



RELATION OF GEO-ENVIRONMENT WITH AGRICULTURE AND SOCIO-ECONOMY – A CASE STUDY OF NAGPUR DISTRICT USING GEOGRAPHICAL INFORMATION SYSTEM (GIS)

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Abstract:

Agriculture is still a dominant occupation in all the districts of Maharashtra State; Nagpur district is not an exceptional case in part of Vidarbha region of the State. The economic social and cultural life of the district is greatly influenced by agriculture. Considering its geo-environmental condition, Nagpur district can be divided into following physiographic units: i) the Ramtek upland on the north which is occupied by the off shoots of Satpura ranges, and ii) Nagpur plain which is formed by the valley of Kanhan and its tributaries. The general height of this low area is about 250 m MSL. Most part of the district is covered by black cotton soil. The district experiences hot-dry summers, warm-wet rainy season and relatively cold winters. This geo-environmental condition is largely responsible for the agricultural development in the district. In Wardha-Wainganga basin, Nagpur plain is the most important and economically the most developed sub-region. Agricultural conditions are reasonably developed here. Considering crops, jowar retains its importance as the first crop, but wheat appears as an important cereal and pulses are uniformly noticeable. The orange cultivation of Vidarbha region, which famous all over the country is highly concentrated in Nagpur district. It has more than 17,000 acres under orange, which is more than 50 per cent, the total orange area in Vidarbha. This peculiar agricultural scenario with its socio-economic of the district is landscape dominated by the geo-environment of the area. This part has motivated in selecting Nagpur district for the study. For present study different resources thematic maps have been integrated using GIS techniques and tahsilwise geo-environmental group in the district have been devised. In the district three groups are found i.e. good, medium and poor. Most of the tahsils i.e. 50% are medium group where 25% tahsils are in good and poor geo-environmental group. These geo-environmental groups has been co-related and studied with agriculture activities and socio-economic status. From this study it has been observed that tahsils in good geo-environmental group having good agricultural activities and socio-economic situation, where as tahsils in poor environmental groups have poor agriculture and socio-economic set up.

In this case study an attempt has been made to describe and to analyse the above results.

Keywords: Geo-Environment, Geographical Information System, Integrated analysis.

Introduction

Various types of landforms are present on the surface of the earth with their own particular characteristics, resulting into different types of geo-environment. Each type of geo-environment influences human life of that area and hence the socio-economic conditions and level of developments differ according to the type of physical landscape. Hence there is definite relationship between geo-environment and the type of socio-economic/cultural conditions of the human society.

Considering geomorphology of Nagpur district, 80 per cent area of the total geographical area of the district is occupied by basalt, and the rest 20 per cent area is constituted by other types of volcanic / basalt, sedimentary and metamorphic rocks are seen in this study area. Therefore, the district can be divided into three types of geo-environment accordingly, and each unit shows different type of socio-economic conditions. This study shows the relation and comparison of geo-environment with the socio-economic status

of the people of Nagpur district.

STUDY AREA

Nagpur district is located in eastern region of Maharashtra State. Geographical location of the district is between north longitude 20^o-25' to 21^o.44' and east latitude 78^o 15' to 79^o 40'. Nagpur is bounded by Bhandara in east, Wardha in south and Amravati north district and in the north M.P. State. The geographical area of district is 9892 sq.,km. Administratively district is divided in 14 talukas.

GEO-GRAPHICAL FEATURES

Geographically district can be divided off shoots of satpura ranges are found in north and western part and in the remaining area is called Nagpur plain contributed by Vena and Kanhan and there tributaries.

CLIMATE

In Nagpur, the climatic condition in summer is hot and in winter season are remain cold. The average temperature of winter in

Nagpur district is in between 7°C to 9°C and maximum average temperature touches 44°C to 46°C. The rainfall in the district is in between 1000 mm to 1250 mm in the district.

DRAINAGE

River Wardha and Wainganga flows on the western and eastern border of the district respectively. Jam and Vena are the tributaries of Wardha river. Jam river flows through Katol tahsil and meet to Wardha river. The Vena river originate from plateau of Kavadas and flows through Nagpur taluka. Kanhan river originate from hills of Satpuda and meet to Wainganga river. Pench and Kolar are the tributaries of Kanhan river. Thus the District consists of tree structural drainage system. The Wardha and Wainganga are the tributaries of Godavari river.

