

Reality 3D: Innovative Representations of an Andean Landscape

Mountain environments present many challenges, not least of which is how to accurately portray their ecological complexity for purposes of integrated natural resource management. In the Andes mountains of Ecuador, the SANREM-Andes team has been experimenting with innovative methodologies that enable a better representation and, therefore, a better understanding and management of the natural landscape. This is particularly important given that the mountainous nature of the research site, which includes the Cotacachi municipality, comprises communities at a wide range of altitudes and with a diversity of livelihood systems. The latter include rainfed cultivation of potato, barley, wheat and quinoa in the uplands, livestock and vegetable production on the slopes, and irrigated agriculture, including export-oriented floriculture in the lowlands. Cotacachi also borders the Cotacachi-Cayapas Ecological Reserve, one of the world's richest biodiversity hotspots.

Since 1994, SANREM has been conducting interdisciplinary research on natural resource management in these sites, producing a wealth of cartographic maps, remote sensing images, aerial photos, soils characterizations, and GIS maps. However, while these products and tools satisfy the needs of research, they do not always represent information in ways that are easily grasped by key decision-makers, such as NGOs, local government, and indigenous communities. To better integrate data into a scenario that is coherent with local conceptualization of the landscape, anthropologist Robert Rhoades, the Program Manager for the SANREM-Andes research team, proposed that SANREM researchers and local stakeholders work together to develop a P3DM (Participatory 3 Dimensional Modeling), a methodology originally developed by IAPAD (Integrated Approaches to Participatory Development) in the Philippines¹. The approach consists of a participatory process whereby spatial information is combined with people's knowledge into a tool to be used in advocacy activity, awareness raising, community planning, conflict resolution, and participatory monitoring and evaluation. In Ecuador, its role was also extended to the realm of collaborative research.



The bare layers of cardboard give the maqueta its 3-dimensionality

The core tool of this methodology is a relief model (called *maqueta* in Spanish) of the landscape, built by placing layers of material such as cardboard or styrofoam on top of one another, each layer having been cut out to represent the contour lines of a topographical map. Because of its emphasis on the vertical dimension, this tool is particularly suited to application in mountain environments. *Verticality* is a fundamental feature of Andean landscapes and livelihoods, which rely on exchanges of goods and services among production zones and social spaces at different altitude levels. In Cotacachi this layered system structures agricultural practices, migratory patterns, community relationships, and cognitive perspectives. In participatory mapping exercises, local people tend to draw their communities in terms of vertical arrangements of upland and lowland fields, pastures, and settlements. A relief model is therefore better able to represent key ecosystem linkages as well as to be more consistent with local understandings of the environment than two-dimensional maps or images.

The participatory process is as important a component of the P3DM methodology as the finished product. This process is inherently dynamic and never completed, since information is constantly revised and updated as new stakeholders or processes intervene and affect the landscape. In the SANREM Ecuadorian site, this process began in January 2003 as a collaborative activity between SANREM, the Ministry of Agriculture of Ecuador, and UNORCAC, a local federation of indigenous communities (Union de Organizaciones Campesinas de Cotacachi). The process was coordinated by the SANREM Site

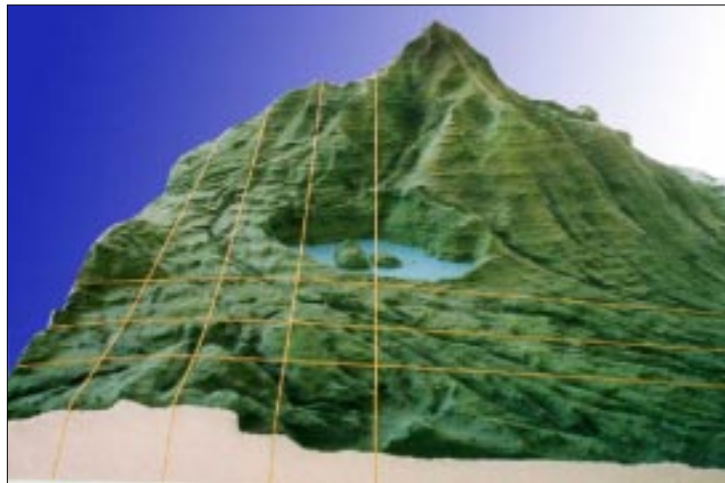
Coordinator Shiloh Moates. Several meetings were held during which stakeholders discussed and decided what to include in the model as well as its appropriate scale and size.

As a catalyst of information exchange and analytical reflection, the *maqueta* constitutes a powerful instrument for social learning, consensus building, and participatory development. After the basic relief model was laid out, the specific features and properties of the landscape were filled in by local people through a participatory process. This exercise offered a unique educational opportunity that enabled local people to clearly visualize and understand issues of both human-environment interactions. Among stakeholders, it also provided a platform for dialogue concerning watershed management and mediation of

conflicts surrounding natural resource use. For instance, it served as a visual aid to indigenous communities and their neighbors in the facilitation of agreements surrounding grazing rights and resource use in the Natural Reserve as well as discussions surrounding territorial boundaries, often the subject of tension because of contradictions between ancestral rights, formal deeds, and land reform provisions. In the effort to promote rural eco-tourism and generate revenues in the region, UNORCAC uses the *maqueta* to highlight locations of cultural and natural interest, such as culturally significant places of ritual (i.e., where ritual baths or cleansings are held) and hiking trails leading to Cuicocha Lake and to the summit of Mt. Cotacachi.

Besides its potential for capacity building and conflict management at the community level, the *maqueta* also fulfills important scientific purposes as a tool for data integration and analysis. Researchers are able to over-

lay their data on the landscape and analyze it in the broader context of regional ecology/economy and natural and social system interactions. For example, water quality data can be used to pinpoint contamination points and examine how those may be affected by production strategies, settlement patterns, and other variables. Likewise, soil data can be overlaid on the model to illustrate issues of erosion and fertility in relation to land use and climate at various altitudes. The *maqueta* has been used by a team of researchers who are studying upstream-downstream interactions surrounding the Pitzambitze river, a tributary of the



Strong gridwork is placed over the *maqueta* to accurately pinpoint locations on the landscape

Ambi river. By plotting their data on the model, they showed how upstream processes of contamination and deforestation affect downstream communities. For instance, the common practice of burning grasslands at high altitudes results in erosion problems and water table disturbances downstream.

In the future, the SAN-REM-Andes team plans to use the *maqueta* in the course of future visioning workshops to elicit local stakeholders' perceptions of

environmental change and imagined scenarios of a desirable future, and in the course of focus groups on social history to stimulate local people's recollections of the past *hacienda* system and of the establishment of indigenous communities. Other experiments will extend to the study of local knowledge and environmental ethos. For instance, by integrating the *maqueta* in cognitive mapping exercises and by adding key landmarks of religious and cultural interest to the model, SANREM researchers can potentially analyze the relationship between cultural values and perceptions on one hand, and landscape integrity on the other.

¹ See http://www.iapad.org/participatory_p3dm.htm

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