Can Participatory-GIS Strengthen Local-level Spatial Planning?
Suggestions for Better Practice

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INTRODUCTION

Participatory mapping (P-mapping) and Participatory GIS (P-GIS) are usually assumed to be cost-effective, notwithstanding that their lower costs may be offset by lower standards of precision and maybe accuracy, than for full-blown GIS. Concomitantly P-mapping and P-GIS are considered to have superior effects in terms of relevance, usefulness, sustainability, empowerment, and meeting good governance objectives, due to their eponymous stress on participation and on utilising local knowledge.

But P-mapping and P-GIS are often used superficially and even falsely, for reasons other than supporting participation.

But, then there are 3 questions:

- what are the ramifications of employing a participatory approach in applying geo-information to spatial planning? what should the principles of PSP (participatory spatial planning) imply?
- how to operationalise the principles and concepts of the participatory approach?
- how much difference will it make in the end to the planning decision and activities?

The paper addresses mainly the first two questions, and the third peripherally.

The first three sections deal with P-mapping and P-GIS as applied over the past two decades in natural resource management and community planning, and at a more conceptual level, the categories of participation as a process. Section 4 examines five questions needed to evaluate applications of P-mapping and P-GIS –: Why a participatory approach is employed? Who is involved? What sorts of geospatial information is involved? When? – at what stages? How does the P-GIS function?, with particular reference to visualisation and presentation. Section 6 outlines key factors and criteria in a 'good practice' sequence for P-GIS.

1 P-MAPPING, P-GIS AND PPGIS

There must be more than 500 published examples of applying P-mapping or P-GIS in rural local resource situations, and hundreds more examples of urban community implementation. (McCall 2004) From these widely accumulated experiences can be derived a number of key factors and conditions related to 'good practice' for local communities using P-GIS methods.

P-GIS methods are widely used in North societies (with a few South examples) in urban community neighbourhood identification, problem prioritisation, and participatory planning. In South countries (with some in the North), applications are mainly in natural resource identification and management (especially forests), or for instance, environmental hazard mapping. Native (indigenous) peoples in both North and South utilise P-GIS for legitimising customary land and resource claims, e.g. Canada, USA, Australia, NZ, Philippines, Indonesia, South Africa, Brazil, Peru, et al.

To give a flavour of P-GIS in action, some instances below:

- The Dene Mapping Project in northern Canada used digital 1:250,000 maps to designate land use and occupancy, 1890-1975. Boundaries were designated and spatial conflicts reduced, not only with Federal and Provincial governments, but also with neighbouring indigenous peoples. (Asch & Tychon IN: Johnson 1997)
- In the Philippines, community GIS resulted in strengthening Ifugao community groups when preparing for negotiations with provincial & municipality authorities re. ancestral lands (Gonzalez 2000). P3DM (participatory 3-dimensional mapping) has been used in the Philippines for conflict analysis and resolution between indigenous groups, which should reduce possibilities of inter-group warfare over land resources. (Rambaldi & Callosa-Tarr 2002)
- In Indonesia, NRM claims and village boundary conflicts between prior resource rights and recent claims in Kalimantan, were addressed through participatory mapping and GPS. (Wollenberg 1999; Fox 1990).
- In Cameroon, P-mapping and P-GIS applied to the regularisation of communities' customary entitlements to forest land - 2 phases from the Tinto case tabled below (Minang & McCall 2003)

	Phase II. Land Use Mapping	**III. Community Forest Boundary Mapping**
Actors	NGO, Min. of Forests, chiefs, hunters, village women	14 hunters, NGO, Min. of Forests, GIS consultant
Activities Involved	Sketch mapping. Transects Map of CF specifications from Community	Boundary Agreement demarcated on ground by villagers (men). GPS by villagers. GIS by consultant
Outputs	Village sketch map, social village map, forest use map	CF Boundary map. (GIS) Landuse zones. P-map of current uses
Git Tools	Topographic sheets	GPS, airphoto interpretation, GIS mapping
Degree Of Participation	P-mapping. forest use survey. *Decision-making, Empowerment*	P-mapping for forest description. *Collaboration Empowerment*

2 FINDING THE P IN THE P-MAPPING AND P-GIS

A distinction might be made between P-GIS (Participatory GIS) as the tool, and PPGIS (Public Participation GIS) as the planning context, but the difference is not always clear-cut. [1]

Definitions abound, such as: 'PP-GIS refers to the uses and applications of geo-spatial information and GIS technology used by members of the public, individually or grassroots groups, for participation in public processes that affect their lives (and so, encompasses data collection, mapping, analysis, &/or decision-making) (Tulloch 2003). But strict definitions have little value, they will be interpreted differently anyway. What matters is the essence of P-GIS.

