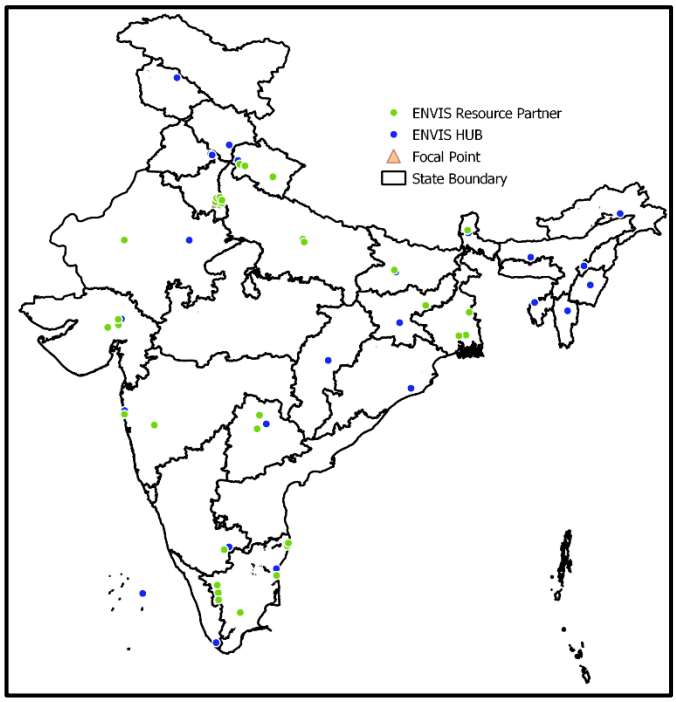

NATIONAL ENVIRONMENTAL SURVEY-GRID BASED RESOURCE INFORMATION & DECISION SUPPORT SYSTEM (NES-GRIDSS)

ABSTRACT

Environmental indicators are essential tools for tracking environmental progress, supporting policy evaluation, informing the public and measuring environmental performance. To ascertain the status of environment at district/state/national levels and to facilitate decision-making at all levels of government, MoEF&CC has embarked on conducting the National Environment Survey.

Consumer Education and Research Centre

Environmental Information System

Resource Partner

(CERC ENVIS RP)

OVERVIEW

Environmental indicators are essential tools for tracking environmental progress, supporting policy evaluation, informing the public and measuring environmental performance. India's first-ever National Environment Survey (NES) will map environment data of all districts and rank all districts on their environmental performance and document their best green practices based on various environmental parameters. The Survey will be carried out by the Ministry of Environment, Forests and Climate Change through Environmental Information System (ENVIS) and its Hubs and Resource Partners across the country.

Consumer Education Research Center-ENVIS Resource Partner (CERC-ENVIS RP) will be working on The Dangs district (South Gujarat) in a first phase to study under National Environment Survey - Grid based Resource Information & Decision Support System (NES-GRIDSS). It requires collection of primary data, secondary data, preparation of thematic maps and district mapping to facilitate policy decisions at all levels of government.

INTRODUCTION

India's first ever National Environment Survey (NES) was kicked off in January, 2019 to map environment data of 55 districts across 24 States and 3 Union Territories and bring out the entire data of different environmental aspects onto a single platform The NES will rank all districts on their environmental performance and document their best green practices based on various environmental parameters. The earliest first set of complete green data from this survey will be available in 2020. The NES will be carried out by Ministry of Environment, Forests and Climate Change (MoEF&CC) through Environmental Information System (ENVIS) and its Hubs and Resource Partners across the country. It will be done through grid-based approach, using grids measuring 5×5 km (grid size is subject to change) to collect comprehensive data on various environmental parameters like air, water, soil quality, solid, hazardous and e-waste, emission inventory; forest & wildlife; flora & fauna; wetlands, lakes, rivers and other water bodies, assessment of carbon sequestration potential of all the districts across the country at regular intervals.

