ICT-05-27-en-DEF.qxp 27-8-2005 14:26 Pagina 1

ICT Update
a current awareness bulletin for ACP agriculture

CTA

Participatory GIS

issue 27, September 2005

features

regulars

http://ictupdate.cta.int

ICT-05-27-en-DEF.qxp 27-8-2005 14:26 Pagina 2

editorial

Barefoot mapmakers and participatory GIS

Resource distribution, tenure and access are crucial factors in natural resources management. What they have in common is that they are spatially defined within broader social, economic and environmental contexts, so that quantitative and qualitative descriptions alone are not sufficient to support their objective interpretation and use in social learning, negotiation and communication processes. Data on resource use, access and tenure lose their full meaning if not considered within their complete social and geographic context.

Interest in the spatial dimension of data has increased since the 1990s due to the diffusion of modern geographic information technologies and systems (GIT&S). These technologies include geographic information systems (GIS), low-cost global positioning system (GPS) equipment and satellite imagery. As the software for gathering, storing and analyzing spatial information becomes ever more user-friendly, practitioners, activists and researchers are adopting GIS both to broaden public participation in regional and local planning processes, and to facilitate consultations between officials and communities about the tenure, use and control of natural resources. As a result, increasing numbers of community-based initiatives are emerging that aim to record, organize, visualize and geo-reference indigenous spatial knowledge using what is generally termed participatory GIS (PGIS).

PGIS is a practice resulting from a spontaneous merger of participatory learning and action (PLA) methods with GIT&S. It builds on the integrated use of tools, methods, technologies and systems ranging from simple sketch mapping, to participatory 3D modelling, collaborative aerial photo-interpretation, and the use of GPS and GIS applications. With PGIS applications, indigenous spatial knowledge is composed in the form of virtual or physical, 2- or 3-dimensional maps that are used as interactive vehicles for spatial learning, information exchange, support in decision making, resource use planning and advocacy actions.

The international conference 'Mapping for Change', to be held in Nairobi, Kenya, in September 2005 will focus on sharing experiences and defining good practices for making PGIS applications more widely available to rural communities, and to enhance their capacities to generate, manage and use spatial information. This issue of *ICT Update* features a number of cases illustrating the issues that will be discussed at the conference. Sanat Chakraborty explains how participatory 3D modelling (P3DM) coupled with GIS applications has helped an isolated hill community in India to optimize the use of their land, but notes that introducing technology without adequate support is not enough. Carol Murphy and Sandra Slater-Jones describe a PGIS mapping procedure developed in Namibia in which local people are the mapping experts. Jeroen Verplanke describes the development of a mobile GIS unit with a simple graphical user interface that can be used by communities in remote areas, regardless of literacy and without expert assistance, to monitor forest resources and record local spatial knowledge.

The next two articles focus on the impacts of PGIS on local capacity development. First, M'Lis Flynn looks at how the Ugunja Community Resource Centre in Kenya has overcome the lack of technical and human resources in the process of building a local GIS and mapping hub. Peter Akong Minang then describes the valuable lessons learned by a community in Cameroon in the process of using PGIS to apply for a community forest management contract. Finally, in the Q&A, Dr Peter Kyem explains that although both conventional GIT&S and PGIS approaches can contribute to natural resources planning and management, PGIS offers specific added value. ■

Giacomo Rambaldi (rambaldi@cta.int) is Regional Programme Coordinator, CTA, Wageningen, the Netherlands.

Mapping for Change

http://pgis2005.cta.int

International Conference on Participatory Spatial Information Management and Communication, Nairobi, Kenya, 7-10 September 2005

This conference will bring together people with extensive practical experience in participatory GIS (PGIS) and community mapping in developing countries and Canadian First Nations. The event will focus on sharing experiences and defining good practices for making GIS technologies and systems available to marginalized groups, in order to enhance their capacities to generate, manage and communicate spatial information in the context of:

- asserting their ancestral land and resource rights and supporting collaborative planning and management of natural resources;
- managing and resolving conflicts among community groups, and between communities and higher authorities or economic forces;
- supporting indigenous peoples and rural communities in their efforts to preserve their cultural heritage and identity, and to promote equity in terms of ethnicity, culture, gender, environmental justice and hazard mitigation.

