rocky phases.		--	--	--	--	--	--
	Total		2807	1684	280	280	280	283

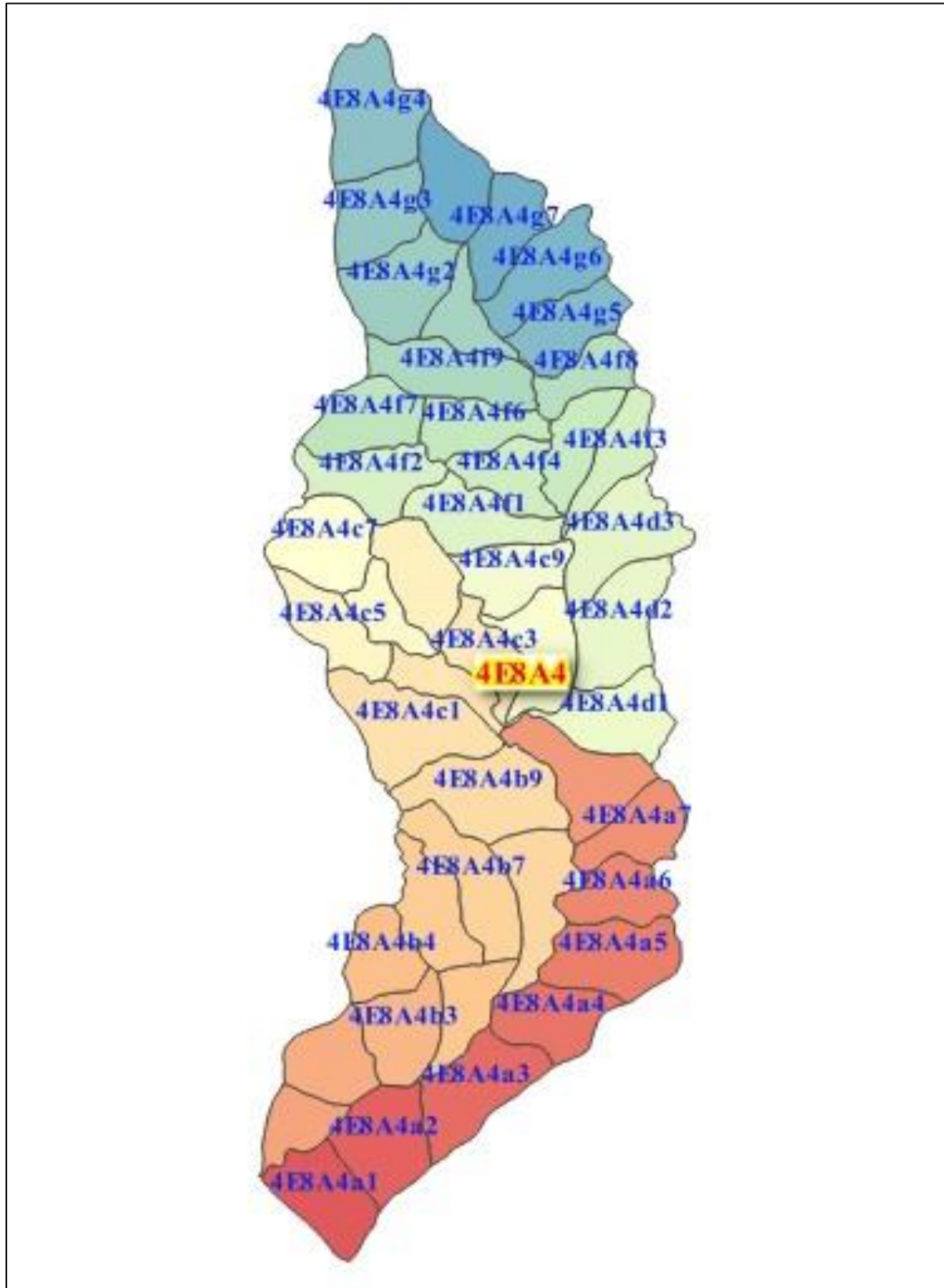
Maharashtra Watershed Divided Districtwise



Chandrapur District Watershed



Pathari River Microwatershed



Pathari River Microwatershed

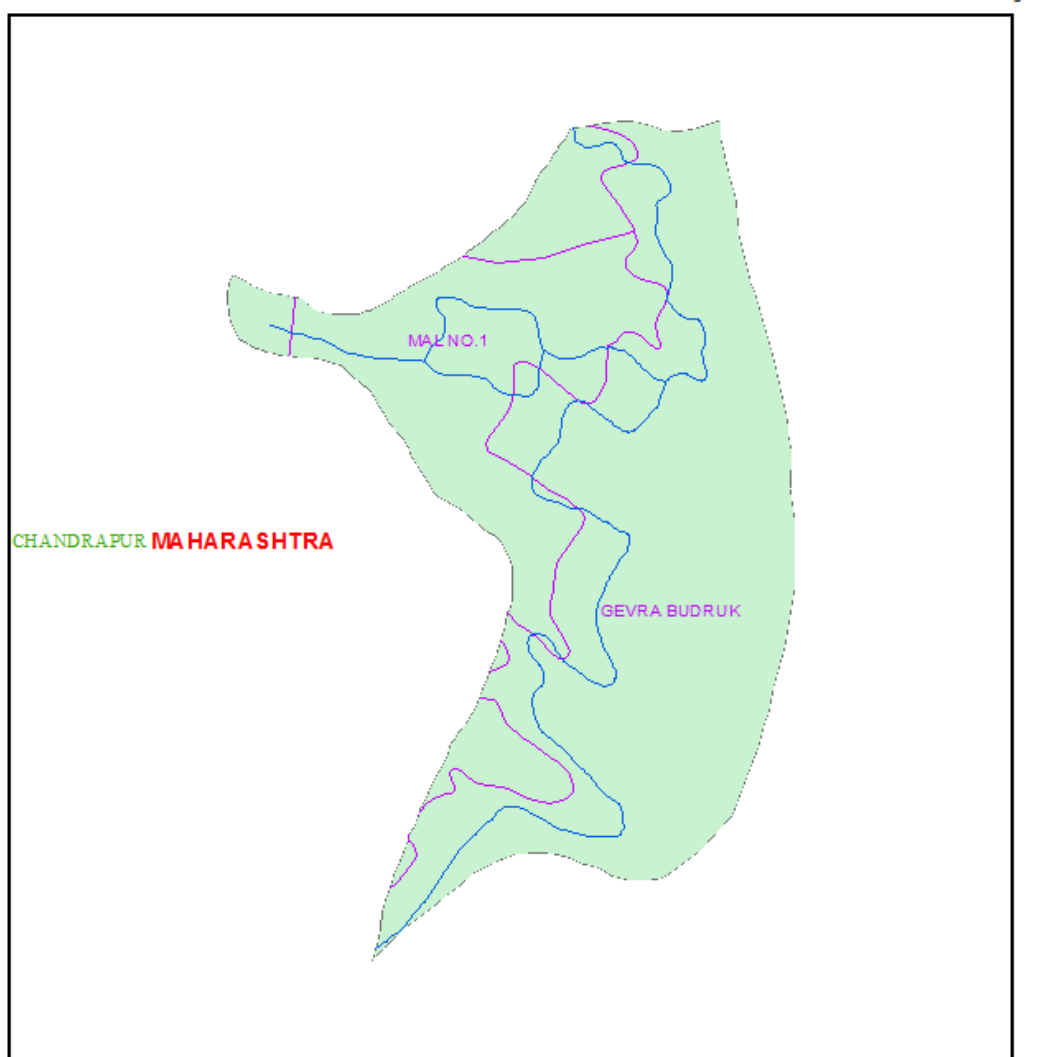
Total Catchment of Asolamendha Project is 245.72 km² which includes 25 micro watershed 10 on Left side and 15 on Right Side

Sr.No.	Left Blank Nalla	Catchment Area	Right Blank Nalla	Catchment Area
1	4E8A4d1	11.86	4E8A4g4	14.643
2	4E8A4d2	13.61	4E8A4g3	9.643
3	4E8A4d3	14.34	4E8A4g2	11.753
4	4E8A4f3	8.13	4E8A4g1	5.303
5	4E8A4f5	8.62	4E8A4f9	11.243
6	4E8A4f8	7.05	4E8A4f7	9.173
7	4E8A4g5	10.24	4E8A4f6	7.403
8	4E8A4g6	12.58	4E8A4f4	6.623
9	4E8A4g7	9.6	4E8A4f2	9.683
10	4E8A4g8	10.34	4E8A4f1	9.723
11	---	---	4E8A4c9	8.053
12	----	---	4E8A4c7	10.431
13	---	---	4E8A4c4	9.553
14	---	---	4E8A4c8	9.411
15	---	---	4E8A4c3	6.712
Total		106.37		139.35







Right Side sub Catchement

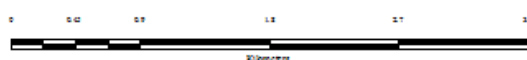
Microwatershed Atlas of Maharashtra

Microwatershed Map : 4E8A4c8



Legend

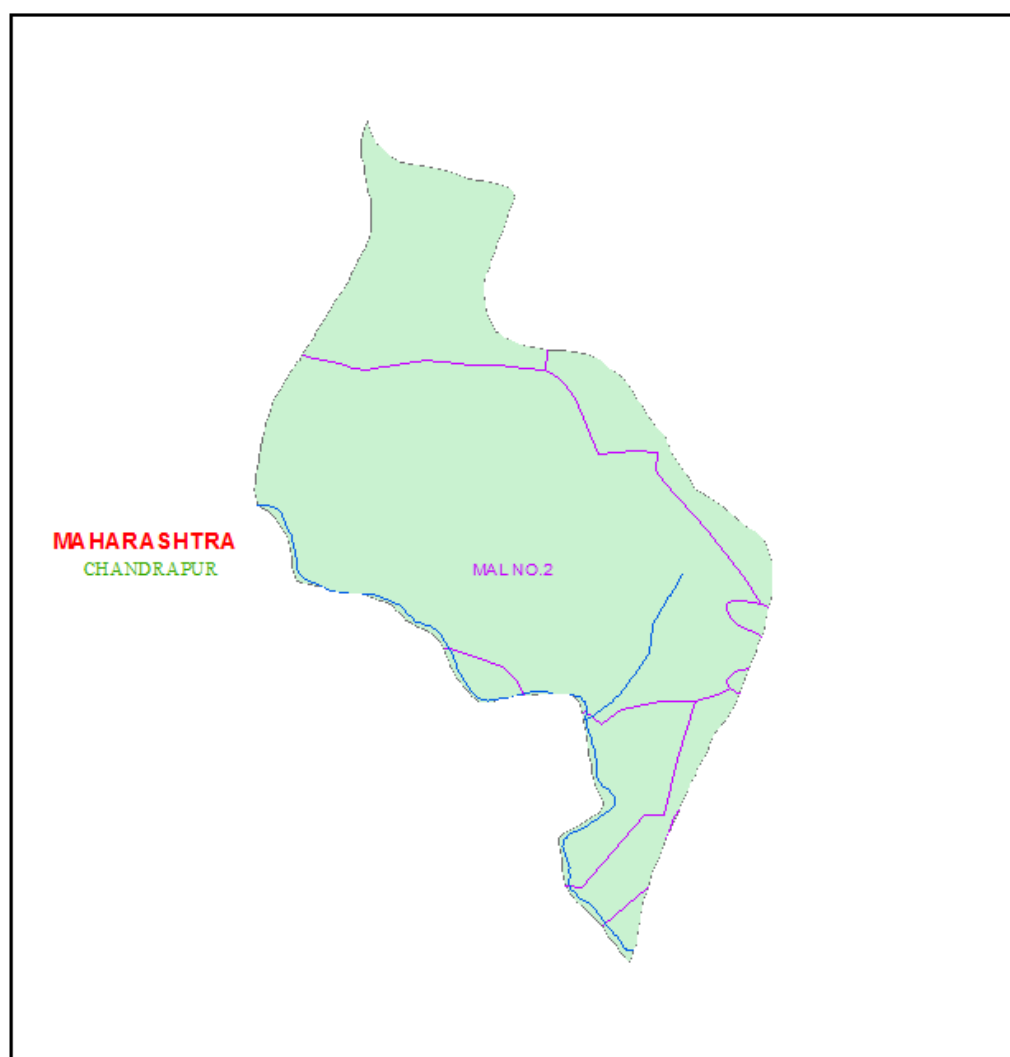
-  STATE BOUNDARY
-  DISTRICT BOUNDARY
-  THESIL BOUNDARY
-  VILLAGE BOUNDARY
-  DRAINAGE
-  MICROWATERSHED