[1] P-GIS is the abbreviation mainly used in this paper for 'participatory GIS', (cf. Obermeyer 1998; Quan et al. 2001), although PPGIS is more commonly used in North America (e.g. Craig et al 2002); less common is 'community-integrated GIS' (e.g. Harris & Weiner 1998). GIT = geo-information technology (or GIS technology)

One end of a continuum sees P-GIS as a form of 'participatory spatial planning' (PSP) which makes use of maps and other GI output, especially GIS. Spatial planning can hardly not include maps, etc., though we could imagine 'participatory planning' without maps, such as the participatory planning of a school curriculum or a cultural policy. So the core here is the 'degree of participation' in the (participatory) planning, in which case the essential issues are: what are the processes, activities, measures, instruments, and procedures that involve participation? and what are the criteria and indicators to measure these?

The other end of the continuum equates P-GIS to 'doing (technical) GIS with some degree of people's participation – the participation could be simply in the data collection, or much more fundamentally, it could in the choice of data inputs, data layers, the analysis and presentation, data storage, and in data queries. Here the core activity is the GI outputs (maps, etc.), and the essential issue is what degree or intensity of participation is there in the design of the GIS and the mapping activities?

In practice, one can analyse separately the mapping activities, and the planning or decision elements, of a PSP process. Deep P-GIS ideally should incorporate both; that is, the degree and intensity of the participation in the mapping/GIS elements should influence the priorities, outcomes and decisions made in the PSP. But in reality this is unlikely.

3 PARTICIPATION IN THE GOOD GOVERNANCE CONTEXT

To pre-empt the conclusions from reviewing myriad cases - participation is the key and the essence to P-mapping and P-GIS. The participation is more fundamental than 'the Map' or 'the GIS'. 'Deep' participation should impregnate through the whole sequence and the whole system – including the implementation and the changes afterwards.

However, the further one questions 'participation', the more of a Pandora's box is opened. Participation is seen in most contemporary literature as normative and essential, it is uncritically accepted as a 'best practice', but in reality it can be an obfuscation. It is the appearance of participation that often matters more than the reality, as an 'opiate of the masses'. Participatory planning (and P-GIS) are all too frequently used to legitimise decisions which in fact were taken externally. (Sect. 4.1)

In the wider societal context, participation is a central element of good governance dimensions [2]:

- accountability & legitimacy (includes 'ownership' of the outputs and process, among other conditions),
- competence (both the effectiveness of outputs, and the facility for local management),
- respect (for local knowledge & skills, as well as for local stakeholders and their interests),
- and, a degree of equity (among the stakeholder groups).

Participation in P-GIS, as in other processes, can be characterised into four degrees or intensities. This does not imply that participation should strive always for maximum intensity, but the intensity should be appropriate to the tasks, competencies and the specific relationships between actors in a PSP (participatory spatial planning) context.

[2] Governance dimensions found in i.a.: Goetz & Gaventa (2001); van Kersbergen & van Waarden (2001); McCall (2003); UNDP (1997)

From lowest to highest, the four intensities can be categorised in terms of a **participation ladder** as follows, with some P-GIS applications:

1. ***Information Sharing***. One- or two-way communication between 'outsiders' and local people, involving primarily technical information, such as baselines or status reports. Although the topics are pre-determined by outside agencies, even this level needs a (low) degree of participation in making maps, primarily in eliciting or exploiting local people's knowledge of for instance, resources.
   Examples such as National Wastelands mapping in India, (Hutchinson & Toledano 1993); IMSD (Puri 2003)

2. ***Consultation.*** Outsiders refer selected issues to local stakeholders for refinement or prioritising. External agents pre-define the salient problems before consultation, and the analysis into scientific knowledge is controlled by outside.
   Examples include mapping of community 'needs' or 'demands' in PRA exercises, or say ITK in ethnobotany or ethnopedology.

3. ***Involvement in Decision-making by all actors.*** Interaction between internal (local) and external actors who jointly identify priorities, analyse current status, select alternatives, and implement. Participation is seen as a right, not just as the means to achieve a project's goals. But it is still basically externally-initiated.
   E.g. mapping community's priority areas (Chattopadhyay et al. 1996) in Kerala; 'setting the map legend'. (Werner et al. South Africa; Rambaldi in Philippines)

4. ***Initiating Actions***. Independent initiatives from, and 'owned' by, local people, and self-mobilisation to perform relevant activities. This is categorically different from simply implementation with local people's labour inputs. If full participation is construed at all stages, this is an indicator of *empowerment,* this implies control of the whole GIT process – from problem prioritisation, geodata collection, spatial analysis, through to map representation and subsequent decision-making.
   Many examples from the "Aboriginal Mapping Network", a community of participatory mappers and P-GIS'ers among First Nations groups in Canada and the US. (www.nativemaps.org)

4 EVALUATING THE APPLICATIONS OF P-MAPPING AND P-GIS

Frequently an assumption is made that participation, as an element of good governance will inexorably and naturally lead to an improved planning system. But to evaluate this assumption in relation to the 500 or so applications of P-mapping, five primitive questions can be phrased very simply -:

1. *Why*, in any particular instance, is a participatory approach being applied to the acquisition, interpretation, use, etc. of geo-spatial information?
2. *Who* is involved? At what stages?
3. *What* geospatial information is going in, and being processed? What GI products are coming out?
4. *When?* - what types of GIT and what GIT activities, at which phases of PSP?
5. *How* does it function?