The organizers intend to build on the experience gained in developing countries and First Nations, both to develop guidelines on sound PGIS/community mapping practices, and to set the foundations for the establishment of regional networks and resource centres.

ICT-05-27-en-DEF.qxp 27-8-2005 14:27 Pagina 3

P3DM: Mapping for sustainable agriculture in Sasatgre, India

Sanat K. Chakraborty explains how participatory 3D modelling has helped an isolated hill community to optimize the use of their land.

'You can see our entire village right in front you', the head of the village told the group sitting around the 3D model. 'You can also see where we are going to jhum this year. It is very clear', he added proudly.

Participatory 3D modelling (P3DM) was introduced to Sasatgre, a village in the West Garo Hills in North Eeastern India, as part of the IFAD supported North Eastern Region Community Resource Management (NERCRM) project in May 2003. P3DM integrates all aspects of the mapping process – participatory resource mapping, data collection and model building – as well as applications of the model for decision making, and for monitoring and evaluating changes in land use. The changes are recorded (using colour-coding) on the 3D model and are digitized to produce a new map, which is then returned to the community for analysis and further decisions.

P3DM is a continuous process that requires gradual the scaling up of activities, follow-up and training. In Sasatgre, it is mostly used for allocating farm plots. The villagers practise *jhum*, the traditional slash-and-burn subsistence farming. Every November, the village head gathers together all 51 families and allocates to each of them a fallow forest plot. They then clear the plot and slash and burn the existing vegetation to provide a bed of nourishing ashes for their crops.

Allocating *jhum* plots

With the 3D model – a simple visual representation of the village and its surroundings – the process of selecting and allocating *jhum* plots for the next season has became much easier and clearer for everyone. At the November 2003 meeting, the community was to allocate plots on an area that had been lying fallow since 1996. First, a plastic sheet was laid on the top of the 3D model, onto which they traced the boundary of the 1996 *jhum* site, which covered an area of about 141 hectares. They realized that for 2004 they would need only 41 ha, so they could leave the remaining 100 ha (almost two-thirds) lying fallow for at least another year.

Rather than allowing families to clear a plot anywhere on the site, as before, the villagers decided to organize the allocation of the 51 *jhum* plots more systematically. By regulating access to the fallow land, they decided, they would be able to protect their water catchment areas, and create a community forest reserve. Sasatgre followed the same process in November 2004.

With the assistance of the NERCRMP, villagers have also used the 3D model to monitor government infrastructure building schemes. For example, when the Public Health Engineering Department announced a plan to build a water supply scheme that would run through the village, community leaders asked officials to indicate the route of the pipeline on the model so that they could assess how the project would affect them. The officials visited Sasatgre and used the model to discuss the plan.

Land use in Sasatgre was first digitized in May 2003. Since then, the villagers have recorded changes in land use in the last two cropping seasons by marking them on the model using coloured paints. However, these changes still need to be digitized to produce a map for long-term impact analysis. Digitization is very important for the process, as it helps the community to optimize the use of their *jhum* plots, thus allowing the land to lie fallow for as long as possible. Unfortunately, since the initial NERCRMP intervention in May 2003, there has been no proper facilitation or follow-up by either the project sponsors or trainers, presenting a major problem for the community.

Critical issues

The people of Sasatgre are still enthusiastic about the 3D model as a visual tool, and appreciate its benefits. Yet the experience has raised a number of critical issues. In particular, they cannot use P3DM to its full potential unless they have adequate expert support. How should they scale up the process? Who should drive the process, and whose purposes should it serve? Although many villagers are illiterate, they possess a wealth of information about their land and its resources. How can they best use this knowledge, with the aid of technology, for the benefit of the community? All changes in land use have to be digitized and stored for monitoring and impact analysis, but how can the community monitor these changes effectively without the right tools and training?