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Ministry of Agriculture & Farmers Welfare
Government of India

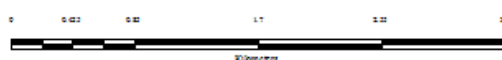
Microwatershed Atlas of Maharashtra

Microwatershed Map : 4E8A4c3



Legend

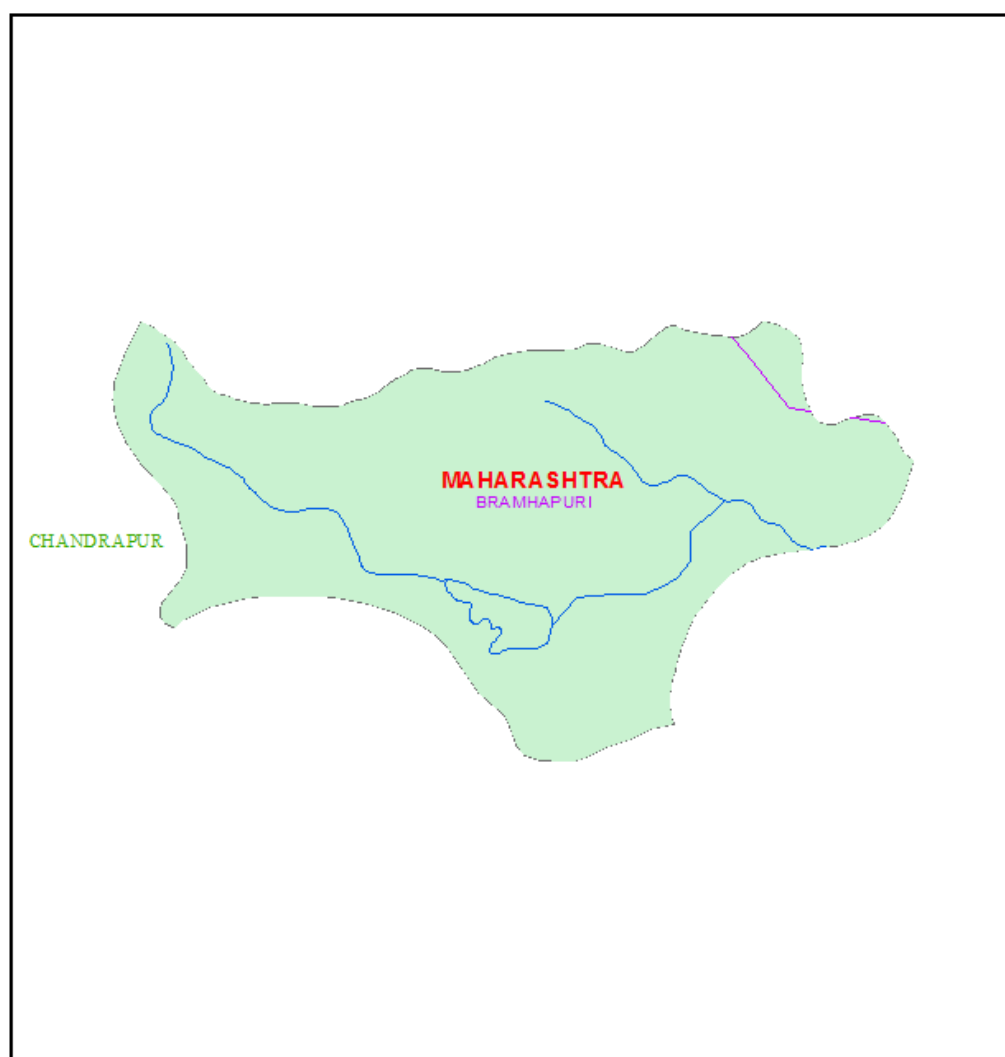
-  STATE BOUNDARY
-  DISTRICT BOUNDARY
-  THESIL BOUNDARY
-  VILLAGE BOUNDARY
-  DRAINAGE
-  MICROWATERSHED









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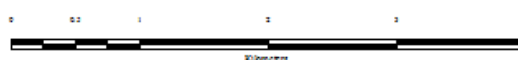
Microwatershed Atlas of Maharashtra

Microwatershed Map : 4E8A4f2



Legend

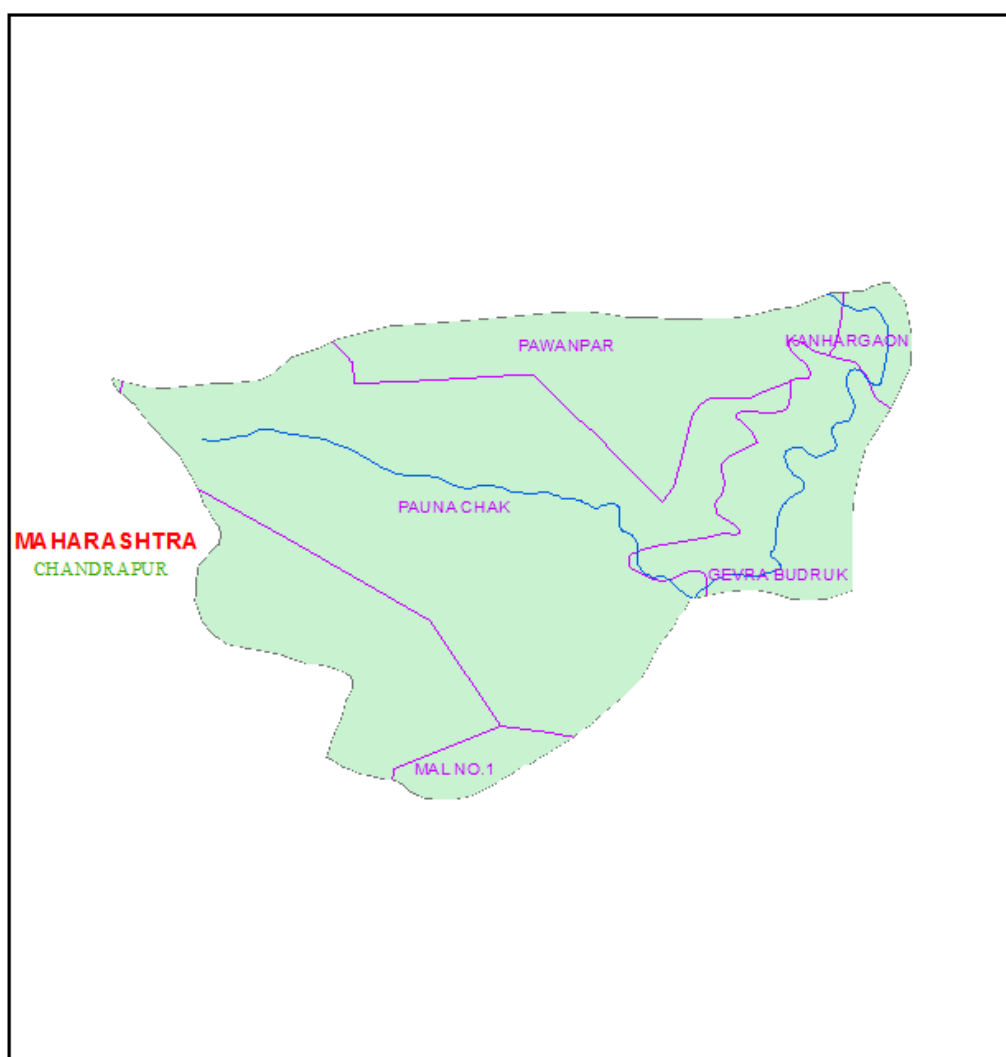
-  STATE BOUNDARY
-  DISTRICT BOUNDARY
-  THESIL BOUNDARY
-  VILLAGE BOUNDARY
-  DRAINAGE
-  MICROWATERSHED









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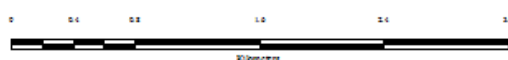
Microwatershed Atlas of Maharashtra

Microwatershed Map : 4E8A4c9



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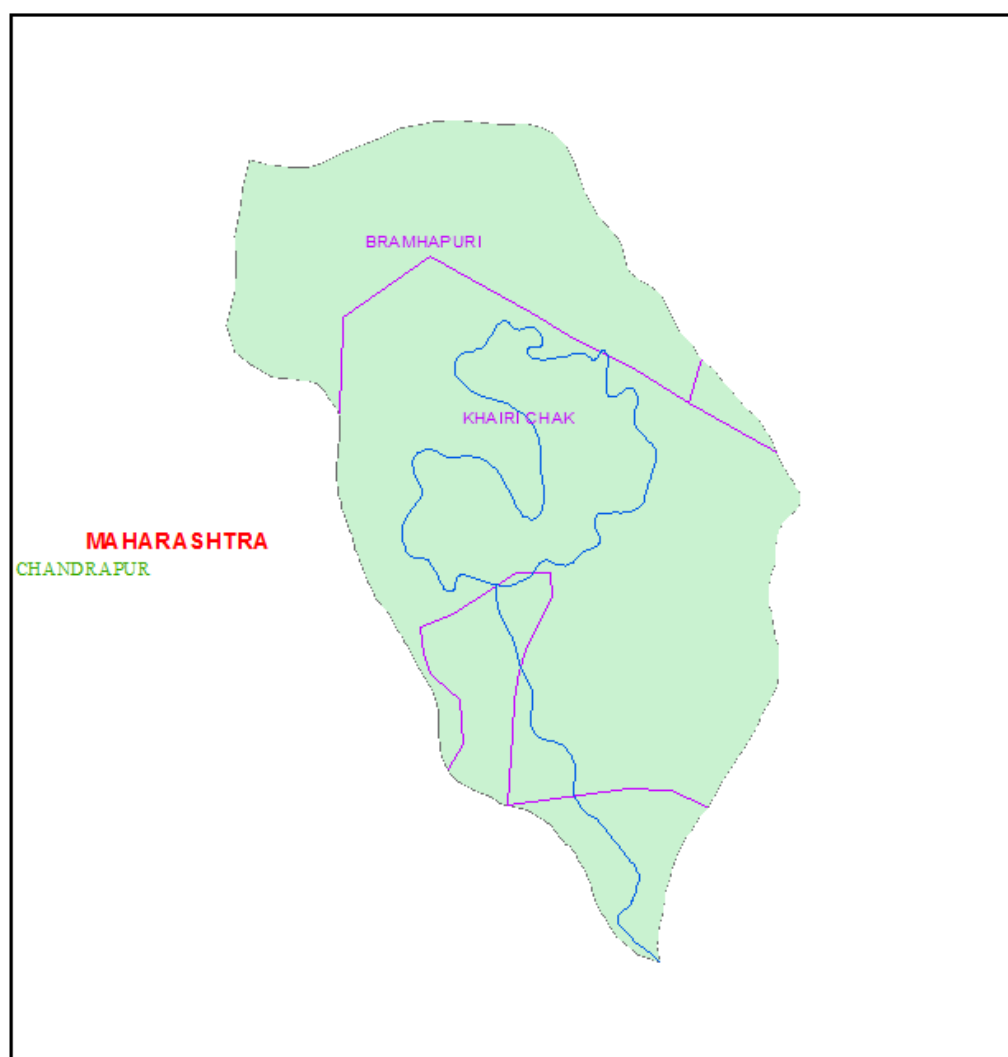
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-  THESIL BOUNDARY
-  VILLAGE BOUNDARY
-  DRAINAGE
-  MICROWATERSHED









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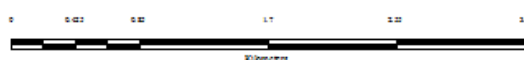
Microwatershed Atlas of Maharashtra