4.1 The 'Why' question: Purposes & Intentions of Promoting 'Participation' in Spatial Planning

Participation has to be examined not just in terms of the procedures and activities by which it is operationalised, not just as the intensities or ladders of participation, but also in terms of the intended functions. There is a submerged contradiction in the *participation* concept, in that participation is always promoted and guided, if not even directed, by *someone* whether within the local community, or more often from outside. What is the intention of the actors who are 'promoting' this Participation?

The intensities of 'participation' (Sect. 3 above) can be related to fundamental differences in three underlying **purposes** or **intentions** of the agencies (external or internal) that are 'pushing' participation as a strategy and promoting PSP.

- ***Facilitation***
  "Participation" is promoted in order to make it easier to introduce an outside project/ programme for the facilitation or lubrication of "external" projects. This is in order to improve external project efficiency, co-opt communities into supporting an outside project, and/or to pass (a share of) the burden of costs onto the "beneficiaries"
  In GI and P-GIS terms, facilitation could mean the elicitation of local knowledge of ITK and NRM, using local school children for participatory map-making, or providing assistance with handling GPS and mapping for baselines and on-going monitoring.

- ***Empowerment***
  At the other extreme, 'participation' is promoted in order to encourage and reinforce local decision-making and local responsibilities to lead towards eventual empowerment of local peoples, as moves towards more equitable social redistribution, to empower weak groups in access to, and control over, resources, and to promote people's initiative, local control, and 'ownership'.
  In GI and P-GIS terms, empowerment subsumes the activities already listed under facilitation and collaboration, but more importantly, it refers to self-determination and local initiative in all stages of P-mapping and GIS.

- ***Collaboration or Mediation***
  "Participation" is promoted in order to make links between outside projects and local people and their priorities in order to create collaboration between "external" purpose and "internal" demands. This is in order to increase project/programme effectiveness, build up capacity of local beneficiaries, and to modify or redirect outside interventions towards local needs, aspirations, and resources.
  In GI and P-GIS terms, collaboration implies not only the activities listed under facilitation, but also the participatory assessment of needs, collaborative spatial problem analysis, and joint prioritising of problems and interventions, etc.

4.2 The 'Who' Question - Stakeholders, Partners and Power

Good practice in P-GIS is determined by essential parameters of participation.

- Who is participating in the P-GIS?
- Who handles and analyses the data and information? Is there open access to the instruments?
- Who uses, and, Who has access to, the outputs?
- Who can use the GI? Who controls the types, analysis, and uses of, spatial data and knowledge – at What stages?

But the real issue is not: *Who* is participating, - but ***How?*** To answer that P-GIS is "controlled by a community or an NGO, or by local civil society", is not sufficient – there are significant power differences and control mechanisms within these. Is it the individual, the household, or the community that is participating? If the household, is there an equitable status between men and women in the household? or, between the adults, children and old & sick? In the community, or NGO representing the community, where do these people pop up from, how are they (s)elected?

GIS's goal is pattern recognition, which is a long way short of understanding process. "… GIS is good at patterns, but not at processes or relationships. (Abbot et al. 1998, 31). GIS does not show power, the technology is not really capable of in-depth understanding about fundamental power relations within communities. As Haklay & Harrison (2002, p.15) found, their survey respondents in London "showed a healthy scepticism of the ability of PPGIS to alter power relations. .... " They recognised that it is raw sources - the political process, the property market, property development, - that form the delivery mechanisms of social-political power, and *not* information.

The outcomes of participatory planning processes are often neglected in studies of GIS, or participatory planning in general. How are the actual outcomes achieved? This is really the most important output of the entire P-GIS processes, which will impact upon people, resources, decision-making, policy actions, for considerable time into the future, but is rarely explored. Is the outcome a consensus? and, what does consensus mean in such a process? There are different views and measures of what constitutes the 'best' social justice solution to a conflict, - the pareto optimal, the least damaging, the median?

This becomes all the more pertinent in conflicts between powerful outsider groups, and marginalised, disenfranchised, power-deficit, inarticulate peoples (whether indigenous or other minority).