Under the NERCRMP initiative, several 3D models have been constructed in the region primarily to promote the tool and raise awareness of its potential. With appropriate support, a comprehensive *jhum* site and fallow land management system could be developed for upland areas throughout the region, where the communities themselves will be able to design and direct the process. The people of Sasatgre have learned that introducing technology is not enough. ■

Sanat K. Chakraborty (gosanat@dte.vsnl.net.in) is a journalist based in India.

For more information about the North Eastern Region Community Resource Management (NERCRM) project, visit www.necorps.org. See also www.iapad.org/publications/ppgis/grassroots_options.pdf.

ICT-05-27-en-DEF.qxp 27-8-2005 14:27 Pagina 4

feature

ICTs in Namibia's communal area conservancies

Carol Murphy and Sandra Slater-Jones describe a GIS mapping procedure in which local people, and not outsiders, are the experts.

In Kasika conservancy, on the East Chobe floodplain in northeastern Namibia, local people are using GIS to produce detailed, coloured maps showing the location of wildlife areas and livelihood resources. Prior to the introduction of the GIS-based community land use mapping system, they used hand-drawn maps that were undecipherable to outsiders, and thus hindered opportunities for local tourism development and new livelihood activities.

ICTs and community involvement are not new to Namibia's Conservancy Programme, which is internationally recognised for granting local communities conditional rights to use and benefit from their wildlife and other resources. The programme already supports a vibrant mapping and natural resource information unit in Windhoek, and maintains a web-based information system called 'Conservancy Information'. Data (spatial and otherwise) are updated centrally and can then be accessed and used in far-flung regions of the country.

Participatory maps are not new either. What is new is that this mapping procedure is being used to upgrade hand-drawn maps by geo-referencing the map data. The procedure involves village mapping workshops and careful recording to capture indigenous knowledge with regard to local area names, the spatial location of resources such as grazing, cropping and useful plant species, as well as wildlife sightings and movements.

Village mapping workshops

At these workshops, local people are asked to draw a map of the area on the ground, and then to copy it onto paper. Data from the map are then painstakingly located on a specially prepared ortho-photo base map marked with previously recorded GPS point data (e.g. schools, shops, water pumps, etc.) to provide orientation. Depending on the size of the area, a number of workshops are held to build up the picture of the whole area in mosaic fashion. Back in the office, tracing paper overlays are made from the base maps and these are

digitized on screen for the final map production. Initially this was done centrally by GIS experts in Windhoek, but through on-the-job training, local GIS expertise has been developed in the region.

The different overlays are then superimposed to produce a composite map showing land use patterns, including areas reserved for tourism and wildlife, grazing, forestry and trophy hunting. Icons (e.g. pictures of animals indicating wildlife sightings) and colours are used as much as possible in the final GIS maps to make them accessible to people with low levels of literacy. The conservancy's logos are added to enhance ownership. Then, conservancy members check the maps for accuracy and comprehensiveness before final copies are printed, covered in plastic and distributed.

Conservancy committee members are using these maps to assist in planning and management of their common property natural resources, including planning of tourism activities (e.g. trophy hunting and rental agreements with private lodges), establishing wildlife corridors to allow the migration of animals such as elephant and buffalo, and for co-management with government authorities in the case of national park residents. Maps have also been lodged with local authorities to establish communal tenure rights to tourism sites.

'Reading the landscape'

So far, four conservancies have been mapped and the procedure has been captured in a guideline document, 'Standard Operating Procedure', and in reports of case studies undertaken in pilot areas. In addition, in an exciting collaborative exercise, 3000 San (Bushmen) residents and the park authorities are currently mapping the Bwabwata National Park in West Caprivi. Residents of the park use natural drainage features known as pans to 'read the landscape', or orientate themselves. With technical assistance from NGOs, local people (especially the elderly) are recording the locations, names and status of over 180 pans within the Park's core wildlife areas as well as the multi-use areas. The results of the efforts to capture information about the residents' livelihood resources over the next six months will be used to support co-management with the park authorities and entrench the residents' resource access and ancestral rights. The procedure is also helping to build better relationships between the two sides.

