GEOINFORMATICS FOR CULTURAL HERITAGE MAPPING - A CASE STUDY OF SRINAGAR CITY, JAMMU AND KASHMIR

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ABSTRACT

Cultural heritage is the most universally valued and most evenly distributed resource in the world. However cultural heritage is under a constant threat of damage or even destruction and comprehensive and accurate recording is necessary to attenuate the risk of losing heritage or serve as basis for reconstruction. Cultural mapping has been recognized by national and international agencies and institutions as a crucial tool and technique in preserving the world's intangible and tangible cultural assets and resources of a country. Geospatial information system is a valuable tool that captures, stores, analyzes, manages, and presents data that are linked to locations. It encompasses a wide range of techniques and activities from community-based participatory data collection and management to sophisticated mapping using geoinformatics based tools such as geographic information systems (GIS), remote sensing (RS), global positioning systems (GPS) and web-based mapping science and technologies. This allows preservation of the information of Cultural and Heritage value and offers new exploitation possibilities, like the immediate connection of different kinds of data for analysis, or the digital documentation of the site for its improvement. In the present study an attempt has been made to map the Heritage sites of Srinagar city through extensive field survey using GPS followed by generation of Geospatial Database of Heritage sites of Srinagar city. The heritage data pertaining to heritage sites was classified into different thematic maps or layers as: Residential, Public, Religious, Natural Features, Educational Institutes, Commemorative and Commercial. The thematic maps were stored in Geodatabase format to generate the final geospatial database of Heritage Sites in Srinagar City. Finally photograph of each heritage site was geo-tagged with each coordinate. It is hoped that this Heritage Information System would be used by concerned department for the planning, development and preservation of Heritage Sites in Srinagar city in future. Moreover, capacity building of such a new and emerging geoinformatics science and technologies is very important among other integral components of cultural mapping and project design for sustainability for conservation and restoration will be presented.

KEYWORDS: *Geodatabase, Cultural Heritage, GPS, Geoinformatics, Srinagar.*

INTRODUCTION

UNESCO (2008), World Heritage Program defines heritage as “our legacy from the past, what we live with today and what we pass on to future generations”. Traditionally, it is classified as intangible or tangible, movable or immovable, natural or cultural, personal or communal. Cultural heritage plays a vital role in education about

the past, in creating cultural or individual identity, and even in providing economical support for local communities (Uzzell 1989, Herbert 1995, Power of Place Office, 2000). Heritage Mapping is the process of identifying natural and cultural heritage resources of a specific locality for purposes of conservation and development (Commonwealth Department of Communication and the Arts, 1995). Cultural heritage includes tangible culture (such as buildings, monuments, landscapes, books, works of art, and artifacts), intangible culture (such as folklore, traditions, language, and knowledge), and natural heritage (including culturally significant landscapes, and biodiversity). Despite these widely acknowledged benefits, cultural heritage is at a constant risk by neglect and decay, deliberate destruction and damage due to social and economic progress, disasters, and armed conflict (Commonwealth Department of Communication and the Arts 1995, UNESCO 2009, Palumbo 2004). From this risk, an increased need to record spatially can be recognized. Comprehensive and accurate documentation can attenuate the risk of losing heritage and in the worst case serve as a basis for reconstruction (Zerrudo, E. (2008).

