Who Owns the Map Legend?

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Introduction

Maps are media in cartographic or digital formats. Communication occurs mainly by way of symbols that need to be interpreted via the map legend and its graphic vocabulary. Lacking universal standards, each map has its own visual language. This language—or enough of it—has to be "common property" in order for communication of any kind to take place.

This *ad hoc* language has become increasingly important since maps have been used in the contexts of interactive processes aimed at bridging barriers among stakeholders having different backgrounds, perspectives, and communication patterns. Intellectual ownership of such language and the *content of knowledge* that it communicates, are critical factors in determining the success of the processes to which mapping and maps are put.

Based on literature review and case studies done in developing countries in the contexts of participatory planning and territorial negotiations, this paper analyzes the roles of the legend—and the processes that lead to its composition—in determining the intellectual ownership of spatial information visualised in the form of maps.

Mapping And Participatory Processes

Historical Perspective

Mapping is a fundamental way for displaying spatial human cognition. "It is a representational medium that both has a history and is part of the practice of history." (Herrington 2003) For centuries and increasingly with the advent of Geographic Information Technologies and Systems (GIT&S), graphic representations of part or the whole of Earth in cartographic, electronic, 2- or 3-dimensional formats have been playing significant roles as media (Sui and Goodchild 2001) used to store, display, and convey information, and as a basis of analysis and decision making.

In the past, maps have been made primarily to serve precise tasks, such as describing discoveries, navigating space, defining boundaries, registering ownership, and locating resources. In the early 1990s, Monmonier (1996, 2) wrote that "*a single map is one of an indefinitely large number of graphical models of the spatial aspects of reality that might be produced for the same situation or from the same data.*"

Changes have occurred since GIT&S have increasingly become accessible to civil society and graphic representations of space have been used as channels for two-way communication purposes to support social learning, dialogue, and negotiation processes. In March 2004, more than 200 representatives from indigenous groups attended the International Forum on Indigenous Mapping in Vancouver, British Columbia, Canada, sharing the motto: "*Maps are more than pieces of paper. They are stories, conversations, lives and songs lived out in a place, and are inseparable from the political and cultural contexts in which they are used.*" (Warren 2004)

The participatory use of maps started in the late 1980s. At that time, development practitioners were inclined to adopt PRA *sketch mapping tools* (Mascarenhas 199 1) rather than venturing into more complex, demanding, and time-consuming *scale mapping*. This was because preference was given to eliciting village dynamics and to facilitating communication between insiders and outsiders (researchers), rather than to courses of action enabling communities to interact efficiently with policy makers. In addition, in many developing countries, aerial photography, satellite imagery, and official, large-scale topographic maps were under governmental control and their access restricted because of national security concerns.

The situation changed in the 1990s, with the diffusion of modern GIT&S including geographic information systems (GIS), low-cost global positioning systems (GPS), remote sensing image analysis software, open access to data via the Internet, and the steadily decreasing cost of hardware. Spatial data, previously controlled by government institutions became progressively more accessible to and mastered by non-governmental and community-based organisations, minority groups, and sectors of society traditionally disenfranchised by maps and marginalized from decision-making processes (Fox 2003). This new environment facilitated the integration of GIT&S into community-centred initiatives, particularly to deal with spatial information and communication management. Practitioners and researchers around the world have been working on different approaches making use of a variety of GIT&S, but all sharing the goals of placing ordinary people in the position to generate, analyse, manage, and exchange georeferenced data, and to integrate multiple realities and diverse forms of information to foster social learning and

broaden public participation across socio-economic contexts, locations, and sectors. This has spurred a rapid development in the management of spatial multimedia information through what is generally termed as Participatory GIS (PGIS), where maps are conceived as interactive vehicles for discussion and information exchange, are physical or virtual, are in 2- or 3-dimensional formats, and are enriched by an array of data types including sound and images (Aberley 2002).

Large-scale maps (< 1:20,000 scale) and physical or digital terrain elevation models have been used for conducting collaborative research (Hampson 2003; Tran Trong 2002; Quan 2001; Martin 2001; Tan-Kim-Yong 1994, 1992), community-based planning, monitoring change, asserting territorial claims (McCall 2004; Bersalona 2004; Rambaldi 2002a; Zingapan 1999; Poole 1998, 1995; Denniston 1995), managing territorial disputes and supporting related negotiations (Cook 2003; Chacon 2003; Carton 2002a; Rambaldi 2002b; Wood 2000; Johnson 1999; Poole 1998), preserving and revitalising indigenous cultural resources and intangible heritage (Poole 2003; Crawhall 2003, 2001), and consultative policy making (Carton 2002b). While most authors point to the effectiveness of GIT&S used in a participative mode, McCall (2004), Fox (2003), Crawhall (2003), Rambaldi (2002a), Abbot (1998), and Rundstrom (1995) call for caution because these may lead to increased conflict, resource privatization, and loss of common property.

