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Assessment of Land Use-land Cover Change in Suki River situated in Raver Tehsil, Maharashtra: A GIS Based Approach

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Abstract:
LULC fluctuations are the most significant determinant of environmental degradation, including that of a catchment. Another important consideration for ranking sub-watersheds is the catchment's land use/land cover (LULC) status. Under several LULC situations, increased slope gradients unevenly increased soil erosion rates. The Suki River is a tributary on the Tapi River's right bank in the upper basin. The river begins in the west Nimar (Khargon) District of Madhya Pradesh, in the Satpuda mountains, approximately 40 kilometers north of Shirpur Raver Road. The river is roughly 29 kilometers long up to the dam location. The river flows quickly during the monsoon season and has a steep gradient with multiple falls. The catchment's height ranges from 915 to 335 meters (300 to 1100 feet). Its total area up to the dam site is 366.5 square kilometers (141.52 square miles), of which 203.80 square kilometers (89.12 square miles), or 63% of the total, are in Madhya Pradesh.

Keywords: *Land Use, Land Cover Change, GIS, Suki River, Raver*

INTRODUCTION

The Garbaldi dam is located in Village Garbaldi near Khiroda, Tal–Raver district of Jalgaon State of Maharashtra India. Its official name is Suki Dam D01350, and its coordinates are 21.307212°N 75.898014°E..

The study catchment area under the Raver tehsil and west near district in Madhya Pradesh. The Catchment area of the Suki River up to the proposed dam site is 366.5 sq. km (141.52 sq. miles) and covers a rainfall range of about 762 m.m to 1016 m.m. The rainfall is generally confined to the southwest monsoon period from June to September. Suki river tributary of Tapi River in upper Tapi Basin. The river originates in Satpura ranges in west nimar (khargon) District of Madhya Pradesh .the length of the river upto dam site is about out 29 km (18 miles). The river has steep gradient with a number of falls and flows with a very high velocity during monsoon.

OBJECTIVES

1. To study the physical Setting of the area undertaken
2. To identify dam construction's impact on agriculture pattern
3. To compare the study of agriculture patterns from 1991 to 2021

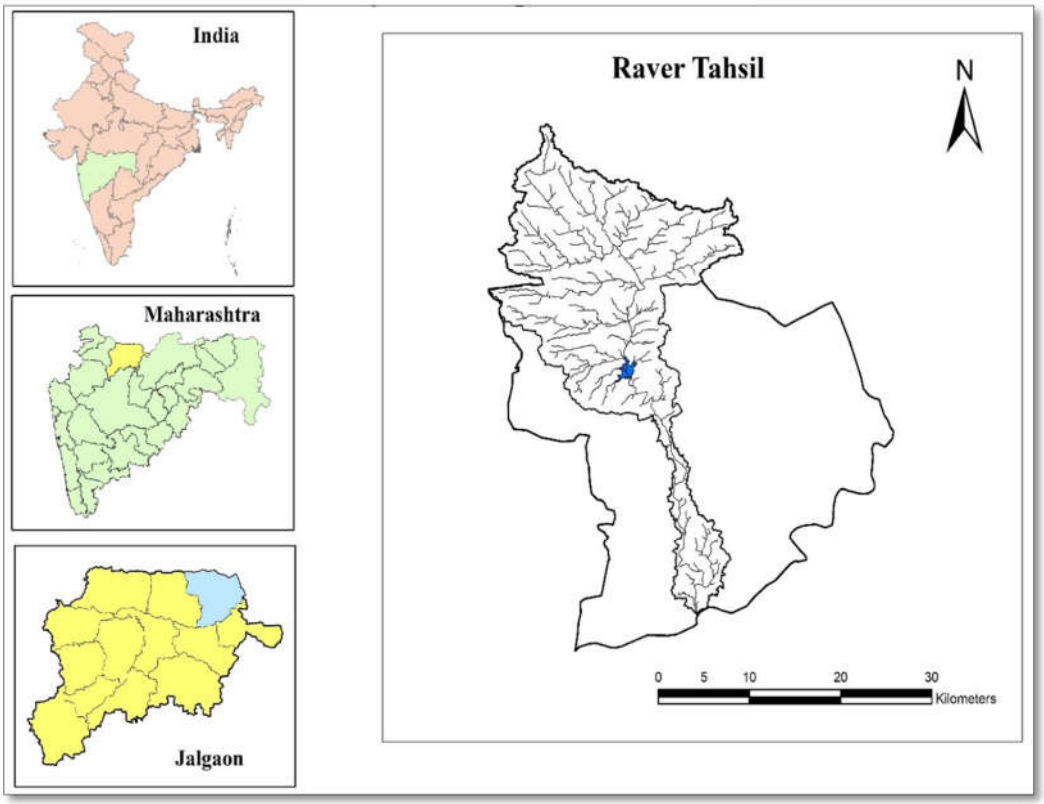
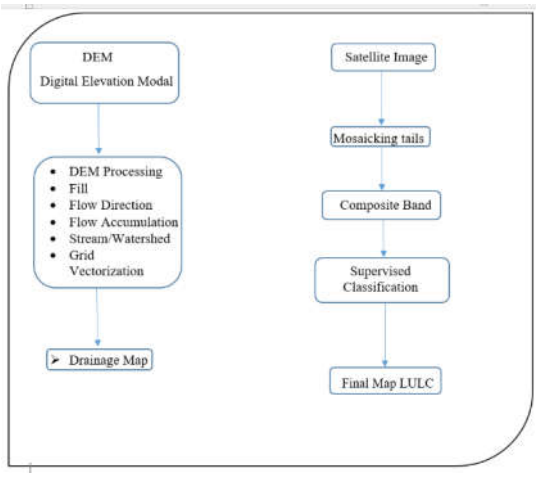


