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Planning Rural Development Programmes using Decision Support System

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Introduction

Next only to China, India has the largest population in the world with more than 75% of them living in rural areas. From this one can easily infer that any meaningful upliftment of the country as a whole, development of the rural population is essential. To this end in view Government of India has initiated various programmes viz., Integrated Rural Development Programmes (IRDP), National Rural Employment Programme (NREP), etc. through five year plans since the last four and half decades. The network of National Informatics Centre (NIC) spread throughout the country is an added advantage for a computer based GIS wherein the local requirement and availability are thoroughly and efficiently analyzed and resources distribution is made optimally.

With the advancement in technology like high speed large storage computers, Digital Mapping Technology and Remote Sensing which can speak out dynamicity in change of land resources, now the question is not whether to have an Information System, but it is when to have the system.

Scope of the Present Study

Inspite of many Information System available at macro and micro levels, nothing categorizes the villages as per their level of development so as to implement necessary development schemes for its upliftment. Hence an attempt has been made to develop an Information System for planning at village level using index criterion.

Study Area

Kothur, is a village and a mandal which is located at 17.144727°N 78.288574°Ein Mahbubnagar district in the state of Andhra Pradesh in India comprising 16 villages were selected for this study and it is shown in figure 1. It is situated about 36 km from Hyderabad, the state capital, nearby Hyderabad International Airport in Hyderabad to Bangalore NH-7. Kothur Grampanchayath includes Kothur, Kummariguda, Fathimapur and Kothur industrial area. Nandigama is a Big village in Kothur Mandal, surrounded by Industrial Area (HBL, Pitti Laminations and number of textile factories). Rangapur is a small village located in Kothur Mandal in mahaboobnager district.

Methodology

The study has been carried out in the sequence as depicted in the flow diagram given in figure 2. The relevant Topographical maps, administrative divisions maps, statistical data and census data were collected from the respective offices. Topographical maps and administrative boundary maps were digitized in MICROSTATION. The .DGN files were then exported to shape format in ArcGIS Environment, wherein the above map layers were over-layered.

Attribute databases for each facility were created in ArcGIS. Programs were written in Oracle to compute various indices, making use of the databases. Programs also classify the villages as per the value of indices. A planning module was generated in which the villages in priority order will be listed out so as to implement any given development programs. By

interfacing the above database with Rural Development Planning module, various queries could be raised to the Decision Support System to generate textual and graphical outputs.

Data Collection

Topographical maps

The relevant topographical sheets were collected from various offices of Survey of India at Hyderabad. The administrative boundary maps are collected from Revenue department.

Statistical Data

i) Demographic Data

Demographic data includes details of the number of households, population (male, female, SC, ST), area of village and literates etc. These data were collected from NIC, Hyderabad and Directorates of census operation.

ii) Educational Data

This includes details of number of schools, population of particular age group, number of students (males, females, SC, ST) teachers (total, SC & ST), number of pucca class rooms etc. This data was collected from Directorate of school education, Hyderabad.

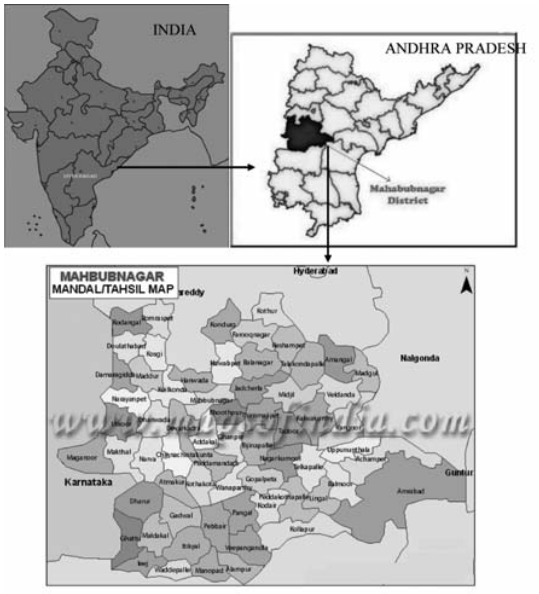

Figure 1: Study Area Map

iii) Medical Data

It refers to the category of hospitals, number of hospitals in each category, number doctors, number of nurses, number of beds, number of assistants and number of veterinary hospitals in the village.