Maps As Media

The Power of Maps

Maps are highly communicative forms of spatial representation, and as Alcorn (2000, 11) puts it: "*Maps communicate information immediately and convey a sense of authority*." Few dispute them, particularly when these are drawn as planimetric projection (in two dimensions) and at scales smaller than 1:20,000. This may be due to the difficulty encountered by individuals in relating the information displayed on small-scale maps to their real world, thus limiting their capability of critical argumentation.

The communicative power of maps has been used for both noble and questionable purposes, including among others education, awareness raising, advertisement, political propaganda, disinformation (Monmonier 1996), re-/deterritorialization, and nationalisation (Wood 2000).

"Maps produced by European explorers were an exemplar expression of cartographic power: by ignoring indigenous names, and barely alluding to the presence of local settlements, in effect they declared the land to be empty and available." (Poole 1998)

The Key to Using Maps as Media

Visual language. Mapmakers use maps to convey information mainly through a visual language made out of legend items, a combination of symbols (points, lines, polygons, and volumes), their variables (hue, orientation, shading value, shape, size, and texture), and interpretation keys. Physical terrain models offer a more efficient interpretation base in displaying the vertical dimension, which provides additional cues to memory and facilitates mental spatial knowledge processing.

The "talkative" capacity of maps rests in the selection of featured items, in the manner these are depicted, and in the capability of users to understand, interpret, and relate these to their real worlds.

Particularly when a map is used to support a dialogue, it is important that its graphic vocabulary is fully understood by all parties involved. Each displayed feature needs a key to be interpreted. As Carton (2002b) puts it, the legend items form the kernels of the mapping language.

Choosing symbols and their variables. The most expressive variables associated to symbols are colour and size. More authoritative than others, colour (or hue) serves as a powerful system of differentiation, "*burdened with cultural meaning, overwhelmed by its associations and its history. Yet colour is a code that is constantly subject to change*." (Ferrier 2002, par. 3) Nonetheless, when it comes to mapping Earth features, there are some silent conventions that have become common practice: water bodies are shown as blue and vegetation as green; more is darker and less is lighter. Other hues are associated with traditional meanings depending on the cultural traits of the participating communities: death is associated to white in India, black among Westerners, and violet amid Mangyans in the Philippines.

> "*What these various figurative uses of colour have in common is the way that they present colour as linked with perception, and as perception that is not neutral or objective, but value added that is, overlaid with cultural value*." (Ferrier 2002, par. 5)

In mapmaking, the association of a specific hue to a symbol or feature is therefore far from being a neutral act and may even become provocative in a participatory setting, like the false colour red that symbolises vegetation in remote sensing. The same applies to points, lines, areas, and volumes, the remaining sets of symbols. When used to depict real-world features, their choice and their variation correspond to selected interpretations of reality made by those who compose the map.

Defining the attribute. For mapmakers, an *attribute* is the characteristic of a geographic (physical and social) feature described by numbers, characters, images, or sounds. To be objectively interpreted, spatial characteristics depicted by the use of symbols need clearly defined attributes. This is quite straightforward with numbers and images, but it becomes relatively critical when text is the chosen medium and when the purpose for participatory mapmaking is to establish two-way communication channels. *Primary forest*, as an example, is a term that may have a different meaning for a scientist, a government official, or a farmer, or it may mean nothing at all.

Figure 1. Indigenous People in the Philippines Featuring a Catchment by the Use of Soil

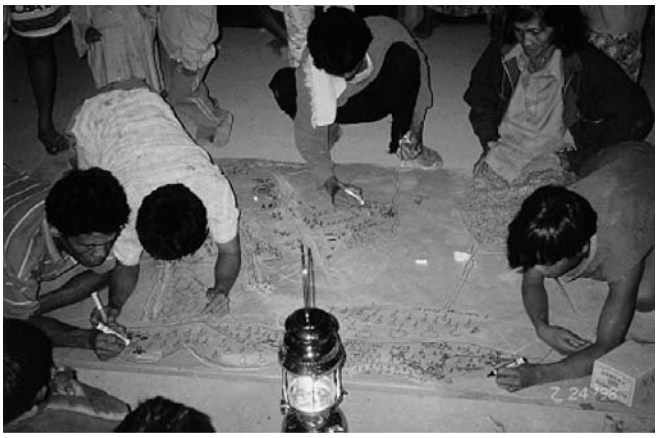

Figure 2. Villagers in Mindanao, Philippines, Preparing a Resource Distribution Sketch Map

Figure 3. 1:5,000 Scale Participatory 3D Model (Indigenous people outlining boundaries.)