The green data from this survey will provide important tool in hands of policy-makers for decision making at all levels – district, state and national. Initially the survey will be focusing on 55 districts and later will be scaled up to all districts in the country. The first set of data will be compiled in one year because it needs to cover seasonal cycles in terms of air pollution and flora & fauna. Presently the survey is planned for 55 districts across the country. All 723 districts in the country are expected to be surveyed in a period of three to four years. ENVIS will include 18 modules, 110 sub modules covering 617 parameters (numbers subject to change). ENVIS Hubs/RPs will periodically update data obtained from state departments/ bodies and maintain the NEG (National Environmental Geodatabase).

Based on the physiological conditions, a sample of grids would be taken and baseline data would be collected through secondary sources. The gaps in data will be filled in through primary survey. All the districts in the country are expected to be surveyed in a period of 3-4 years. The survey will be repeated thereafter. The

exercise of conducting the 'Environment' Surveys regularly will be coordinated by the designated ENVIS Hub/RP in each state.

To avoid duplication of efforts, the aim is to converge resources and access the data/ Information /maps available with different government (both central and state) agencies. ENVIS Hubs/RPs will continue to collect data from the state departments/bodies and periodically update and maintain the India State-level Basic Environmental Information Database (ISBEID), a web-enabled application. All data/ Information /maps collected through primary survey would also flow into the ISBEID database.

To undertake the nationwide Environment Survey huge skilled work force would be required. Candidates successfully skilled in different courses under the Green Skill Development Programme (GSDP) of the Ministry would be engaged in survey of grids for collection of information on various environmental parameters. College and University students will also be encouraged to carry out survey of the grids. This activity can be taken up by students during their specified internship period or long holidays and can fulfil the mandatory credit internship requirements.

OBJECTIVES

The objective of study is the Inventorying, mapping and monitoring of natural resources in India using grid based strategy. The goal of Ministry of Environment Forest and Climate Change (MoEF&CC) is to facilitate economic development with sustainable environment. A crucial input to decision making and to achieving this goal is robust, disaggregated environmental data. These are technical, spatial, and temporal data on the environmental media, such as air, water (surface and ground}, soil, biota (plants and animals) etc., covering parameters like waste, pollution, hazardous substances, fauna and flora, terrain, species conservation. A necessary condition is that environmental data should be easily accessible, easy to use and efficiently managed.

The grid based environmental survey of districts would facilitate:

1. Creating a robust database/information on various environmental parameters grid-wise and district wise,
2. Expanding the ISBEID database from State level to district level for all selected environmental parameters,
3. Critical assessment of environmental proposals at district, state and national levels,
4. Preparation of District, State and National Level Status of Environment Report (SOER),
5. Valuation of eco-system services at district, state and national levels,
6. Assessing the carbon sequestration potential of the districts,
7. Ranking of districts on their environmental performance,
8. Documenting the best environmental practices of the districts.

STATE-WISE LIST OF SELECTED DISTRICTS FOR GRID BASED ENVIRONMENTAL SURVEY

State-wise List of Selected Districts for GRIDSS (2018-19)		
Sl. No.	**ENVIS Hub/RP**	**Selected Distt/State**
1	East Godavari River Estuarine Ecosystem (EGREE) Foundation, Andhra Pradesh	East Godavari, A.P.
2	Department of Environment & Forests - Arunachal Pradesh	Papum Para, Arunachal Pradesh
3	Assam Science, Technology and Environmental Council, Guwahati	Morigaon, Assam
4	Asian Development Research Institute (ADRI), Patna	Nalanda, Bihar
5	Department of Environment - Chandigarh	Chandigarh
6	Chhattisgarh Environment Conservation Board	Raipur, Chhattisgarh
7	Central Pollution Control Board (CPCB), Delhi	Shahdara, Delhi
8	School of Environmental Sciences, Jawaharlal Nehru University (JNU), Delhi	South Delhi
9	Gujarat Cleaner Production Centre (GCPC), Gandhinagar	Bharuch, Gujarat
10	Consumer Education and Research Centre (CERC), Ahmadabad	Dangs, Gujarat
11	Gujarat Ecology Commission (GEC), Gandhinagar	Jamnagar, Gujarat
12	National Institute of Occupational Health (NIOH), Ahmedabad	Mehsana, Gujarat
13	The Energy Resources Institute (TERI), Delhi	Gurugram, Haryana
14	International Institute of Health and Hygiene (IIHH), Delhi	Mewat (Nuh), Haryana
15	State Council for Science, Technology and	Kullu; Shlmla; Chamba; Sirmaur, Hlmachal Pradesh
	Environment (SCSTE), Shimla	
16	Department of Ecology, Environment and Remote Sensing, State Government of J&K	Ganderbal, J&K