GEOLOGY

Three different types of geology exists in the district namely old crystalline rock (metamorphic) on top of the sedimentary rock of Gondwana super group . Major part of the district is covered by deccan trap / basalt rock. The major mineral of the district is coal. Manganese is the other mineral found in the district. Black cotton soil is found in river valleys.

SOIL

There are major four soil types occur in the district 1) Coarse, 2) Silty / Sandy, 3) Clay & 4) Black cotton. Coarse soil mainly found on hill tops and silty soil occurs near foot hills. Where as the clay soil mainly found on the upper part of the valleys. The black alluvium soil found near the lower part of the vally i.e. near the river area. The 60% of the district consist of black cotton soil. This black soil is very good for growing cotton and jowar.

LAND USE AND MAJOR CROPS

The total geographical area of the district is 986000 Ha. The area occupied by the forest is 159000 Ha. The agricultural land is 639000 Ha. Out of the total available arable land, the area 134000 Ha. is under irrigation by different means. Area not suitable for cultivation is 143000 Ha.

The major crops in the district are jowar, pulses, wheat, rice, cotton other crops grown are vegetables and fruits (Orange).

SOCIO ECONOMIC CONDITION OF THE DISTRICT

Total population of the district is 46,54,000 and the population density is 470 per sq.km. The population of schedule caste is 18.60% and scheduled tribe is 09.40%. There are 951 female per 1000 male. The literacy rate

is 88.40% where 92.10% are the male and 84.50% are female. 11,67,900 peoples out of total population of the district are working in different areas. The number of people working as marginal worker is 67,800. Out of total working population 2,02,400 are farmers (37 per cent). The remaining are the labours / workers working in different organizations. 40% of the total labour force is dependent on agriculture. Which indicate that majority of workers dependent on agriculture. The average land holding of the district 2.50 ha. (Source: Census report of 2001 & 2011)

Methodology

For present study geo-environmental condition in different talukas are taken. The different types of natural resources thematic maps are analyzed in this study. This thematic map are integrated on GIS platform and good environment zones to poor environment zones are prepared using weighted average system in the talukas using the geographical information system.

GEOGRAPHICAL INFORMATION SYSTEM (GIS)

Geographical Information System (GIS) "Is computerized information storage processing and retrieval systems that have hardware and software specially designed to cope with geographically referenced spatial data and corresponding attribute information (Tables, charts and statistics):.

Thus, according to definition of GIS, it is the combination of computer hardware, software and man wave using large formats data, which may in the form of maps or tables can be processed efficiently and analyzed as per requirement.

Before the development of GIS, the integrated study of different natural resources was very tedious and time consuming. The interpretation and overlaying of maps on each other for the analysis of natural resources, like afforestation soil erosion, ground water potential etc. was difficult task. But GIS converted this analysis easy, effective and accurate. This technology brings all types of information on single platform and plan accordingly for the development activities in the regions becomes accurate possible and implementation can be done. .

DATA USED

While studying geography of the area, it is required to study rainfall and other climatic conditions etc. Similarly the study of soil types and natural vegetation, land use land cover is

also essential. In short, available visual natural resources study is greatly done in general. For present study rainfall, soil suitability, geomorphology, geology and land use maps have been used. The analysis was done by the weighted average as per descending order ex., alluvium had given number 1 and hilly rocky area weighted number 6. This integrated weighted average given to each taluka shown in the table 1.

INTEGRATED ANALYSIS

The above thematic maps are interpreted on GIS platform and average weighted had been calculated according to the weightages assigned, overlaying the different above themes. The added weightages are analyzed and class weight was calculated by dividing the area of class. The summation of average weight divided by the area of taluka and thus talukawise weighted average is calculated.