This procedure ensures that local people become the mapping experts and not outsiders. Although the accuracy of the point data is confirmed by GPS, the land use patterns themselves are not ground-truthed as there is no real need, and no resources to do so. These maps embrace the participatory learning action principles of 'optimal ignorance' and 'appropriate imprecision'. They also serve the purpose for which they were intended, i.e. an appropriate geographic information technology to enable marginalised groups to communicate the spatial distribution of their natural resources and to benefit from their sustainable use. One of the main challenges ahead will be to ensure that the local people develop their new GIS skills, so that they can produce their own tailor-made maps. ■

Carol Murphy (cmurphy@africaonline.com.na) works for Integrated Rural Development and Nature Conservation (IRDNC), an NGO that promotes conservation and development within the Namibian communal area conservancies. **Sandra Slater-Jones** is a sociologist and consultant for Conservation International. For further information, visit www.irdnc.org.na.

ICT-05-27-en-DEF.qxp 27-8-2005 14:27 Pagina 5

Mobile GIS and local knowledge in monitoring carbon stocks

Jeroen Verplanke describes the development of a mobile GIS unit that can be used by local communities to record and monitor the carbon stored in natural forests.

Traditional communities around the world know how to manage their forests in a sustainable manner. With mobile GIS technology they can now apply that knowledge to measure and monitor the carbon stored in community forests, and thus may become eligible for project financing under the 'clean development mechanism' of the Kyoto Protocol, which aims at reducing global carbon emissions.

For local communities to benefit from this funding in the future they will need to provide accurate, verifiable baseline measurements of the carbon stored in natural forests, as well as effective ways to monitor changes in carbon stocks. With this in mind, the University of Twente and the ITC have launched a research and capacity building project to look at how local knowledge and GIS technology could be brought together to meet the requirements of this international agreement, and to promote sustainable forest management.

The project set out to identify a suitable methodology for gathering and managing geo-information that will enable communities in developing countries to monitor forest carbon stocks. Since it was unlikely that communities themselves would be able to meet all the data requirements in the short run, the project aimed to show that community involvement could serve as a short cut or replace some of the procedures required in formulating climate projects, and reduce project transaction costs considerably. The question was how to enable local communities to do their own 'carbon accounting' as cheaply as possible.

As a first step, communities in several countries were trained, using participatory methods, to carry out forest surveys and to define indicators for sustainable development. If these communities could perform such activities themselves, it would reduce the need for expensive (foreign) consultants to assist them.

Mobile GIS unit

Until recently, the complexity of GIS technology and the lack of portable measuring equipment prevented the hands-on participation by local communities in developing countries. Today, portable computers and simple graphical user interfaces (GUIs) mean that GIS is accessible to communities in even the most remote areas, regardless of levels of literacy and without expert assistance. To test the technical aspects of achieving this integration, the project team carried out participatory research in India, Senegal and Tanzania. First, the team had to assess the usability of the standard GIS interface, including which parts of the interface needed to be modified, and to what extent, as well as what training was needed for users who had never used a computer.

The initial step was to assemble a mobile GIS unit that could be used to record data in the field. It was decided to use an HP iPAQ pocket PC, a handheld personal digital assistant (PDA) loaded with Windows and GIS software ArcPAD 6.0.2. For data recording, ArcPAD has the advantage that it can be used to display maps and images as geo-referenced background layers, and can also be tailored to include a user-friendly interface for data entry and basic operations. The equipment also includes a GPS so that users can register directly the exact locations of all data recordings.

The second step was to organise workshops in each of the three countries, where community members with no previous experience with the technology were invited to evaluate the mobile GIS unit, and to record its strengths and weaknesses. During these workshops, the villagers, most of whom had little formal education, were taught how to use the mobile GIS unit to collect data. Some had never even seen a computer before, yet within a few hours they had mastered the basics of the iPAQ and learned how to locate themselves using the iPAQ-GPS system, and to retrieve pre-recorded data points. They also managed to plot an area, while watching the polygon develop on the screen, and (with some assistance) to enter data describing the plot on a pre-designed form.