Map Legends From A Practical Perspective

From Pebbles to Keyboards

The most basic mapmaking method consists of drawing maps on the ground (Figure 1). Informants use raw materials like soil, pebbles, sticks, and leaves, at the reach of their hands to reproduce the physical and cultural landscapes as they know and perceive them.

Finger-pointing, verbal interactions, and progressive additions and modifications of landmarks lead to the visualisation of the territory and issues at stake.

Hardly any legend is produced, and such ephemeral maps disappear in a matter of a wind blow. Acquired knowledge is memorised by participants and mentally recomposed when needed.

Sketch mapping is a slightly more elaborate method that makes use of large sheets of craft paper and is usually facilitated (Figure 2). Features are depicted by the use of natural materials or more frequently by coloured marker pens or chalk.

Participants are in the position to make their choices in terms of what to use and how to visualise desired items. Usually depicted features are exaggerated in size, depending on the importance participants attached to each of them. When properly facilitated, the process is documented and records are kept in terms of the keys necessary for interpreting depicted symbols. Provided a legend is produced and joint to the final output, this method ensures storage, mobility, and wider shareability of collated information. Still, the lack of a consistent scale and georeferenced data leaves ample room for subjective interpretations.

More sophisticated methods of participatory 2- or 3-dimensional *scale mapping* aim at generating georeferenced data and depend on a disciplined use of selected symbols and colours for depicting desired features (Figure 3).

These methods rely on the availability of such topographic data as contour lines, and they require substantial preparatory work.

Good facilitation ensures sufficient and varied stock of materials for depicting symbols and their variables to be placed at the disposal of mapmakers.

A legend may be "proposed," "imposed," or better "composed" during the course of the mapping exercise. In the latter case, the legend evolves dynamically through an iterative process.

GIS used in a participatory mode allow communities to display and eventually handle spatial data. Nonetheless, these are necessarily fed via a computer keyboard or other digital devices. Thus, the choice on how to visualise tangible or intangible features through digital maps rests in the sole hands of the system operator and in the graphic capacity of the software, which may

Table 1. Evolution of Legend Items during Phases of Participatory Mapmaking

On the Field		On/Off the Field
Community Consultation and/or Raw Data Collection	Data Collection & Non-digital Mapmaking	Data Analysis, Digital Editing, Manipulation, etc.
• Tentative list of features compiled • Textual description of single features drafted • Eventual customary associations between "features" and "their display" identified • Draft legend prepared	• Draft legend items revised • New items included • Selected items excluded • Sensitive features identified • Makeshift legend(s) produced (showing public and/or confidential items)	• Content matching • Polishing • Symbols and variables matched with available software graphics • Display of layers (public and restricted access) agreed on and defined • Legends prepared

or may not be in the position to reproduce features as envisioned by the participants.

Nurturing the Legend

In practical terms, the facilitation of a community-based mapping exercise involves the drafting of a list of legend items ahead of the event to kick-start the process (Table 1). Such a list is the result of preparatory consultations held with concerned stakeholders with the objective of identifying features of the physical and cultural landscapes that are relevant and known to those who will take part in mapmaking.

As the mapping process enfolds, facilitators solicit the thorough revision of the proposed legend items (Figure 4), their unambiguous definition, and their association with clearly identifiable and culturally acceptable symbols in order to distinctively depict and describe physical, biological, and socio-cultural features of the territory and its people, and to facilitate their objective interpretation.

The participatory process of progressively adding features to a map has important discovery and social learning implications that frequently induce participants to identify, prioritise, and select new items to display or, in some cases, to remove previously listed ones, for example, those that are nonexistent, are considered as nonrelevant, or are insufficiently defined (Boxes 1, 2, and 3). These processes, which lead to the interactive development of the legend, depend on local knowledge, perceived priorities, and sensitiveness of data, and are based on dialogue and negotiation as documented by Hardcastle (2004), Rambaldi (2003, 2002a, 2002b), and Carton (2002b) in the contexts of community-based mapping exercises in Southeast Asia, the Pacific, and Europe.