4.3 The What? Questions
Qualities and Values of Geo-Information

- What are the geo-information inputs and the output products?
- Can P-GIS (or GIS) elicit and represent cognitive space, the space of local conceptualisations and natural discourse, naïve space which is holistic, non-reductionist, non-binary, non-Euclidean?
- Can it capture and translate 'mental maps' of boundaries, locations and zones into geo-referenced mappable outputs?
- Does P-GIS hold abilities to build GIS into the local knowledge process?

Handling Imperfect Data and Notions of Spatial Precision

Reasoning in geographic space deals with incomplete information in the sense that people have to interpolate much missing information using 'common sense' rules.

Common 'imperfect data' characteristics are -:

- fuzzy and layered zones and zonal information (areas, polygons);
- fuzzy, blurred, flexible and multiple boundaries (line data);
- uncertain, hidden or restricted spatial locations (point data); and
- dynamics - flows of physical resources, information, ideas, flows of influence, power.

GIS does not represent well the non-exclusiveness, fuzzy boundaries and flows in real space. 'Standard' GIS approaches, especially those built on remotely sensed data,

may place unnecessary and misleading emphasis on spatial preciseness of the output information. Most rural development activities do not need a high degree of spatial exactitude; they are concerned with communities or zones which are relatively large spatial entities, and may not have precise boundaries. Many interventions are aimed at communities of people without a unique, fixed location, such as pastoralists, students, or the "poorest 10%". Thus, high spatial accuracy does not necessarily equate with local perceptions of resources and 'official' spatial data may be 'inaccurate' from the perspective of a villager. Moreover, the flashiness of GIS outputs can create a false precision and legitimisation of what is actually 'bad data'. (Abbot et al. 1998)

Respect for Local Knowledge - ITK and ISK

Indigenous (spatial) knowledge is a measure of local community capability, it has the potential to put the community on equal status with outsider 'experts', and may be the only resource that local groups, especially the 'resource-poor', have ownership.

IK and scientific knowledge are not always so different.

Much ISK is similar to scientific knowledge, e.g. pest management, hunting, soil and water conservation, ethno-veterinary and ethno-medicine. ITK/ISK might even be considered more accurate because it embodies generations of practical knowledge, and is working in interactive, holistic systems.

Examples: Interpreting RS images of land capability with Bedu shepherds in Jordan (Patrick 2002); ITK of grazing lands in Burkina Faso (Sedogo 2002); Senegal River valley: comparison between farmers' and scientific soil classifications (Tabor & Hutchinson 1994); Australia: mapping ITK of valuable vegetation types (Bartolo & Hill 2001)

Beyond this, there is ISK that is cognitively different from scientific knowledge. This IK is symbolic and visionary, (mystical in 'scientific' terms), and especially related to land and land features. The sense of place associated with particular localities by particular groups of people in their mental maps is qualitative, fuzzy, and metaphorical, not reductionist, not necessarily in Euclidean space, nor vectorisable. People deal naturally with overlapping, layered zones and zonal information (areas, polygons, raster grids); with fuzzy, blurred, flexible and multiple boundaries (lines), and with uncertain, hidden or restricted spatial locations (point data).

Respect for People's Cognition and Conceptualisation of Land

ISK is specific and dynamic knowledge about the land and land resources and indigenous people's management of them. It is both problem- and solution-oriented, it sets people in their environmental context by describing activity-spaces and responsibility-spaces, and it uses a language understood locally.
Land and place have deep, visceral, cultural values, rather than the simple economic categories of 'high value', 'marginal', or 'wastelands'. The sense of place associated by peoples in perceptual or mental maps, is qualitative, fuzzy, metaphorical, emotional, - holistic, not reductionist. This deep conceptualisation, with its obligations of stewardship of the land, together with the location- and resource-specific, problem-oriented ITK, determine the depth and the manner of local people's participation.

Equity - Gendered Space

ISK has a gender component. Command over space is a fundamental source of social power; and conversely, limited access to certain spaces relatively disempowers groups of people, most commonly, women. Gendered space refers to the specialised gendered knowledge of distributions in space, the differential access

to, ownership of, and use of, resources, and the nested scales of cultural and economic landscapes associated with the life experiences of men & women. Similar mobility differences are mirrored in the restrictions, and thus "invisibility", of the large proportion of housebound, non-car owning women in the US or Europe.

Countermaps are explicitly intended to display the needs and requirements of groups who tend to be excluded scientifically, as well as socially-institutionally. Rocheleau et al. (1995) refer to countermaps of resource use and management, etc., constructed by and with rural women, which can then be contrasted with men's resource maps. A simple measure would be the 're-labelling' of standard landuse maps to reflect women's uses. Peluso (1995) proposed countermaps as alternative representations for the marginalized, dispossessed, unseen, or inarticulate, which 'counter' the views and voices of the powerful.