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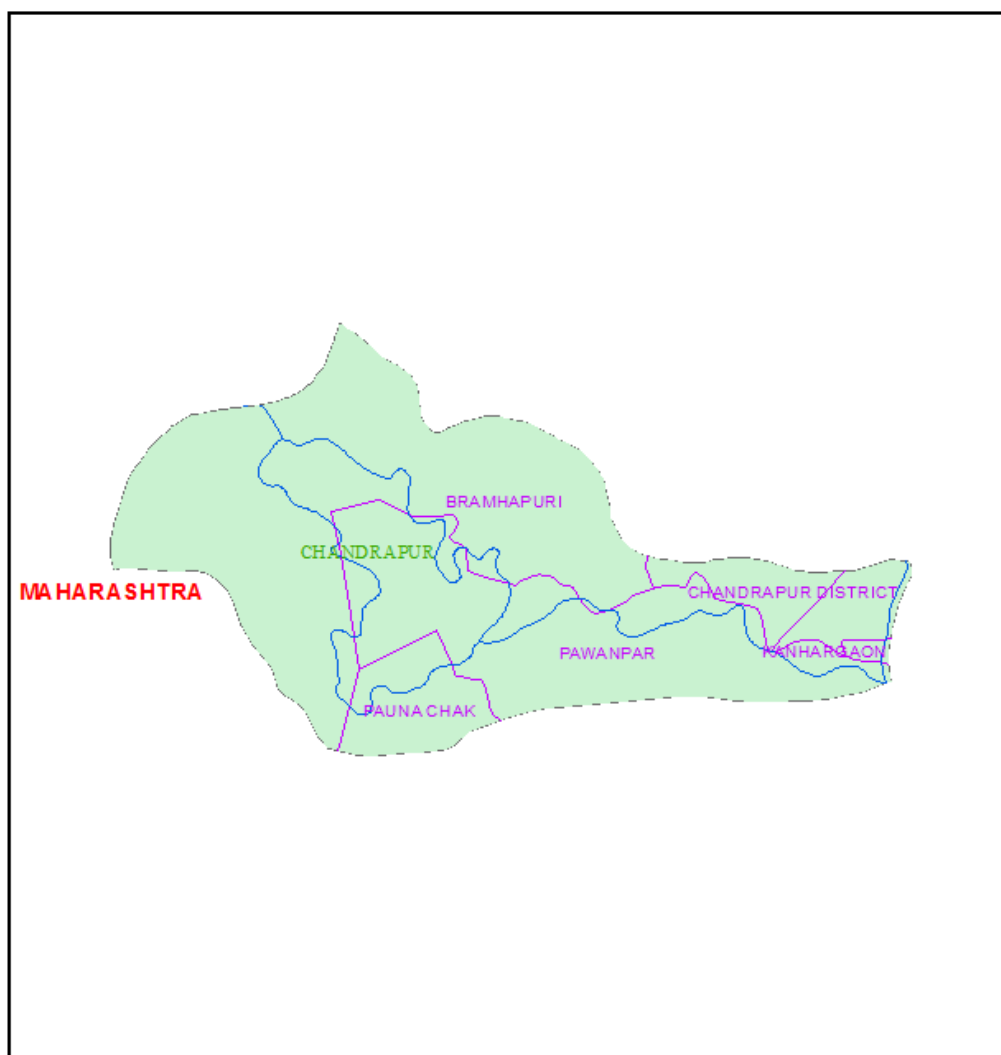
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-  DISTRICT BOUNDARY
-  THESIL BOUNDARY
-  VILLAGE BOUNDARY
-  DRAINAGE
-  MICROWATERSHED



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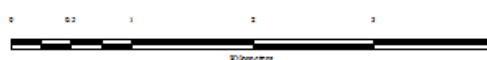
Microwatershed Atlas of Maharashtra

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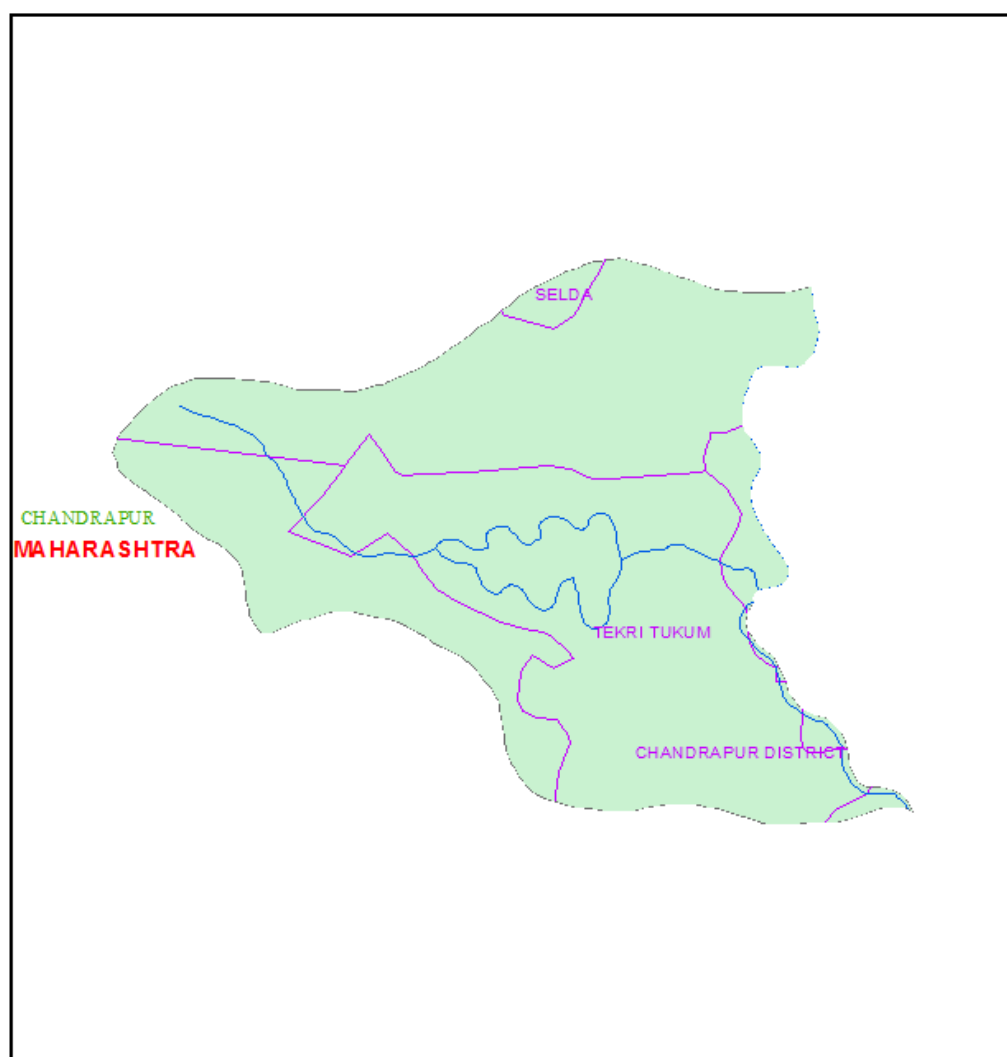
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- DRAINAGE
- MICROWATERSHED









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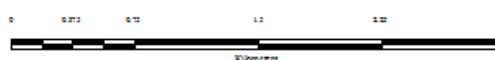
Microwatershed Atlas of Maharashtra

Microwatershed Map : 4E8A4f4



Legend

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-  THESIL BOUNDARY
-  VILLAGE BOUNDARY
-  DRAINAGE
-  MICROWATERSHED









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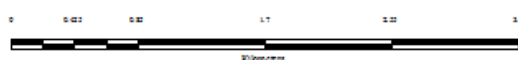
Microwatershed Atlas of Maharashtra

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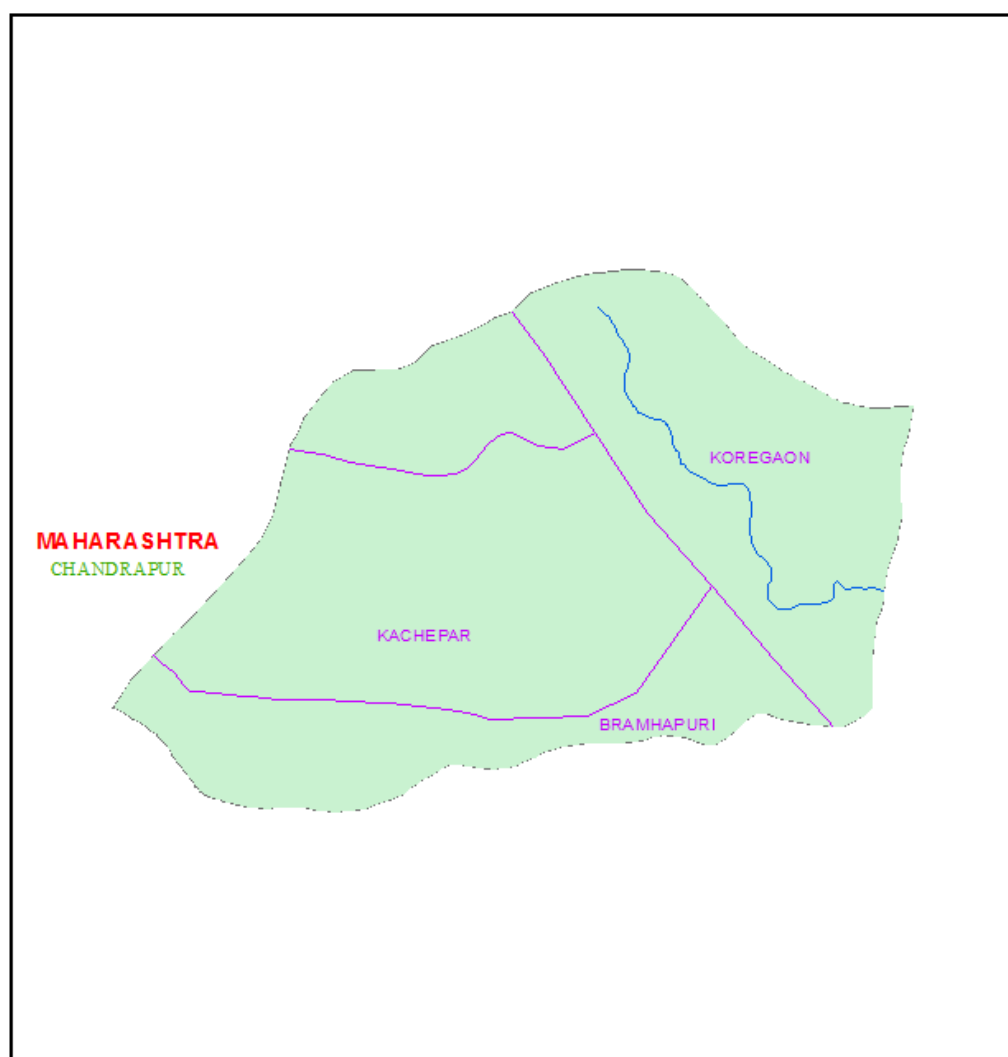
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-  DRAINAGE
-  MICROWATERSHED









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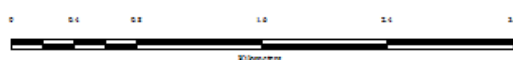
Microwatershed Atlas of Maharashtra

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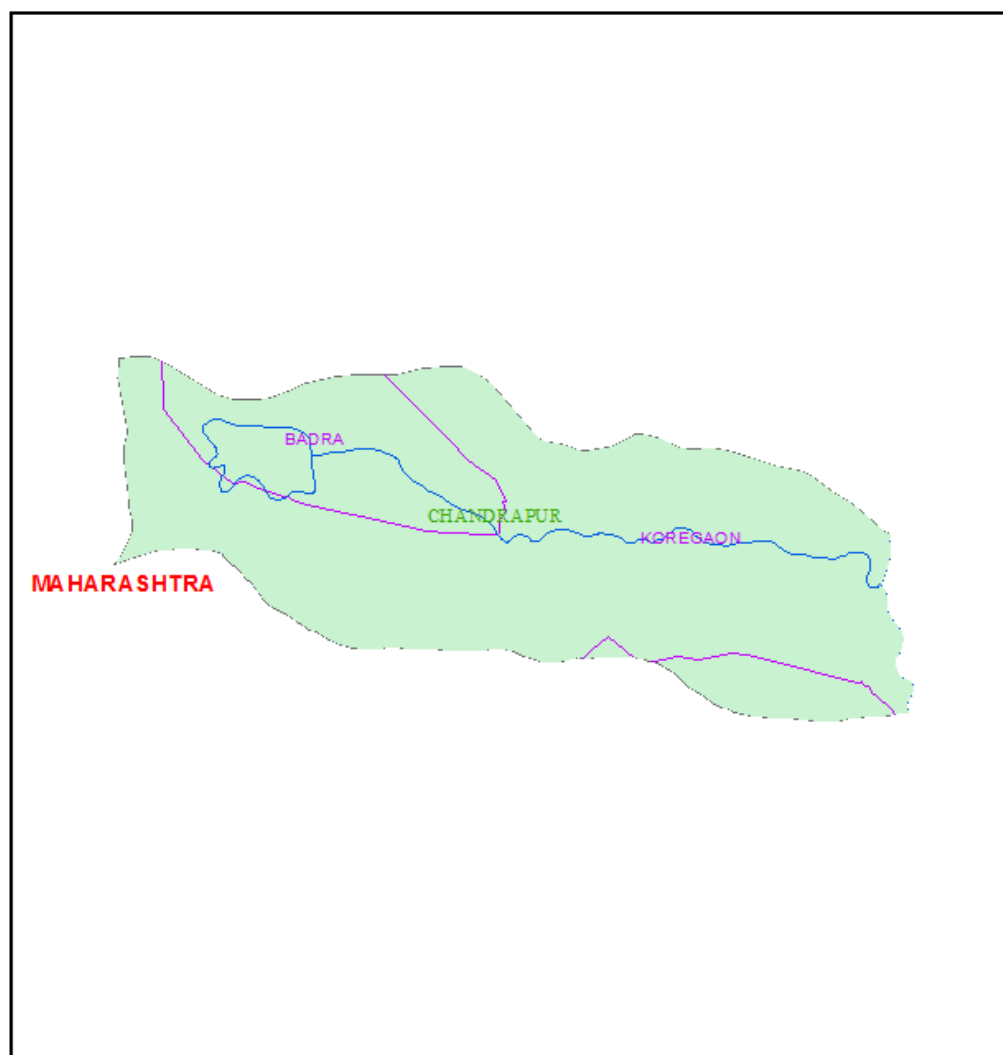
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-  MICROWATERSHED