The villagers learned very quickly both the forest measurement techniques and how to use the iPAQ. They were also able to provide feedback on problems related to the computer system itself, as well as about what should be measured in the forest. What they needed most of all was a simple, well illustrated manual to accompany the system; the rest would become easier with practice.

The project team succeeded in determining what is practically possible with hands-on participatory GIS. Community members can learn without much difficulty to use the mobile GIS to compile inventories of natural forest resources. In the near future, as user-friendly portable computers become cheaper and more widely available, communities worldwide will be able to use this technology to record and quantify their natural resources.

Jeroen Verplanke is a researcher at the International Institute for Geo-information Science and Earth Observation (ITC) in Enschede, the Netherlands. For more information, visit www.communitycarbonforestry.org

ICT-05-27-en-DEF.qxp 27-8-2005 14:28 Pagina 6

feature

Kenya: Introducing GIS to a rural community

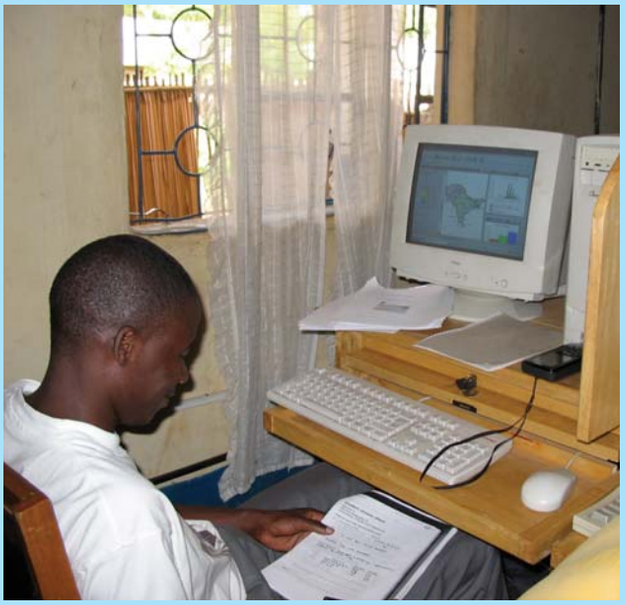
M'Lis Flynn looks at how the Ugunja Community Resource Centre has overcome the lack of technical and human resources.

At the edge of the town of Ugunja, in the Siaya district of Kenya, there is a small blue and white building where the activities of a group of volunteers are generating considerable local interest. The volunteers at the Ugunja Community Resource Centre (UCRC) are involved in a new project to develop their skills in spatial technologies, and to build the foundations of a locally owned and managed hub for GIS and mapping. The volunteers are collecting local data and developing a GIS database that can support decision making, planning and the implementation of projects to improve health care services and natural resource management. The overarching principle is to ensure that the GIS remains a community resource.

The development of the project began in October 2004, with discussions on how to introduce GIS to the Centre in a way that was culturally appropriate, and involved all members of the community. To help kick-start the project, Oakar Services (ESRI's local distributor) generously donated ArcView 3.3, the Mapping Our World teaching kit and other materials, and offered technical support.

Before the Centre could establish a stable and useful GIS, however, it first needed to address a number of technical and organizational challenges. Ugunja's electricity supply was unreliable, with regular prolonged 'blackouts', and the Centre was equipped with old stand-alone computers with limited disk space and processing capacity, and different operating platforms. In addition, the Centre would have to address the impacts of introducing a technology-heavy project (GIS) on an organization whose funding was sporadic and which could afford to pay its volunteer staff very basic wages. In particular, without a 'champion' who would motivate the staff, develop and maintain the GIS database, and establish networks with other organizations using GIS, it was more than likely that the project would grind to a halt.

It was agreed that to ensure that the GIS was successful in the long term, the Centre needed a solid foundation in terms of skills. Thus a number of volunteers were selected for training to take up key positions, including an IT manager, potential future trainers, and a champion who would network with other organizations, seek technical support, and manage the sharing of resources and knowledge.