Legitimacy and Accountability - Ownership of (Spatial) Information

'Ownership' by the governed, and 'participation' of the governed, are central elements of legitimacy in governance terms. Ownership as a totality implies owning the sources of data and information, the processes of making the product, as well as the final products themselves. Allocating ownership is therefore an element of building trust between governed and governing. In the context of PSP it has been argued that the symbolic as well as the practical concept of 'ownership' of geo-information is most clearly illustrated by the simple question - 'Who chooses the items depicted on the map and defined and decoded in the map legend?' (Rambaldi, 2004) Even then of course, there are crucial questions of who in the community has provided the alternative names of legend items, and what questions were they asked to initiate the naming? Respecting the rights of ownership of the output results is a good governance condition. Thus not just the legend, but the whole 'map' needs to be liberated into the control of those who are affected by it.

Ownership and Data Privacy

There are cultural and ethical, as well as economic, reasons for protecting ISK data layers – examples below taken from e.g. USA (Makokis & Buckley 1991), and NZ (Harmsworth 1997):

- hunting, trapping, fishing, grazing, woodfuel collection lands,
- sources for handicraft and tool materials.
- waterholes.
- outer boundaries of culture areas, clans, tribes, etc.
- customary property delineations/demarcations: e.g. by clan, lineage, bands, household, intra-household, age-groups, male and female areas.
- historic places, battlegrounds, old villages.
- sacred sites, burial grounds, ceremonial areas, shrines, buried art,.
- indigenous place names, cosmological locations.

Asserting and ensuring confidentiality of IK data is always a concern, even when not taken as far as the NZ case. The very first stage of the Nunavik Mapping Project was to develop protocols for participation and Inuit control of confidential mapped information, (Kemp & Brooke 1995); similarly amongst Canadian First Nations (Johnson 1997). More generally, Harris et al (1995), Pickles (1995) et al. are concerned over the surveillance capabilities of GIS used in combination with hi-tech spatial data collection. Police and security services, and tax and revenue authorities are the first to use the enhanced spatial information. "The map tells state authorities where you are ", as in apartheid S. Africa. (Abbot et al 1997).

4.4 'When?' question

Table 1 Phases in PSP and Management

Phases In Problem-Driven Planning	Spatial Planning & Management Activities	Participatory Planning Context	Geo-Spatial Information Components
PHASE I. ***EXAMINE & RECORD THE PROBLEMS***	**Identify & Categorise Problem(S)** Record and Describe (& Measure) Environmental Problems, Conflicts	**joint decisions on scope of PSP, priorities, design of study** (collaborative) stakeholder identification & cross-checking	**spatial boundaries (time boundaries)** locations and spatial ranges of stakeholders
PHASE II. Understand & assess the problems	**Analyse & Scope Problems** Analyse & Scope (& Forecast) the Problems Prioritise the Problems Screening. Decision – to go further.	**participatory problem identification & analysis. use of ITK/ ISK** joint problem trees, scoping analysis; Needs assessment joint problem trees, priority-setting consensus on execution	**Identify location of events, conflicts, resources, etc.** participatory mapping; counter maps, impact maps visualisation tools
PHASE III. Seek alternative solutions (mitigations) for problems. & prioritise	**Identify & Screen Alternative Options (Potential Solutions)** Seek Alternative 'Solutions' Appraising Potential Solutions. Screening Solutions Decisions	**elicitation of ITK for alternative 'solutions' and options** systematic exploration of ITK potential solutions (+ externals) using ITK in social. economic, cultural & envir. appraisal collaborative decision support	using resource and potential maps, hazard maps, etc. maps of impacts and benefits, etc. Visualisation tools
Recycle	FEEDBACK to Phase I.		
PHASE IV. Design & Implement Some Of Alternatives	**Implement Option(S)** Strategic Design Detailed Design of Solutions. Implementation. Monitoring & Evaluation Replication	**joint planning and implementation of primary and mitigating activities** collaborative design participatory implementation participatory monitoring; feedback	Point & zonal locations, maps for planning construction, operations, etc, Impact maps

4.5 How? Question

What does good governance and participation imply for the praxis and procedures of performing P-mapping and P-GIS?

Most GI practitioners would consider "Where and How should participation appear within the P-GIS process?" to be merely a technical question, with the appropriate setting being simply found in the PSP sequence (Table 1 above).

But such responses reflect the common lack of respect for local participatory initiatives. Projects to promote or disseminate GIS and remote sensing have mainly been technology-driven from 'outside' as 'hardware & software solutions looking for a problem', (Dunn et al 1997; cf. Puri 2003), as recognised by many GIS professionals - "GIS and RS demonstrations [in the Wastelands project case as well as in general] are 'technology-driven' rather then 'demand-driven'." (Hutchinson & Toledano, 1993)

The following principles and criteria are elements of primary importance in implementing P-mapping and P-GIS in communities.