iv) Drinking water Data

The details of category of drinking water facility, capacity and daily supply of overhead water tanks and number of hand pumps available in each village are included in this data.

v) Proximity Data

It refers to the distance of various facilities like schools, hospitals, banks, bus-stop, post office, nearest town/city and railway station from the centre of village.

vi) Bank Data

This data includes category of bank, number of banks, number of village served, number of account holders and transaction amount (deposits and loans).

vii) Employees Data

This data includes number of employees in agriculture, trade and commerce, construction, industries and service sector.

viii) Socio-economic Data

Socio-economic data collected at village level include details regarding basic facilities like postal and telegraphical services, electricity, approach roads, bus-stop, social requirements like community centre, ration shop, co-operative market and police station.

ix) Land use Data

Land use data includes the area of each village, the area of cultivated land with irrigation facilities, the area of cultivated land without irrigation facilities, mode of irrigation, area of cultivable waste and forest area. For irrigation mode, different codes were used for different modes of electricity usage.

x) Accessibility Data

It includes the number of all weather roads, seasonal roads, poor roads, number of trains and buses.

Creation of Attribute Database

Attribute databases have been created as per the requirement and specifications mentioned above.

Creation of Spatial Database

Spatial data includes position of point data like huts, wells, springs, village blocks, line elements like roads, rivers, administrative boundaries, railway lines and aerial elements like rivers, cultivation, tanks etc. Spatial databases for Kothur Mandal was created by using MICRISTATON.

Artificial Intelligence to GIS

An Artificial Intelligence was introduced to improve the capability of GIS to quantify the development of each village in more of scientific way and arrive at an efficient Decision Support System.

Defining various indices

From the attribute database files, the following indices were introduced and weighted appropriately for each attribute based on which the villages were classified.

