

Seeking Good Governance in Participatory-GIS.
A review of indigenous spatial knowledge, participatory processes, and
governance dimensions in local-level GIS for development.

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Introduction

Over the past 10 or 15 years, 'Local-Level' and 'Participatory-GIS' have been applied to mapping traditional lands and resources, demarcating ancestral domain and resource areas, usually as a step towards legal recognition of customary land rights, e.g. for First Nations. They have also been used for analysing, and potentially ameliorating, land resource conflicts, for mapping local development potentials, and in sometimes for awareness-raising and eventually, to build people's empowerment.

The geo-information tools used in these applications include participatory spatial data collection using RRA /PRA methods; 'mental maps', 'ephemeral maps', and participatory sketch maps and time-space diagrams; 3-dimensional models; maps; aerial photos and RS images; and GIS analyses and representations.

There is an implicit, sometimes explicit, assumption that GIS at this local level is both efficient and effective, in that it is believed to simultaneously meet the content needs, answer the questions asked of the geo-information, and address and satisfy the local stakeholders' underlying interests. P-GIS (Participatory-GIS) is expected to be participatory and make use of local people's information or indigenous knowledge (IK), of which indigenous spatial knowledge (ISK) is a special category. As such there is an often-made assumption that this GIS is a tool for better governance.

This paper raises questions to investigate the validity of these assumptions.

- The guiding question is: Can the goals of good governance be met in such application of GIS? – with their criteria of accountability, legitimacy, respect for rights, equity, and competence to assess this?

To answer this the following questions may be asked:

- What degrees of 'participation' are found in participatory mapping and P-GIS?
- What motivations lie behind the promotion of P-GIS?
- Is Indigenous Spatial Knowledge (ISK) applied to better governance?
- Who has access to ISK? Do access and use respect customary cultural rights / entitlements? Ultimately who is the owner?
- Does ownership of the spatial information output (and input data) accord advantages to the owner (beyond the boundaries of good governance)?
- Ultimately, what difference does the introduction of GI technology make to the distribution of power?

The paper begins by briefly describing local-level GIS applications in Section 1. ^[1] Section 2 discusses the criteria for governance and Section 3 looks at the difficulties faced by participatory GIS in practice. The paper addresses in section 4, the character of the data necessary for participatory GIS applications, that is to say ITK and particularly indigenous spatial knowledge (ISK), and how this differs from 'scientific' knowledge. Section 5 considers questions of ownership and accessibility of this knowledge and what this ownership implies, particularly in the context of good government. Section 6 looks briefly at whether GIS can 'represent' ISK. Section 7 presents further practical problems; and Section 8 provides some conclusions on participatory GIS. P-GIS approaches have very positive benefits, but need to be very carefully considered regarding their contribution to good governance. Although it has potential for empowerment, the way in which it is actually used will always reflect the power situation of the status quo. Scientists should be fully aware of the dangers, particularly as regards whose information is used and how.

1. Local (Indigenous) Communities using Local-level Mapping and Participatory-GIS

To move beyond indistinct goals of local-level P-GIS with its ideals like empowerment and participation, we need to see what concrete purposes local-level geo-information acquisition / analysis is put towards. ^[2]

The best test of usefulness is whether indigenous communities actually acquire and apply GI technologies themselves. Estimates differ, though all are positive, e.g. 50 US tribal groups (out of c. 550) were using the BIA's digital spatial data bases by 1995, 10 years after their introduction, mostly for NRM. (Goes in Center, 2000) A survey in 2002 by the Canada-BC Information Sharing Protocol of GIS capacity found that 44% of 109 First Nations currently use GIS (and another 36% are interested.) The majority use ArcView and ArcInfo, because of the practical and institutional support provided over many years by ESRI. The commonest application is "Traditional Use Studies", followed by treaty processes including land selection, and NRM. (AMN 2002). In NZ as of 1996, 8 iwi (Maori clans) used GIS for resource identification and management (Harmsworth 1997)

Outside of Canada, USA, NZ and Australia, applications of community GIS by indigenous peoples are less easy to find. Poole's seminal survey (1994, 1995) found multiple examples only in: Canada 17, USA 3, Brazil 6, Philippines 5, Indonesia 6, Peru and Thailand 2, Kenya 3. Nine Latin American, 3 African and 3 Asian countries had one case each. ESRI (1997) lists far fewer, one each from Guyana, Borneo, Kenya, Uganda, Laos, and Philippines, compared with about 75 from North America, though unsurprising given ESRI's main interest in the First Nations.