Manageability at Local Level by Local People

Equity goals are promoted by reinforcing local communities' abilities to manage and maintain the GI system and its technology, not only during the life of a P-GIS project, but also after any external support ends. This can be seen as sustainability of the system. [3]

The local manageability may be assessed on a number of criteria:

- **Feasibility** – is the GIS technology adapted to local conditions? This includes the cultural, social, political, and institutional context of use, as well as the suitability of the GIT to rugged hard usage and infelicitous climates. Not only is hardware missing, but there is irregular electricity, etc.
- **User-friendliness**: comprehensible and intuitive, simple to use by local people. Are the literacy, numeracy, computer literacy requirements reasonable?
- Does the introduction of modern geo-information tools in spatial planning change the **balance of power** in the community?

  There will be differences between community groups in familiarity with the GIT materials: from drawing ephemeral maps in the sand, building a physical model, to introduction of mobile digital technology, such as GPS, Tablet PCs, PDAs.
- **Appropriate spatial scale:** Different actors relate naturally to different spatial levels, according to social and cultural situations and the daily levels at which they function; and usually at several different levels simultaneously., and these do not necessarily mesh with administrative hierarchies or planning levels. (Aitken 2002). Rocheleau et al (1995) emphasise need of an appropriate spatial data scale to capture the often-hidden ITK and resource practice of rural women.
- Maintaining the **currency of the data** – the tasks of updating the information sets are daunting, costly and time-consuming, and are therefore liable to be overlooked in the enthusiasm of applying the new tools.
- P-GIS should be a **common (community) enterprise**, not just using "key informants" - who are likely to be educated, adult, senior, Anglophone males.
- **Funding & Finance**: GIS output may be directly connected to financial returns, as in cadastral information for raising tax revenues. (Similarly for e.g. utilities, power lines, electricity, oil, gas, telecoms, water management & maintenance.) Where the financial benefits to a particular powerful stakeholder easily and quickly outweigh the costs, there is little need to promote or support GIS.
- Cost effectiveness in local terms. **Basic hardware and software costs** of standard GIS equipment are always a major barrier, despite the continuous reduction in technology prices. What are representative realistic costs of P-mapping and P-GIS? Obviously they depend primarily on the specific

[3] e.g. The Shuswap Nation Council in Canada assessed alternative GIS packages in terms of factors important to them-: ease of learning, analytical capability, information interchange, usability, support, and primarily - ease of use, application development capacity, and cost. (Johnson 1997) c.f. other AMN documents.

location and circumstances – labour costs, equipment costs, costs of supporting participation, payments to professional expertise, etc. [4]

- GIS does not solve **data deficiencies** - it highlights them. The commonest reason given as an answer to the question "why have you not used your installed GIS?" is: "we didn't have sufficient, or reliable enough, data to fit it".

- Maintaining the **confidentiality** of sensitive data (AMN 2002) and respect for rights, including for IK & ISK. Moreover, the trade-offs in maintaining certain types of confidentiality whilst simultaneously improving or optimising access to information for the public; balancing commercially-claimed confidentiality against the 'public's right to know'. (cf. Barndt 1998; Harris & Weiner 1998)

- **Training & Capacity Building** - most packaged GIS training is geared to computer literates. There is a clear need for appropriate training of GI professionals, i.e. clarifying the context and deficiencies, as well as opportunities and technical skills of GIS, – 'SID as well as GIT' [5] (Dunn et al. 1997). Imbalance between hardware/software expenditure and training expenditure, whereas there is considerable waste on consultants e.g. Penang (Meng and Tan 2002)

  There is a fast turnover of trained GIS staff poached to better jobs, especially because most training is applied to other applications besides ISK. A pre-condition is for the involvement of some local civil society group or a capable NGO/ CBO.

Being Comfortable Working with GIS (and with computers)

Similarly to findings for untrained people in recognising and interpreting aerial photos (above), working with computer hardware and GIS software is not only feasible, but with the appropriate approach – culturally as well as technically – it is very effective. There is a broad spectrum of approaches to "people's GIS" -: ranging from Gonzalez's (2000) experience of deep, intensive involvement with the Ifugao people, to McKinnon's more rapid MIGIS ('Mobile Interactive GIS') in Thailand and Yunnan, China. (McKinnon 2001). Within 24 hours in a Cambodian village, local facilitators could support drawing an ephemeral map, transferring to paper, digitally photograph, and digitise it into a GIS for participatory land assessment. (McKinnon 2001, 11)

