Geographic information systems and democracy

Wow, what a view!

Way back, when you'd done with learning to walk and run and were seriously into jumping, remember how you used to leap as high as the sky and think you could stay up there for ever and ever? How much more you could see from up yonder! That was GIS-1, your first geographic information system.

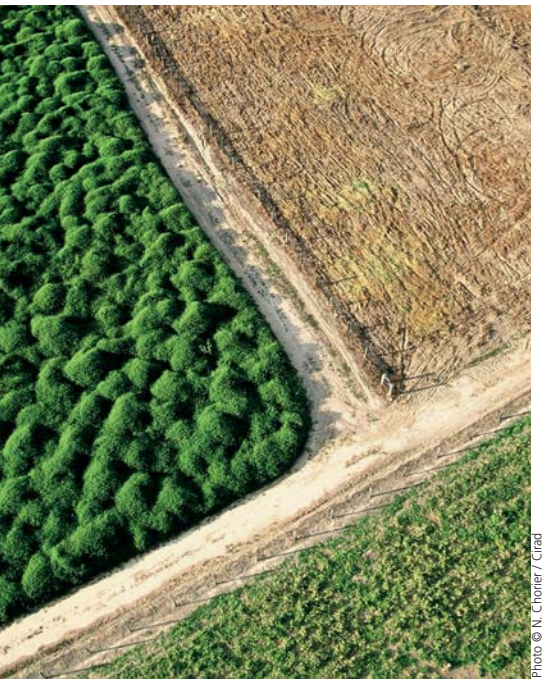

Photo © N. Chorier / Cirad

Today, if you have the good fortune to fly into Kingston, Jamaica and the wind is westerly, about 35 seconds before landing you'll be above Portmore town, home to maybe 70,000 people. It is built on a reclaimed and still wobbly marsh at the south-west end of the sweep of Kingston Bay, herself Nature's Number One Gift to maritime trade, so sweet she is.

Beneath the streets laid out by square-eyed planners, nudging a few plants and goats of urban farmers, between the higgledy paths etched out across pale empty plots by contrary pedestrians, sometimes even below rows of houses, you'll see darker patches of land. The dark stands out most when seen from above – it's moisture. These are the old tidal creeks which the land and the banished sea still remember, even if the planners have forgotten – having drained them and covered them with trash ('landfill'), sand and buildings. Today, an astute plane passenger (tip: sit on the right-hand side) can look down and reflect on the ebb and flow of humanity's relationship with the rest of Nature. For, 5 seconds later, you'll fly over the village of Port Royal (see *Spore* 84 and Millennium issue), first swallowed by the sea after an earthquake in 1692. Woe betide Portmore, some say.

Fitting bits together

The ability to see and interpret details of a physical landscape from above is a science that is fast coming of age via geographic information systems (GIS). They take data from various measurements, texts, maps, views and pictures (from a nearby hill, a kite, a plane or sometimes a satellite) of the natural cover, and of people's interventions, in a defined area.

By converting the data into layers (as in the diagrams), the user of a GIS can see how different sets of data relate to each other: the relationships possible, for example, between the incidence of trypanosomiasis and changes in vegetation cover as a result of climatic changes, or tensions these changes are provoking about land ownership, or the impact of people-induced deforestation on water flows and fertile alluvial deposits downstream. Such links are, to be sure, also often visible to the human eye, but the use of a GIS, and the number-crunching and graphic presentation that a computer allows, make the process easier and more informative. In short, the value of a GIS for any range of stakeholders in rural – and urban – development is, in the jargon, multi-functional, and potentially highly enriching. But for whom exactly?

Technology? Let's appropriate it!

One encyclopaedic explanation (Encarta's) notes that "scientists use GIS images as models, making measurements, gathering data, and testing ideas." That description, in the opinion of many communities and development specialists who want to make GIS technology their own, should be expanded beyond just scientists. It is perhaps a sign of the relative youth of GIS that the scientific communities working on them, just like any new faith communities, are giving their emerging schools of thought such labels as 'participatory', 'resource-driven', 'community integrated' or 'people-based'.

Whatever the labels, appropriating GIS technology is definitely no easy task. The technology for collecting, presenting and layering data is, in the main, sophisticated – though such innovations as the kite-carried camera (see *Spore* 85, and the related new publication due to be reviewed in *Spore* 110) are welcome additions to the simpler end of the scale. Among participation-minded GIS scientists a whole new approach has broken through, particularly in the area of natural resource management. Expressed mainly through the construction of physical scale models by local communities, carving out and colouring landscapes from layered and glued cardboard, it focuses on 'participatory 3-dimensional modelling' (P3DM).

Photo F. Hoogervorst © Panos Pictures

Guidance from on high. Satellite data help you plot the spot.

Developed in the Regional Centre for Biodiversity Conservation of the Association of Southeast Asian Nations (ASEAN) in the Philippines, with support from the European Union, its proponents argue passionately that the use of scaled-relief models, in a process of consultative participation, can become a highly empowering form of inclusive knowledge management. P3DM has already been used with success in resolving land conflicts in the Philippino Cordillera. Approach it with humility, though.

The co-author of *Participatory 3-dimensional modelling: Guiding principles and*

applications, Giacomo Rambaldi, cautions that "enlarged participation brings to the fore an increased number of interests which may be conflicting. Therefore it is important that the process be carefully prepared, well managed and embedded in a long-lasting, articulated intervention, able to deal with follow-up arrangements to accommodate new realities emerging from the process."