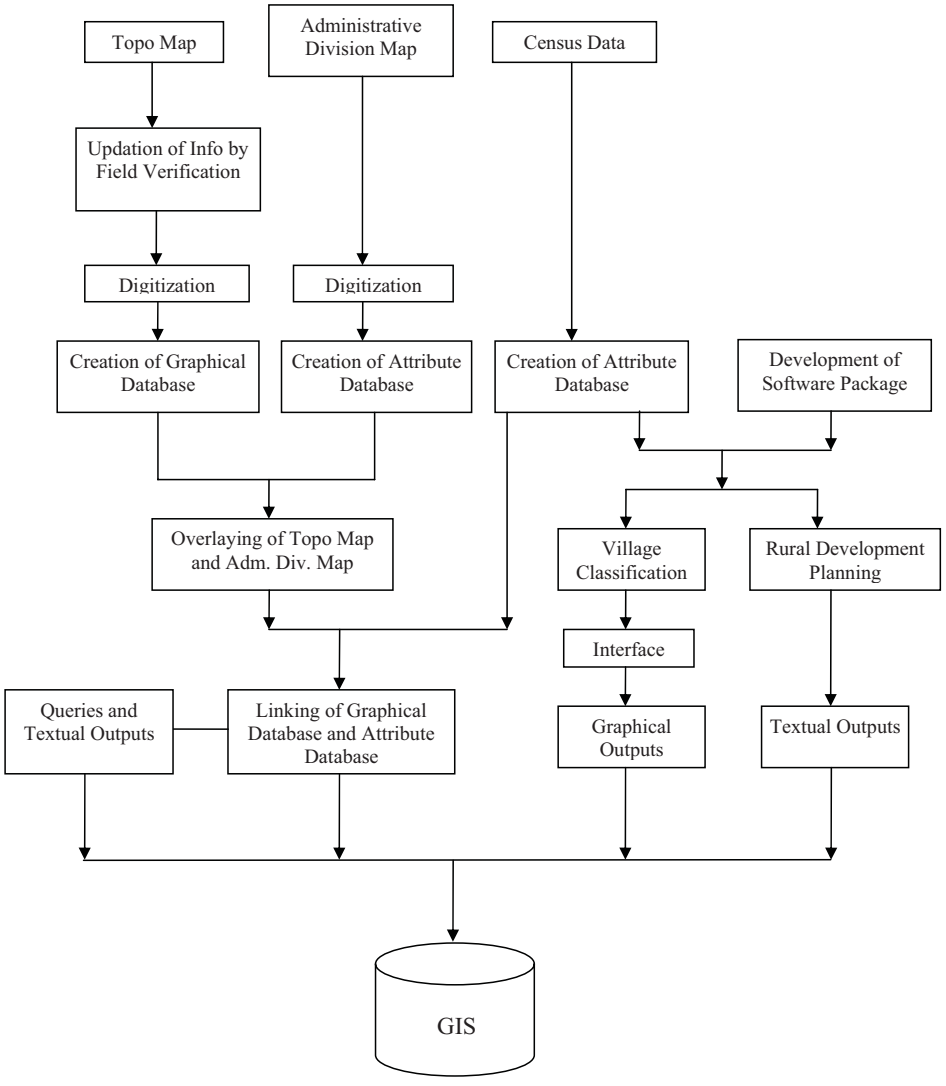

Figure 2: Flow Diagram of Methodology

i) Literacy Index (LITI)

A Literacy factor (LIT) was expressed as the ratio of Total Literates to Total population expressed in percentage. A Literacy Index (LITI) to a scale of 0 to 5 was assigned as per the value of LIT.

ii) Primary School Index (PRSI)

A Primary School factor (PRS) was expressed as the ratio of Number of primary schools to Population of age group 6 to 11 years.A Primary School Index (PRSI) to a scale of 0 to 5 was assigned as per the value of PRS.

iii) Upper Primary School Index (UPRSI)

A Upper Primary School factor (UPRS) was expressed as the ratio of Number of upper primary schools to Population of age group 6 to 13 years. A Upper Primary School Index (UPRSI) to a scale of 0 to 5 was assigned as per the value of UPRS

iv) High School Index (HISI)

A High School factor (HIS) was expressed as the ratio of Number of high schools to Population of age group 6 to 16 years. A High School Index (HISI) to a scale of 0 to 5 was assigned as per the value of HIS.

v) Medical Index (MEDI)

A Medical factor (MED) was expressed as the ratio of Number of hospitals to Total population. A Medical Index (MEDI) to a scale of 0 to 5 was assigned as per the value of MED.

vi) Drinking Water Index (DWATI)

Drinking Water factor (DWAT) was expressed as the ratio of Number of overhead tanks x daily supply to Total population. A Drinking Water Index (DWATI) to a scale of 0 to 5 was assigned as per the value of DWAT.

vii) Proximity Index (PROXI)

A Proximity Factor (PRSI/UPRSI/HISI/HOSI/BANI/BSI/POI/TWNI/RSI) for each facility to a scale of 0 to 5 was computed as per its distance from the centre of village. A proximity Index (PROXI) was arrived at by taking weighted mean of each proximity factor as per its importance.

viii) Bank Index (BANI)

A Bank factor (BAN) was expressed as the ratio of Number of banks to Total population.A Bank Index (BANI) to a scale of 0 to 5 was assigned as per the value of BAN.

ix) Employees Index (EMPI)

Manufacturing Sector includes Industrial Employees, Construction Employees and Trade Employees.