5 VISUALISATION AND PRESENTATION

Can P-GIS be used effectively? This raises issues of presentation and visualisation, and thus the interpretation of outputs. Can the hardware and software of P-GIS reflect the real spatial interpretations and interests of local communities; or conversely, do the colourful products of P-GIS create biased interpretations and a false confidence,

It is difficult to overestimate the visual impact of GIS output, maps, or RS images. It is not only the quantity of bits of information that can be summarised in an image (compared with say a written report or a set of data tables), but the quality of the

[4] Satyaprakash (2003) analysed the situation in India for the 'Mapping the Neighbourhood' project of low cost rural mapping with community participation, and came up with a rough figure of Rs. 15,000 per village (over 25 villages), based on costs for the PDA, GPS, IKONOS satellite image interpretation, integrating data, and preparing the final map.

[5] SID = 'spatial information for development'.

information imparted is also different - the "clarity", the simplicity of "distinguishing", the ease of making comparisons.

Interactive mapping, or the combination of tools in multi-media approaches, present layers of information and flows of time, and thus represent multiple views and many voices. The restrictive spatial and temporal constraints of standard map or GIS representation can be removed. (e.g. Kingston et al 2000 in the UK).

The functionalities and performances of animated web maps and new graphics software include-: transparent layers, layers on/off, shading, fuzzy symbols, blurring boundaries, and fading of areas or boundaries. However there are more technical possibilities of animated, interactive visualisation -: zooming-in / out, 'looking glass', bubbles (to show scale awareness or relative position), panning and rotational capabilities. The easy ability to click on a map to find a magnification, or photo, sketch, or written information, helps the inexperienced user to overcome map-reading problems, (Kingston et al 2000). There are legend options - pop-ups, menus, sliders, etc., which are also animatable. Sound also can be added, as can hyperlinks to other material and web sites.

Visual and Technical flim-flam

Many observers have noted how GIS displays can have too strong a convincing impact – the ease of layering, the ease of changing maps, the apparent objectivity and scientific content of the display can have a blinding effect. (cf. Obermeyer 1995) This should decline as decision makers and policy advisors become more familiar with the techniques, but it is a current danger. Even proponents of GIS applications, point out (in the context of First Nation land claims) how ".. GIS can provide an air of scientific objectivity required within the legal system." (Johnson 1997, p.4). "Spurious" could be added to this. Moreover, the flashiness of GIS outputs can create a false precision and legitimisation of what is actually 'bad data'. (Abbot et al. 1997). de Vos (2003, p.107) reports from the introduction of GIS into land use planning in Costa Rica "… several examples where "nonsense maps" were used for convincing policy makers, politicians and funders of the necessity to do more research or to continue projects. "

There are concerns here for accountability, as well as efficiency in a practical sense. The flashy GIS images create non-transparency and non-visibility, so that representations and decisions are distorted or confused by the image. (Wood 1993)

6 'GOOD PRACTICE' SEQUENCE TO P-MAPPING AND P-GIS

A 'good practice' sequence or 'users' guide' to improve the application and performance of P-mapping and P-GIS in community-level spatial planning should be expected to satisfy some, though not necessarily all, of the following elements:

I. the Pre-conditions.

II. the Works - 20 or so steps in the Process and Procedures.

I. Pre-conditions:

- "Purpose, - which purpose?, whose purpose?" – analytical clarity about the ***purpose*** of the P-GIS exercise is the key element. Purpose can be translated into the competing intentions of participation – facilitation, collaboration, and empowerment.
- Local people and their communities are the principals or partners, <u>not</u> the clients. Thus the P-GIS initiatives emanate from them, not from the outside.

- P-GIS is directed towards the marginalized, the unrepresented, the inarticulate, the resource-poor, the power-deficient. Show positive discrimination towards people identified by gender, age, wealth, resource levels, caste, religion, class.
- Envision from the start, what are the GI outputs / products going to be? – And, are they of any use to anyone? – if so, for whom?

  This would usually imply that the products should be simple, clear, understandable, testable, and convincing, as well as relevant, reliable, logical, replicable, and coherent.
- Consider collaboratively what might be the negative impacts of the outputs – PSP and P-mapping can lead to more conflicts, and more concentration of power or resources in a few hands.
- Despite the necessity for a long-range vision, nevertheless, the approach should remain flexible, adaptive, and recursive in the actual approach, without sticking rigidly to pre-determined tools and techniques, or blindly to the initial objectives (participation is learning).
- Participation is always a learning process – best if it is learning in two directions-:

  Experts learn the interests, objectives, limitations, constraints, and variability from the insiders.
  Insiders (community traditional leaders, elected leaders, NGO, CBO, civil society, etc) learn from the expert (planner, GIS, mapper, geographer, doorkeeper to outside knowledge, contact with outside power). Insiders learn technical knowledge, and new technical, economic and social skills, but also a wider vision.
- Participation is always slow – by procedural design, if not even by definition; this is true also of PRA, P-mapping, and P-GIS.
- Nevertheless, the output results should be as timely as possible.
- Adherence to deep PRA and Participatory-RRA principles and methodology, especially in terms of their information needs assessment; and not just blindly use the tools of RRA to exploit local knowledge.