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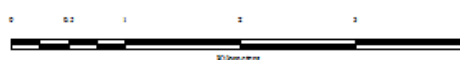
Microwatershed Atlas of Maharashtra

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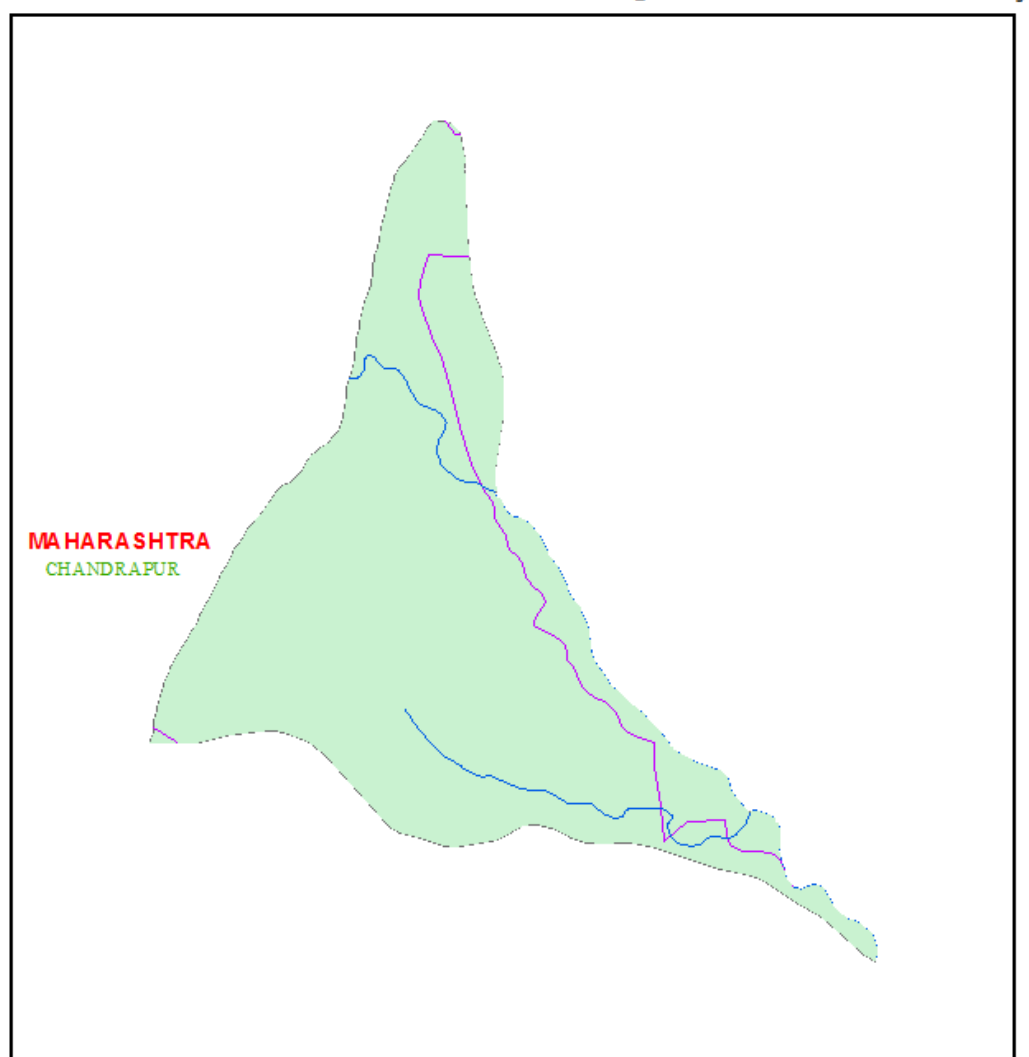
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-  MICROWATERSHED









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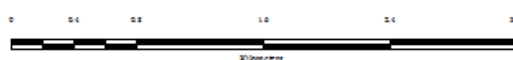
Microwatershed Atlas of Maharashtra

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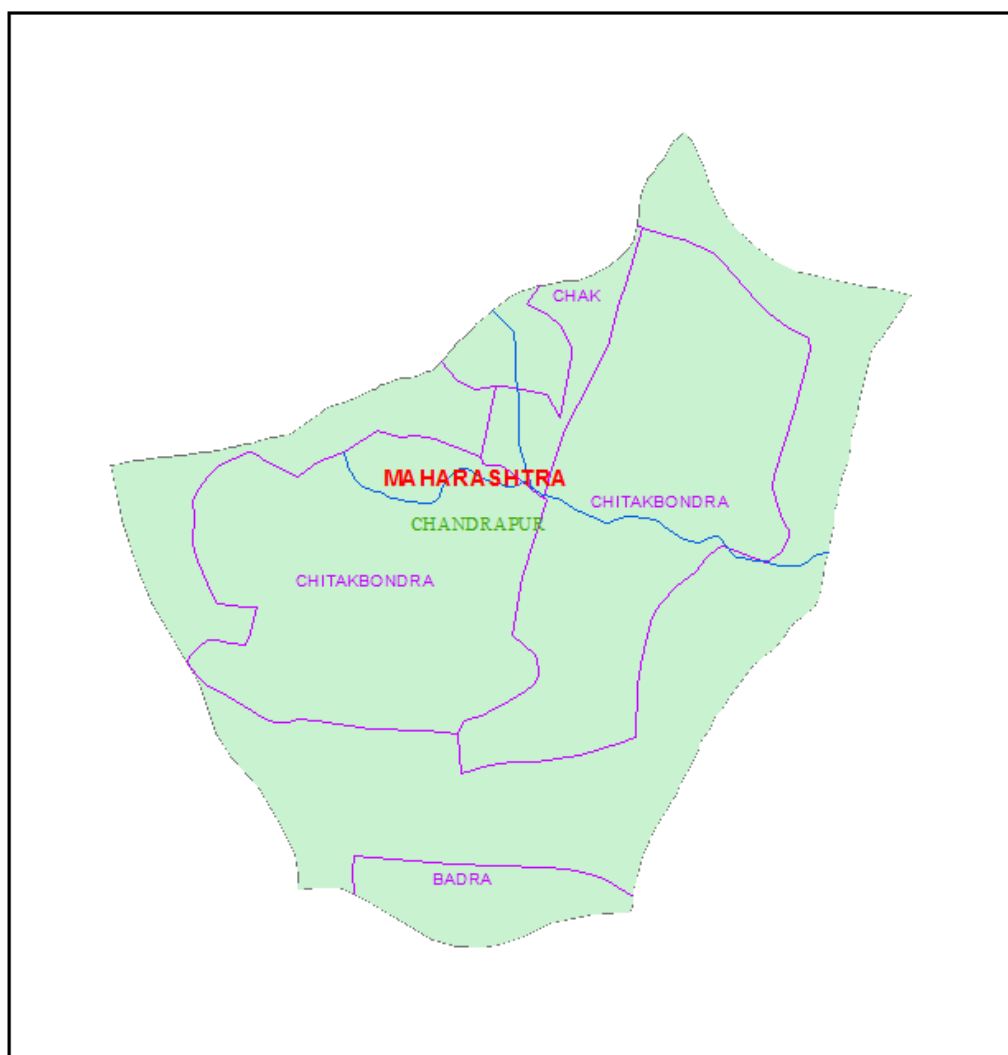
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
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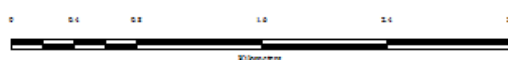
Microwatershed Atlas of Maharashtra

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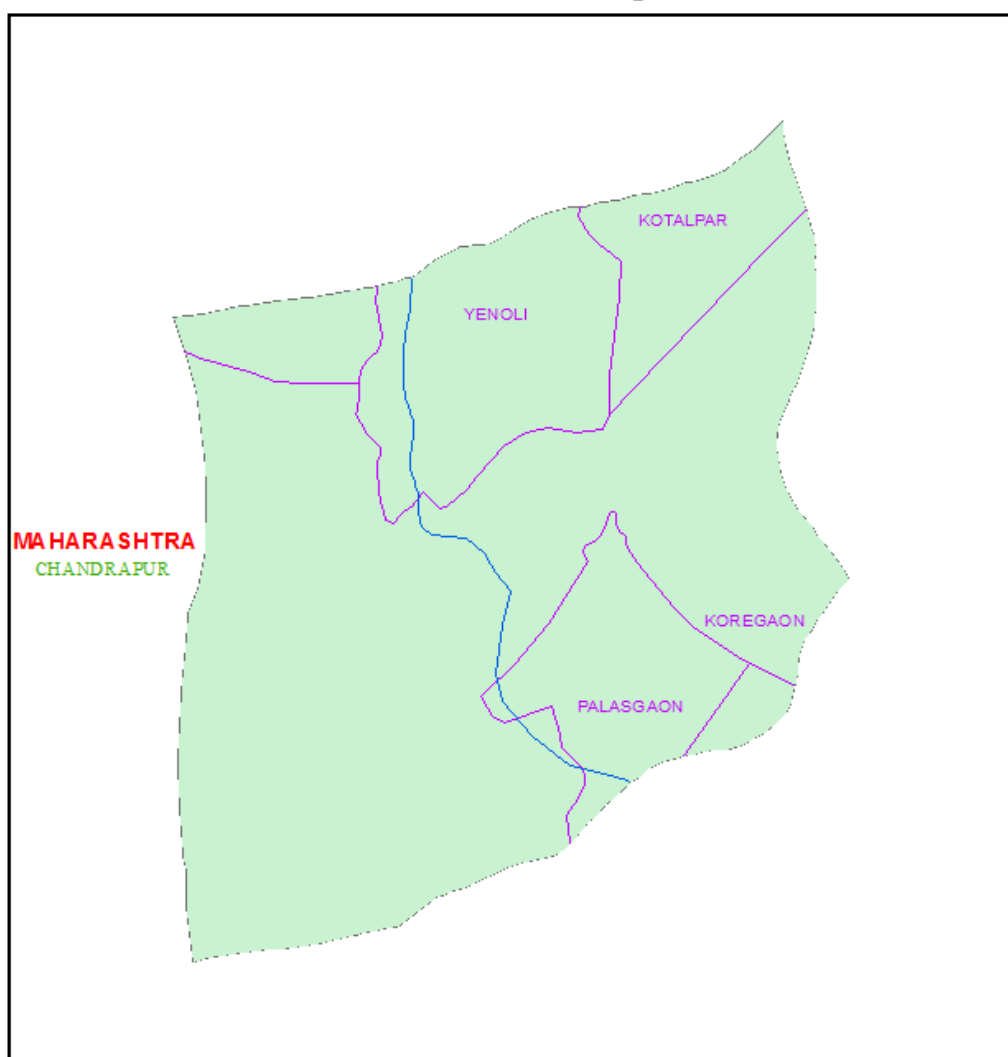
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-  DRAINAGE
-  MICROWATERSHED









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Microwatershed Atlas of Maharashtra

