

# Micro Level Information System for Decentralized Planning Using Geo-Informatics Approach- A case study of Karnal District

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**Abstract**— The association between remote sensing and GIS together helps in planning. Nowadays Geospatial Technologies play a vital role in generating consistent and timely spatial information for decision making and planning from micro to macro level. The people are now opening up and started taking part in planning process at grass root level. In order to involve the people and make planning exercise more effective, National Remote Sensing Centre (ISRO), Dept. of Space (DOS) have begun activities using GIS and Communication Technology (Geo-Ict). Considering the potential of Geo-ICT a project titled “Space Based Information Support for Decentralized Planning (SIS-DP)” was launched by NRSC/ISRO under PC-NNRMS, DOS, Govt. of India. Haryana Space Applications Centre as a partner institution, have full-filled the commitment of generating thematic information on 1:10K from High resolution satellite data (Ortho-Rectified Cartosat-1 & LISS-IV data) for the state of Haryana. Karnal district falls in the north-east part of the Haryana State and is bounded by North latitudes 29°25'05" & 29°59'20" and East longitudes 76°27'40" & 77°13'08". It falls in parts of Survey of India Toposheets nos. 53C and 53G covering an area of 2520 sq.km. The district covers 5.69% area of the state.

**Keywords**—Micro-level Information system, Decentralized planning, rural development and decisions making tool.

## I. INTRODUCTION

The state government is now focusing on decentralized planning and created administrative infrastructure for Gram Panchayat (Village Community) level planning in participatory way. The people are now opening up and started taking part in planning process at grass root level. Annual planning processes followed in India in earlier years ignored the role of local bodies such as Panchayat, Municipalities, Blocks, and Districts. These processes were not participatory in nature and lacked scientific approach which resulted in total failure. Hence the concept of Decentralized Planning emerged. The decentralized planning at local level was introduced in the Eleventh Schedule of the 73rd Constitutional Amendment. The 73rd

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and 74th a Amendment led to the establishment of Panchayat at village and local self-government at block and district levels.

## Geo-ICT Solutions to Decentralized Planning:

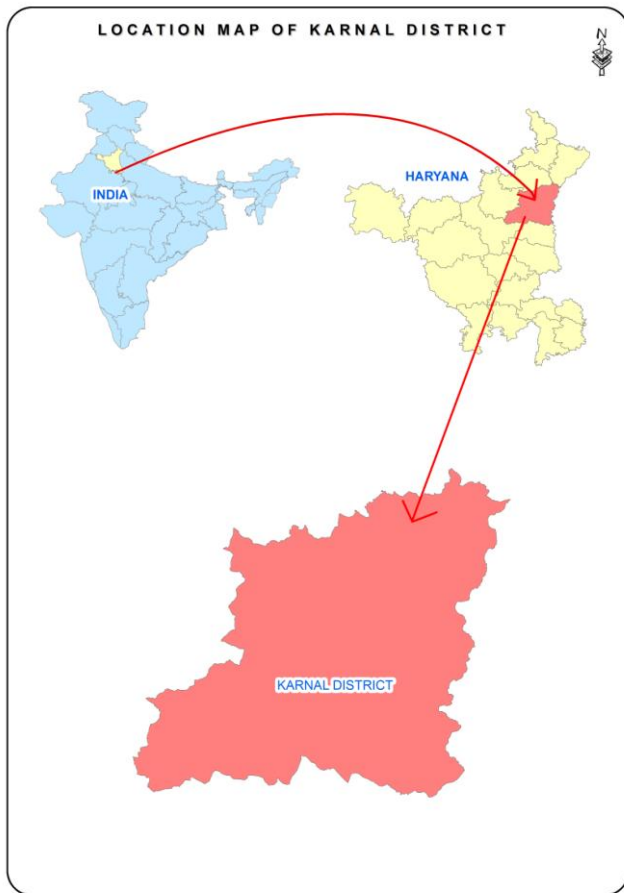
Innovations in Satellite Remote Sensing, Global Positioning System, Information Technology and Geographical Information System have the capabilities of generating, capturing, integrating and analyzing spatial and non-spatial information of a local area. These base line data can be stored, manipulated and displayed on computer screen so that decision makers at all level can plan and manage their localities in integrated and inclusive ways. Remote Sensing and GIS technologies enable the local area planners to create various natural resources information in shortest possible time and repeatedly allow further analysis in systematic, compatible and quantitative manner. This will considerably enhance the quality of decentralized planning on the outset.