Since the 1960's, the decision-making process has become increasingly quantitative, and mathematical models have become commonplace. Prior to the computerized map, most spatial analyses were severely limited by their manual processing procedures. Geographic information systems (GIS) technology provides the means for both efficient handling of voluminous data and effective spatial analysis capabilities (Carter 1989, Coppock and Rhind 1991, Van Leusen 1995).Geographic Information Systems (GIS) is rapidly developing in the applications that manage and use GIS in combination with other media (Fajuyigbe et al., 2007). The integrated data will give better visualization and understanding of the situation surrounding the user (Stobl 2002). Old maps digitization has been performed in the past (International Cartographic Association 1995, Hongye, 2009, Chias et al., 2008) and discussion is being made regarding the technique choices and developments (Daniil 2003, Adami 2007). GIS database have become invaluable tools for addressing a variety of contemporary societal issues and for making predictions about the future (MacDonald 1999, Guoqing and Kaufmann 2000, Gabrielli 2006, Zeiler 1999, Grimwade and Carter 2000). The purpose of the geo-database management system is to provide the end-user with attribute information. When making decisions, planning, analyzing the effect of changes, looking for patterns, etc., we may look at maps, tables, charts, lists, graphs and reports, and sometimes it is rather difficult or nearly impossible to pull all these sources of information together and make sense out of them. Geographic information systems however, have the capability to handle several kinds of information that can be related to a location or area (ISO, 2003). For example, hotels and tourist destinations all have one thing in common – location. And since the geographic position of any map feature is unique, it provides a complex link between the different data sets. The result is no longer a simple map but a complex multi-dimensional model of information.

Heritage sites are our guide to the past history, culture of that era and the

architecture of that time. The current study holds significance from the point of the view that our heritage sites in Jammu and Kashmir have become the victims of the absolute negligence both by the authorities, which were supposed to preserve our heritage sites (Mire 2007, Meyer 2006) and by the people equally **(**Smith et al.,2003, Hodges and Watson 2000). The current study has tried to map each and every heritage site located in the Srinagar city (as declared by INTACH- JK Chapter) in a comprehensive Geodatabase format, where in within a single click of the mouse we can know attributes such as location, name of heritage site, owner, age etc. The study will be helpful for Archeological department of Jammu and Kashmir Government for planning various projects relating to the preservation of our perishing cultural heritage in the future. In the Current Study, Heritage Sites of Srinagar City using Geoinformatics where mapped and a Geo-Database of Mapped Heritage sites was generated.

STUDY AREA

Srinagar, is the summer capital of the state of Jammu and Kashmir, and is located in the valley of Kashmir at an altitude of 1,730 m above sea level. The city lies on banks of the Jhelum River, a tributary of the Indus River. The Dal and Nagin lakes enhance its picturesque setting, while the changing play of the seasons and the salubrious climate ensures that the city is equally attractive to visitors around the year. The city is famous for its lakes and houseboats floating on them. Srinagar lies between the coordinates $34^0$01` N to $34^0$27`N latitude and 74^0 36` E to $75^0$ 30` E longitude over an area of 105 km^2. Srinagar is surrounded by Budgam district in the west, district Pulwama in South and district Ganderbal in north.

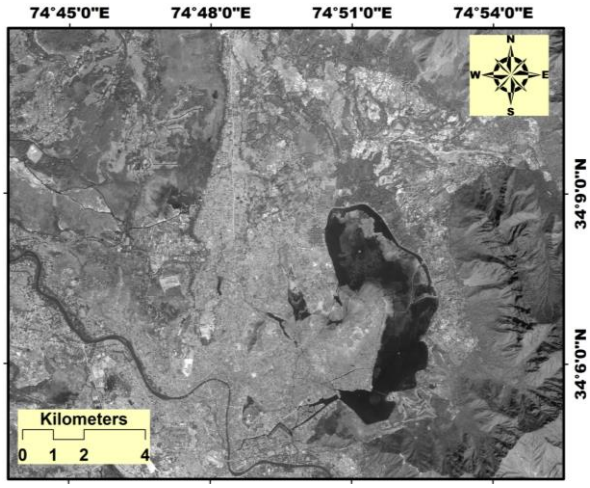

Figure-1: Location of Study Area

MATERIALS AND METHODS

Nowadays there are a great number of sensors and data available for digital recording and mapping of visual Cultural Heritage (Drap et al., 2005). For the present study a high resolution IKONOS of October 2008 was used as the satellite data source. The IKONOS data was geo-referenced by field GCPs in order to make it reliable for the study and confirm it with our study area. Extensive field survey of the study area was carried out in order to locate and map the heritage sites. The Coordinated data of heritage sites was collected using Handheld GPS and was later on processed in GPS pathfinder software in order to make the data readable in GIS environment and remove errors that had occurred during the field survey. The heritage site database developed in Excel format was converted to .dbf format and integrated with the point locations of heritage sites through a joining process in GIS environment. The heritage ancillary data pertaining to heritage sites was classified into different thematic maps or layers as: Residential, Public, Religious, Natural Features, Institutional, Commemorative and Commercial. The thematic maps were stored in the Geodatabase format to generate the final

geospatial database of Heritage Sites for Srinagar City.