Figure 1: Location Map

SCOPE AND METHODOLOGY

The present study is based on a secondary source of data. Suki River in Raver tehsil was studied with the help of decadal Landsat images. This land sat images of 1991, 2001, 2011, and 2021 were processed with the help of GIS software. Primary and Secondary data are most important for making a map and accurate information to help output project work. However secondary data is more useful than primary data because primary data is not available all every time.

1. The data taken from the USGIS website for satellite images and DEM data
2. We have taken the data from the government offices of Tapi Patbandhare Vikas Mahamandal Jalgaon District and the Agricultural department from Raver Tehsil.
3. As the reference and base map of the canal preparation topo sheet number 46 O/15 and 16 on 1 inch = 1-mile scale soft copy format used.
4. The topo sheet georeferenced to the world coordinate system using image processing software ArcGIS and Autodesk Map to digitize work has been carried output for the entire area.
5. Field Work.



LITERATURE REVIEW

Water is a prime necessity of life and has been fundamental for the development of civilization from the ancient period. The beginning of our civilization was confined to river basins and early settlements were associated with the proximity of surface water such as springs, running streams, and rivers. Many civilizations came into existence around perennial water resources. The need to prospect for additional groundwater sources in a typically hard-rock terrain like the Raver sub-division in Jalgaon district, Maharashtra, became inevitable in order to cope with the ever-increasing population, basic amenities, and rapid development for utilizing the water resources for their increasing needs. (Gautam Gupta, S N Patil, S T Padmane, Vinit C Erram and S H Mahajan 2015)

Groundwater resource occupies a key place in the irrigation sector in India because of its role in stabilizing Indian agriculture. With more than 700 million people sustaining their livelihood through agriculture in India, dependence on groundwater has recently increased due to introduction of high-yielding varieties of crops and adoption of multi-cropping pattern, both of which require a timely assured water supply. This reliability on groundwater as the most dependable source for irrigation has led to over exploitation in many parts of the country, both in hard rock terrain and alluvial areas. The Geographical Information System (GIS) technique has emerged as a very effective and reliable tool in the groundwater management studies (Reddy et al., 1996).

This technique provides an authentic source of information for surveying, identifying, classifying, mapping and monitoring of natural resources in general and water resource in particular. The groundwater regime of any area is largely controlled by parameters like lithology, structures, geomorphology, slope, and land use/land pattern, which are inter-related and imperative for understanding the hydrological set-up of any area (Prakasa, 2010). The relevant baseline information on such features can be generated and analyzed as an individual thematic layer in the GIS environment (Gupta, 2003).

The status of the catchment's land use/land cover (LULC) is another crucial factor to consider when prioritizing sub-watersheds. The most influential factor and indicator of environmental degradation, including a catchment, is LULC changes. Several researchers have explored and used LULC analysis in catchment prioritizing. Increased slope gradient irregularly enhanced soil erosion rates under various LULC scenarios, which were determined to be greatest at a particular critical degree of slope. Changes in the catchment's LULC have been recognized as the principal cause of environmental change, resulting in accelerated soil erosion, and are primarily anthropogenic. RS and GIS techniques can represent various LULC categories through classification procedures. RS and GIS techniques

have been used in catchment prioritizing, which is a basic prerequisite for planners and policymakers to design management schemes that consider the immensity of the catchment area.