## II. STUDY AREA

Karnal district falls in the north-east part of the Haryana State and is bounded by North latitudes 29°25'05" & 29°59'20" and East longitudes 76°27'40" & 77°13'08". It falls in parts of Survey of India Toposheets nos. 53C and 53G covering an area of 2520 sq. km. The district covers 5.69% area of the state. The district is bordered by the river Yamuna in the east, Panipat district in the south, Kaithal district in the west and Kurukshetra district in the north. The district falls in the Upper Yamuna Basin. The river Yamuna which marks the eastern boundary of the Haryana State as well as Karnal district provides the major drainage in the area. Irrigation in the district is done by surface water as well as ground water. 70% of the net irrigated area is covered through ground water.

The climate of the district is characterized by the dryness of the air with an intensely hot summer and a cold winter. The year may be divided in to four seasons. The cold season starts by late November and extends to the middle of March. It is followed by hot season which continues to the end of June when the southwest monsoon arrives over the district. July to September is the southwest monsoon season. The average annual rainfall in the district is 522.6 mm, which increases

from south-west to north-east. About 48% of the annual rainfall is received during June to September. 8% of annual rainfall is received during winter from December to February. The location map of the study area is shown in figure- 1.



**Figure-1**

### III. MATERIALS & METHODOLOGY

The study was made utilizing High Resolution Ortho-Rectified Satellite data Cartosat-1(PAN) and Resourcesat-1(LISS-IV Mx) on 10,000 scale. The PAN sensor has spatial resolution of 2.5m and the LISS-IV Mx has a resolution of 5.8m.

Ortho photo was prepared by the following methods. Cartosat-1 stereo-image of the period 2008-2009 was used for Block preparation using Leica Photogrammetry Suite. Control points (provided by NRSC) were added to the Block and Block Triangulation was under taken. Then, DEM editing was under taken by manual method. Ortho-photo and mosaic were generated subsequently. Then Resolution Merged data was prepared using the Cartosat Ortho-Rectified images and Resourcesat LISS-IV data. The Ortho-rectified satellite data was interpreted by onscreen visual interpretation using ARC-GIS software in 10,000 scale.

The following layers were generated viz.,(i)Land use/Land cover (Polygon),(ii)Drainage (Line),(iii)Infrastructure (Roads & Rails), (Line),(iv)Settlement (Polygon).These layers were overlaid on Gram Panchayat boundary and

linked with GP wise socio-economic data resulting in GP wise GIS database. All administrative boundaries such as village, GP, Block and Assembly constituency have been super imposed with the space input maps. The following Legacy Data available in 1:50,000 scale were registered with Ortho-rectified Cartosat Data and integrated with the GIS Database viz.,1. Adiministrative details-District, Block, Gram Panchayat, Village & Asseembly/Parliament constituency boundaries,2. Land use/Land cover,3. Geomorphology,4. Soil,5. Litho logy,6. Ground Water,7. Drainage (polygon),8. Drainage (line),9. Canal,10. Slope,11. Wasteland,12. Watershed,13. Land degradation,14. Settlement, 15. Transportation (Railway/Road lines).

The following stake –holder’s data (point data) collected for the entire district of Karnal were also inked to the GIS database of the district. ,viz., Census, Village level organization, Agricultural service facilities, Fisheries service , Commercial centers, Educational, Health, Industries, Public utilities, Women & child care, Banking, Communication, Drinking water and Livestock facilities.

### IV. RESULTS & DISCUSSION

Gram Panchayat wise maps on land use/ land cover, infrastructure, settlement and drainage were provided to all Block Development Officers of the Karnal district as PDF files as shown in figure no-2. This information enabled the local people and planning officials for grass root planning. The land use / land use cover area of all classes is shown in table-1. It is very helpful in planning of village level.