RESULTS AND DISCUSSIONS

Safeguarding and exploiting cultural heritage induce the production of numerous and heterogeneous data. The management of these data is an essential task for the use and the diffusion of the information gathered on the field. Until the growth of computer science, other methods have been carried out for the digital preservation and treatment of cultural heritage information. The development of Geographic Information System store and make use of archaeological datasets is a significant task nowadays. Especially for sites that have been excavated and worked without computerized means, it is now necessary to put all the data produced into computer. This allows preservation of the information digitally (in addition with the paper documents) and offers new exploitation possibilities, like the immediate connection of different kinds of data for analyses, or the digital documentation of the site for its improvement.

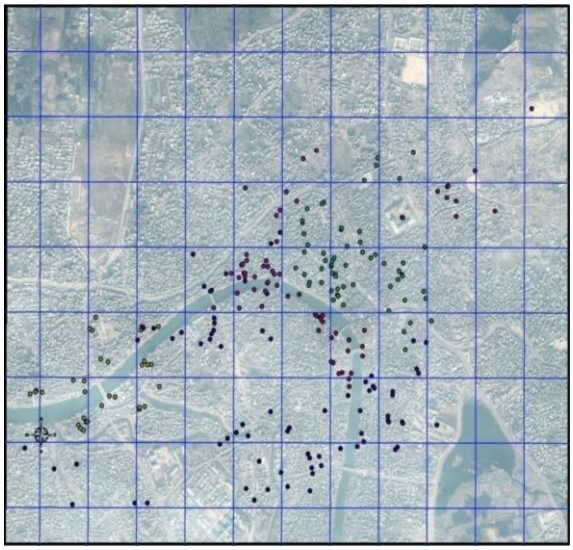

Figure 2: Distribution of heritage sites

The heritage ancillary data pertaining to heritage sites was classified into different thematic maps or layers as: Residential, Public, Religious, Natural Features, Institutional, Commemorative and Commercial. Following maps were generated theme wise along with information of each heritage site in order to generate Geo-Database. The attribute information about each GPS point in different themes that were mapped on IKONOS image is attached.

Commercial Sites:

The sites that are used for commercial purposes have been classified as commercial sites and include Shopping Complexes, Shops and Stores. Twelve commercial sites were mapped using GPS and generated point theme was then stored in the Geodatabase. The Commercial Sites map is shown in figure 3.

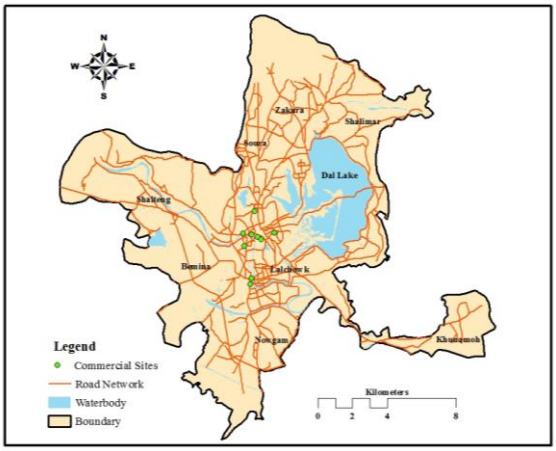

Figure 3: Commercial Heritage sites

Commemorative Sites:

These sites were mapped using GPS and the generated point theme was then stored in the Geodatabase. Twenty Eight sites which include Tombs, Cenotaphs, Mazars, etc. where mapped in this category. The Commemorative Sites map is shown in figure 4.