¹ More detail about the case studies and their employment in community-NRM and local development situations are found in a review & annotated bibliography (McCall 2002).

² The categorisation used here and in McCall (2002) builds on the sound analysis of Poole (1995). His seminal review of local-level mapping of ISK categorised six types of applications: Gain recognition of land rights; Demarcate traditional territories; Protect them; Guard traditional knowledge; Manage traditional lands and resources; Mobilize community awareness and Resolve conflicts.

Other classifications of community or local GIS in developing countries are made by e.g. Gonzalez (2000); King (2002).

1. Claiming 'Our Land'

1.a Demarcate Traditional Boundaries of Lands and other Natural Resources

Demarcation of ancestral domain, customary tenure, and traditional living areas are notable in Canada and USA especially, followed by NZ and Australia, with their 'First Nations' constitutional status. Mapping and GIS of ISK by indigenous peoples are most developed there for similar reasons. Brasil and some Latin American countries also have experiences, but much less common in Africa and Asia.

1.b Legal Recognition of Customary Land Rights

"More indigenous territory has been claimed by maps than by guns." (Nietschmann 1995, p.37) - but, claimed by outsiders more than by indigenistas. Poole (1995) and Gonzalez (2000) distinguish such external *claims* from the *reclaiming* made by indigenous people whose land has been taken.

In western law, GIS is commonly aimed at formalisation and commodification of land and property rights. What is the implication of this for e.g. common property regimes and customary law? On one hand, there is the need to follow procedures acceptable to the 'local communities', therefore, both transparent, and in accordance with traditional decision-processes. Concomitantly there is the need to make spatial (map) products which satisfy the formal, legal land tenure requirements for accuracy, reliability, as well as the legal legitimacy.

2. Knowing, Using and Managing 'Our Resources'

2.a. Identify, Locate, and Analyse Specific Natural Resources. e.g. forest products, medicinal plants, grazing lands, water sources, wildlife, fishing grounds, fuel sources, minerals, building materials.

2.b. Manage Traditionally-held Lands and Land Resources Systems [1]

Many conventional applications of GIS are aimed at 'efficient management' of natural resources. What is the implication of utilising geo-information and GIS with regard to common property regimes and customary resource law?

"Management" of environment and natural resources is used at any of three levels of intensity – (i) simple, exploitative use of a resource or of an eco-unit, (ii) maintenance or reproduction of a particular resource or unit, (iii) management of the broader ecosystem containing and nurturing the resource.

e.g. *Bioregional Maps* (Aberley 1993; Aberley & George 1998)

e.g. *TUS – Traditional Use Studies* (Weinstein 1997)

e.g. indigenous knowledge of hazards (CESS 1991)

e.g. *Land Literacy* ('environmental appraisal') Kerala (e.g. Franke & Chasin 1994).

3. Managing Conflicts

3.a. Manage (and reduce) Conflicts between Community and Outside, as well as Internal Conflicts

Utilise the outputs of applications 1. and 2. (above) as inputs to appropriate conflict analysis and management techniques. E.g.

- Delineate boundaries (not necessarily *lines*) between competing groups.
- Initiate negotiation efforts between competing groups with an acceptable, legitimate 'mapping' of actual or dormant conflicts (competition) over space and resources in space. 'Conflict mapping' includes 2- or 3-dimensional spatial maps.
- Reduce conflicts by mediation / negotiation etc. by using GIS (e.g. real-time P-GIS)

¹ *Locally-managed* does not necessarily imply under traditional management systems such as CPR, or low-technologies. The NRM may be co-operative grazing, fishing or forestry with 'modern' techniques.