Microwatershed Map : 4E8A4g3



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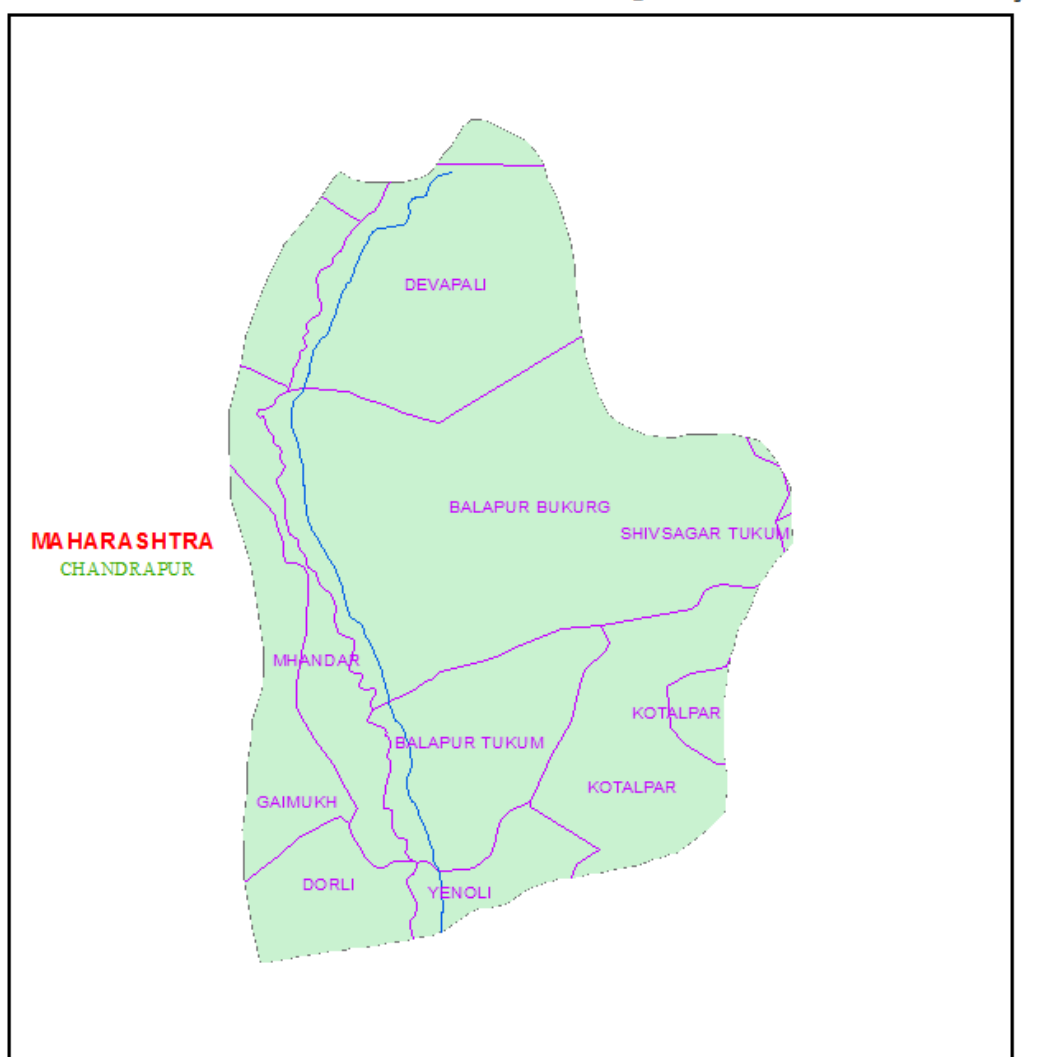
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-  VILLAGE BOUNDARY
-  DRAINAGE
-  MICROWATERSHED



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Microwatershed Atlas of Maharashtra

Microwatershed Map : 4E8A4g4



Legend

- STATE BOUNDARY
- DISTRICT BOUNDARY
- THESIL BOUNDARY
- VILLAGE BOUNDARY
- DRAINAGE
- MICROWATERSHED

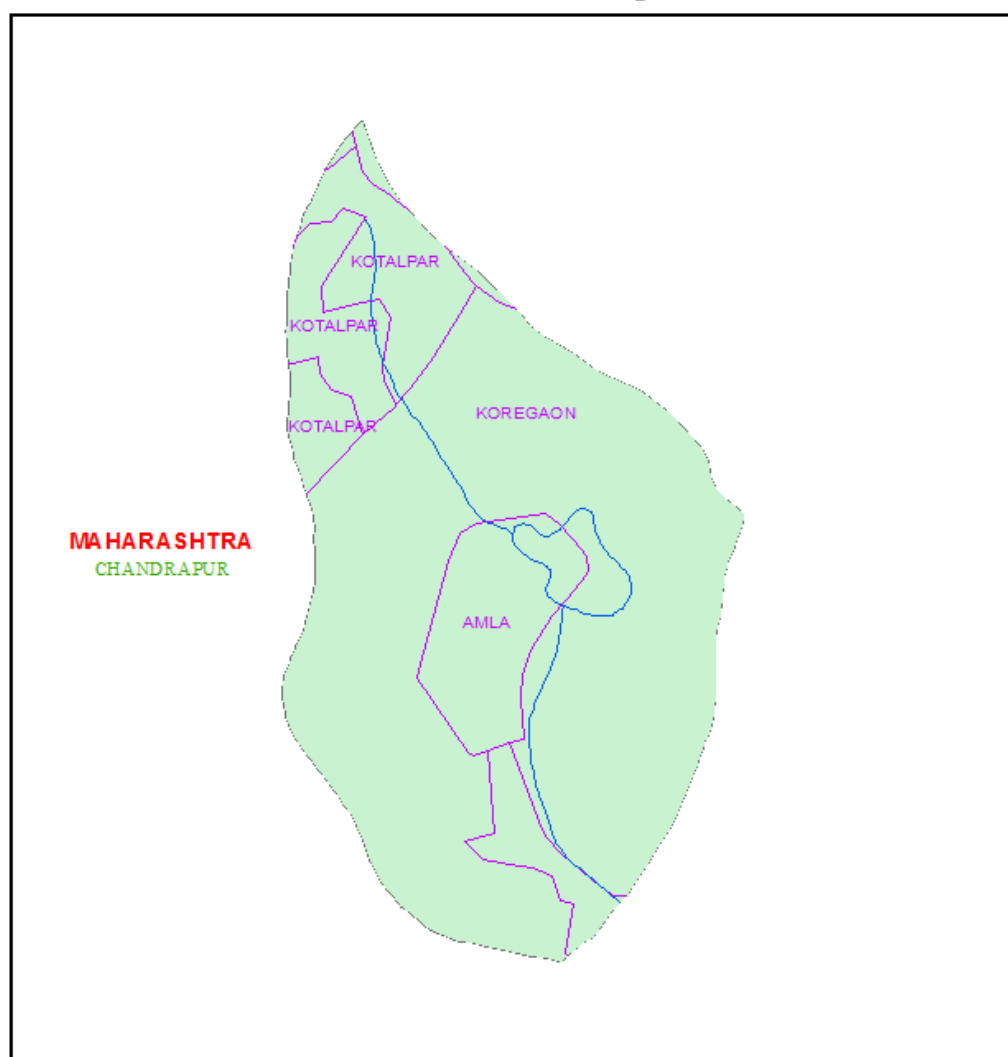


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Left Side sub Catchement

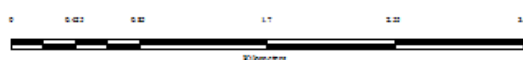
Microwatershed Atlas of Maharashtra

Microwatershed Map : 4E8A4g8



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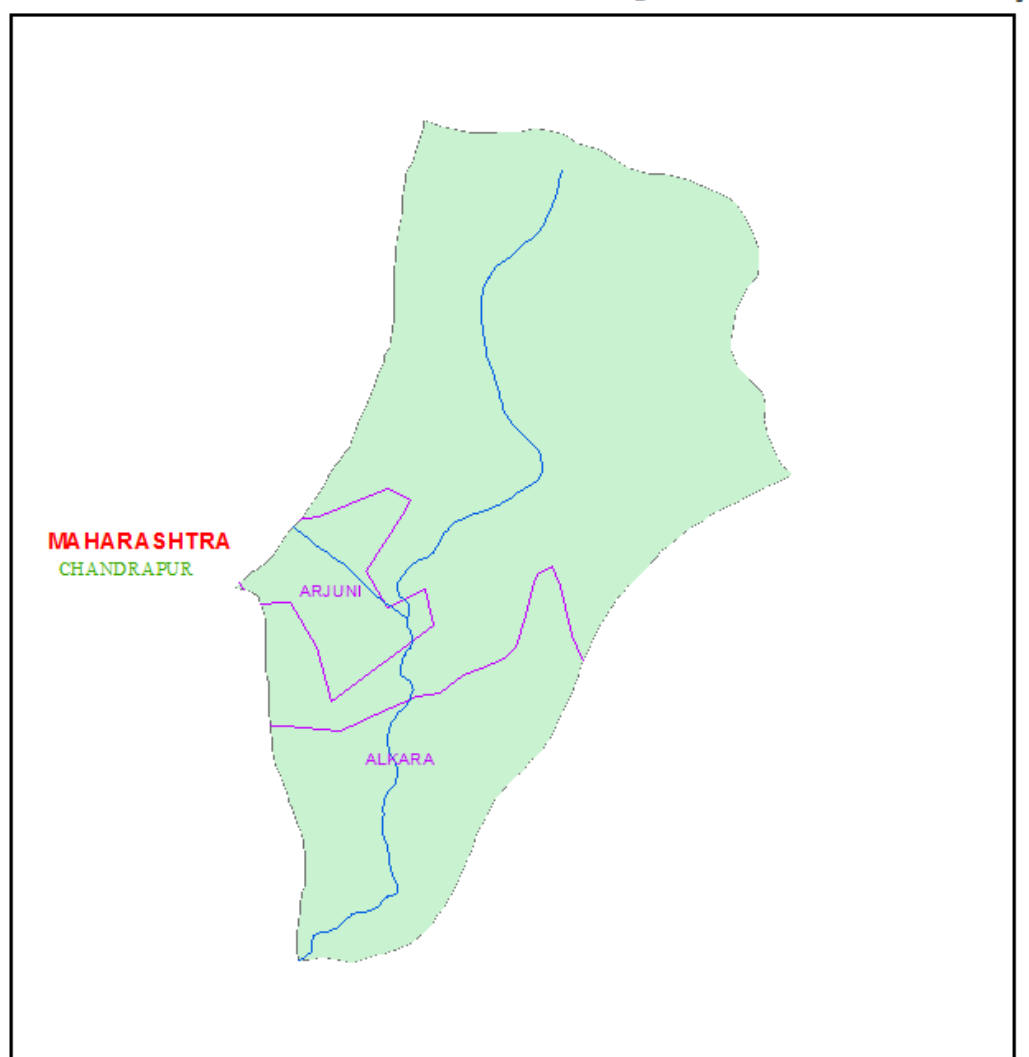
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- DRAINAGE
- MICROWATERSHED









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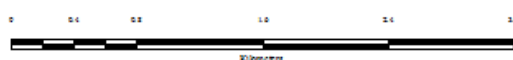
Microwatershed Atlas of Maharashtra