Natural Sites:

These sites were mapped using GPS and the generated point theme was then stored in the Geodatabase. Four sites including hills,

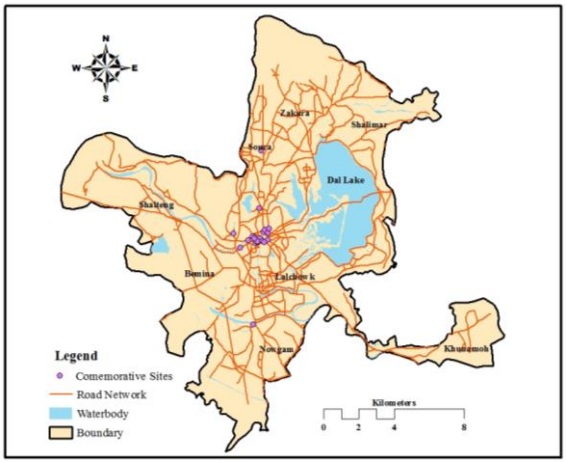

Figure 4: Commemorative sites

springs, etc. were mapped. The Natural sites map is shown in figure 5.

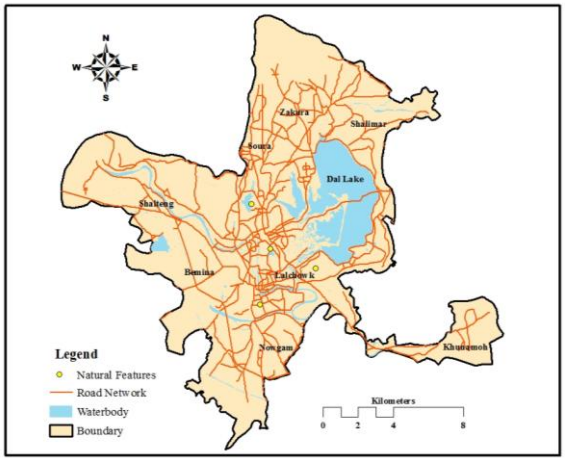

Figure 5: Natural Heritage sites

Public Sites:

These sites were mapped using GPS and the generated point theme was then stored in the Geodatabase. Fifty four sites include Parks, Precincts, and offices were mapped. The Public sites map is shown in Figure 6.

Religious Sites:

These sites were mapped using GPS and the generated point theme was then stored in the Geodatabase. Seventy four sites including Shrines, Mosques, Temples, etc. were mapped under this category. The identification of this heritage sites was based on an active choice as to which elements of this broader 'religious culture' are deemed worthy of preservation as an 'Inheritance' for future generations.

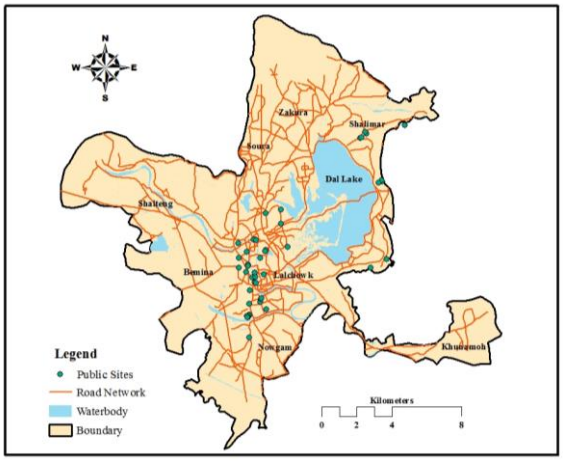

Figure 6: Public Heritage sites

Thus, the significance of religious cultural heritage as symbolic of the culture and those aspects of it, which a society (or religious group) views as valuable is obvious. In fact, it is this role of religious cultural heritage which lends it its powerful political dimension, since the decision as to what is deemed worthy of protection and preservation is generally made by State authorities at national level and by inter-governmental organizations at a broader international level (Blake2000). Religious sites map is shown in figure 7.

Residential Sites:

The sites that are used for residential purposes have been classified as Residential sites and include Residential Houses. Fifty eight sites were mapped using GPS and the generated point theme was then stored in the Geodatabase. The Residential sites map is shown in Figure 8.