3.b. Incorporate Traditional Use and ISK of NRM into 'local' resource management plans of outside agencies, e.g. Forest or Wildlife Depts; or for EIA

4. Mapping Equity and Inequalities

4.a. Analysis and Mapping of "Poverty", "Exclusion", "Discrimination".

Social Equity maps to identify socio-economic groups which are relatively disadvantaged, whether by economic class, ethnicity, caste, gender, or, by location. Their disadvantages may be due to low income or poor access to jobs or markets, or to social services. Disadvantaged groups can be mapped as distinct spatial *sites* or *zones* of deficiency. (McCall 1998)

4.b. Participatory Mapping for Local Development

Likewise, in Kerala's PRM, the end result was not simply producing participatory maps, but their application to action plans. (a much slower job of course). PRM is but one component of a socially progressive, equity-driven, policy, under leftist Kerala state governments. PRM has emerged into a 'People's Campaign', including neighbourhood groups 'evaluating local resources' (not only natural) and Panchayat Development Action Plans. (CESS 1991; Franke & Chasin 1994).

5. Building Community

Promote Community Awareness, Institutional Strengthening, Empowerment.

5.a. Participatory mapping of **cultural-social-indigenous space & resources** other than natural resource use and management, e.g. sacred lands, burial grounds, ancestral tenure.

5.b. Elicit, structure and guard **Traditional Knowledge** (ITK/ISK),

5.c. As an element in promoting **empowerment**.

It is often difficult to distinguish between activities aimed at these; 5c. is usually the intention of the other two.

Participatory Mapping & GIS – some key tools [1]

Aerial Photos and Scales: Most practitioners assert the primacy of aerial photos over maps (& over RS images) (cf. Groten 1997). The methodology is sometimes known as participatory photo-mapping, using large-scale aerial photos (and similar to participatory sketch mapping). (e.g. Fox 1986; Jordan & Shrestha 1998). Poole (1995) argues for 1:5000 –1:10000 as the optimal scale to stimulate useful discussions by villagers on spatial features; thus most air photos at scales of 1:20000 upto 60000 are too coarse. Acquisition and analysis of data should be made at the "scale of everyday use of the landscape." (Rocheleau et al., p.64) GIS provides the medium for working with multiple spatial scales and comparison of scales.

'**Countermap**' is a term (from Peluso) referring to maps explicitly to display the needs and requirements of groups usually excluded from scientific surveys as well as socially-institutionally. Rocheleau et al (1995) contrasted "countermaps" (gendered maps) of resource use and management, constructed by and with rural women, with more 'conventional' maps made by men. A simple measure is the 're-labelling' of standard LU maps to reflect women's uses, as in the "wastelands" issue. Sowerwine's (2001) 'counter-maps' in Vietnam demonstrated how "barren lands", as classified by the state, were actually biologically rich and economically valuable to local communities.

¹ Some examples of P-mapping and P-GIS procedures in McCall 2002.

3-D Representations and DEMs: Physical 3-D models have been used, e.g. for urban environmental planning in the UK (Carver 2001), for community-based NRM in Thailand (Uraivan 1993), and P3-DM in Philippines. Rambaldi & Callosa-Tarr (2000) maintain that P3-DM provides advantages over alternative displays (sketch maps, 2-D topo maps) because of the scale, the visualisation impact and the geo-referencing, as well as the significant participation element. There are similarities with using DEM with a GIS base and display (e.g. Gonzalez 2000) In the Yukon, DEMs provided the realistic perspectives users needed to feel familiar with their terrain [¹], and thus helpful in imagining alternative scenarios (Johnson 1997), similarly in the P3-DM approach.

