RUIS - A WEB BASED GEOGRAPHICAL INFORMATION SYSTEM FOR RISHIKESH AREA, INDIA

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ABSTRACT:

An attempt has been made to develop Rishikesh Urban Information System (RUIS) with this concern in mind so that efforts made during data collection and acquisition of latest data on resources available in the Rishikesh township and its environs can be used by the administrators, town planners, tourists and even common man to locate and appraise of the areas of their interest. The study of Rishikesh township and its environs carried out in this work would be useful in formulating developmental planning strategies in the area, as the spatial and attribute information about various utilities-facilities and geoenvironmental parameters is available in a georeferenced GIS mode. RUIS is a GIS based application system that amalgamates Visual Basic .Net, ESRI MAP OBJECT 2.0, and Microsoft Access. This system allows linkage of spatial and attributes data with suitable visual display of both the data types. RUIS supports on screen map viewing with attribute information to provide meaningful insights into the geo-aspects of the region for updating the knowledge of planners and tourists interested in this area. Anyone can easily access it anytime, anywhere by using internet.

1. INTRODUCTION

Information systems provide data access to common man, render data transparency and its authenticity to use. The huge information available with government departments, NGOs, universities, and research institutions prepared with lot of hard work and public money remained unutilized, primarily due to lack of coordination, unawareness regarding data availability, different format and scale of maps and related data. This leads to the duplication of data and waste of national resources in terms of money, manpower and time. Urban information systems combine map images with other kinds of information (like tabular data) for the purpose of analyzing spatial relationships among data related to locations in the city (Huxhold, 1999). An urban information system is the combination of talented persons (Geographic Information System team), spatial and descriptive data, analytic methods and computer software and hardware - all organized to automate, manage and deliver information through geographic presentation (Zeiler, 1999). Urban information systems make things easier as the graphical data can be visualized, connected and related with non-graphical data, queried and measured. Thematic maps can be analyzed, synthesized and alternatives can be produced. The database of the system builds spatial and topological relationships. Real-time updating is very easy with the possibility of its integration with the other technologies like global positioning systems, remote sensing or internet. Technical reports associated with accurate charts, tables, statistics, graphics can be derived from the system (Kim and Levine, 1996). Urban information system can help in decision making at administrative level even with no knowledge of software used in designing information system. The system prevents duplication, loss of effort, and makes comparisons easily. The system can make queries from legal documents, reports about the spaces, the citizens and result thematic maps like building, population and infrastructure based on physical, technical, social, economic and administrative database. The system may contain transportation maps, traffic-density maps, and shortest path for the fire-fighters or ambulance drivers. According to the population, the decisions can be made about the locations of the social facilities like schools, health centers or green areas, utility service areas, telecommunication, gas, electricity (Reis,1996). The analyses can be made about the topography, 3D surfaces, network analysis, service area analysis etc.. All these systems are built for recognizing, understanding, planning, directing, monitoring and controlling the city for an effective and efficient urban management.

Beginning in the late 1950s in the world, planners started to develop and use computerized models, planning information systems and decision-support systems to improve performance (Nedovic-Budic, 2000). They have found tools to enhance their analytical, geospatial technologies that differ from one country to another. The industrialized information societies are well adapted to this technology. They use it in many fields; the governments apply Urban Information Systems in all aspects of the planning process, including data collection, storage, data analysis and presentation, planning and policy making, communication with the public, policy implementation and administration. The United States is the pioneer in this field.