The Infrastructure layer identified National Highway, State Highway, District roads, Village roads, City roads, Cart tracks and Footpaths as shown in figure-3. This helped the local people and planners to make connectivity studies and propose new roads in the district as well at village level.

Drainage map at village level helped identification of river, stream, drain, main canal, branch canal and distributary canals in the entire district. The drainage map of the Karnal Block is shown in figure- 3. With the help of drainage map the local people and the planners could plan water harvesting structures and check dams for the study area. The planners can also Proposed canals could be taken up.

Table-1 Land use/ Land cover classes of karnal district

Land Use Classes	Area (sq. km)
<i>Waterlogged</i>	0.11
<i>Scrub Land Open</i>	22.32
<i>Scrub Land Dense</i>	0.32
<i>Reservior/ Tanks</i>	0.83
<i>River/Stream/Drain</i>	27.69
<i>Lake/Pond</i>	8.13
<i>Canal</i>	11.18
<i>Grassland/Grazing land</i>	14.70
<i>Forest Plantations</i>	7.29
<i>Forest</i>	0.69
<i>Peri- Urban</i>	9.12
<i>Core Urban</i>	43.09

<b>Transportation</b>	3.28
<b>Villages</b>	53.33
<b>Built up (Rural)</b>	3.29
<b>Mixed Settlement</b>	2.38
<b>Hamlets</b>	2.55
<b>Mining/ industrial</b>	17.23
<b>Agricultural Plantation</b>	1.37
<b>Crop Land</b>	2291.09
<b>Aquaculture</b>	0.01
<b>Total Area</b>	2520

Table-2 Infrastructure classes of karnal district

Status	Length(Kilometers)
National Highway	60.83
State Highway	241.14
District Road	21.23
Village Road	3928.16
City Road	663.12
Cart Track	2931.9
Foot path	386.83
Railway	51.3

