Towards a regional geographic information infrastructure (RGII) in the Hindu Kush-Himalayan (HKH) region: Project proposal

Project Background and Justification

The mountains and their ecosystem have been constantly gaining the attention of the world community for their contribution towards life support. The linkages between environmental degradation in the mountain areas and its effect downstream started becoming ever more prominent in the recent years. The importance of mountains as global life support systems has been duly recognised by the proclamation of the year 2002 as International Year of Mountains (IYM) by the United Nations. The overall goal of the IYM is to promote conservation and sustainable development of mountain regions, thereby ensuring the present and future well-being of mountain and lowland communities.

There is increasing awareness of alarming environmental conditions of Hindu Kush-Himalayas such as forest depletion, loss of bio-diversity, glacier meltdown, soil erosion, flash floods etc. To enable sustainable decision making, there needs to be a realistic assessment of natural resources and socio-economic conditions through the systematic generation of data indicating the present situation and changing status through time. In particular, geographically specific, spatial information is critical for this purpose. The availability of consistent database from local, national and regional levels will help improve the ability to investigate key components of Himalayan environment and related issues and support towards sustainable decision making. The significance of geographic information in addressing various issues of sustainable development has been well recognized and the demand for such data and information has been clearly established in the scientific circles both at the national and regional levels.

The International Centre for Integrated Mountain Development (ICIMOD) has been working for poverty alleviation and sustainable development in the Hindu Kush-Himalayan (HKH) region since 1984. It has been promoting the use of Geographic Information Systems (GIS) and Remote Sensing (RS) technology and its applications for sustainable mountain development in the region. The growing awareness of the usefulness of these tools and technology in planning and resources management has increased the demand of these systems. However, the major hurdle faced in successful implementation of projects with GIS is unavailability of appropriate data. The region faces with the isolated development of databases due to the lack of a proper framework. As a result information is often dispersed, heterogeneous, and inaccessible and the available information is not sufficiently relevant in term of continuity, reliability and the nature of parameters. Although ample amount of geographic information on the region has been prepared and compiled by various institutions and individual researchers, this valuable information is hardly accessible or shared. Without formal mechanisms for data sharing, much time and resources are wasted in duplication of efforts for data collection and digital data conversion process.

ICIMOD through its Mountain Environment and Natural Resources Information System (MENRIS) program has been focussing on GIS capacity building and networking of the national institutions in the region to promote the development of geographic information, its sharing and effective use of GIS and RS in the region since early 1990. The advent of Internet technology has revolutionised the concept of networking and information sharing. Internet provides a big potential for efficient and effective ways in obtaining, using and sharing geographic information. The recent developments in Internet Mapping technology have leverage to publish potential map/geographic information and associated data so that user can have access to them through the Internet.

The project intends to develop a system using the Internet technology to serve the geographic information and databases on the HKH region that MENRIS has developed over a decade. Easy access to these resources will contribute in the development of the region by helping the researchers, development workers and decision-makers in integrating various socio-economic and biophysical data, thus providing a better understanding of the problems for specific solutions. The system, once developed, will be a step ahead in the use of Internet by ICIMOD for its networking and outreach objectives.

Objectives

General objective

The long term general objective of the project is accomplishing towards a Regional Geographic Information Infrastructure (RGII) thus facilitating the sharing, integration and use of geographic information across a broad base users, giving particular consideration to standardised datasets, data availability and facilitation of exchange of information using the potential of modern information and communication technologies, particularly the Internet. This will in turn helps increase the availability and accessibility of geographic information for sustainable development in the region.

Specific Objectives

The project outlines creation of a system on the Internet offering a new *one-stop experience* for geographic data needs in the region. The specific objectives in this context are:

1. **To develop a customized system for serving the GIS database on the Internet using latest Internet mapping technologies**
   A system will be designed to serve the GIS database on the Internet using the new technologies e.g. ArcIMS, SQL server etc. The users will be able to view the database dynamically to browse the map database or customise maps as desired. The user will also be able to integrate the database with their own data to prepare map based information.

2. **To develop a metadata system based on international standards for searching and viewing the metadata through the Internet:** Metadata are the comprehensive, systematic, and deductive information about the content, structure, relationships, representation, and use context of the data stored in the underlying database. It is a mechanism for informing the existence of data sets and other form of information associated with the datasets. A metadata system will be developed based on the international standards with facilities of spatial and textual search of the existing database.

3. **To publish the GIS database at ICIMOD using the system:** Once the system is developed, the metadata and the database at MENRIS/ICIMOD will be served on the Internet. The users will be able to have access to the enormous quantity of maps, create their own maps using these databases or download the data into their systems and use them for further analysis.

4. **Extension of the system to partner institutions through capacity building:** The concept of RGII cannot materialise without the active participation of the national institutions. Therefore, the project will extend the system to its partner institutions so that they can join in to publish their own databases. The project will therefore provide training on the system to at least to three member countries actively using GIS and possessing public interest database. During the

project period, metadata from these institutions will be incorporated into the system.

Project Beneficiaries

The researchers, development projects and agencies working with GIS in the region will be the direct beneficiaries of the project. With reduced efforts for searching and accessing the databases, there will be substantial saving of resources in the long run. The growing use of GIS technology with easily available spatial databases will facilitate in developing more realistic policy planning and action plans which will ultimately benefit the mountain community at large. With adoption of standardised formats for database queries and information sharing and consistent presentation across multiple participating organizations, who will be the major users as well as producers of information and knowledge, the whole GIS community in the region will benefit from such a system.