2. GOOD GOVERNANCE and its CRITERIA

In order to assess whether participatory GIS furthers good governance, it is necessary to define the dimensions of good governance. Good governance is not just about *accountability* – though accountability is the context, and overarches other political and socio-economic categories [²]:

- ❖ **Accountability** - expressed in terms of:
 - transparency, visibility; accountability mechanisms
 - degree of devolution, or, decentralisation (subsidiarity principle)
 - responsiveness to lower levels; community involvement

But the ‘context’ for what? – ‘accountability’ relates to legitimacy, respect for rights, equity (not simply equality), and competence (including efficiency). [³] These dimensions can be broken down towards identifiable criteria:

- ❖ **Legitimacy** – of the governing over the governed:
 - the selection process and (types of democratic) procedures;
 - recall & re-selection procedures;
 - representativeness of regional, ethnic, tribal, class, religious, age, gender interests.
 - appropriate attention paid to ‘**participation**’.
 - performance monitoring, etc.
- ❖ **Respect for** - by the governing for the governed:
 - basic human rights - women’s rights, freedom of expression, religion, sexual orientation, ...
 - citizens’ rights, civil liberties, workers’ rights, working conditions,
 - cultural group and regional rights; indigenous (technical) knowledge,
 - laws, property rights – fairly and impartially enforced.
- ❖ **Equity** (a distribution issue) - within the governed; and, between governing and governed.
 - indicators of the distribution of government services, take-up rates, relative to disadvantaged groups and individuals in society.
 - degree of access to public and to private services

¹ Similar arguments for utilising oblique air photos or a hilltop perspective when conducting a P-RRA survey.

² Conceptual categories and operational measures of governance are derived from i.a.: Riggs 2000; Gaventa & Valderrama 1999; Goetz & Gaventa 2001; JICA 1995; UNDP 1997.

³ Unhappily, the latter is often mistaken for the whole, cf. Africa’s critiques of World Bank presumptions that ‘good governance’ means ‘downsizing governments’. (Kruijter 1996)

- degree of open access to market
- laws, property rights, etc. impartially enforced for all individuals.
- ❖ **Competence** (an efficiency issue) – of the governing (w.r.t. the governed)
- efficiency; - and -
- effectiveness in delivery of govt. services; and in policy implementation.
- administrative competence.
- degree of stability in implementation (of government, etc.)
- strategic vision; and, therefore a degree of predictability.

Spatial Aspects of Governance Measures

The governance dimensions and measures are used in the following analysis of P-mapping and P-GIS. A priori it should be queried there is a spatial dimension or criterion to these measures. Competence and Equity categories (which are more social-economic in nature) have very clear geo-information connotations. However, the Legitimacy and Respect categories, as well as overall Accountability, also have their regional (meaning sub-national or local) distributional aspects. These spatial aspects correspond to specific types of geo-information related to governance and the relations between civil society, private sector and the state.

3. Where is the 'Participation' in Participatory GIS? and how does Participation relate to Governance Indicators?

Clearly, participation is related to **legitimacy** in governance terms, but it has wider significance than that. A good dose of participation also supports the governance imperatives of **equity** and **respect for minority rights**.

Intensities and Purposes of 'Participation'

'Participation' means different things to different people - one reason is that many analysts confuse the *intensities*, with the *purposes*, of *participation*. (McCall 1988)
Four intensities of participation are given here, from the least to the most 'participatory' level: [1]

- **Information Sharing.** One-way or two-way communication between 'outsiders' and local people, primarily technical information, such as needs assessment. Topics and most information-gathering techniques are pre-determined by outside agencies.
- **Consultation.** Outsiders refer certain issues to local stakeholders for refinement or prioritising. External agents pre-define the salient problems before consultation; analysis is controlled by outside.
- Involvement in **Decision-making** by all actors. Internal (local) and external actors jointly identify priorities, analyse current status, assess and select alternatives, and implement. "Participation seen as a right, not just as the means to achieve project goals".
- **Initiating Actions.** Independent initiatives from, and 'owned' by, local people who are empowered, e.g. self-mobilisation of people to perform community activities – this is completely different from simply implementation with their own labour inputs.