In this way, weighted average obtained for all taluka. Following table shows geo-environmental weighted average according to class weight. Good class is shown for good geo-environmental conditions and low class is shown for poor geo environmental condition of the taluka. The table shows the taluka wise weighted and classwise division. From this it can be stated that, Kamptee, Mauda & Kuhu talukas are good geo-environment and Bhiwapur, Nagpur, Umrer, Kalmeshwar, Saoner, Narkhed, Parseoni talukas are medium geo-environment and Hingna, Ramtek and Katol are poor in geo-environment group (Table 2).

CO-RELATION OF GEO-ENVIRONMENT WITH AGRICULTURE, SOCIO-ECONOMIC ASPECTS

The following aspects regarding to the impact on agriculture and socio-economic conditions is analysed and study of its parameter which are co-related with geo-environment is done.

CO-RELATION WITH AGRICULTURE

While studying the agriculture pattern in any part of the region, it is necessary to study land use/land cover pattern of that region. Other aspects are also equally responsible to affect agricultural practice in the region. But aim of present study is to examine the relation between geo-environment and agriculture in the region. 1) Land available for cultivation, 2) Average land holding 3) Irrigation facility. These aspects have been studied.

CO-RELATION WITH SOCIO-ECONOMIC SITUATION

The impact of geographical conditions of the region gives the clue of the socio-economic status and conditions of the regional people. Each region has its own characteristics. But the geo-environmental existence develops the socio-economic and living conditions of the regional population. To study this impact following factors has been studied 1) Population density, 2) Literacy rate 3) SC/ST population 4) Earning of population.

This study is done using socio economic data of district handbook.

Table 1

Sr. No.	Geomorphology	Land Capability	Land use	Geology	Annual Rainfall in mm	Weightages
1	Alluvium and valley fill	Ies	Double crop	Soil alluvium	>1250	1
2	Slightly dissected plateau, undulating plains and pediplains.	IIIes	Rubi & plantation	Sandstone shale	1200 to 1250	2
3	Moderately dissected plateau	Ives	Kharif & fallow	Lametas, deccan trap inter trappean	1150-1200	3
4	Pediments	Ves	Deciduous forest	Granitic gneisses phylites schist	1100-1150	4
5	Highly dissected plateau	Vies	Degraded forest, land with / without scrub, forest plantation	Amphibolite marble sausar super group	1060-1100	5
6	Structural hills, denudational hills	VIIes	Barren rocky, sandy, forest blank	Quartzite.	<1000	6

Table 2

Sr. No.	Tahsil	Weightage	Weightage	Geo-Environment Group
1	Kamthi	7.749	8	Good
2	Mauda	7.898	8	Good
23	Kuhi	9.906	10	Good
4	Bhiwapur	11.406	11	Medium
5	Nagpur (Rural)	12.756	13	Medium
6	Umred	14.68	15	Medium
7	Kalmeshwar	15.287	15	Medium
8	Savner	15.928	16	Medium
9	Narkhed	16.328	16	Medium
10	Parseoni	16.399	16	Medium
11	Hingna	17.338	17	Poor
12	Ramtek	17.634	18	Poor
13	Katol	18.603	19	Poor