17	Centre for Mining Environment (CME) IIT- Indian School of Mines (ISM), Dhanbad	Dhanbad,Jharkhand
18	Environment Management & Policy Research Institute (EMPRI), Bengaluru	Ramanagara, Kamataka
19	Centre for Ecological Sciences – Indian Institute of Science (IISc), Bengaluru	Shimoga; Kodagu; Kannada, Kamataka Uttara
20	Kerala State Council for Science, Technology and Environment (KSCSTE)	Thiruvananthapuram, Kerala
21	Disaster Management Institute (DMI), Bhopal	Bhopal, M.P.
22	Indian Institute of Tropical Meteorology {IITM), Pune	Pune, Maharashtra
23	Bombay Natural History Society (BNHS), Mumbai	Palghar; Nagpur, Maharashtra
24	Directorate of Environment, Dept. of Forests and Environment, Govt. of Manipur, Imphal	Bishnupur, Manipur
25	North Eastern Hill University (NEHU), Shillong	East Khasi Hills, Meghalaya
26	Mizoram Pollution Control Board, Aizawl	Aizawl, Mizoram
27	Nagaland Pollution Control Board, Dimapur	Kohima, Nagaland
28	Centre for Environmental Studies (CES), Forest & Environment Department, Government of Odisha, Bhubaneswar	Cuttack, Odisha
29	Puducherry Pollution Control Committee	Puducherry
30	Punjab State Council for Science and Technology (PSCST), Chandigarh	Mohali (S.A.S. Nagar), Punjab
31	School of Planning and Architecture (SPA), Delhi	Alwar, Rajasthan
32	Central Arid Zone Research Institute (CAZRI), Jodhpur	Barmer, Rajasthan
33	Forests, Environment & Wildlife Management Department, Sikkim, Gangtok	East Sikkim
34	State Council of Science and Technology for Sikkim (SCSTS), Gangtok	West Sikkim
35	Salim Ali Centre for Ornithology and Natural History (SACON), Coimbatore	Coimbatore, Tamil Nadu

36	Centre for Advanced Study in Marine Biology (CASMB), Parangipettai	Cuddalore, Tamil Nadu
37	Department of Zoology - University of Madras, Chennai	Kanchlpuram, Tamil Nedu
38	Thiayagaraj College of Engineering (TCE), Madurai	Madurai, Tamil Nadu
39	Institute of Forest Genetics and Tree Breeding (IFGTB), Coimbatore	The Nilgiris, Tamil Nadu
40	Department of Environment, Govt. of Tamil Nadu, Chennai	Thiruvallur, Tamil Nadu
41	Institute for Ocean Management (IOM), Anna	Tirunelveli; Kanyakumari; Ramanathapuram; Tuticorin (Thoothukudi), Tamil Nadu University, Chennai
42	CPR Environmental Education Centre	Villupuram, Tamil Nadu (CPREEC), Chennai
43	Environment Protection Training and Research Institute (EPTRI), Hyderabad	Hyderabad, Telangana
44	Environment Protection Training and Research Institute (EPTRI), Hyderabad	Kumool, Telangana
45	Indian Institute of Chemical Technology (IICT), Hyderabad	Vishakapatnam, Telangana
46	Tripura State Pollution Control Board, Agartala	Sepahijala, Tripura
47	Directorate of Environment - Uttar Pradesh, Lucknow	Allahabad, Uttar Pradesh
48	World Wide Fund for Natura - India (WWF), Delhi	Gautam Buddh Nagar, Uttar Pradesh
49	National Botanical Research Institute (NBRI), Lucknow	Lucknow, Uttar Pradesh
50	Forest Research Institute (FRI), Dehradun	Dehradun, Uttarakhand
51	Uttarakhand Environment Protection & Pollution Control Board (UEPPCB), Dehradun	Haridwar, Uttarakhand
52	G.B. Pant National Institute of Himalayan Environment and Sustainable Development (GBPNIHESD), Almora	Almora, Uttarakhand
53	Wildlife Institute of India (WII), Dehradun	Uttarkashi, Uttarakhand