¹ **Sharing of Benefits** - receiving goods and services or even political clout - is sometimes considered a form of participation, but it is 'recipient participation', conceptually different from involvement in 'doing'.

The intensities of 'participation' can be critically related to differences in the underlying *purposes* or *intentions* of the agencies (external or internal) which are 'pushing' participation as a strategy. (McCall 1988)

- **Facilitation** - 'Participation promoted' to ease introduction of an outside project/ programme:- To improve external project efficiency; To lubricate outside interventions; To pass a share of the burden of costs onto the "beneficiaries"
- **Mediation** - Participation promoted to link outside projects and local people's priorities, to mediate between "external" purpose and "internal" demands:- To increase project/programme effectiveness; To build up capacity of local beneficiaries; To modify or guide outside interventions towards local needs, aspirations, resources.
- **Empowerment** - Participation promoted to reinforce local decision-making and responsibilities leading towards local empowerment:- Moves towards equitable social redistribution; To empower weak groups in resource access and control; To promote people's initiative.

Obstacles to Participation in Practice

P-GIS has to deal with many obstacles, though they are not confined to ISK. [¹]

- High-level political resistance to 'real' local empowerment (and devolution).
- Internal local holders of power will not give it up.
- Breadth of needs, opinions, etc. between actors in the local community is too wide.
- Unequal distribution of access to power - ultra-poor, elderly, children, handicapped, inarticulate, minorities - e.g. ethnic groups, castes, nomads.
- Women especially are frequently excluded from macro structural decision-making.

And, the last three are structural problems:

- Serious time constraints involved in participation processes – and solutions (*any* solution) are needed too urgently.
- Participation may be costly.
- An absolute scarcity of resources to be shared, and, overall poverty – in which case, P-mapping and GIS are luxuries beyond sensible behaviour.

Incorporation of ISK into the local community / society is already a major benefit/strength, providing the potential for the exchange of information and goals and values and increased understanding between the parties involved; (Aberley 1993; Srait et al 1994; Poole 1995; Gonzalez 2000; AMN; Harris & Weiner; Powell) Carrying out a GIS exercise with the proper involvement of the parties concerned (not necessarily a fully-fledged "participatory GIS" or PRA), has effects on empowerment of, and strengthening the capabilities of, those parties. Being involved in a GIS means that "the stakeholder parties are being taken seriously". "current steps in GIS are steps towards citizen empowerment through greater involvement and openness and accountability on behalf of decision makers." (Carver 2001)

Nevertheless, if the original data or GIS output is not processed in situ, the participation and the empowerment benefits will be lost, and maybe the situation is made even worse because an alienation between people and 'their' data can arise (Jordan & Shrestha 1998). However this is overcome, when the GIS per se is integrated into, and is seen as just one component of, the whole process of the NRM (or whatever) decision-making. The importance of using PAR (participatory action research) as the contextual approach, and the GIS as the technical tools, is emphasised by e.g. Robinson & Sawicki (1996) in their support for 'fusing' ecological IK with 'western scientific knowledge'.

¹ Carver (2001, 9-13) makes a SWOT analysis of "participation and GI", not restricted to rural applications. See also: AMN (2002) "Insight and Advice" on implementing a GIS.

Much of what terms itself “participatory GIS” lies only in the improved implementation purpose (Jordan & Shrestha 1998). In typical applications a superficial and lazy approach is taken in terms of what sorts of IK information are made use of, moreover there is usually very little “triangulation” (cross-checking) which should be a sine qua non of RRA-PRA.

Online participation technologically extends participation in decision-making, and policy support, etc. It is not much available even in the North, though Bengal and Karnataka in India, and Porto Alegre, Brasil are locations where it is developing (Goetz & Gaventa 2001). [¹] Briefly, some of the strengths of online participation are that: spatial accessibility and geographical location are not constraints, access from everywhere with internet; similarly, no time restrictions with 24/7. Anonymity cuts down cultural and also psychological barriers of gender, caste, age, and shyness. (cf. Carver 2001). Weaknesses however should also be clearly recognised: access *only* where there is internet, and it is not face-to-face.