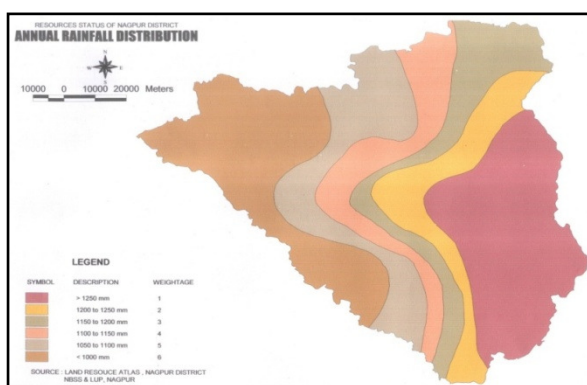


Figure 1

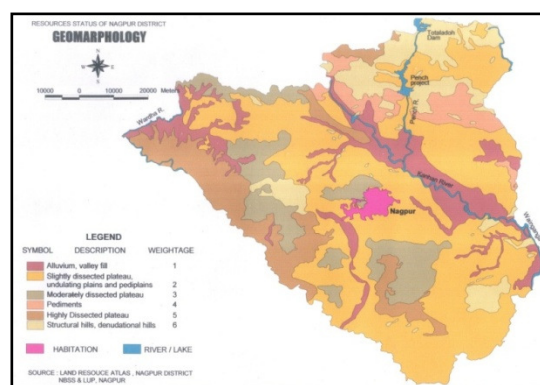


Figure 2

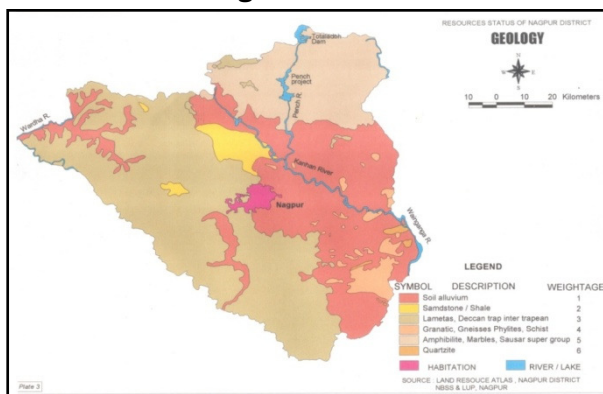


Figure 3

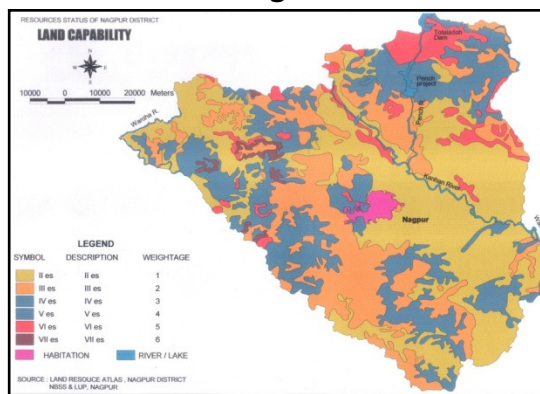


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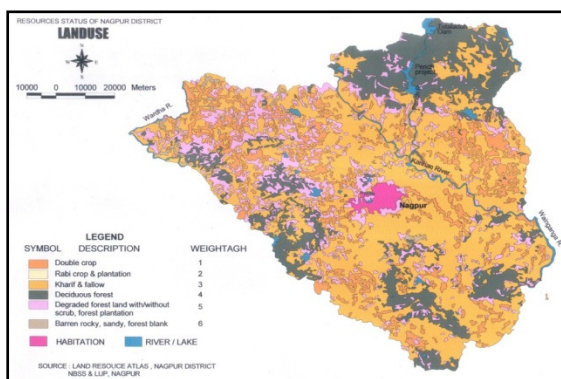


Figure 5

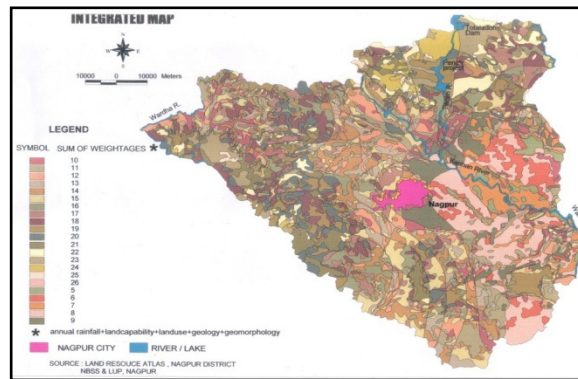


Figure 6

Conclusion

Thus the study concluded the following co-relations with agricultural and socio-economic conditions with geo-environmental parameters..

1. GIS helps efficient and effective geomorphological integrated study by calculating weighted parameters.
2. This method can be implemented in any part of the region.
3. This methodology can be use to study geo-environmental study of small unit in large regions..
4. This study shows direct relationship between geo-environmental and agricultural, socio-economic conditions.

5. This study can be use to decide the backwardness and undeveloped regional conditions due to geo-environment.
6. It can give directions for planning to develop regions.

Reference

- Nagpur.nic.in (2001 & 2011)
- Nagpurdistrictcencers.nic.in (2001 & 2011)
- Maharashtra.gov.in (2001 & 2011)