54	Department of Environmental Sciences (DES), Kalyani University , Nadia	Nadia, West Bengal
55	Botanical Survey of India (BSI), Kolkata	Purulia, West Bengal
56	Zoological Survey of India (ZSI), Kolkata	Purulia, West Bengal

LIST OF SELECTED DISTRICTS FOR GRID BASED ENVIRONMENTAL SURVEY FOR GUJARAT STATE

Bio-geo Region	**Sl No.**	**ENVIS Hubs/RPs**	**Districts selected**	**Districts allotted in own State**	**Addnl distts. allotted in other states (no. of distts)**	**TOTAL DISTRICTS**	**States/UTs Covered (No. of Distts.)**
1	2	3	4	5	6	7 (= Col 4+5+6)	8
Semi-arid	1	GEC, Gandhinagar (Hub)	Jamnagar - 1	Saurashtra-Kutch region - Rajkot, Amreli, Bhavnagar, Botad, Devbhoomi Dwarka, Gir Somnath, Junagadh, Morbi, Porbandar, Surendranagar, Kachchh = 11	NIL	12	Gujarat (33)
	2	GCPC, Gandhinagar (RP)	Bharuch - 1	Central Gujarat region - Ahmedabad, Vadodara, Anand, Chhota Udaipur, Dahod, Kheda, Mahisagar, Panchmahal = 8	NIL	9	
	3	CERC, Ahmedabad (RP)	Dangs - 1	S Gujarat region - Surat, Narmada, Navsari, Tapi, Valsad = 5	NIL	6	
	4	NIOH, Ahmedabad (RP)	Mehsana - 1	N Gujarat region - Gandhinagar, Aravalli, Banaskantha, Patan, Sabarkantha = 5	NIL	6	
		TOTAL DISTRICTS IN BIO-GEOGRAPHIC REGION				33	