The trainees would utilize ESRI's Mapping Our World training data to avoid the accidental corruption of real local data. Once collected and entered into the system, the GIS data would be regularly backed up and immediately downloaded. These tasks would be performed by at least two people for cross-checking and training a group of volunteers. Finally, the Centre would seek the long-term involvement and support of the Ugunja town council and relevant Kenyan ministries.

In the three months that followed, seven volunteers were trained in the concepts and uses of spatial data and the GIS, including data collection, development of databases, map design, and how to use GPS devices. Instruction manuals were developed for more complex processes such as downloading and converting GPS data, and the planning, design and management of the GIS databases. In December 2004, Oakar Services, ESRI International, and the UCRC launched the GIS project to more than 50 community members and gave demonstrations of data collection and GIS applications. The level of interest was high, and the feedback extremely positive.

Addressing local issues

By July 2005 the volunteers were already training others in GIS, and seven comprehensive datasets had been established. The UCRC is now organizing community meetings where they are utilizing the map data to address local issues. One of these concerns the local brick-making industry and its impacts on supplies of firewood, water quality and increased soil erosion. Using GIS data on brick-making sites, the community now has firm evidence establishing a relationship between these sites and the declining area of forests. They are now pushing for changes in the way the sites are managed, and are planning to lobby the Ministry of Environment to regulate brick-making in the district and to promote sustainable forest management.

What of the future? The Centre plans to develop their system as a hub for the whole of Siaya district and to extend their GIS capacities by developing participatory 3D modelling for the community. Involving farmers, health care workers and others in data collection would greatly enhance the datasets the Centre has already compiled. While the growth of the GIS will present many challenges, particularly in relation to computers and funding requirements, their commitment remains strong – and that has already taken the UCRC a long way! ■

M'Lis Flynn (mlis.flynn@epa.qld.gov.au) is project officer in GIS and indigenous issues at the Wet Tropics Management Authority, North Queensland, Australia (www.wettropics.gov.au).
ESRI GIS Mapping and Software: www.esri.com.

ICT-05-27-en-DEF.qxp 27-8-2005 14:28 Pagina 7

Web resources

This section lists key resources in the field of participatory GIS.
Additional information is available from the web magazine at http://ictupdate.cta.int

Integrated Approaches to Participatory Development (IAPAD)
www.iapad.org/
This portal site is the best starting point for anyone looking for information on PGIS. It offers access to a wide range of information on PGIS, including applications, a mapping toolbox, glossary, FAQ, a virtual library, links to P3DM projects and sources of funding.

Open Forum on Participatory Geographic Information Systems and Technologies (PPgis.net)
http://ppgis.iapad.org/
PPgis.net serves as a global forum for discussing issues, experiences and good practices related to community mapping, participatory mapping, counter mapping, public participatory GIS (PPGIS), community integrated (CiGIS), mobile interactive (MiGIS) and other geospatial information technologies and systems used to support integrated conservation and development, sustainable natural resource management and customary property rights in developing countries and First Nations. Members of the network can share information and post questions, resources, documents and announcements.

Global Spatial Data Infrastructure Association
www.gsdi.org/
The GSDI Association, whose members include organizations, agencies, firms, and individuals worldwide, aims to promote international collaboration in support of local, national and international spatial data infrastructure developments that will allow nations to address social, economic and environmental issues.

GeoNetwork
www.fao.org/geonetwork/srv/en/main.search
GeoNetwork, FAO's portal to spatial data and information, offers access to interactive maps, GIS datasets, satellite imagery and related applications that will support decision making in agriculture, forestry, fisheries and food security. The network aims to enhance understanding of the benefits of geographic information and to promote multidisciplinary approaches to sustainable development. The facility enables FAO units, other UN agencies, NGOs, etc., to share geographically referenced thematic information.