Educational Institute Sites:

The sites that are used for Educational purposes have been classified as Educational Institute sites include Schools, Coaching Centres, Trusts, etc. Fourteen sites were mapped using GPS and the generated point theme was then stored in the Geodatabase. The Institutional sites map is shown in figure 9.

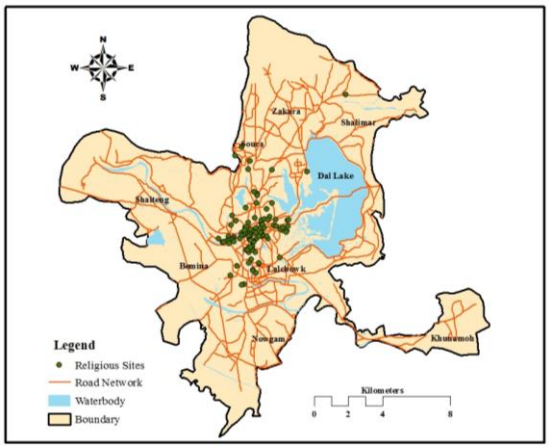

Figure 7: Religious Heritage Sites

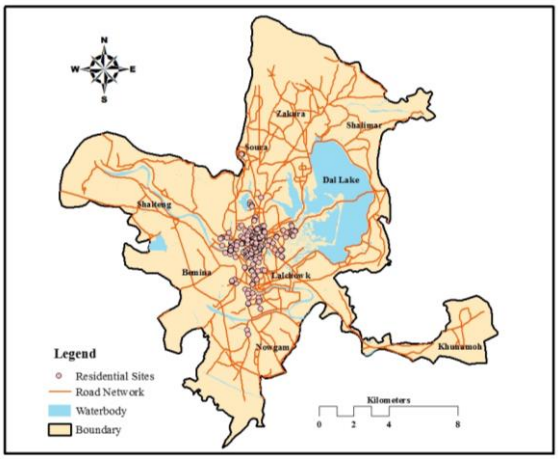

Figure 8: Residential sites

Conclusions and Recommendations

Since the inception of GIS and Remote sensing technology, man has become equipped with some invaluable tools for addressing a variety of societal issues and predictions about the future, which have helped in the preservation and sustainable use of natural resources. Developing and designing of GIS database is a skill oriented process, based on the observations and processes to concrete user oriented organized data. Objective collection of appropriate data with precision in a systematic way from valuable sources is, however, the key to development of credible GIS database.

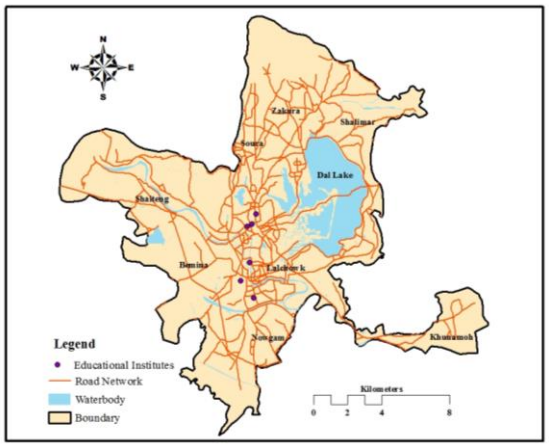

Figure 9: Institutional Heritage Sites

The studies led to the vision for the generation of Geospatial Database for Srinagar City in a GIS environment. This in our opinion will constitute a major Geoinformation framework for Srinagar City. The varieties of products which come from the Geospatial database are very important for decision making especially in town and regional planning. As the planners require topographic mapping with both natural and man-made features, place names and other attributes, planners need to bring all these and other socioeconomic data together for good planning. Integration of most of the spatial or graphic data sets will enable expeditious and informed decision making. The layout of Heritage Sites and extensions directly give you the exact information of each and every Heritage Site in Srinagar City. The linkage of datasets through common identifications on attributes enhances spatial consistency and adds value to existing data. The major users of this Geospatial database are town and state planning Departments, roads and other civil engineering organizations, local government, land boards, utilities, tourism and many others.

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