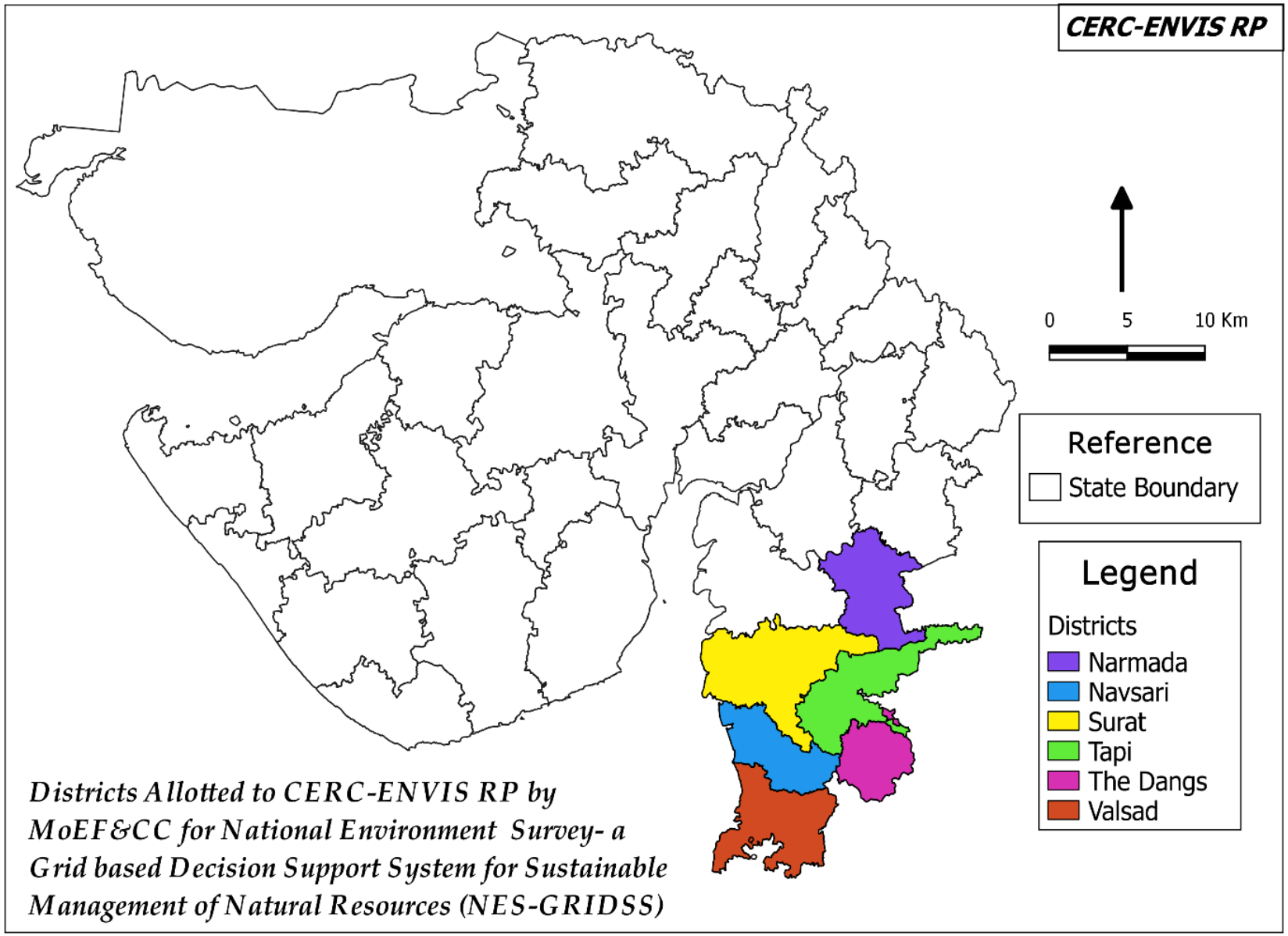

Figure 1 Map showing districts to be surveyed under GRIDSS by CERC ENVIS

THE DANGS

The Dangs was known as “Dakaranya or Dandak” during the period of Ramayana. The smallest tribal district of Gujarat, is located in the south western part of state of Gujarat in western India. A cluster of thickly forested hills, the Dangs rising to the Sahyadri mountain range, shares boundary with the neighbouring state of Maharashtra. It is bounded in the North by Surat district (of Gujarat State) and Dhule district (of Maharashtra State), in the east by Nasik district (of Maharashtra State) and West by Valsad District (of Gujarat state). This is the only district of the Gujarat state with high hills and rich forest. The total geographic area covered is 1,776 sq. km and lies between 20° 33’50” to 21° 04’ 52” Latitudes and 73° 27’58” to 73° 56’38” Longitudes which is above 300 to 1300 m Mean Sea Level (MSL).

Major physiographic region is terraced topography with flat topped conical hills, small plateaus and steep sided narrow valleys. The district has semiarid climate. The temperature varies between 9.2^{o}C and 36.4^{o} C. Average rainfall for the district is 1760 mm having spread over 90 rainy days. The forest of Dang is classified under North Western Ghats mist deciduous forest which lie within the belt of heavy rainfall and can be classified as South Indian Moist deciduous forest (38%) and Southern Dry Deciduous Forest (58%). The Dangs forests fall in the bio geographic zone 5 “Western Ghats” , under biotic province 5 A “ Malabar Coast “ and 5 B Western Ghat Mountains”.

The total area under forest in the year 2015 is 1054.88 sq. km. which is 59.80% of total geographical area of the district. The Dangs is rich in timber as most of the trees are of high quality teak. There are total 311 villages and 3 talukas named Ahwa, Waghai and Subir. There are total 70 gram panchayats: 3 Gram Panchayat and 3 Group Gram Panchayats. The entire district is tribal dominated with 98% of the population comprised of tribal.