Table 1: Landsat image details.

Landsat image	Sensor	Date of acquisition	Path/Row	No. of bands	Resolution (m)	Source
Landsat 5	TM	17/5/1991	146/45	7	30	**USGS**
Landsat 7	ETM+	8/7/2001	146/45	9	30	
Landsat 5	TM	1/2/2011	146/45	7	30	
Landsat 8	OLI_TIRS	14/4/2021	146/45	11	30	

Source: USGS Earth explore

RESULT AND DISCUSSION

Raver tehsil land use land cover map is created using the Interactive supervised classification technique in ArcGIS Software.

Before classification, each satellite image underwent pre-processing, including radiometric and atmospheric correction. Six parameters— Agricultural Land, Barren Land, Built-up land, Forest, River Non-Perennial, and water bodies—were examined to identify land use and cover patterns. Landsat 5 Satellite image used to years 1991 and 2011, Sensor of Thematic Mapper (TM) image was captured. It is displayed as a false color composite using the near-infrared, red, and green bands (bands 4, 3, 2).

Landsat 7 uses the satellite image from the year 2001, the satellite carries the Enhanced Thematic Mapper plus (ETM+) sensor.

Landsat 8 satellite Image used in the year 2021, Operational Land Imager (OLI) and Thermal Infrared Sensor (TURS).

Table 2: Land Use Land Cover Condition of Suki River Basin 1991

Name	Area sq.km	%
Agricultural Land	494	43.05
Barren Land	515.82	44.95
Built Up	26.94	2.35
Forest	74	6.45
River Non-Perennial	32.06	2.79
Water Bodies	4.74	0.41
Total	1147.62	100

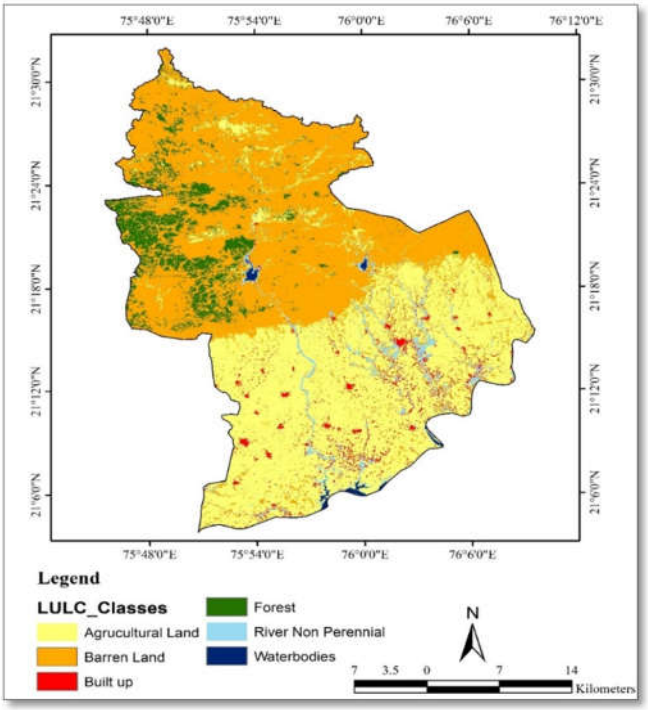


Figure 2: Land Use Land Cover Map of Suki River Basin 1991

Land use land cover mapping results in the Suki River basin most of the land is under the agricultural use. The north-to-southern area benefits from the Suki River and Bhokar River. The irrigation schemes in this area helped in the development of commercial farming.

But the shown by barren land most covered in area, yes because my study area Suki River dam streams are originated in west Nimar (khargaon) Madhya Pradesh. Then the upper part of the study area is in the west nimar part of Madhya Pradesh.

The agricultural land is vital in the raver tehsil at 43.05% (94 sq. km) of the total area in the raver tehsil, Barren Land is the upper part of west Nimar (khargaon) at 44.95% (515.82 sq. Built-up area and Forest area are 2.35% (26.94 sq. km), and 6.45% (74 sq. km) respectively. While River non-perennial and waterbodies amounted to 2.79 %(32.06 sq. km), and 0.41% (4.74 sq. km) respectively. Most of the people engage in the agricultural sector.