A Employees factor (EMP) was expressed as the ratio of sum of employees in Agricultural sector, Manufacturing sector and Service sector with respective weightings to the Population of age group 20 to 60 years. An Employees Index (EMPI) to a scale of 0 to 5 was assigned as per the value of EMP.

x) Socio-economic facilities Index (FACI)

Socio-economic facilities factor includes Approach Road, Ration shop, Community Centre, Post and Telegraph, Power Supply, Co-operative Market, Police Station, Bus Stop Facility factor etc. Accordingly various indices viz. Approach Road Index (ARI),Ration shop Index(RATNI), Community Centre Index (CCI), Post and Telegraph Index (PTPI), Power Supply Index, Co-operative Market Index(CMI) and Bus Stop Index (BSI)to a scale of 0 to 5 were arrived at as per the availability of that particular facility in the villages. Subsequently the socio facility index (FACI) was computed by taking weighted mean the above indices as per its importance.

xi) Cultivable Waste Land Index (CLWLI)

A Cultivable Waste Land factor (CLWL) was expressed as the ratio of Cultivable waste land area to Total Land area expressed in percentage. A Cultivable Waste Land Index (CLWLI) to a scale of 0 to 5 was assigned as per the value of CLWL.

xii) Land Load Index (LALDI)

A Land Load factor (LAND) was expressed as the ratio of Number of agriculture employees to Total area of cultivated land.A Land Load Index (LALDI) to a scale of 0 to 5 was assigned as per the value of LALD.

xiii) Accessibility Index (ACCI)

An Accessibility Factor(ACC) was calculated by taking ratio of total number of people travelling by road on all weather roads and seasonal roads and by train to the floating population with appropriate weightages. An Accessibility Index (ACCI)to a scale of 0 to 5 was assigned as per the value of ACC.

xiv) Rural Development (RDI)

Finally a composite Rural Development Index (RDI) was arrived at by taking weighted mean of the above indices. This index will reflect the overall degree of development in terms of all facilities available in that particular village.

Development of software in ORACLE

Computation of the Indices: Programmes on ORACLE were written to carry out the computation of various factors Indices which reflect the degree of development. The capability of ORACLE in linking more than two databases was utilized in generating the programmes. Each index is the representative factor which reflects the degree of development of the village with respect to that attribute.

Classification the villages: Based on the indices computed, the villages were classified into six categories viz. model, largely developed, developed, marginally developed, poorly developed and undeveloped villages which is shown in Table 1through programming.

Table1: Classification of Villages

RDI	Classification
5	Model village
4	Largely developed village
3	Developed village
2	Marginally developed village
1	Poorly developed village
0	Undeveloped village

Planning and Decision Support System: The information system developed by integrating the topographic, thematic, socioeconomic and all other data can output the answer for any queries posed by the users. The program lists the villages in the order of priority for implementing certain projects/ programmes in the mandal by sorting the villages as per value of composite index in ascending order. The Decision Support System caters for planning ten aspects as listed below.

1. To organize literacy programme
2. To construct primary school
3. To construct upper primary school
4. To construct high school
5. To construct hospital
6. To construct water tank
7. To extend bank facility
8. To improve socio economic facilities
9. To organize agricultural programmes
10. To improve transportation system.

Master Program: Finally, a master program was developed which is user friendly in controlling 27 programs with menu options for the user to select the Mandal, update the databases and to run the programs displaying necessary messages to guide the user. The master program has also the capacity of invoking a planning module program for various Rural Development Schemes.

Result and Discussion

Stored data of Kothur Mandal was analyzed and manipulated using the programs developed in ORACLE and the results were obtained in the form of graphical output and textual outputs. The spatial database and attribute database were linked up in Micro Station for both graphical and textual representation. Queries covering various applications were raised to the Information System through terminal and the results were obtained in standard forms.

Analysis of Indices: From the indices arrived at by the programs, various inferences were drawn for each village with respect to various facilities. Typical bar chart to compare the indices is given in figure3. The composite index namely Rural Development Index (RDI) was also computed considering all necessary requirements of a village and shown in table 3 for

Kothur Mandal. This index (RDI) reflects the overall development of the villages.

