Building spatial data infrastructure in Ethiopia

Highly dynamic planning and decision-making requirements in Eastern Africa need accurate and up-to-date information and knowledge, especially on the geographic distribution of key development indicators. In Ethiopia, ESAPP launched a capacity development and spatial data infrastructure programme to improve the availability of country-level geospatial data, significantly contributing to human resource development efforts.

Sustainable development challenge

In Eastern Africa, government institutions at national and subnational levels are faced with the challenge of having to take decisions and conduct planning in a context of accelerating socio-economic dynamics. Investments in land, competing claims on natural resources, and soaring economic growth lead to ever-changing planning and decision-making requirements that can only be addressed with the aid of accurate and up-to-date information and knowledge bases. Unfortunately, the same institutions often lack such tools, causing planning and decision-making to constantly lag behind real-world developments.

The Government of Ethiopia is following an integrated growth and transformation plan that aims to achieve an annual growth level of almost 10 to 15 per cent of the gross domestic product, accomplish the Sustainable Development Goals, and attain middle-class income status by 2025. To reach these goals, the country is investing heavily in agriculture, infrastructure, and energy. However, project planning and impact assessments are hampered by a number of factors, including a lack of reliable country-level spatial data, missing standards for spatial data infrastructure, non-existent or contradictory administrative boundaries due to political instability, and an absence of expertise in data management among local institutions.

ESAPP's response

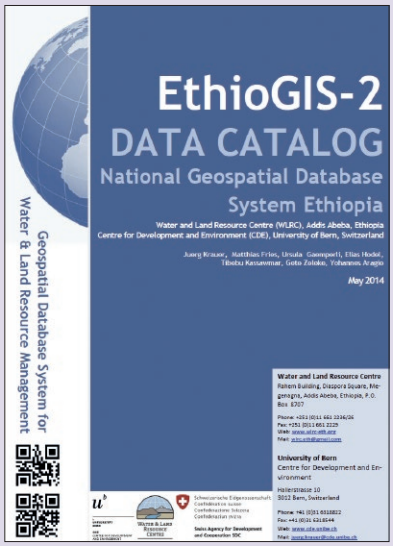
Mindful of the importance of geoinformation technology for resource management, regional planning, and socio-economic development, ESAPP carried out several projects that aimed at improving spatial data and information bases at national scales in the region. ESAPP partners built on the experience of the Centre for Development and Environment (CDE) in the Mekong Region and on existing data from previous projects in Eastern Africa. The focus of these projects was to provide insights into the geographic distribution of key development indicators, especially in remote areas.

In Ethiopia, ESAPP focused on scaling up key environmental variables from single case studies to the national level, in view of integrating them into a spatial data infrastructure. Various capacity building projects were designed, implemented, and then tailored to address the needs of different institutional partners, in an effort to enhance the capacity, mainly of government institutions, for the spatial documentation and analysis of relevant environmental information. An important aspect of this effort has been to provide a platform for knowledge exchange and networking among partners, to make accessible to these partners the latest applications in hydro-informatics, and to strengthen communication and data exchange processes.

Main messages

- Long-lasting research partnerships are a key asset for the successful implementation of projects with a strong focus on geoinformation and communication technologies.
- Many Ethiopian institutions realized that geospatial information – in particular open-source medium-scale remote sensing data – can greatly support their work processes. In the future, these data will have to be complemented with socio-economic data, for example on poverty and disparities, or on access to land and water.
- Information sharing and providing open access to data are new and far-reaching concepts for most African partners. Building trust and sharing the benefits and potential of open geospatial data among all involved partners were key lessons learned within the institutional context of Ethiopia.

This extension worker is participating in an EthioGIS training course. Participants of the course learned skills that are crucial for extension workers: how to read a map featuring contours, landmarks, and models, how to understand the scale of a map, how to interpret map legends, and many more. (Photo: Jürg Krauer)



The project story

The former Soil Conservation Research Project (SCRP), coordinated by CDE, established comprehensive databases in six watersheds in the Ethiopian highlands (Krauer 2006). After the project ended in 1988, Ethiopian partners suggested expanding and harmonizing the SCRP databases into one homogeneous spatial and statistical database for the entire highlands. For this purpose, they approached ESAPP with a request for financial and technical support.

The end of the SCRP coincided with major breakthroughs in climate modelling using weather station data. One decade later, advances in remote-sensing technology made it possible to spatially capture and classify various types and patterns of vegetation, key variables for sustainable development research. The use of aerial and satellite imagery became standard practice for detecting spatial features such as infrastructure or conservation structures, and to model terrain and drainage systems. Technical limitations initially prevented successful scaling-up of environmental data beyond the six SCRP sites, but these were soon overcome. After this, ESAPP began its first trials of modelling soil types, terrain characteristics, land cover, and other environmental data, and integrating them in a country-wide geospatial information system. However, modelling efforts were challenged methodologically by the sizable scale gap between the SCRP research stations and the entire Ethiopian highlands, and by limited availability of data (let alone standardized data) and scarce ways of exchanging them.