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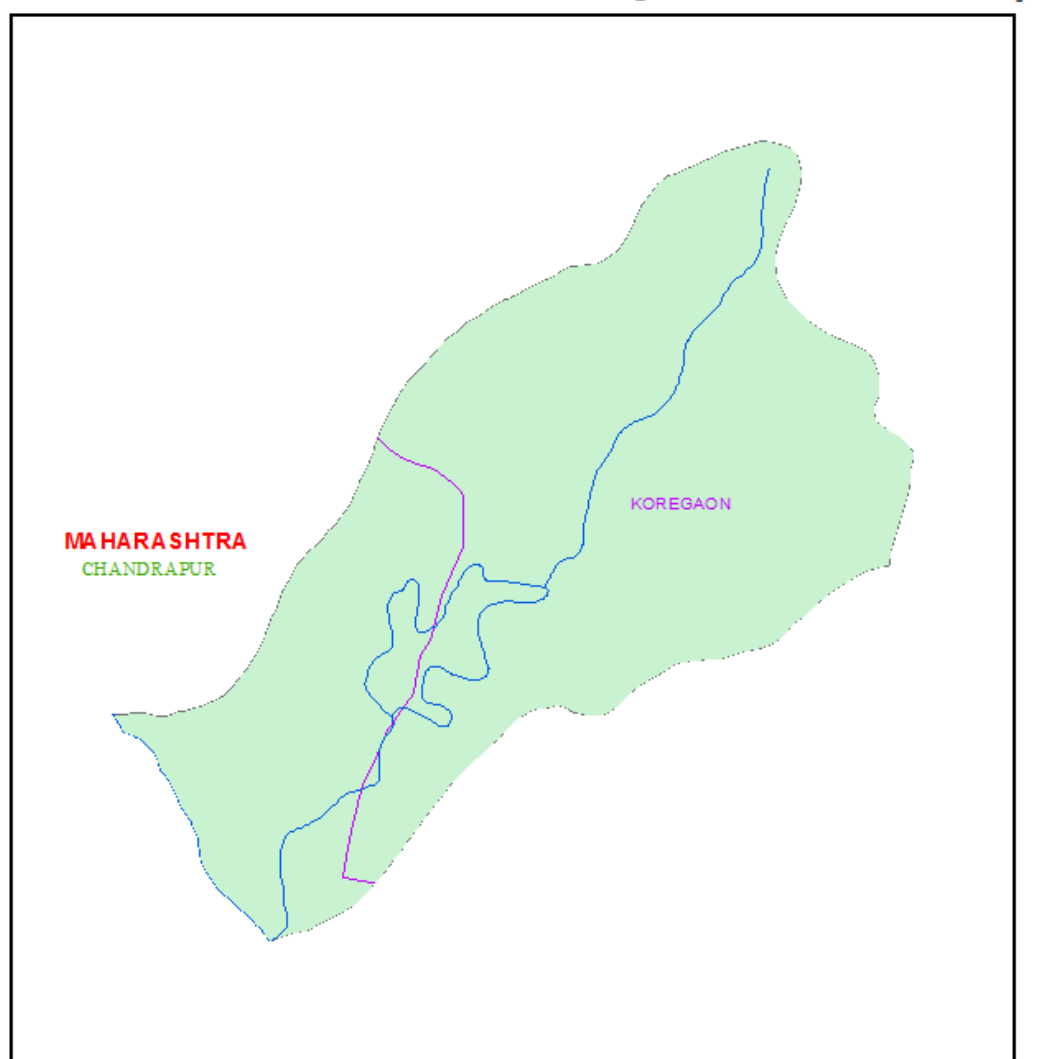
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-  MICROWATERSHED









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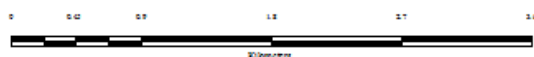
Microwatershed Atlas of Maharashtra

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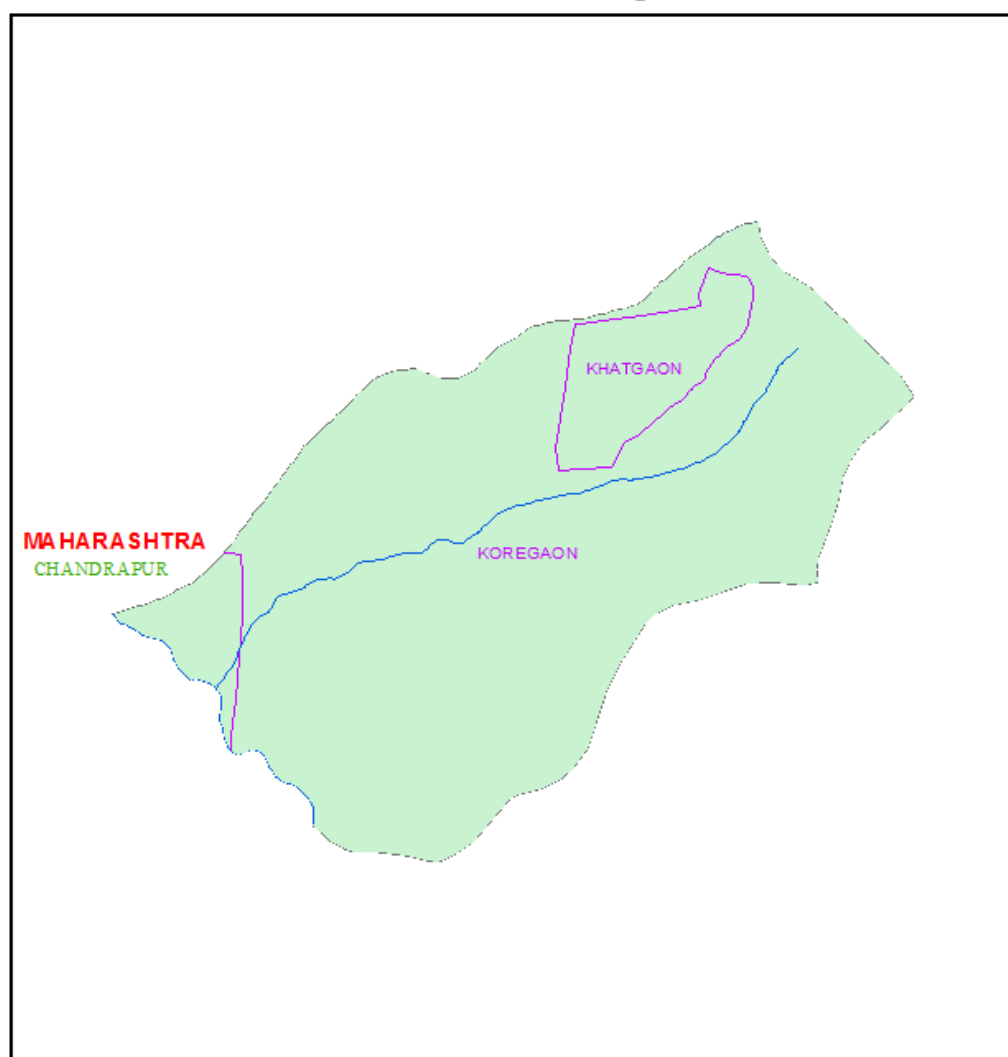
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-  MICROWATERSHED









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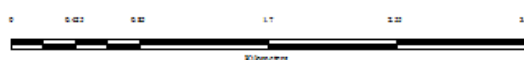
Microwatershed Atlas of Maharashtra

Microwatershed Map : 4E8A4g5



Legend

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-  DISTRICT BOUNDARY
-  THESIL BOUNDARY
-  VILLAGE BOUNDARY
-  DRAINAGE
-  MICROWATERSHED









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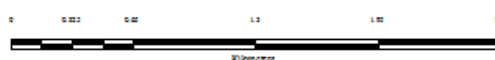
Microwatershed Atlas of Maharashtra

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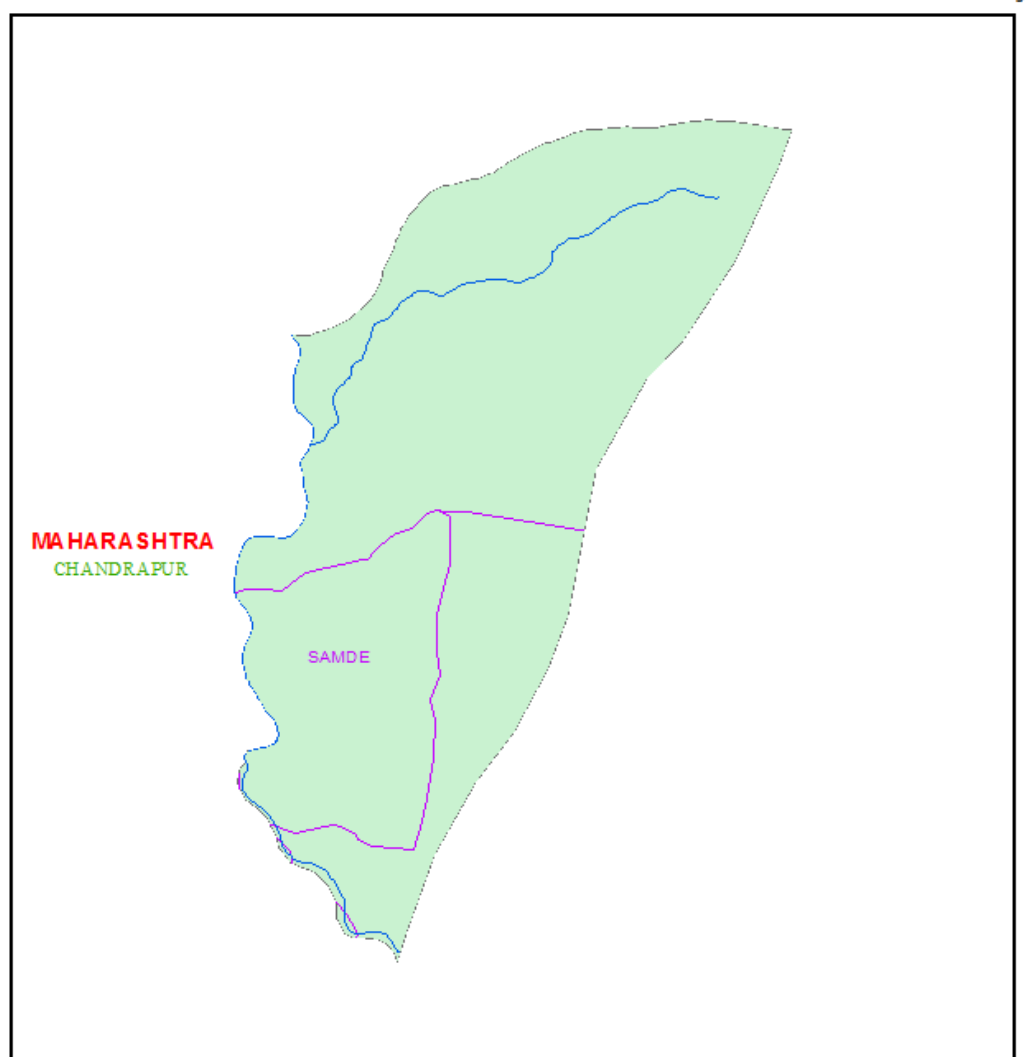
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-  DRAINAGE
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Microwatershed Atlas of Maharashtra







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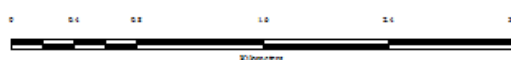


MAHARASHTRA
CHANDRAPUR

SAMDE

Legend

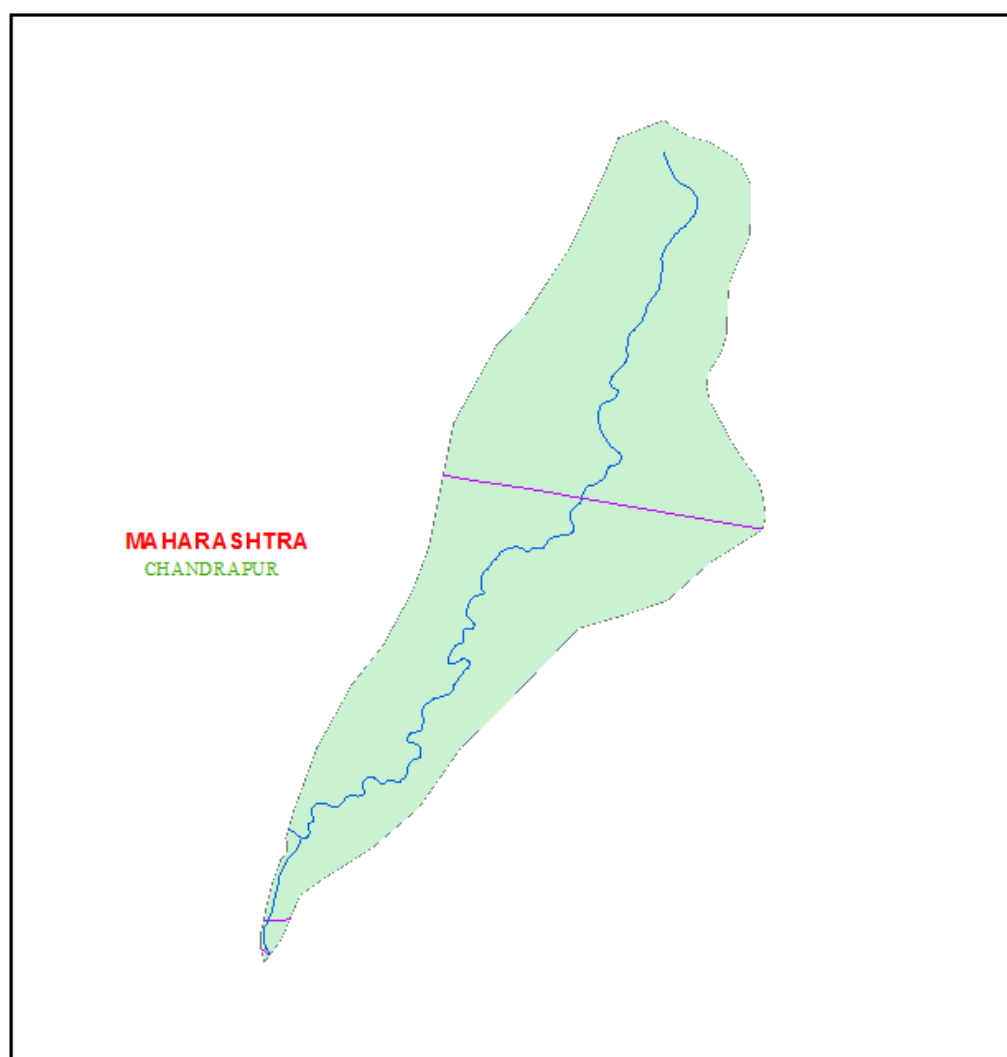
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
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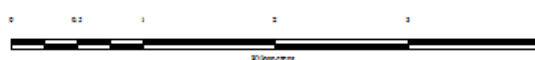
Microwatershed Atlas of Maharashtra