Project Sustainability

The system is aimed at helping in organizing, documenting and disseminating ICIMOD and its partners' own geographic data and information. Once the framework is place, its potential will be realized when more partners will join together to publish their metadata and spatial database using the basic system developed without further cost involvement. Such a network through the Internet will make it possible for the user to know about existing geographic information on the region and have access to it. The application has the potential to be extended to other regional and national institutions of the HKH, an important then step towards realizing the vision of a Regional Geographic Information Infrastructure. As there is no recurrent cost involved in the project except for maintaining the web site (which is one of the ICIMOD's core activity) the project will be sustainable and self-rolling. The system has plenty of scope for growth without extra cost and seen as a mechanism for a "Provider" and a "User" of geographic data and information in the region.

Project Methodology

1. Requirements analysis

A detailed discussion with potential partners institutions will be held to identifying the most commonly used spatial data. A two days workshop will be conducted at Kathmandu with 2 participants from Bhutan, 2 from Bangladesh and 6 from Nepal. The list of potential institutions is given in Annex 1. The workshop will prepare a preliminary list of the available datasets in these organizations and most widely requested by the GIS users. The content standard to be adopted for metadata will be identified.

2. System Design and Development

A system will be designed to serve the spatial database using the available Internet mapping technology. Non-spatial databases will also be integrated in the system. A spatial search engine will also be developed to search and view the data. All text searches and retrieval will be based on ASP (Active Server Page) technology. It gives interaction and dynamism to the searches.

The endorsed content standard for metadata will be modelled into a database structure. The database will be hosted on SQL Server 2000 on Windows Advanced Server. The system will provide the facility to update the metadata content by the partner institutions themselves through the Internet. User Interfaces for on-line addition, deletion, editing and general maintenance will be available for partners with appropriate security mechanism.

3. System Testing

The system will be populated with the existing spatial and attribute data from MENRIS/ ICIMOD. The metadata for these databases will also be loaded in the system. It will be hosted at MENRIS server and tested in the ICIMOD Intranet environment. Modifications in the interface as well as functionality will be made based on the users' comments and the system's performance.

4. Training of partners

One week training program will be conducted for professionals from selected partner institutions in Nepal, Bangladesh and Bhutan. Training will include various aspects of the system, metadata standards, its input and maintenance. The participants will be involved in the preparation of the metadata of the available databases in their respective institutions, which will be incorporated in the system.

5. Final Testing and Launch

The whole system will be launched at the last quarter of the project. It will be hosted either at MENRIS or at a suitable Internet Service Provider (ISP) depending upon the performance of the system. Based on the feedback received, the project will be used to modify and fine tune the system based on available results and future requirements.

6. Documentation

A report will be published at the end of the project documenting all the technical details. This will help in future extensions of the system to the vast network of institutions created by MENRIS over the number of years.

Conceptual System Architecture

Project time-line

The duration of the project will be two years. The work plan for the entire project duration is given below.

S.No.	Year 1	Month ---->	1	2	3	4	5	6	7	8	9	10	11	12
1.	Requirement analysis/ Preparation for consultative workshop		▓	▓										
2.	Consultative workshop				▓									
2.	Procurement of Hardware/ Software			▓										
3.	System Design and Development					▓	▓	▓	▓	▓	▓			
4.	System Testing/ Improvement											▓	▓	▓
5.	Mid-Term Report								▓					
6.	Annual Report													▓

S.No.	Year 2	Month ---->	13	14	15	16	17	18	19	20	21	22	23	24
1.	Training for Partner Institutions		▓											
2.	Review meetings with partners				▓	▓								
3.	Preparation of metadata by partners			▓	▓	▓								
4.	Integration of data/ metadata in the system							▓	▓					
5.	Launching the System									▓				
6.	Fine Tuning										▓	▓	▓	
7.	Mid-Term Report								▓					▓
8.	Project Evaluation													▓
9.	Final Report													▓

Project Outputs

The major outputs of the project will be:

1. A customised Internet based Mapping system for publishing geographic data and information, thus providing access and increased availability for multi-sectoral analysis and decision making.

2. A metadata system based on International standards for documentation and search of the existing spatial databases, which will facilitate search through the Internet and encourage data sharing in the region.

Other outputs of the project will be:

1. Easy access to the spatial databases available at MENRIS/ ICIMOD through the Internet and integration of custom data.

2. Access to the metadata of the spatial databases at ICIMOD as well as of selected partner institutions, from three countries.

3. Trained personnel in the partner institutions for preparing metadata and using the system for publishing their own spatial data.

4. A methodology on web based GIS, which will be useful for future implementation of similar projects and extension of the system to other institutions.

Project Monitoring

The project will submit one mid term report and one annual report in the first year, and another mid term report and the final project report at the end of the project. Besides, ICIMOD has its own mechanism for monitoring its program activities and projects. The implementation of the project consists of doing the tasks described in the workplan. The monitoring process will take place alongside the implementation of the project. The monitoring is based on the objective and is oriented to the direct monitoring work of the project.

S.No.	Objective	Indicators	Means of Verification	Timing	Assumptions
1.	A customized system is developed for serving the GIS database on the Internet	System and URL established	Access to the URL	End of first year	Required software are available
2.	A web based metadata system with international standards is developed	Common Metadata Standard formulated, Metadata database established	Requirement analysis, Workshop report, Metadata	End of 17th month	Standards are agreed upon
3.	GIS database at ICIMOD published using the system	On-line GIS database	Downloadable database on the web	End of 19th month	ICIMOD database readily available
4.	Extension of the system to partner institutions through capacity building	Training of Partners, GIS database and metadata available	No. of trainees, data availability from partners	End of 13th month	Partners are willing to share data

http://www.idrc.ca/en/ev-61568-201-1-DO_TOPIC.html