Table 3: Land Use Land Cover Condition of Suki River Basin 2001

Name	Area sq.km	%
Agricultural Land	411.78	35.89
Barren Land	457.62	39.89
Built Up	21.09	1.84
Forest	92.31	8.05
River Non-Perennial	156.61	13.65
Water Bodies	7.77	0.68
Total	1147.19	100

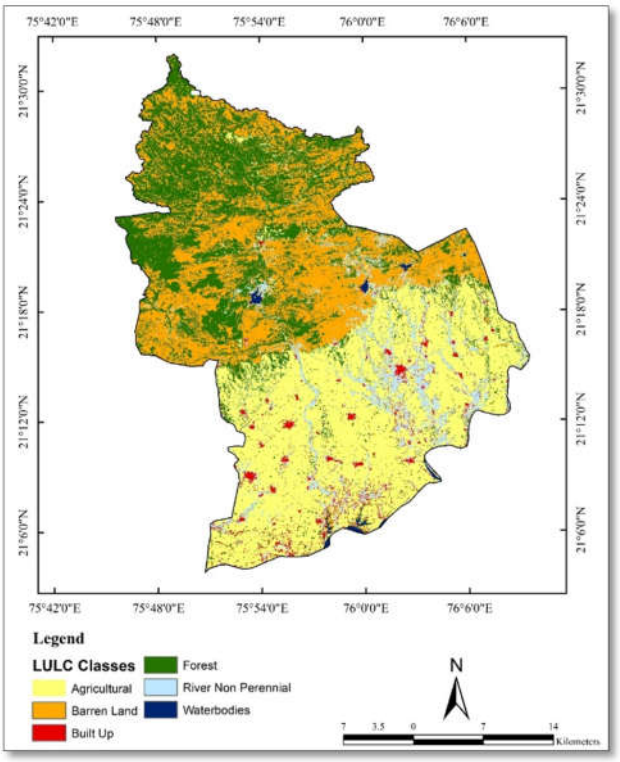


Figure 3: Land Use Land Cover Map of Suki River Basin 2001

Land use land cover map classification for 2001 shows that the agricultural land occupied 35.89% (411.78 sq. km), Barren land, and built-up area are 39.89% (457.62 sq. km) and 1.84% (21.09 sq. km) respectively. While the Forest, River non-perennial and waterbodies amounted to 8.05% (92.31 sq. km), 13.65% (156.61 sq. km), and 0.68% (7.77sq. km) respectively of the study area.

According to 1991 analysis data. Barren land, Build up land will be decreased according to the 2001 year. The increase in the Agricultural land, Forest, River Non-Perennial Barren and Waterbodies and also the small dams are found in the 2001 year respectively.

Table 4: Land Use Land Cover Condition of Suki River Basin 2011

Name	Area sq.km	%
Agricultural Land	421	20.46
Barren Land	317.27	15.42
Built Up	23.67	1.15
Forest	295.02	14.34
River Non-Perennial	995	48.36
Water Bodies	8.36	0.26
Total	2057.32	100