The district with its characteristic topography, is rich in forest cover in the whole of Gujarat. Forest covers more than 50% of its geographical area of the district. Its natural resources is rich in timber and teak of high quality. The terrain of the district is hilly / undulating dissected by a network of streams and rivers. The district is a storehouse of number of medicinal plants, many of them still unexplored. The district was once dominated by various types of wild animals. Even today, sloth beer, panthers, etc. is usually sighted in the remote part of the district.

Product (NTFP) is still a major source of livelihood for the people. Timru leaves, teak seeds and mahuda flowers and seeds are mostly collected during the summer and they provide an alternative livelihood source. Manufacturing of various household bamboo products, a major source of livelihood.

Secondary Data for the Dangs district was collected under the pre-defined format of 17 modules & 110 sub modules having 617 parameters by MoEF&CC. National remote sensing centre-Bhuvan, Geological Survey of India, Census of India, India data portal water resources department etc. are few data source for collecting information. Different thematic layers were prepared and attribute tables were created after collecting secondary data for the Dangs district. A Thematic map to represent location, state boundary, district boundary & village boundary was prepared using QGIS 2.8.1 software. It is shown below:

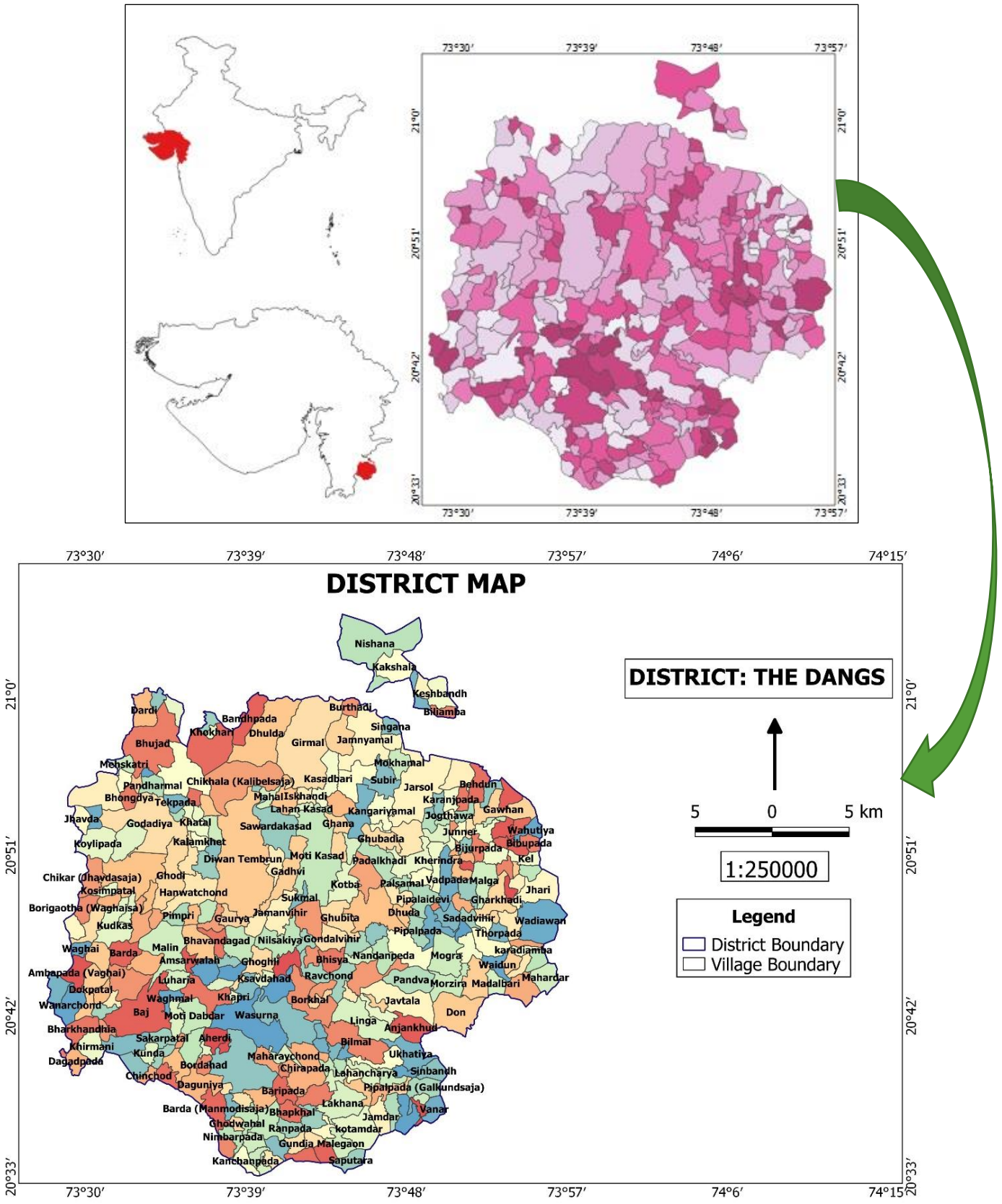

Figure 2 District (The Dangs) map

Mapping of districts involves preparation of thematic maps for different environmental parameters. Providing an example, population density methodology is explained in this section.

Population density is a measurement of the number of people in an area. Population density is calculated by dividing the number of people by the area. It is usually represented as number of people per square kilometer.

Population Density =Number of persons/Square kilometer area

There are two fundamental modes of representation for quantities – Choropleth Symbols & Proportional Symbols. Here, we have represented population density using choropleth mode. Choropleth Maps are maps that shade geographical areas according to statistics tabulated for each area. Choropleth maps are very effective in creating an impression of the spatial pattern of statistical information. The Methodology used for preparing population density map is provided below:

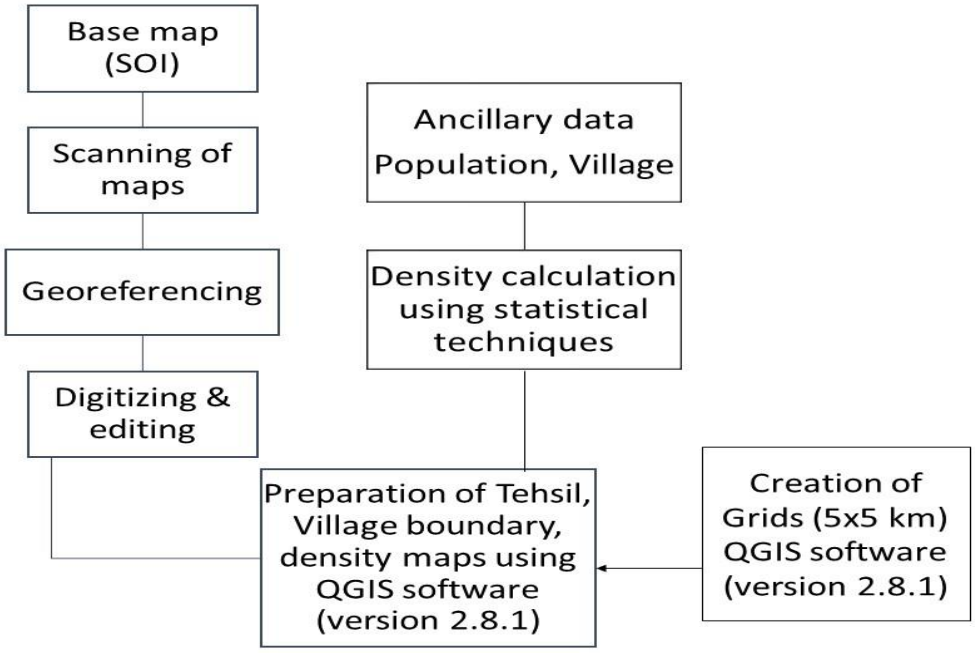

Figure 3 Flow chart of methodology to prepare grid wise population density map

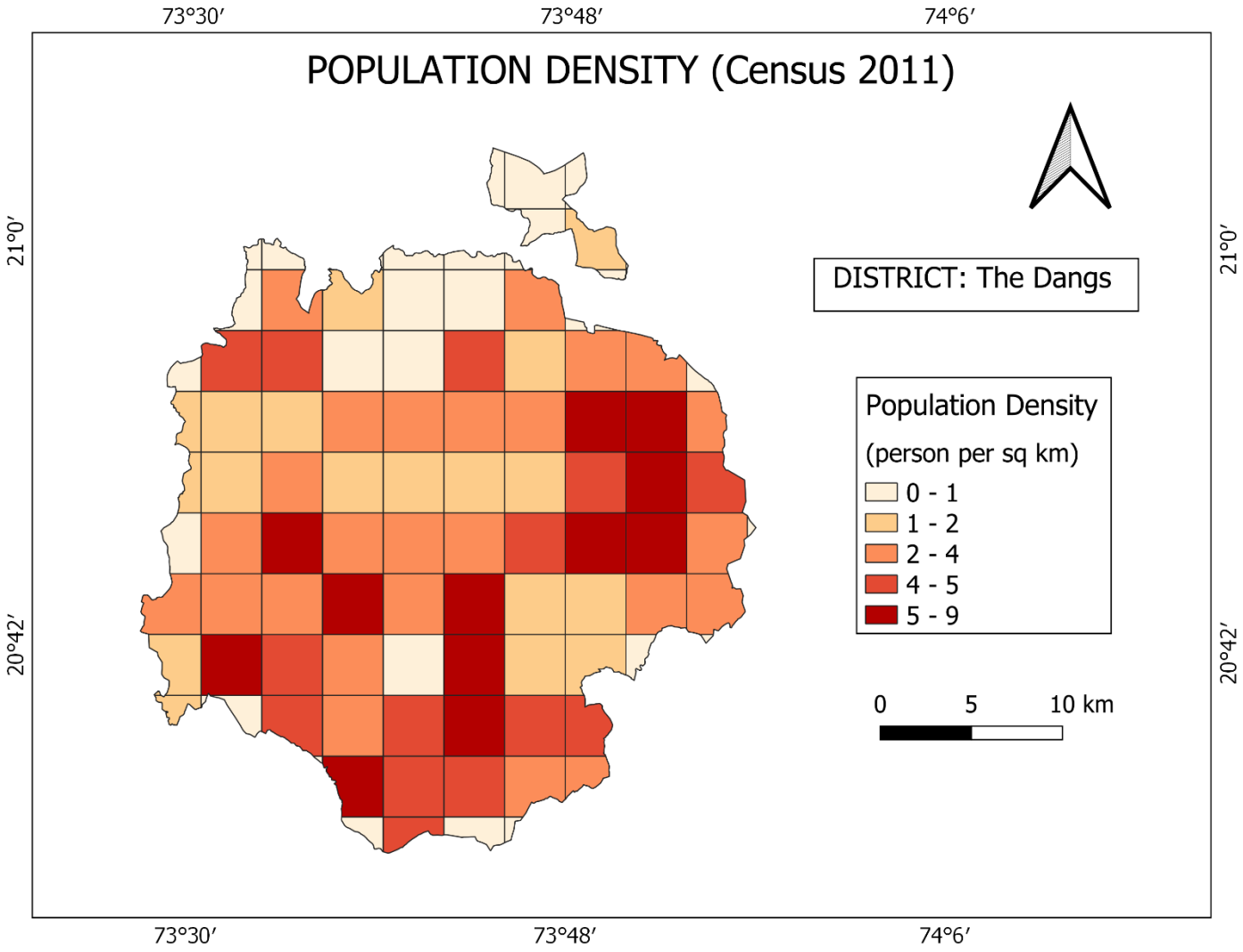

Figure 4 Population density of the district (The Dangs)

Population density is just one parameter but mapping of districts would involve various environmental parameters. Factors, such as steepness of slopes, aspects, vegetation etc. can be viewed and overlaid to determine various environmental parameters and impact analysis. Likewise various thematic maps would be prepared under GRIDSS to fulfill its objective.

GRIDSS would focus on future assessments on a set of key ecosystem services which can be clearly coupled to the achievement of other policy targets in policy domains such as health, security, climate, water quality, air quality, social wellbeing, and energy use/efficiency. Operationalization of ecosystem services needs dedicated tools, which consider the specific conditions of environment & hence GIS can be used most effectively for environmental data analysis and planning. GIS would provide better viewing and understanding physical features and the relationships that influence in a given critical environmental condition for better policy making.

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