In response to these challenges, ESAPP launched a capacity development and spatial data infrastructure programme to improve the availability of country-level geospatial data. The programme also contributes to the National Spatial Data Infrastructure (NSDI) and the development of spatial planning tools among project partners. In parallel, a network of Ethiopian experts was set up to foster long-term independent data analysis and compilation capacity. Network members gained expertise in field-based and online geospatial data collection. They also learned to analyse online data and validate their results in the field or through comparison with existing map models. As of 2012, the newly established centre of competence in integrated water resource management, the Water and Land Resource Centre (WLRC) in Addis Abeba, was able to find and further build capacity of qualified national staff – an important outcome of ESAPP's human resource development efforts in Ethiopia.

Top: ESAPP's efforts towards building up a national geospatial database system for Ethiopia culminated in the release of the EthioGIS-2 data catalogue by CDE and the Water and Land Resource Centre in 2014. The geospatial database contains administrative and topographic information as well as specific datasets about soil, land, and hydrological resources. It is widely known as Ethiopia's most up-to-date and accurate non-governmental national geospatial database.

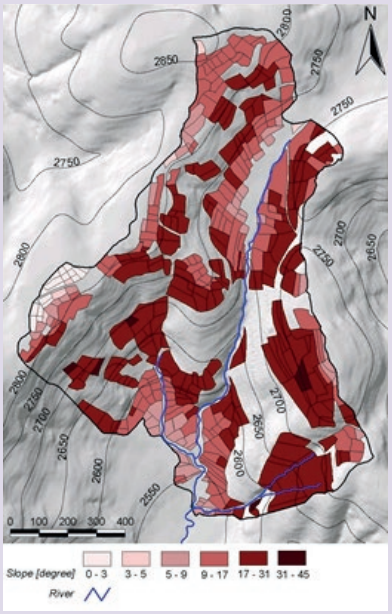
Bottom: Due to Ethiopia's very large size, the majority of data contained in the EthioGIS database had to be derived from global data servers, governmental sources, or satellite images. Assumptions made during data processing and interpretation had to be verified in selected areas in the field. (Photo: Jürg Krauer)

Innovation and relevance

These days, satellite systems make it possible to track environmental changes in very remote areas with increasing precision, and the resulting data may be shared online. Platforms such as GeoWiki and map servers such as Google enable users to combine their own data with global geospatial datasets at various scales, greatly contributing to the standardization and dissemination of geographic information. ESAPP and its partners strived to acquire the competences needed for the productive use of these tools, and to adapt them to the specific requirements of the project context in Ethiopia.

The space provided for mutual exchange between participants was probably the most valuable contribution of ESAPP's capacity development programme in Ethiopia. The course structure that was developed for that purpose featured conferences, training programmes, and field components, helping participants to integrate theory with practical project work. The EthioGIS database has since become a reference in Ethiopia, widely used by a number of stakeholders. Finally, the efforts of ESAPP in facilitating long-term exchanges between experts within a multi-disciplinary network were highly instrumental in creating strong local expertise from which other programmes now benefit.

National governments in Eastern Africa are confronted with rapidly accelerating development dynamics, in urban and rural areas alike. Large-scale investments in land, competing claims on natural resources, infrastructure development, rapid economic growth, and other dynamics represent a huge challenge for planning. National governments need accurate and up-to-date information to help them harness and harmonize these dynamics and guide them onto sustainable pathways. Tools such as ESAPP's EthioGIS database therefore have increasing planning relevance. The extensive experience gained in Ethiopia can go a long way in helping other national institutions in the region develop similar decision-making and planning tools.



Top: A country-wide high-resolution digital terrain model was generated as part of the EthioGIS projects. Various topographic layers were derived from this model, for example slope gradients. This map shows the average slope gradient of crop fields in the Anjeni river catchment. Maps like this one can serve as a basis for planning soil and water conservation measures across an entire river catchment.

Bottom: Participants of a course on geographic information systems (GIS) and remote sensing in Ethiopia during a field trip in the Gerda watershed. Capacity building within ESAPP focused not only on enhancing technical skills, but also on confronting maps and spatial models with the reality on the ground. This enabled trainees to develop a better feeling for the potentials and limitations of these tools. (Photo: Jürg Krauer)

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Highlight profile

This highlight is based on the achievements of 8 ESAPP priority action projects.

Implemented during:
2000–2014

Total funds contributed by ESAPP:
CHF 387,000

Implemented by:
Centre for Development and Environment (CDE), University of Bern, Switzerland

In collaboration with:
Water and Land Resource Centre (WLRC), Addis Abeba, Ethiopia

Main beneficiaries:
Government and various ministries of Ethiopia, as well as Ethiopian regional planners and experts

References and further reading

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What is ESAPP?

The Eastern and Southern Africa Partnership Programme (ESAPP) is a research implementation programme funded by the Swiss Agency for Development and Cooperation (SDC), coordinated by the Centre for Development and Environment (CDE) of the University of Bern, Switzerland, and implemented jointly by CDE and a network of partner institutions in Eastern and Southern Africa. Launched in 1999 and completed in 2015, ESAPP implemented over 300 priority action projects in the programme region, which included Eritrea, Ethiopia, Kenya, Tanzania, Mozambique, and Madagascar.

What are ESAPP Highlights?

ESAPP Highlights are a series of 24 project descriptions providing insights into ESAPP's research and implementation partnerships. Each Highlight describes a succession of demand-driven priority action projects addressing local and regional sustainability issues. The 24 Highlights are collected in a publication that includes additional background information on ESAPP (see citation above). The individual Highlights and the entire publication are also available for download on CDE's website: www.cde.unibe.ch (keyword search: "ESAPP").

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