Discussion

The three cases featured in this paper indicate that prioritising and getting a consensus among mapmakers on which items are relevant and what should be featured on a map, are the first steps in a participatory process aimed at addressing community-based issues related to the territory and its resources

The key for depicting spatial information for communication purposes is to make such visualisation objectively understandable through the development of a visual language having a clearly-defined vocabulary. Common ground and understanding need to be established, and the use of local definitions and vernacular translations helps.

In choosing symbols and their variables, good practice ensures that these are visually linked to real-world features, culturally significant and acceptable, sufficiently assorted, readily available, and consistently applied. Furthermore, good practice makes sure that their attributes are clearly and unambiguously spelled out to grant as far as possible objective understanding.

Except for community maps making use of locally available materials, such as soil, leaves, charcoal, and the like, community mapmakers have to match the features they want to depict with symbols made available by the technology in use. Participatory 3D models offer pushpins and map pins, yarns, and paint to depict points, lines, and polygons. Digital maps display results based on the available sets of symbols, which are numerous but limited to the software and available add-ons.

Questions of ownership should arise in the minds of the facilitators: Who decides on what is "important"? Who defines the attribute of single items in objectively understandable terms? Who selects the symbol and variable to depict a given feature? If made public, who decides on what to display on the map and its legend? Ultimately, who owns the pictorial language, its graphic vocabulary, and the resulting message? Who owns the map legend?

Conclusion

The full potential of GIT&S as two-way communication channels will become a reality when practitioners and facilitators realise the importance of ensuring full involvement of concerned stakehold-

Box 1

Context: Protected area management plan preparation, Pu Mat National Park, Social Forestry and Nature Conservation (SFNC) Project in Nghe An Province, Vietnam (1998–2004)

Purpose of the community mapping exercise: To improve relationships and foster reciprocating respect between National Park staff and local communities; to induce a paradigm shift on "Who knows" and "Whose knowledge counts"; and to provide stakeholders with a comprehensive, user-friendly research, planning, and management instrument.

GIT&S used: P3DM and GIS

Key informants/mapmakers: 76 Dan Lai, Thai and Kinh Hill Tribe peoples, 6 park rangers, and 10 SFNC project staff

Figure 5. Hill Tribe People Discussing Legend Items during a P3DM Exercise, Pu Mat, Vietnam

Context issue: At the beginning of the activity informants were invited to review the draft legend, suggest changes, make integrations, and improve definitions (Figure 5).

Figure 6. Final Legend of the 3D Model of Pu Mat National Park, Vietnam

By the end of the exercise, after 4 days of intensive dialogue, the initial legend had expanded from 18 features to a total of 55 features, including points, lines, and polygons.

Some items listed on the draft legend were removed, because they were nonexistent or deemed as irrelevant or too sensitive as per community perspective. These included among others the following features: (1) points: gold-mining site, abandoned village, hunter's hut, resting site for forest rangers; (2) polygons: industrial crop (changed by informants to more specific definitions, such as sugarcane and tea plantations and planted bamboo forest); and (3) lines: buffer zone boundary.

Others were added, including: (1) points (i.e., locations): like Commune's People Committee, border police station, temple, cave, docking site along river, tree nursery, cemetery, etc.; and (2) polygons: identified as natural bamboo forest, resettlement area, crops on terraces, stony areas.

Some features identifying wildlife sighting sites for tiger, bear, elephant, deer (saola), gayal, and the like were removed from the model and excluded from the final legend because they were deemed sensitive and at risk of exposing endangered species to increased pressure from poachers.

In addition to revising the listing of the legend items (Figure 6), the villagers in collaboration with government officials improved their textual definitions and ensured the translations of the various features to ensure an objective understanding across stakeholders (Rambaldi 2003).

Box 2

Figure 7. Villager Inputting Data on a 3D Model by the Use of Colour-coded Paint

Context: Collaborative Protected Area Management Planning, Mount Malindang Natural Park, Misamis Occidental, Mindanao, Philippines. National Integrated Protected Area Programme (NIPAP), Philippines (1996–2001).

Purpose of the community mapping exercise: To contribute to the development of a protected area management plan based on a blend of indigenous technical knowledge (ITK) and scientific knowledge.

GIT&S used: P3DM and GIS

Key informants/mapmakers: 98 community members including representatives from the Subanen Indigenous Communities, residents of all local administrative units (barangays), local government officials, Department of Environment and Natural Resources (DENR) and non-governmental organizations (NGO).

