



Sustainable Livelihoods and Biodiversity in Developing Countries

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GIS database support for decision-making

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Abstract

Geographic Information Systems (GIS) have played an important role in the LiveDiverse project's work. LiveDiverse developed a GIS database already in its initial phase, and has to date collected over 130 map layers for all four case study areas (Vietnam, India, Cost Rica, and South Africa). To assess environmental vulnerability indexes, GIS provides geographic information and helps perform spatial analyses on map layers. Results from GIS analyses have not only quantized environmental vulnerability, but also provided useful information that links bio-physical, socio-economic, cultural-spiritual and policy aspects together.

Introduction

No other tools can replace GIS in representing geographic information. However, this is not the only useful feature of GIS. GIS is also useful in spatial analysis, data management, intuitive 2D and 3D visualization, and seamless mapping representation. GIS is an excellent way to visualize the distribution of any objects or themes which both researchers and decision makers need to observe.

The LiveDiverse project has recognized the importance and utilization of GIS in its research work. Dealing with bio-physical features, environmental vulnerability assessment, socio-economic and cultural-spiritual aspects, GIS is not only an information hub, but also a tool for decision making. Mapping environmental vulnerabilities and other analytical works require a number of spatial analysis tasks which are performed by GIS. GIS acts as a link between technical information and decision makers. From Costa Rica to South Africa, over India towards Vietnam, an overview of bio-physical features, socio-economic, cultural and spiritual lives and environmental have been represented by GIS in the form of maps. The spatial analysis function is a powerful feature which allows spatial

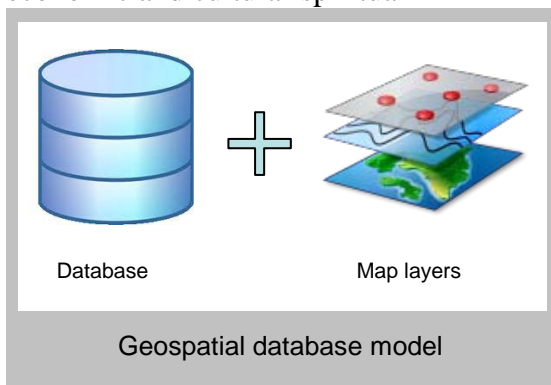
information overlay and theme superimposition that significantly supports decision makers with visualisation as well as multi-criteria analyzing outputs.

LiveDiverse's GIS database

In the past few years, the requirements of information availability and rapid access have significantly increased. In addition, geo-referenced information has been recognized as very useful and by default, has become a standard for many database management systems. A GIS system can accommodate large varieties of spatial and aspatial (attribute) data (Salem, 2003). This feature supports users in linking information with its geographical location.

The four case areas of the LiveDiverse project are located in different continents, comprising the Mutale River basin (South Africa), the Terraba-Sierpe River basin (Costa Rica), the Warana River basin (India) and the Ba Be – Na Hang complex in (Vietnam). A database has been established to accommodate several map layers from different countries as well as facilitating analysis of these layers.

The LiveDiverse project's GIS database is designed to manage biophysical, socio-economic and cultural-spiritual

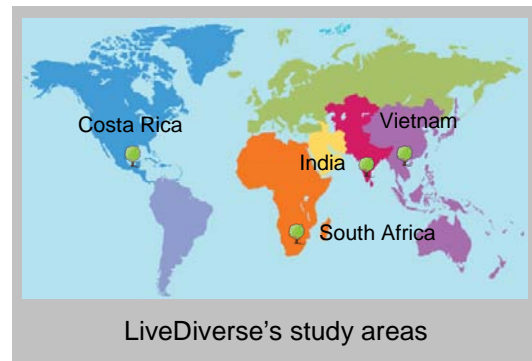


information which is then accessible by researchers and decision-makers via online graphical user interfaces. The connection to the database can be managed through internet with a web browser such as Internet Explorer, Firefox, Chrome or Opera, etc.

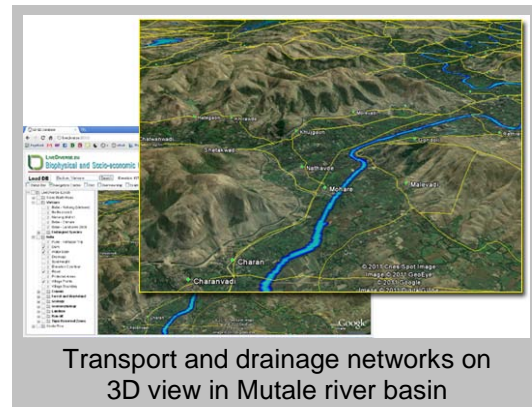
A tool for visualization

In the context of data visualization, the GIS database of LiveDiverse provides data viewers with a seamless view of all case areas' information in one view with a layer-structured model. Users can chose to display *Actor, communication and conflicts; cultural-spiritual; natural sciences; policy and law; and socio-economic and livelihood* themes. This provides a graphical overview of all case areas as well as making it possible to compare different themes from different areas. Additional information is provided by superimposed layers such as topography, population, income, weather and climate, infrastructure, biological species, etc. These can then show relationships between biophysical, socio-economic and other disciplines. This also helps create linkages between biophysical and other human activities.

GIS for environmental vulnerability assessment



LiveDiverse adopted a SOPAC approach (Pratt, C.R et al., 2004) for environmental vulnerability index (EVI) calculation. Twenty-nine of fifty indices are derived from GIS data. The quantitative results from LiveDiverse's works support decision makers in determining the levels of environmental vulnerability and enabling them to compare the situation in different geographical areas. On the



other hand, additional information from LiveDiverse's GIS database also contributes to other parts of the project's research work.

GIS supports scenario development

GIS helps graphically represent the past, present and the future scenarios developed in the project and their visualization. Stakeholders are able to utilize results from spatial data overlays in GIS to analyze the

interaction between driving forces and natural resources. Moreover, GIS supports change-detection analysis which shows the tendencies of phenomena over time. Several interactive role-play models with topographical features have been modelled in wood and presented to local stakeholders, a simple method which successfully bridged the gaps between technical work, stakeholders and policy makers (Boissau et al., 2001).

Linking stakeholders and researchers world wide

The GIS database is an important part of LiveDiverse's website (<http://www.livediverse.eu>), which provides information about project activities and scientific research. Stakeholders, decision makers and researchers can gain access to the website for reports, photos and geographical information. The online mapping interface (<http://hydro-gis.jrc.ec.europa.eu/Livediversewebgis>) provides interaction and a user-friendly tool to browse maps and related information. Users can also update information from the project's server once it has been modified by the project's partners. This information system ensures that maps and other data are centralized from a unique source, and thus, guarantees the reliability of the data source.

Conclusion

Geographical information is one of the projects very important components. The LiveDiverse GIS database is not

only been a system for data management, but also a supporting tool for environmental vulnerability assessment. It links both geographical information and non-spatial data into a unique system with a user-friendly, interoperability, cross-platform and interactive interface. The database also provides multi-disciplined information that supports researchers and decision makers in both technical and managerial routines.

Acknowledgement

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Additional information

- LiveDiverse's GIS database includes over 130 thematic themes from Costa Rica, India, South Africa and Vietnam.
- 29 environmental vulnerability indices have been derived from GIS data and other information.
- The online GIS database has been collected and refined by the National Institute of Agricultural Planning and Projection (Vietnam), and online managed by Joint Research Center (Italy).