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They began working with urban information systems in 1970s. Canada and Australia have developed similar systems followed by European countries like France, Germany and Holland. The municipalities of Canada have been successful in applying urban information and multi- participant systems. A good example is the City of Edmonton. Edmonton's Geographic Base Information System (Mines, 1997) is a multi-participant process that shares geographic data. Urban planners use Geographic Base Information System (GBIS) to integrate addresses, socio-economic and land use data, while landscape planners use it to plan the green areas, engineers use GBIS to design the streets and utilities. Fire, ambulance and police services use it for dispatch and decide where best to place their sources. It is also used for garbage collection, route locations, meter reading etc. It is a successful shared urban information system integrated with the internet. Historic City, Jerusalem, Israel uses latest urban information system technology in many municipal projects. The system supports decision making at all levels, a central database for all agencies and common city information for all urban planners. It also contains area base maps, plan information and the outlines of the facilities (ESRI Local Gov. in Europe, 2000). Many applications are built in the municipality, for example a system for road accidents, a decision-support system for education facilities, inventory control and planning. Urban information system also supports analyses for social trends and social planning. Furthermore, interaction between the local government and the other agencies can be coordinated with this system. In India the Department of Space, Department of Science & Technology are trying to create a National Spatial Data Infrastructure (NSDI). This initiative will create a forum/platform for almost all data generating agencies to meet at one place and carve out well-integrated programmes for India.

2. THE RISHIKESH URBAN INFORMATION SYSTEM (RUIS)

Rishikesh Urban Information System (RUIS) is an attempt to develop a small database on select information of the Rishikesh town and its environs. The area under investigation comprising of Rishikesh township and its environs of Uttarakhand State of India, spreading over an area of about 98.7 km², and bounded by 30º 02´17″ to 30º 09´10″ North latitudes and 78º 09´6″ to 78º 20´40″ East longitudes. It is covered by the Survey of India topographical maps 53 J/4 and 53 J/8 at 1:50,000 scale at the foothill zone of Lower Garhwal Himalayas with elevation ranging from 340 m to 1120 m above mean sea level. It is being developed on the concept of Geographical Information System (GIS) which allows data updating, queering and report generation. The spatial database contains latest information available or collected for select utilities-facilities and geo-environmental parameters viz transport network, ward information – ward wise population, area, road networks, bank, post office, bus stand, hospital, offices, college-institute, ashram, hotels, dharamshalas (guest houses), cinema, park etc facility, lithology, geomorphology/hydrology, soil type, groundwater prospects zone, land use / land cover of Rishikesh and surroundings which have been extracted from satellite imagery, Survey of India (SOI) topographical sheet, guide map and collated data available at government departments and published literature or collected through in the field (Table 1, Table 2, Table 3, table 4, Table 4, table 5, Table 6, Table 7, Table 8).

Rishikesh Urban Information System is a GIS based application system that amalgamates VISUAL BASIC 6.0, ESRI MAP OBJECT 2.0, and Microsoft access. This system allows linkage of spatial and attributes data with suitable visual display of both the data types. The Rishikesh Urban Information System (RUIS) aims to provide geographically referenced information pertaining to natural resources and terrain parameters of the area around Rishikesh township and facility-utility information for the Rishikesh urban agglomerate, details of which are enumerated below. The potential users would be administrator, tourists, academician, researchers and even general public wanting to know all about the Rishikesh township and its environs.

It is envisaged to implement the Rishikesh Urban Information System with internet backbone after successful utilization of present information base. The implementation over internet would require Web-GIS based application system that may be amalgamated with GIS software like MapInfo MapXtreme server, Oracle8i database server, Microsoft Internet technologies like Active Server Pages (ASP), Component Object Model (COM), ARC IMS, Visual Basic.net software.

Geological information has been generated from remote sensing satellite data and published IIRS geology map whish are useful for rock type information in planning activities. Geomorphologic information has been extracted from remote sensing data and for understanding physiographic of the area to planning purpose. Ground water prospects zone has been evaluated in GIS environment by using different parameters derived from satellite image and others secondary data which are very useful information's to planning purposes. Soil type has been derived from soil map of study area published by NBSU&LUP (Nagpur) and soil type information are very helpful in planning activities. Land use Land cover has been derived from satellite images by using digital image processing (DIP) technique. Details land use land cover information can be used for further planning purposes. Different facilities i.e., bank, post office, govt. offices etc have been identified for RUIS. Some of the facilities identified accurately on satellite images whereas others were located accurately during fieldwork by using hand held GPS. Planners, decision makers can easily do analysis of existing facilities using RUIS to estimate of new facilities need for the study area. Ward information, ward boundary digitized using secondary data (ward map provided by Rishikesh Nagar Parishad / Municipality), attribute data collected from different secondary sources input in GIS environment. Planner, executive even to general people can see on screen ward information using RUIS. Transport information, transport networks were derived from high resolution satellite images, attribute data has been created in GIS environment. Planner, executive, tourist, general people may get transport information easily by using RUIS.