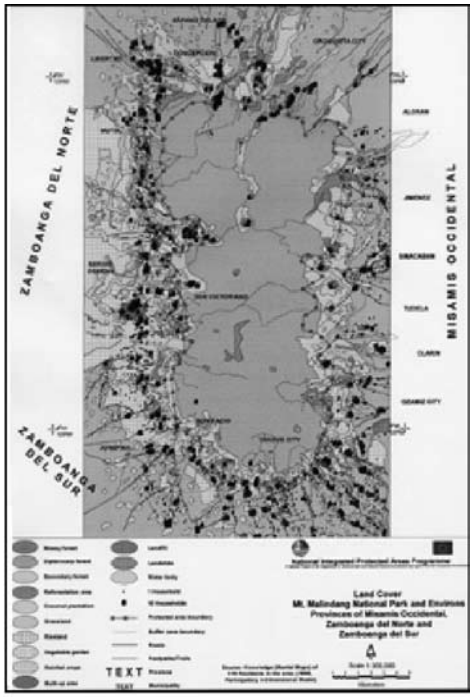

Figure 8. Map Resulting from Data Extracted from a Participatory 3D Model, Mt. Malindang National Park, Philippines, 1999

Context issue: The 1:10,000-scale exercise covered a vast area (1,176 km2) including portions of five Indigenous Peoples' Ancestral Domains. In order to assist participants in recomposing their mental maps (Figure 7), the facilitators produced base maps featuring roads in addition to contour lines, which are a standard feature for base maps used in P3DM.

When assisted in outlining the roads by transposing their coordinates from the base maps to the 3D model, participants contested the validity of the data, stating that the roads no longer existed and that these were logging roads currently overgrown by natural vegetation. The legend item was modified and what was originally indicated as "road" was redefined as "footpath" (old logging road) and depicted on the model only where applicable depending on its actual existence.

It is worth noting that the data used for the production of the base map were obtained from the National Mapping Resource and Information Agency (NAMRIA). The data turned out to date back to World War II.

In reviewing and expanding the legend, informants included such new items as "landslide" and "landfill area," and further refined specific land uses (e.g., coconut plantations, vegetable gardens, orchards, etc.) and vegetation types. In this latter case, participants listed and depicted five different types of forest that were not shown on pre-existing maps (Figure 8).

Box 3

Context: Collaborative Protected Area Management Planning, Mount Pulag National Park, Benguet, Cordillera Region, Philippines. National Integrated Protected Area Programme (NIPAP), Philippines (1996–2001).

Purpose of the community mapping exercise: The model has been used by the Protected Area Office for raising awareness on the location of the park boundaries and important natural resources. More importantly, it has been used for discussing the outlining and revision of protected area boundaries with local communities (Figure 9).

The local government unit has used the model for revising local administrative boundaries and for planning purposes.

Figure 9. Village Elders Outlining Linear Features on a 3D Model in the Cordillera Administrative Region, Philippines, 1999

GIT&S used: P3DM and GIS

Key informants/mapmakers: 75 representatives from the Ibaloi, Kalanguya, Kankana-eys, and Karaos indigenous communities, local government officials, DENR, National Power Corporation (NAPOCOR), and NGOs.

Context issue: This has been the first P3DM exercise implemented in 1998 in the framework of NIPAP.

Informants were provided with a draft legend including 15 different features, and were asked to check, update, and further expand it.

The definition and translation of each legend into vernacular required thorough discussion and levelling off among informants and facilitators.

Figure 10 . Elders Locating Sacred Areas in Mt. Pulag, Cordillera, Philippines, 1999

Proposed items were redefined, associated to clearly identifiable symbols. New items sprung up as the mapping process enfolded. These reflected deep-rooted community concerns and priorities. "Landslides" and "bare land" were singled out as important items to be depicted on the model.

The discussion and depiction of administrative and cultural boundaries turned out to be an extremely sensitive topic among neighbouring tribal communities (Figure 10), and was toned down and finally dropped from the discussion. This was an important learning from the exercise, as boundaries are most frequently leaded with latent conflicts and need special, well-prepared approaches to be dealt with, possibly after the "neutral" depiction of land use and cover, most likely in a separate exercise.

"Sacred areas" with extensive textual description took their due place among the listed legend items.

ers throughout the entire process. This means that besides putting stakeholders at the forefront in generating, collating, and analysing local knowledge, they must be prime actors in defining the map's pictorial language and its graphic vocabulary, the legend.

This also means that in an interactive process that would lead to the composition of a map as a means for social learning and negotiation, the preparation of the legend, particularly the selection of features to display, and the way they are depicted and textually defined, assumes a key role in determining its final intellectual ownership, its resulting message, and its usefulness in the process.

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