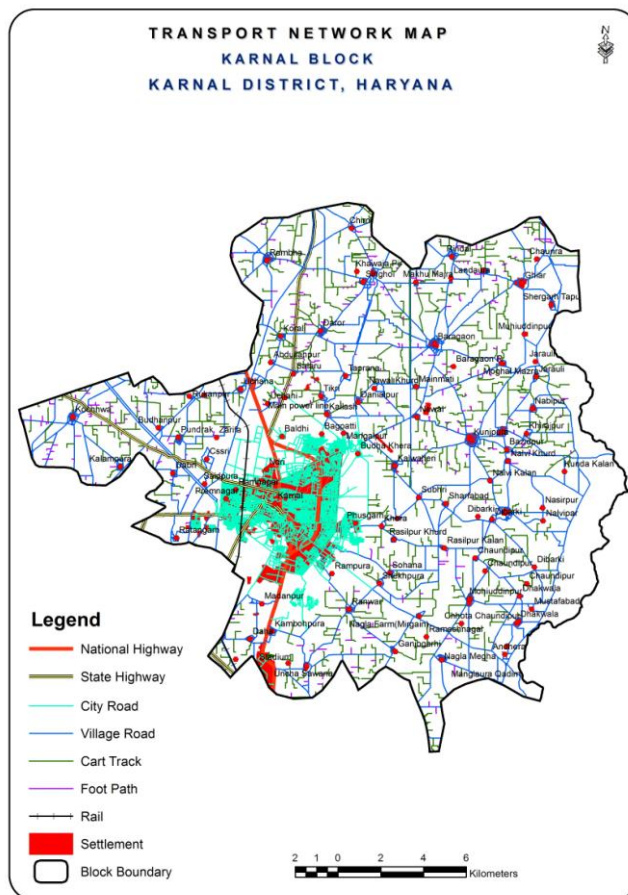


Figure-3

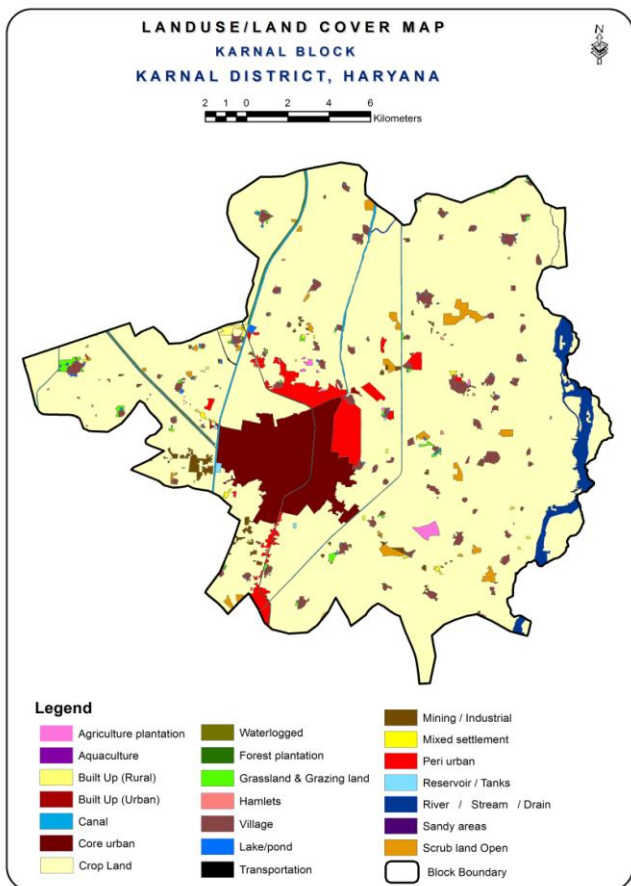


Figure-2

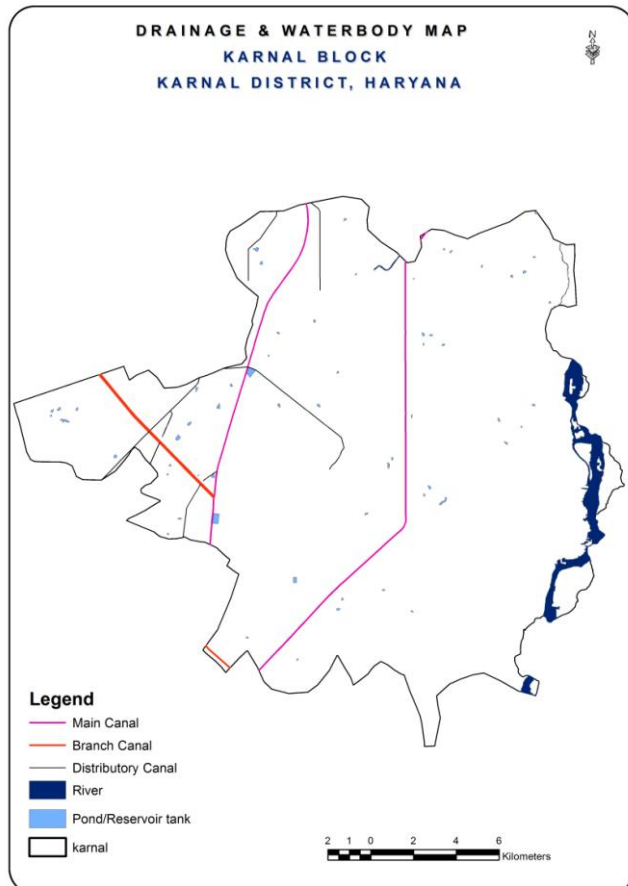


Figure-4

## V. CONCLUSIONS

The present study is conducted for Micro level planning for Decentralized planning for the Karnal District using cartosat-1 and LISS-IV data on 1:10000 scale. The conclusions are as under:-

1. The major class in the study area is crop land which covers 2291.09 sq. km. area.
2. The second major class is built up in the study area.
3. The study area is flat and entire area falls in 0.1% degrees slope classes.
4. Total 435 village maps are prepared of all themes viz. land use/ land cover, transportation and drainage for the study area.
5. The micro level information is very useful for planning purpose at village as well district level.

## REFERENCES

- [1] Space Based Information System Support for Decentralized planning Manual, NRSC.
- [2] Statistical abstract of Karnal District- 2011.
- [3] P. Kumar, S.K. Das et al, Space Based Information System Support for Decentralized planning (SIS-DP) - A case study of Balangir District Odisha, India. The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, Volume XL-8, 2014

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