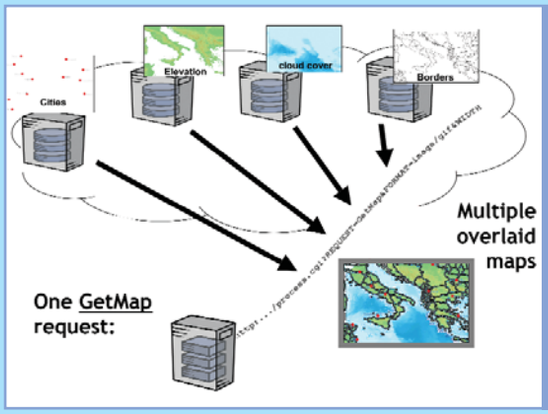
GRID-Arendal's Online GIS and Map and Graphics Database
www.grida.no/db/index.htm
This UNEP site offers free access to GIS datasets consisting of georeferenced (geo)graphical features linked to an attribute database, including base maps and thematic maps (biodiversity, population, protected areas, etc.). The datasets are produced using ARC/Info (for PCs and Unix), ARC/VIEW and IDRISI software. It also offers a collection of maps, graphics and diagrams illustrating environmental issues.

Global Mapper
www.globalmapper.com/
Global Mapper is a viewer capable of displaying the most popular raster, elevation and vector datasets. It also converts, edits, prints, tracks GPS, and allows users to utilize GIS functionality on datasets in one software package. It can directly access the entire TerraServer database of USGS satellite imagery and topographic maps from within Global Mapper and view elevation data in true 3D.

Applications of P-Mapping and PGIS to Issues in NRM and Community Development: A Partial Review
www.iapad.org/publications/ppgis/ITKNRMmapsLitReview_IAPAD.pdf
M.K. McCall, April 2005 (draft working paper)
This paper reviews recent and current research and projects that make use of participatory GIS (PGIS) and associated mapping technologies and methodologies. The paper identifies four main areas of application, with examples: Claiming 'our land'; 'Knowing and using resources means mapping resources'; Managing conflicts; and Mapping 'equity-building'.

TechTip: Standards maximize the value of geospatial software

Participatory GIS projects usually involve collaboration, which in turn requires the sharing of geospatial information. Until recently this often meant that data files needed to be converted from one system's internal format into that of another system.



A web browser accessing multiple map servers.

To overcome these 'non-interoperability' problems, the Open Geospatial Consortium (OGC) and ISO Technical Committee 211 (ISO TC/211), together with geospatial technology vendors, have developed a set of standards for open interface and encoding specifications. By applying these standards in their products, vendors can now offer geoprocessing software systems that can access data regardless of where and how they are stored.

The OGC standards open up many new opportunities for GIS projects. For example, with the OGC's OpenGIS® Web Map Server (WMS) anyone with an ordinary web browser can call up multiple overlaid thematic maps. The maps may be generated by different servers at different sites running different software. This integrated access is possible because the OGC's standards have been applied in these systems.

To learn more about these standards, see the Spatial Data Infrastructure Cookbook v2.0 (January 2004, pdf), which is available on the GSDI Association website (www.gsdi.org/gsdicookbookindex.asp). See also the OGC Reference Model (ORM): www.opengeospatial.org/specs/?page=orm

ICT-05-27-en-DEF.qxp 27-8-2005 14:28 Pagina 8

Q&A: GIT&S and PGIS for developing countries

Peter Kyem explains that although both conventional GIT&S and participatory GIS approaches can contribute to natural resource planning and management in developing countries, PGIS offers specific added value.

Dr Kyem, you are an expert in the use of geographic information technologies and systems (GIT&S) for managing natural resources and the environment. Why are GIT&S applications important for developing countries?

Information technology is now part of the daily lives of many people in developing countries. Economic planners and policy makers have become increasingly dependent on GIT&S for decisions regarding the use of their countries' resources. They require a wide range of high-quality spatial information, which can only be collected, organized and analyzed using GIT&S tools.