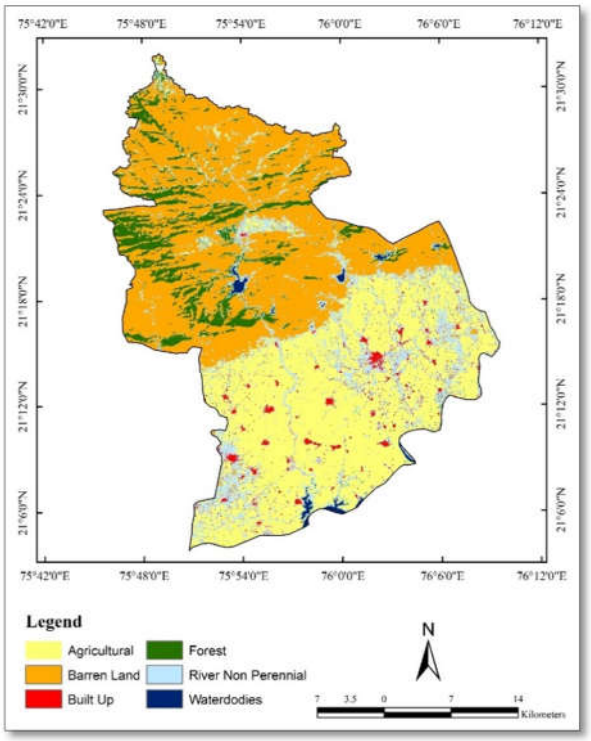


Figure 4: Land Use Land Cover Map of Suki River Basin 2011

The land use land cover map classification for 2011 shown that the agricultural land occupied 20.46% (421 sq. km), Barren land, and built-up area is 15.42% (317.27 sq. km) and 1.15% (23.67 sq. km) respectively. While the Forest, River non-perennial and waterbodies amounted to 14.34% (295.02 sq. km), 48.36% (995 sq. km), and 0.26% (5.36 sq. km) respectively of total study area.

After the analysis of data only barren land has been decreased to according to 2001, The Agricultural land, Build Up, Forest and river non-perennial and Waterbodies are increased, and found the form new small dam are created according to the 1991 year respectively.

Table 5: Land Use Land Cover Condition of Suki River Basin 2021

Name	Area sq.km	%
Agricultural Land	580.90	50.62
Barren Land	290.06	25.28
Built Up	34.34	2.99
Forest	111.36	9.70
River Non-Perennial	121.36	10.58
Water Bodies	9.59	0.84
Total	1147.61	100

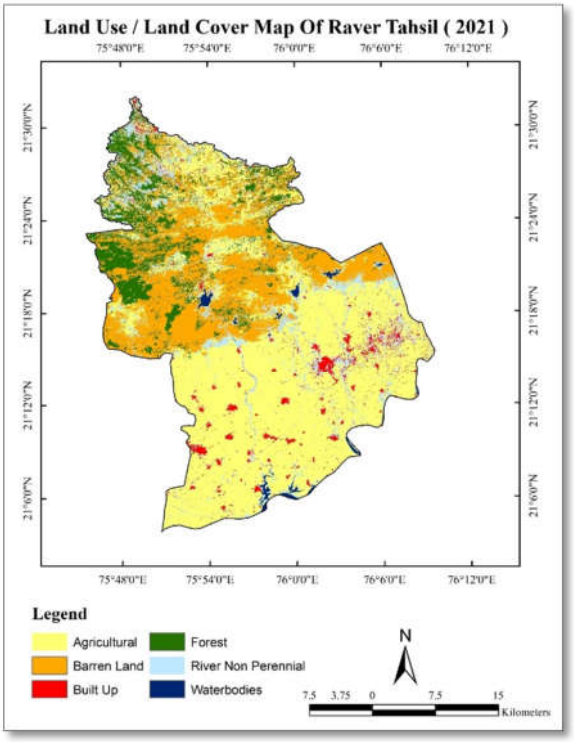


Figure 5: Land Use Land Cover Map of Suki River Basin 2021

The land use land cover map classification for 2021 shows that the agricultural land occupied 50.62% (580.90 sq. km), Barren land, and built-up area are 25.28% (290.06 sq. km) and 2.99% (34.34 sq. km) respectively. While the Forest, River non-perennial and waterbodies amounted to 9.70% (111.36 sq. km), 10.58% (121.36 sq. km), and 0.84% (9.59sq. km) respectively of the study area.

The final analysis of the years 1991, 2001, and 2011 studies to big development of 2021 year.

Table 6: Land Use Land Cover changes in 1991 to 2021 of Suki River Basin

	Area Sq. km			
Name	**1991**	**1991**	**1991**	**1991**
Agricultural Land	494	411.78	421	580.90
Barren Land	515.82	457.62	317.27	290.06
Built Up	26.94	21.09	23.67	34.34
Forest	74	92.31	295.02	111.36
River Non Perennial	32.06	156.61	995	121.36
Water Bodies	4.74	7.77	8.36	9.59