Advantage of RUIS will be:

- Multi user access of existing information can be obtained from RUIS.
- Data exchange capacity can be established within different organization using RUIS.
- Information compiled from different sources so that information can easily share, distribute and advices to different organization.
- Multi-user environment can be established using web based technology

3. DESING AND IMPLEMENTATION

The software design is based on hierarchical file structure where both spatial and non-spatial database are used as inputs. There is a built in security feature providing data access through password only to make database updating by authorized persons.

The complete software consists of more than programming 19000 lines, 25 forms (including 1 MDI form) for spatial data and other purposes. For programme customization, different controls have been used in full program. For this purpose different types of components were used - references, class module, user control and need DLL were designed for the program.

4. OVERVIEW OF SOLUTION

The RUIS is a GIS based system where data entry requires digitization of thematic data and entry of related attributes into a database. Attribute data are stored in the MS access whereas thematic layers are stored as GIS layer. The users have options to view the maps on screen and get information required for decision-making. The system can generate consolidated charts and related statistical reports as required by the user.

The main part of the screen shows the map and others related information accessed through identifier along with map navigation utilities like zoom in, full extent and pan control to navigate through the map in an easy way (Figure - 1.a, Figure 1.b). By using zoom in full extent options the user will be able to see the map in different scales and will be able to browse to the detail at micro and macro level (Figure 2.a, Figure 2.b, Figure 2.c, and Figure 2.d).

4.1. Functional Benefits

• Knowledge of terrain and natural resources for effective management of resources for sustainable development.
• Presentation of information of municipal assets of the town.

• Better planning of public utilities and services and town planning

• Management of utilities for effective town planning

• Ease in maintenance and better monitoring of municipal resources.

• Colour coded thematic maps for better understanding

• Generation of analytical reports based on data diagrams.

Data	Geology
Source	Remote Sensing Data and Published IIRS geology map
Utilizations	For rock type information in planning activities

Table 1. Thematic database (Geology) used in RUIS

Data	Geomorphology
Source	Remote sensing data
Utilizations	For understanding physiographic of the area to planning purpose

Table 2. Thematic database (Geomorphology) used in RUIS

Data	Ground water prospects zone
Source	Evaluate groundwater prospects zone in GIS environment by using different parameters derived from satellite image and others secondary data
Utilizations	For rock type information in planning activities

Table 3. Thematic database (Ground water prospects zone) used in RUIS

Data	Ward information
Source	Ward boundary digitized using secondary data (ward map provided by Rishikesh Nagar Parishad / Municipality) , attribute data collected from different secondary sources input in GIS environment
Utilizations	Planner, executive even to general people can see on screen information

Table 4. Thematic database (Ward information) used in RUIS

Data	Soil type
Source	Soil map of study area published by NBSU&LUP (Nagpur)

Utilizations	For soil type information in planning activities

Table 5. Thematic database (Soil type) used in RUIS

Data	**Land use / Land cover**
Source	Derived from satellite images by using digital image processing (DIP) technique and others secondary data
Utilizations	Details land use land cover information for further planning

Table 6. Thematic database (Land use / Land cover) used in RUIS

Data	**Facilities (bank, post office, govt. offices etc.)**
Source	Some of the facilities identified accurately on satellite images whereas others were located accurately during fieldwork by using hand held GPS
Utilizations	Analysis exiting facilities and estimate need of facilities