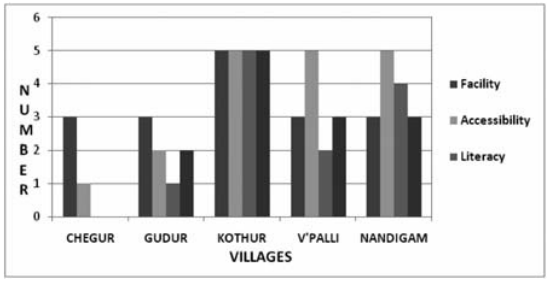

Figure 3 :
Comparison of Indices for Kothur Mandal

Based on the Rural Development Index, the village has been classified into various levels of development to indentify the villages clearly to implement various development programmes. From Figure 5.2, which shows the village classification for Kothur Mandal, it can be seen that in Kothur Mandal, there are 6% of model villages and 13% of largely developed villages, 13% of developed villages, 44% of marginally developed villages, 19% of poorly developed villages and 6% of undeveloped villages.

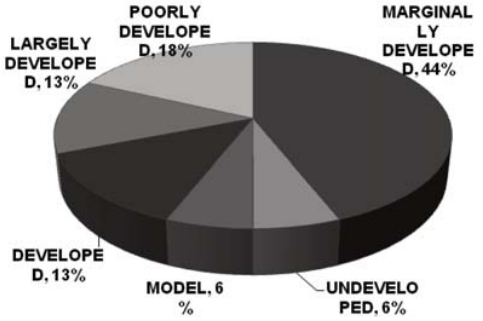

Figure 4 :
Village Classification for Kothur Mandal

Analysis of Planning Module Results

The results of planning module program as given in table 2, shows that the top priority to Khajiguda and last priority to Kothur should be given while planning to improve Socio-economic facility in Kothur mandal.

Table 2:
List of Village in Priority Order to Improve Socio- Economic Facilities

Priority Order	List of Village
1	Khajiguda
2	Siddapur
3	Edulapally
4	Mamidipally
5	Chegur
6	Gudur
7	Theegapur
8	Veerlapally
9	Nandigam
10	Penjerla
11	Inmulnarva
12	Kodicherla
13	Seriguda
14	Mallapur
15	Thimmapur
16	Kothur

Summary and Conclusions

The village Kothur of Kothur mandal was found to be model villages, possessing almost all necessary facilities. The village Khajiguda in Kothur mandal was basically undeveloped which need proper improvement programmes to implement.Population density in Kothur is literally higher than the surrounding villages since it has all the facilities. Hence migration of people towards such developed village can be avoided by implementing Integrated Rural Development Programmes (IRDP) in the villages appropriately. In about 70% of villages in Kothur Mandal, the service sector is very poor which can be improved by Integrated Rural Employment Programmes (IREP) etc.

With limited resources and a huge population to support, India seriously needs a Geographic Information System for planning optimum use of available resources and also to manage the various

development programmes advantageously. As we have all the necessities required for switching over from conventional methods to modern methods of data collection, storing and maintenance, availability of expertise in the fields of computer technology and above all the willingness of the state revenue officials to use modern concepts and techniques in maintaining the records, we should decide to switch over to the use of modern technology at the earliest.

Data collection for the development of GIS should be at the lowest possible Government level (i.e. village level) that has the technical ability to collect it accurately and efficiently. Such information system can then be aggregated up to form the higher level information systems to meet the district, state or national planning considerations.

Effective rural development planning and control measures cannot be implemented unless the public and all levels of Government have access to adequate information. Comprehensive information, characteristics and use should be collected and continuously updated so that all citizens and levels of Government can be assisted in planning various development programmes. If a GIS developed with modern concepts and technology for efficient management of the various resources, to be a successful, it should meet the aspirations and expectations of the village officials and rural people.

As various organizations viz. Survey of India, Land Revenue Department, Survey and Settlement Department, Agriculture Department, Bureau of Economics and Statistics, Wasteland Reclamation Board are involved in rural development, a powerful co-ordinate and purposeful approach is essential for efficient management programmes.

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