Cost Efficiency in Participatory Approaches

The properties of information supply most important to a decision-maker are speed and simplicity. Participatory approaches are always time consuming; all participatory data collection methods have a huge appetite for time and patience. Eliciting historical resource use or NRM information from key informants means first getting their trust, involving lengthy discussions of rationale and benefits.

For the sake of simplicity, the typical project or government decision-maker will acquire information from the ‘embodied knowledge’ of known and trusted subordinates rather than from a data base, (e.g. the District Commissioner collects information from sub-District officers). Of course the information is biased, but the higher-level decision-maker can adjust for that, and s/he cannot adjust for the built-in biases of the geo database. (McCall 1992) The underlying governance issues here are **respect** for citizens and **legitimacy**.

When GIS is involved, the output may be fast, but the inputs certainly are not. Acquiring, sorting, and inputting the spatial data can be very time consuming. Indeed a common outcome is that the whole GIS process diverts time away from field activities - defeating the original purpose of the project. E.g. typically, a Brazilian participatory mapping study identified the ‘limiting factor’ as simply the “restricted time” of their key informants. (Foster Brown et al. 1995). From a good governance position, therefore, **competence** and **efficiency** are compromised.

The bottom line on P-GIS however, is that the process itself of making a participatory GIS product based on people’s ISK promotes empowerment, and thus strengthens the **respect, equity** and **legitimacy** dimensions.

4. Indigenous Knowledge & Scientific Knowledge

Participatory approaches to planning must involve the elicitation and application of indigenous (technical) knowledge (ITK); therefore differences between ITK and ‘scientific knowledge’ need to be considered.

¹ See also the combination of GIS and computer-supported participation into “Perceptive GIS” (Giger & Loidold 2002).

ITK is a local resource which by rights belongs to people as individuals and communities. Indeed in rural societies penetrated by global market effects, indigenous knowledge is the main resource which local people probably still control, whilst their lands, natural resources and labour are being rapidly appropriated. (McCall 1988, 1995). ITK is a key, because:

- it may be the only resource that the poorest groups control;
- it is a resource needing little investment for its immediate realisation;
- it reflects the capability and competence of the local community and should put them on equal footing with outsiders;
- local knowledge is operational.

The importance in natural resource management of understanding and legitimising ITK is recognised since at least the Rio Conference. (Warren et al. 1991; Brodnig & Mayer-Schonberger 2000) However, the kind of knowledge has been disputed since ITK entered development discourses. Most scientists hold there are essential differences, albeit with fuzzy boundaries, between Indigenous and Scientific Knowledge, whether in the subject matter and ontology, methodology and epistemology, or in the application context. Some however, maintain that the inferior values ascribed to ITK by 'western' scientists really reflect political attitudes towards participatory development, shown by the deliberate side-lining of local expertise. (Agrawal 1995). E.g. Hutchinson & Toledano (1992) found "almost universally, local officials were viewed as sources of data rather than of expert guidance".

Two definitions out of many can summarise I(T)K and the significance for ISK and GI applications:

"IK is the information base for a society, which facilitates communication and decision-making. Indigenous information systems are dynamic, and are continually influenced by internal creativity and experimentation as well as by contact with external systems." (Flavier et al 1995, p. 479).

IK is "the unique, traditional, local knowledge existing within and developed around the specific conditions of women and men indigenous to a particular geographic area." (Grenier, 1998)

ITK is distinct from scientific knowledge in the following respects:

- Localness of ITK – derivation from close, long relationships between people and a specific land / resource area gives ITK its focus.
- Ownership by the local community, even though non-homogeneously, integrates ITK with social priorities.
- Classifications in ITK are usually assumed to be more based on functionality or purposiveness than those of Scientific Knowledge; though there is evidence countering this, e.g. Birmingham's (1998) ethno-pedology study in Burkina.
- ITK is more holistic because of the purposiveness – e.g. an emphasis on holistic, combinatorial explanations. Although this holism is usually seen in opposition to reductionist epistemology, holistic systems approaches are also utilised in science.