The same tools can also be used to empower marginalized groups and disadvantaged communities, and to give them leverage in their dealings with government officials. With such community-based applications, or participatory geographic information systems (PGIS), local people can provide their own inputs and contextual information, so that local issues can be discussed and feed into national debates, which in turn may compel public officials to take action.

Are there drawbacks for developing countries that wish to adopt GIT&S?

GIT&S require complex and expensive hardware, software, spatial data, power supplies and stationery. Developing countries that wish to make use of these technologies therefore tend to rely on external assistance programmes. Unfortunately, donors' interests, and even international agreements on the use of spatial data and satellite imagery, often dictate the ways in which these technologies are applied. Moreover, this assistance often comes with specific GIT&S hardware and software, each with its own 'standards'. In the implementation of GIT&S projects in developing countries, therefore, the agenda is often set by the donors, together with their consultants, and can result in data compatibility problems when the results of different projects need to be combined or compared.

Nevertheless, there have also been many positive developments. The prices of computer hardware and software have declined sharply over the years, accompanied by remarkable improvements in quality. Computers and GPS units have become smaller, lighter and more portable, and so can be used in remote areas. These developments have made GIT&S, and in particular PGIS, increasingly attractive for NGOs and civil society groups that wish to involve local communities in mapping, planning and managing their natural resources.

What are the differences between PGIS and conventional approaches?

Conventional GIT&S and PGIS approaches have much in common. They require the same hardware and software, and specialists have similar professional training and academic interests. The principal difference is that the agendas of conventional GIT&S studies are usually defined by experts and public officials, and concentrate on collecting and analyzing spatial data to support decision making. In PGIS projects, in contrast, the agendas are set by local groups and activists, and tend to emphasize participatory processes and empowering communities. They incorporate many qualitative techniques, such as sketch maps, photographs or oral traditions, to enable communities to articulate their knowledge of their land, forests and other resources.

The approaches differ in terms of the social contexts within which the technologies are applied (by public institutions as opposed to community-based organizations), the nature of the issues addressed (official decision making rather than local empowerment) and the intended beneficiaries (public officials versus marginalized communities).

At present, there is little agreement among GIT&S experts on the limitations of PGIS. Some experts contend that PGIS models fail to meet the accepted data standards for conventional GIS. Others argue that 'pseudo-data' models can be developed to bridge the gap between the strict spatial models used by conventional GIT&S, and those used to visualize local people's perception of space in community areas.

Why has PGIS such a potential for developing countries?

As the growing number of PGIS projects in developing countries clearly demonstrate, local people, with minimal basic training, can use GIS hardware and software to record data and other spatial information about their land and resources. They are also able to 'work their maps', and use them effectively to express their opinions in debates about the sustainable use of those resources. These developments are encouraging. They show that sophisticated technology can empower marginalized groups by providing them with some leverage in their dealings with government agencies and private companies that are making plans for exploiting natural resources in their environs. ■

Dr Peter A. Kwaku Kyem (kyemp@mail.ccsu.edu) is Associate Professor of Geography at the Central Connecticut State University, New Britain, CT, USA

***ICT Update*, issue 27, September 2005.** *ICT Update* is a bimonthly printed bulletin with an accompanying web magazine (http://ictupdate.cta.int) and email newsletter. Each issue focuses on a specific theme relevant to ICTs for agricultural and rural development in African, Caribbean and Pacific (ACP) countries, and includes feature articles and annotated links to related web resources and projects. The next issue will be available on 1 October 2005.

Publisher: CTA Technical Centre for Agricultural and Rural Cooperation (ACP-EU), Postbus 380, 6700 AJ Wageningen, The Netherlands
Production and content management: Contactivity bv, Nieuwe Mare 23, 2312NL Leiden, The Netherlands
Coordinating editor: Rutger Engelhard / **Research and editing:** Mariana Mozdzer, Valerie Jones / **Graphic design:** Anita Toebosch / **Translation:** Nadia Sadoughi, Patrice Pinguet / **Editorial advisory committee:** Kevin Painting and Peter Ballantyne / **Copyright:** © 2005, CTA, Wageningen, The Netherlands / **Website:** www.cta.int