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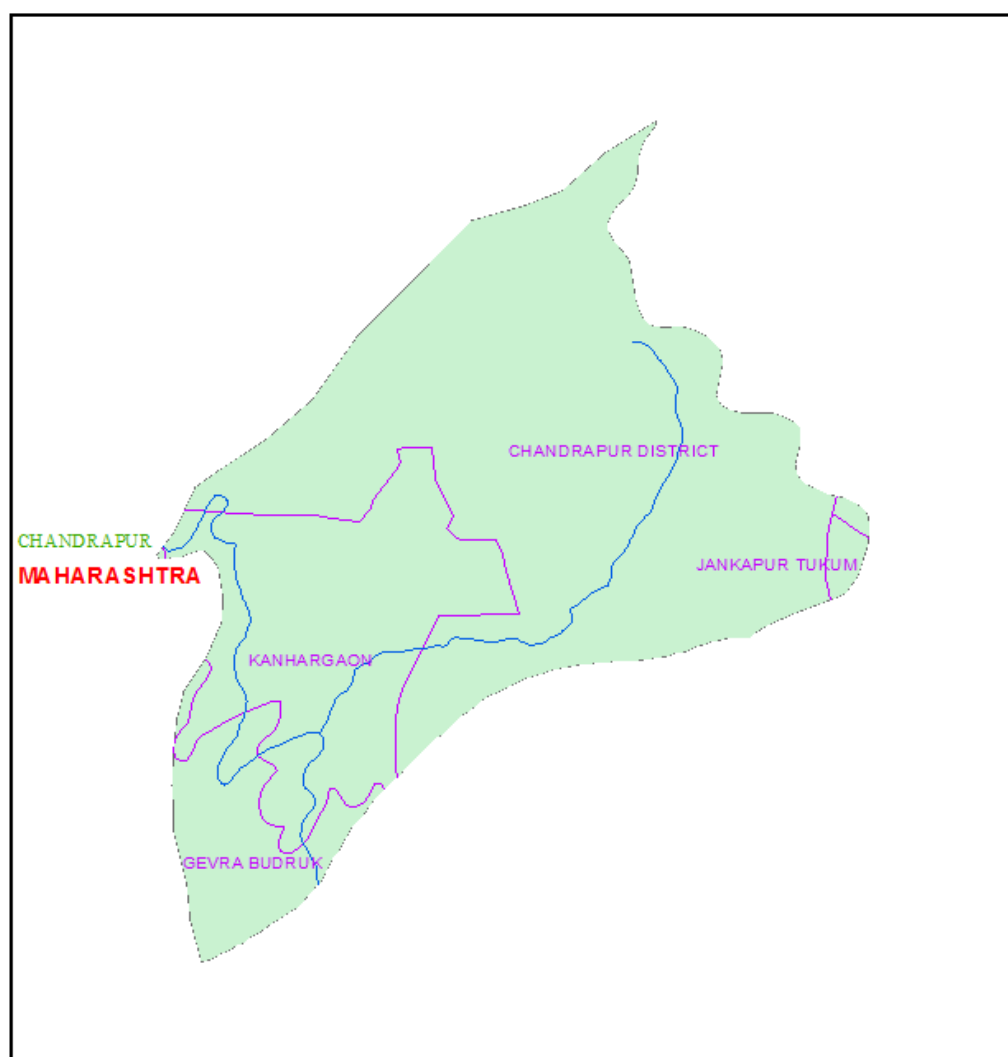
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-  MICROWATERSHED









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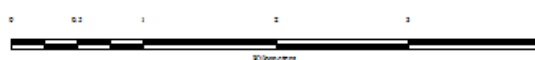
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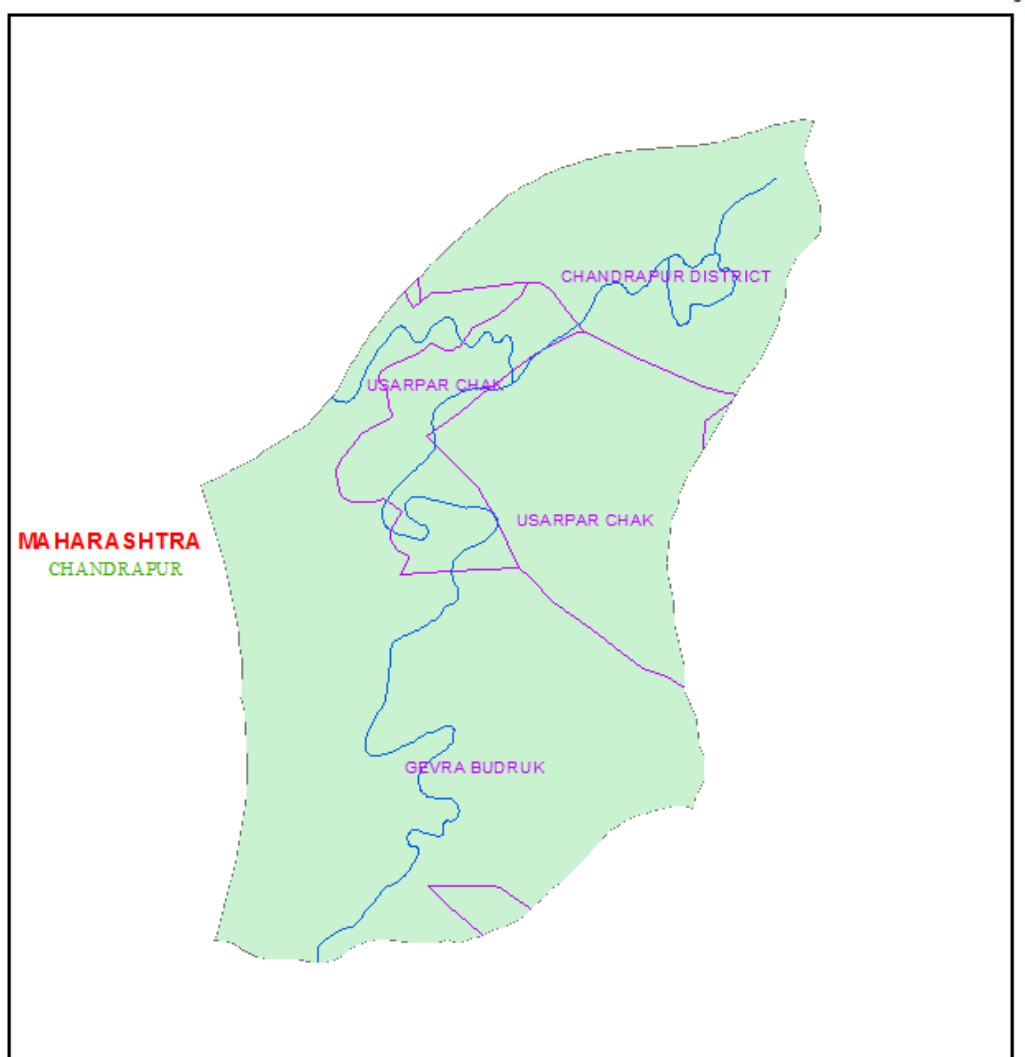
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-  DRAINAGE
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
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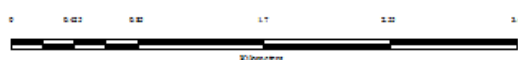
Microwatershed Atlas of Maharashtra

Microwatershed Map : 4E8A4d2



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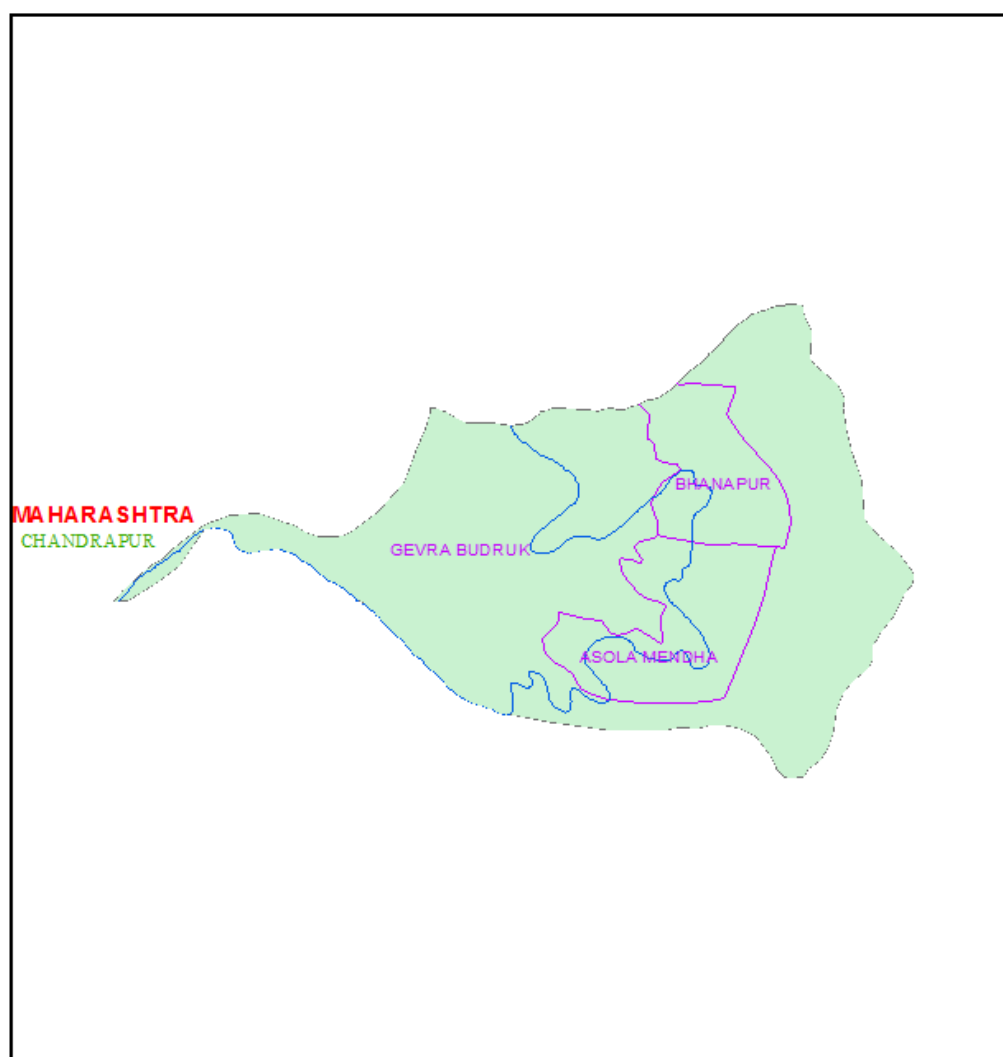
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
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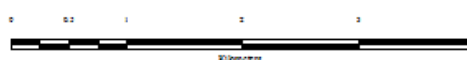
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Microwatershed Map : 4E8A4d1