Table 7. Thematic database (Facilities (bank, post office, govt. offices etc.)) used in RUIS

Data	**Transport information**
Source	Transport network derived from high resolution satellite images, attribute data input GIS environment
Utilizations	Planner, executive, tourist, general people may get transport information easily

Table 8. Thematic database (Transport information) used in RUIS

Figure 1.a: RUIS Home Page

Figure 1.b: RUIS Home Page with Menu Bar

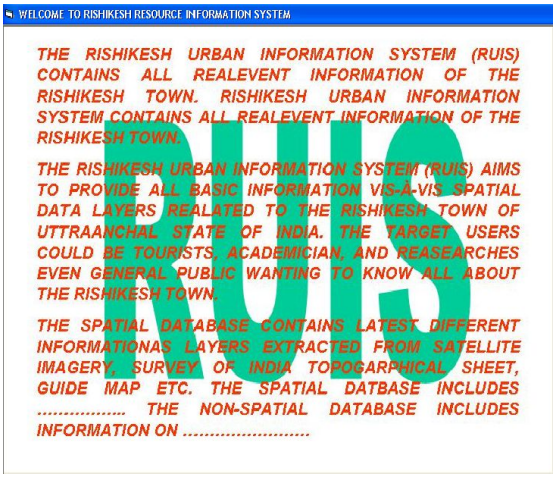

Figure 2.a: RUIS Window Page, General Information about Rishikesh Urban Information System (RUIS)

Figure 2.b: RUIS Window Page, General Information about Rishikesh Town

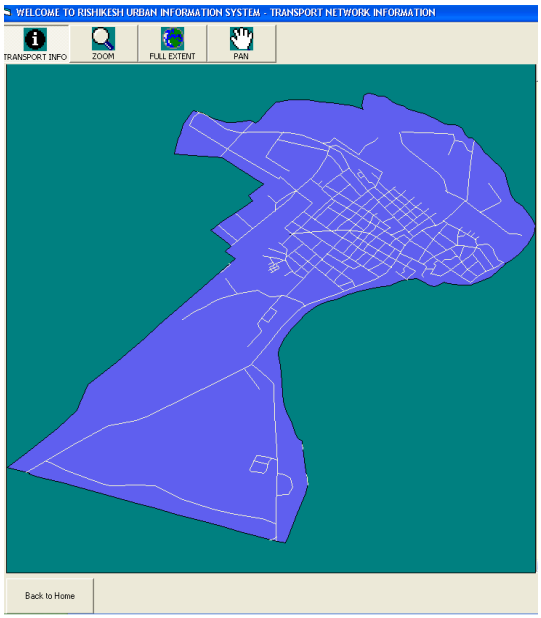

Figure 2.c: RUIS Window Page, Information about Road Networks

4.2. Technical Benefits

• Multi-user capability

• Centralised database to avoid duplication, misuse and data error.

• Password protected thematic and attribute data updating

• Highly secure system with privileges to authentic users

• Basic windows operations like zooming in, panning, zoom to layer extent for better graphic display.

Figure 2.d: RUIS Window Page, Information about Road Networks with Zoom in & Zoom out Options

5. CONCLUTION

Rishikesh urban information system (RUIS) is a GIS based application system that amalgamates Visual Basic, ESRI Map Object, and Microsoft access.The Rishikesh urban information system (RUIS) aims to provide basic information vis-à-vis spatial data layers related to the Rishikesh and surrounding areas. The target users could be tourists, academicians, researchers and general public willing to know about rishikesh and surroundings. Rishikesh urban information system contains relevant information of the Rishikesh and surrounding areas. This GIS based independent system would be highly useful when hosted on internet. Planners, decision makers can use information which is available in RUIS for planning activities, planning purposes. Planners, decision makers, administrator can easily also take decision using information which is available in RUIS. Planner, executive, tourist, even general people may get different kinds of information easily by using RUIS.

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