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Mobile GIS and local knowledge in monitoring carbon stocks

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Jeroen Verplanke describes the development of a mobile GIS unit 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 georeferenced 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 predesigned 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 userfriendly 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 (verplanke@itc.nl) is a researcher at the International Institute for Geo-information Science and Earth Observation (ITC) in Enschede, the Netherlands.

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