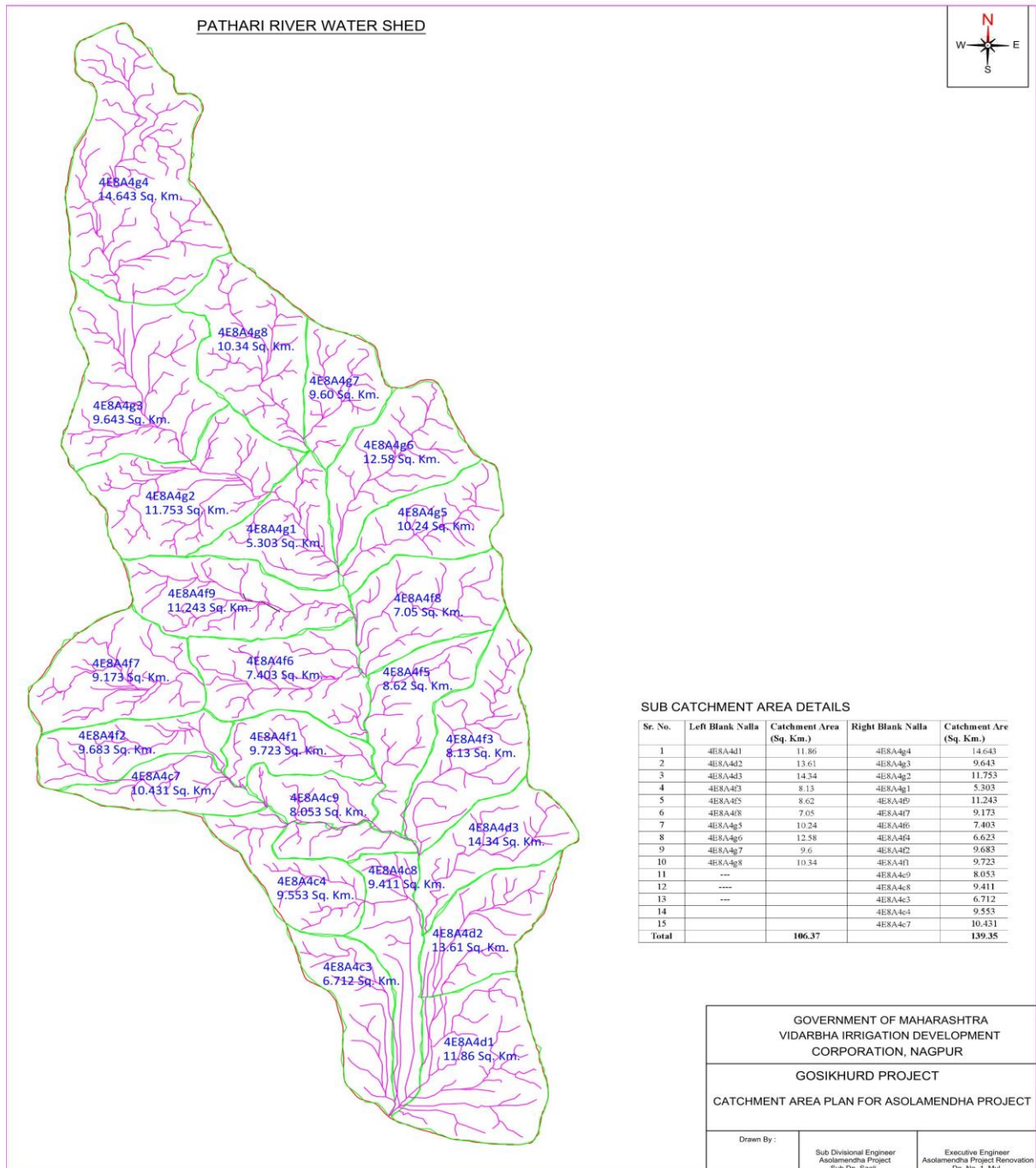



Legend


-  STATE BOUNDARY
-  DISTRICT BOUNDARY
-  THESIL BOUNDARY
-  VILLAGE BOUNDARY
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-  MICROWATERSHED



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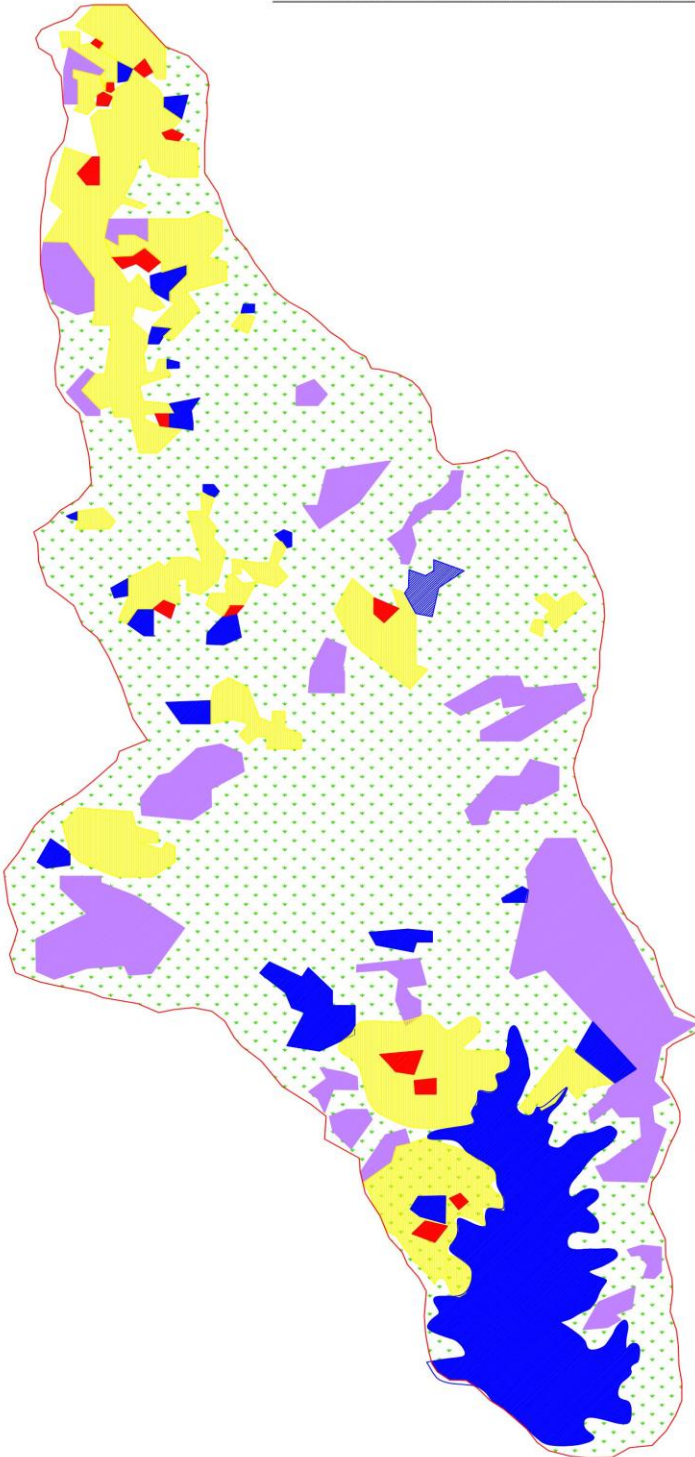



 Junior
 Engineer


 Sub Divisional Engineer
 Asolamendha Project Renovation
 Division, Saoli


 Executive Engineer
 Asolamendha Project Renovation
 Division No. 1 Mul

LAND USE PATTERN OF CATCHMENT AREA OF ASOLAMENDHA DAM



INDEX

Sr. No.	Particular	
1	Private Land	Yellow
2	Scattered Forest	Purple
3	Gaothan Area	Red
4	Water Body	Blue
5	Dense Forest	Green with dots

LAND USE PATTERN OF CATCHMENT AREA

Sr. No.	Particular	Area (Sq. Km.)	Remark
1	Agriculture Land	30.08	15.50%
2	Forest Land	180.79	73.57%
3	Other than Cultivation & Forest Land	26.85	10.93%

GOVERNMENT OF MAHARASHTRA
VIDARBHA IRRIGATION DEVELOPMENT
CORPORATION, NAGPUR


GOSIKHURD PROJECT


CATCHMENT AREA PLAN FOR ASOLAMENDHA PROJECT


Drawn By :

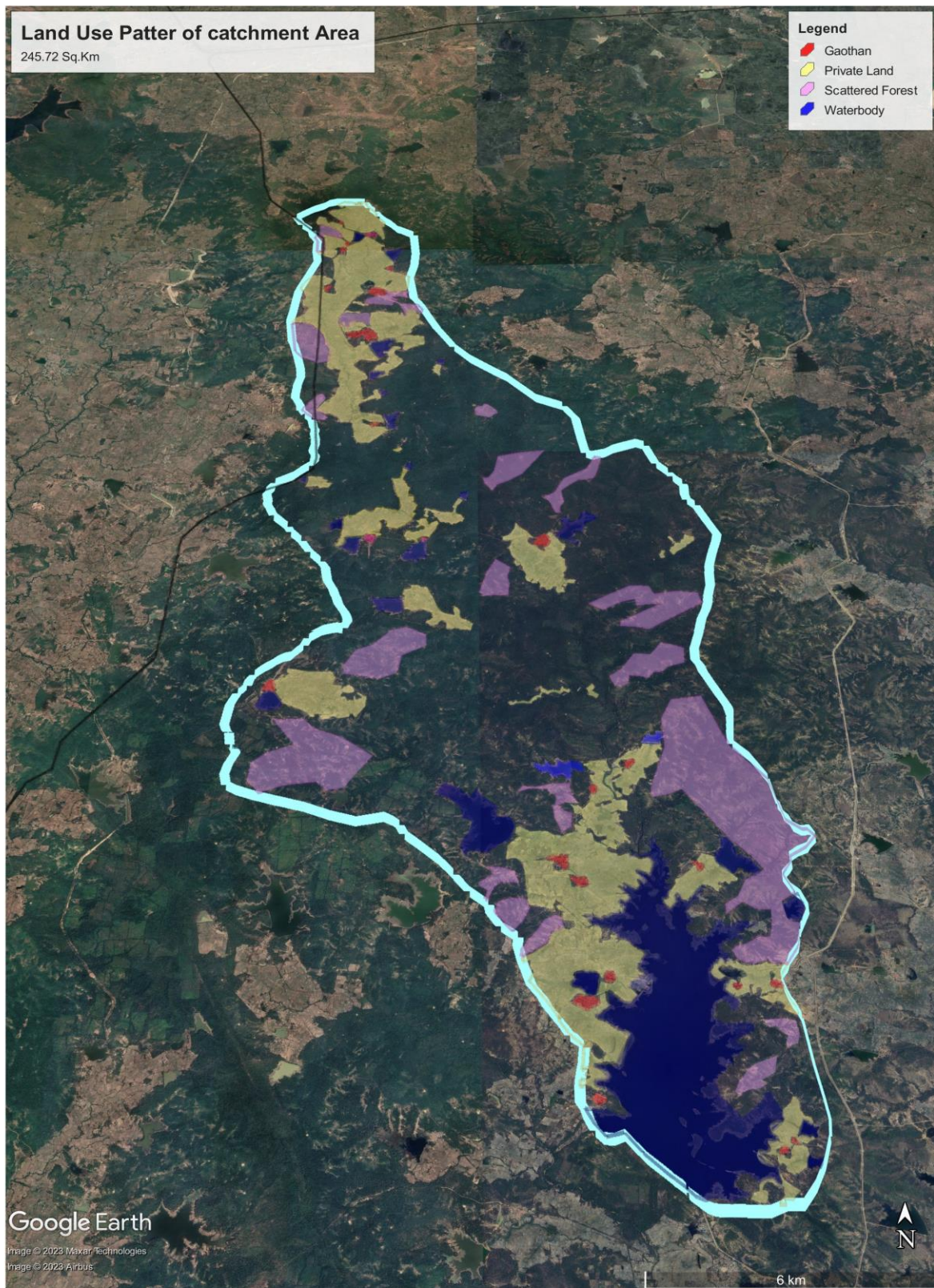
Sub Divisional Engineer
Asolamendha Project
Sub Dn. Saoli

Executive Engineer
Asolamendha Project Renovation
Dn. No. 1, Mul



Junior
Engineer


Sub Divisional Engineer
Asolamendha Project Renovation
Division, Saoli


Executive Engineer
Asolamendha Project Renovation
Division No. 1 Mul




Junior
Engineer


Sub Divisional Engineer
Asolamendha Project Renovation
Division, Saoli


Executive Engineer
Asolamendha Project Renovation
Division No. 1 Mul