Nevertheless, ITK has more elements in common with Scientific Knowledge :

- Dynamism - Interest and ability to incorporate new knowledge from other (outside) sources, notwithstanding they may contradict held beliefs. (Brouwer 1995)
- The imperative for taxonomies, as the building blocks of some kind of explanations.
- Identification of specific conditions under which general 'laws' or explanations will hold.
- Drive to experiment – to explore the effects of altering the underlying conditions; (for ITK, see Richards 1989; Rhoades & Bebbington 1996)

- Knowledge is unevenly distributed within a community of experts - whether the 'controlling' ITK arrogated by male elders/ castes (McCall 1995; McKinnon 2001), or, by closed scientific 'academies'.
- ITK is often devalued as "culturally-embedded, encoded in ritual"; but there is a parallel in growth-driven, individualistic, materialist cultures that form the context of western science funding.

Indigenous Spatial Knowledge (ISK)

"Naïve geography is the body of knowledge that people have about the surrounding geographic world" (Egenhofer & Mark 1997). Some of the propositions about "naïve geography" are valid as generalisations about ISK, and therefore relevant to applying GiT, including:

- Real space is "tightly coupled" in people's conceptualisations with time – examples from old farming systems where land areas are related to time requirements, such as acre, arpent, morgen. (Egenhofer & Mark 1997)
- Reasoning in geographic space deals with incomplete information, i.e. people have to interpolate much missing information using 'common sense' rules.
- Multiple levels of detail which correspond to different conceptualisations of space. Some spaces are continuous, some discrete; much ITK of NRM is not point data, but areal. Traditional users maintain that hunting, fishing, collecting, etc. do not occur at specific sites but are a 'range', which does not always fit into standardised resource mapping.
- Boundaries are not necessarily discrete entities, and not necessarily seen by neighbours as symmetric.
- Distances are normally asymmetric, depending on various measures of overcoming 'friction of distance', especially in areas of altitude change, congestion, etc.

Goes In Center (1999) provides a cultural interpretation that "GIS functions like a traditional Indian 'scout' who would obtain and synthesize information to support collective decision making." GIS would "metaphorically recapture one's spiritual connection with the land" in line with Indians' self-image as stewards, not owners, of the land. American Indian communities argued, re. GIS, that ".. Indians tend to be spatial reasoners, .." and that their cultural information is easier understood on maps than in tabular databases. (Online 1999 p.2) "[Lakota] ancestors .. had star knowledge, star maps, winter counts .." as spatial representations that augmented oral traditions. (Goes In Center 2000)

Land has strong common values in addition to those of an economic commodity; so 'land' should not be dumped into categories of 'high value', 'marginal', 'wastelands', etc. Harmsworth (1997) puts it in Maori values, land has tapu (respect [for resources]), mana (authority), and mauri (life force, life energy). The ISK of resources per se, and resource management, were applied to specific "ancestral" decision-making processes. (e.g. Goes in Center, 2000)

Similar values are easily identified in the concepts of indigenous peoples who retain a spiritual and sacred feeling for land. e.g. Gonzalez (2000), Bartolo & Hill (2001), AMN website. ISK "describes home and action space, is innate and sustained knowledge about the land, identifies issues of immediate significance, and encodes the information about the environment in a language a regions' inhabitants understand." (Duerden & Kuhn 1996)

"Community maps" may well be distorted if they are simplistic agglomerations of individual mental maps. Group representations of space are needed, i.e. PRA methods of community surveys and mapping, with (time-consuming) feedback.