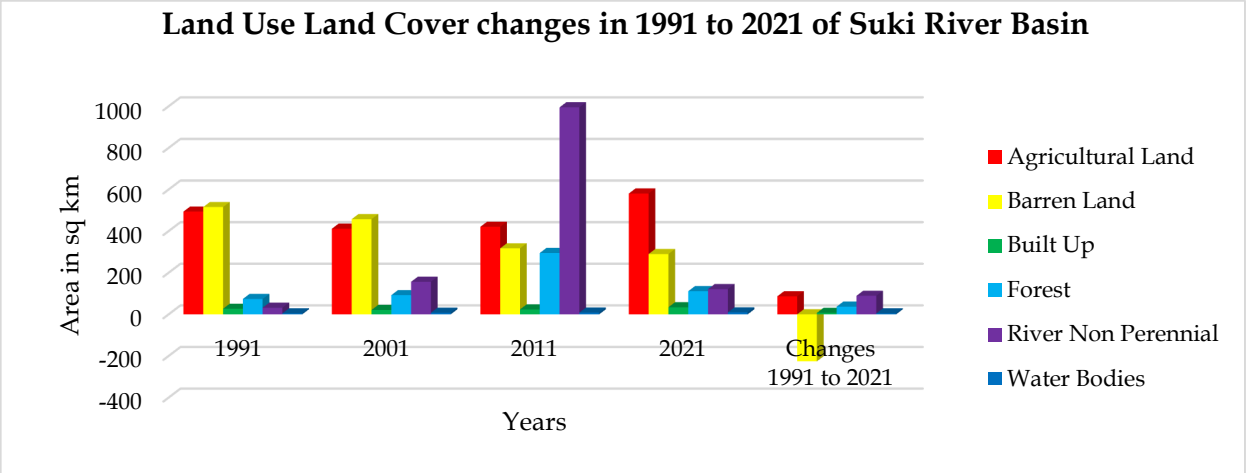


Figure 6: Land Use Land Cover changes in 1991 to 2021 of Suki River Basin

The analysis of the data from 1991, 2001, 2011 and 2021 to changes in land area are 1991 to 2021, The Agricultural land, Built up, Forest, River Non Perennial and Waterbodies area increased by 86.83 sq. km, 7.40 sq. km, 37.36 sq. km, 89.30 sq. km and 4.85 sq. km. As well as the Barren land -225.76 sq. km decreased respectively study area.

CONCLUSION

The present project work deals with "Using geospatial techniques of Land use-land cover change analysis of Suki River, Raver Tehsil.", is we conclude that.

1. From 1991 to 2021, agricultural land has increased by 11.2 percent, and the barren land, Built land, and River non-perennial decreased respectively in the study area.
2. Suki River tributary of the Tapi River in upper Tapi Basin. The river originates in the Satpuda ranges in the west Nimar (khargon) District of Madhya Pradesh.
3. The Physiography of the Garbaldi Dam (Suki River) basin is the part of Deccan plateau as well as it's composed of the Satpuda ranges.
4. The study area of Garbaldi Dam (Suki River) represents the various topographical features and landforms such as a Mountain chain, Hill Ranges, Valleys, Forest, Dyke and Quaternary Sediments, Paleocene cretaceous extrusive rocks.
5. The linked Deccan trap, with its top regions in the north and south covered with Paleocene Cretaceous Extrusive Rocks, is the research area. Quaternary sediments encompass the southern lower region of the

research area and the middle northern section, which includes an extant Garbaldi Dam area.

6. The height of the dam is 42 meters, and the length including the watershed 575 meters as well as only length of the watershed 116 miters. The mean water level of the Dam is 379 meters.
7. The water is distributed of canals; location of the canals is the Village of Lohare in Raver tehsil. The canals are divided in two ways Right bank and Left Bank Canals.
8. The soil type in this region can vary, but it is typically classified as predominantly black clay soil (vertisols) and Alluvial Clay Loam.
9. Raver Tehsil experiences hot and dry weather during the summer, which usually lasts from March to June. Temperatures can rise dramatically; throughout the day, they frequently reach 35°C (95°F) or higher.
10. The winter season, spanning from November to February, is relatively mild and dry compared to the summer months. Temperatures during this time generally range from 10°C to 25°C (50°F to 77°F), providing relief from the summer heat.
11. The 14 villages connected by the canal are greatly helped by the water from Garbaldi dam to irrigate the agricultural fields.
12. The Garbaldi dam drainage pattern is the dendritic drainage pattern characterized by a tree-branch-like appearance.
13. To the analysis of the data from 1991, 2001, 2011 and 2021 to changes in land area are 1991 to 2021, The Agricultural land, Built up, Forest, River Non Perennial and Waterbodies area increased by 86.83 sq. km, 7.40 sq. km, 37.36 sq. km, 89.30 sq. km and 4.85 sq. km. As well as the Barren land -225.76 sq. km decreased respectively study area.

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Suki River Project book, Tapti patbandhare vikas mahamandal Jalgaon Government office, Jalgaon

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