II. Process and Procedures – the Works:

Essential element is the indigenous technical and management knowledge (ITK) and local expertise, seeking to understand local culture, society, spatial cognition, and livelihoods, local resources, hazards and options, etc.

i. Usually there is special need for the historical perspective in IK and ISK - conflict analysis especially needs a historical understanding.
ii. Make full use of non-conventional information and knowledge acquisition – semi-structured interviews, open-ended discussions, stories, songs, pictures, serendipitous meetings, and the panoply of RRA/PRA methods.
iii. Collaborative, scientific selection of appropriate software and hardware by insiders and outsiders together.
iv. Acquisition of professional geospatial information - base maps, aerial photos, remote sensing imagery, etc.
v. Prepare in advance for any desired protection of indigenous data layers. How can they be protected? How accessed? etc. Clarify the current and

future status of the ownership of ITK and ISK, taking into account guidelines on the protection of Indigenous Intellectual Property Rights.

vi. Follow international survey guidelines such as the AAA Code of Ethics which reminds anthropologists that they are responsible not only for factual content of information, but also the socio-cultural and political implications.

vii. Apply local indigenous spatial knowledge (ISK) concepts of boundaries, core areas, conflict and risk zones, resources, priority areas, time-distance relations, dynamic spaces and landscapes, etc.

viii. Collaborative selection of the appropriate spatial scale for geo-data inputs, and especially for the map and GIS products, based on social, political as well as scientific criteria.

ix. Utilise spatial Participatory-RRA tools – participatory joint interpretation of air photos, RS images; ephemeral maps, participatory sketch maps, time-space diagrams, transects, etc.

x. Prepare a series of countermaps representing the interests and values of various groups of actors, especially the marginalised and power-deficient.

xi. Identify and record spatial information directly on the ground using GPS with mobile GIS (using iPAQs or Tablet PCs).

Participatory Sketch maps can be transferred directly onto ArcPad, etc.

xii. Supplement these information sources with digital photography, video, sound recordings, and with sketching where photography is ineffective.

xiii. If it will be appropriate for specific spatial planning and management purposes, translate the ISK visualisations into user-friendly GIS software, e.g. ArcPad.

xiv. Transfer participatory maps into appropriate visualisation software, such as FreeHand10, or MaPublisher, which are better attuned to the ISK rich information characteristics of indeterminacy, qualitativeness, fuzziness, metaphor, emotion, holistic and not reductionist.

xv. Cross-check the ISK visualisations and the geo-referenced point ITK data with geo-information from standard maps, topographic maps, etc.

xvi. But do not treat the ISK maps, or 'mental maps', simply as perceptual aberrations; i.e. do not take standard official maps as the only authentic base against which to measure.

xvii. When appropriate for specific spatial planning and management purposes, apply GIS versions (e.g. ArcPad) of the ISK visualisations.

xviii. Make use of interactive visualisation software for further development and for participatory spatial planning (PSP) with user groups. Presentation and visualisation, interpretation of outputs, and understanding.

xix. Apart from visualisation, if applicable, use physical three-dimensional models, sound, multi-media, or web-based (dynamic) GIS and mapping.

xx. Distribution, delivery and dissemination of GI and other outputs should be pre-planned collaboratively so as to meet good governance objectives of equity, respect, transparency and accountability.

xxi. Follow-ups, monitoring and evaluations should be designed into the P-GIS process from the outset, and with an independent component.

7 CONCLUSIONS

Participation is the essence and the key to P-mapping and P-GIS. The *participation* is more fundamental than the Map or the GIS product. 'Deep' participation flows through the whole sequence and the whole system – including the implementation and the changes afterwards.

In the Good Practice Users Guide, the pre-conditions can be reiterated:

- Participation must be through the whole sequence and the whole system – including the implementation and the changes thereafter.
- In all the steps, above, there should be not just short-term, functional, participation with local people (e.g. not just using school children or villagers to carry out the mapping). But there should be a deep participation directed towards the empowerment objective throughout the process, leading towards sustainable, local capacity-building to carry the community and other parties through PSP.
- Re-consider the purpose of the exercise: local initiative?, or external intervention? What will have changed? Who will have benefited? and, Who will have borne the costs? - in the long as well as the short term.

The spotlight always falls back on the participation and the participatory processes, rather than the GIS. The core question always is what do we mean by 'participation'?

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