Looking at models is even better than looking at maps. In Vietnam, stakeholders carved a scale model to discuss land and water access.

Photo G. Rambaldi ARCBC

That picture of you – is it yours?

Let us hope that P3DM methods can be adapted to the varying training contexts and practices prevalent in ACP regions. It could lead to many demands from ACP producer groups for GIS to help in land mediation and management, natural resources management and infrastructural development. It could also serve as a facilitator for other uses of GIS.

Yet even then, broader issues will remain. Whose data are GIS data, anyway? Some authorities, indeed even some landowners, will be none too happy about the collection of such data through such hard-to-prohibit technologies. Will they see it as espionage? Will they grasp what a tool this could be for democratisation? Or will they hear, just as we all should, that levelling refrain of a Celtic peasant song: "You don't own the land, the land owns you"?

For more information

Geographical information systems and remote sensing as tools for rural development in sub-Saharan Africa
Seminar proceedings, *Enschede, The Netherlands, 1997.*
CTA, 1998, 228 pp.
ISBN 92 9081 1986
CTA number 904. ***40*** *credit points*

Participatory 3-dimensional modelling: Guiding principles and applications
by G Rambaldi & J Callosa-Tarr
ARCBC, Los Baños, Laguna, Philippines, 2002, 82 pp.
ISBN: 971–8986–472
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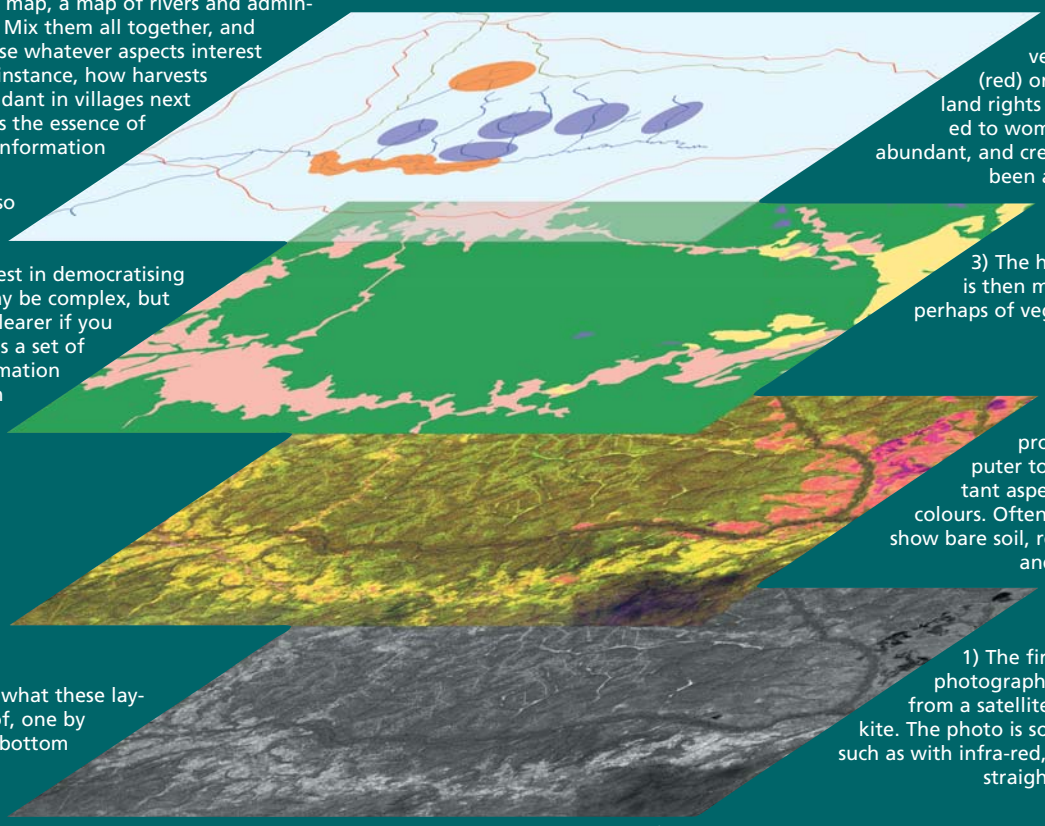
Extensive set of GIS and P3DM documents, people and links: www.iapad.org

Making a GIS, layer by layer by layer

First take some statistics – a population census, harvest yields or meteorological data. Add some maps – a relief map, a map of rivers and administrative areas. Mix them all together, and you can visualise whatever aspects interest you most. For instance, how harvests are more abundant in villages next to rivers. This is the essence of a Geographic Information System.

Are GIS really so simple? Not really – hence the keen interest in democratising them. They may be complex, but they become clearer if you look at them as a set of layers of information piled neatly on top of each other.

Take a look at what these layers are made of, one by one, from the bottom up.



4) The map is then combined with statistics about the area and you can make new maps of linked aspects. The map on the left could show, for example, where harvest yields are high (red) or low (blue) when land rights have been granted to women and rainfall is abundant, and credit for inputs has been available (or not).

3) The highlighted image is then made into a map – perhaps of vegetation or crops.

2) The photo is processed on a computer to highlight important aspects with arbitrary colours. Often, green is used to show bare soil, red for vegetation and black for water.

1) The first layer is often a photograph of an area taken from a satellite, plane or even a kite. The photo is sometimes filtered, such as with infra-red, but mostly it is a straightforward picture.

Image building B. Favre / courtesy of Cirad