Gendered ISK and its Analysis

ISK has a gender component. The significance for gendered spatial analysis follows from women's high involvement in land and natural resource use, and their specialised local technical and management knowledge; and the necessity to measure and map the double burden of rural women engaged in agriculture and NRM. Women's land resources are often denigrated as 'unused wastelands' or the like, and the products they make from bio-resources or NTFPs are not recognised as having economic or even livelihood value. The 'no market value' label is often elided into 'primitive', 'undeveloped', 'not modern', etc. (cf. Scott 1995) Ignoring specialised NR knowledge held by women is also a failure to protect biodiversity, because it loses information valuable throughout society (Rocheleau; Vandana Shiva)

The gender aspect is often invisible. Much of it *cannot be seen* - women's use of forest resources is much more likely to be the collection of foods, medicines, fibres, taking place under the closed canopy; and production in the lower stories of forest gardens, rather than large-scale removal of trees for timber or agricultural clearing, usually done by men. Satellite imagery is not sensitive enough to show the vital elements of women's specialised involvement in agriculture and natural resource use. Land use responsibilities specific to women in many farming systems operate at a very small and 'invisible' scale, i.e., intercropping and multi-cropping, weeding activities (time-consuming, but not easily visible), home gardens and forest gardens, vegetable growing, etc. "They may, in fact, be limited to particular resources, or even particular products of those resources, certainly much smaller than a single pixel in most land use or property images in use today." (Rocheleau et al., 1995, p.64)

Moreover, the gender aspect even when it could be, *is not seen*, because most census data do not show the richness of women's real lives (nor much of men's), because of the general focus on monetised activities, and because they make highly restrictive assumptions about the roles and capacities, and thus the spatial activity patterns, of women. It follows that the mapped versions or other spatial databases are unable to show gender distinctions. "... women's spaces are often nested between and within lands controlled by men." (Rocheleau et al., 1995, p.64) Similarly, gender differences in levels of mobility in developing countries are mirrored in the restrictions, and thus the "invisibility", of the large proportion of house-bound and non-car owning women in the US (Hall 1997).

In the resource planning context, gendered space refers to several dimensions:- specialised knowledge of distributions in space, differential use of resources, and access to and ownership of resources with their nested scales, and cultural landscapes associated with life experiences.

5. Ownership of Indigenous Spatial Knowledge

If ITK, and more particularly ISK is a key element of participatory GIS, then it is essential to understand who *owns* I(S)K, and what are the implications.

'Insiders' and 'Outsiders' and ITK

Ownership can be seen in terms of 'insiders' and 'outsiders'. The case for the 'insiders' ownership of ITK grew with the 1988 "Declaration of Belem" pressing for compensation

to indigenous peoples for their ITK, especially of plants and fauna, with lawyers working for the protection of indigenous Intellectual Property Rights. In opposition to this, Northern pharmaceutical, seed, and food companies jealously guard the new varieties which they poach and develop. Critics contest that rights, similar to bio-technology patenting and copyright, are not accorded to IK sources or to farmer-experimenters. The situation is now greatly exacerbated by the uneven distribution of power in setting and interpreting WTO and WIPO regulations.

The bio-product companies' position is based on the deliberately erroneous assertion that ITK is merely inherited, or serendipitous and ascientific knowledge founded in trial and error. The intended conclusion of such argument is that ITK is "open-access" knowledge, open for plunder by all. Harmsworth (1997) criticises this in relation to Maori cultural and indigenous (spatial) property rights, which include not only traditional foods, special plants for medicines and handicrafts, but also the ecosystems which support the plants, traditionally-protected biodiversity, tribal landmarks, sacred sites, etc.

However, not all 'insiders' are equal with respect to the ownership of knowledge. It may be attractive to assume that ITK is, or ought to be, equitably distributed within the community, but this would be very mistaken. Indigenous knowledge is found among the categories of: (McCall 1988, 1995)

- some vernacular technical knowledge held by all local people,
- social knowledge belonging to the group (village, clan, caste, tribe, etc.) qua community,
- specialized knowledge of skilled 'resource persons',
- controlling knowledge held by dominant groups in society. [¹]

Ownership of (Spatial) Information

Ownership of local ISK may follow down the path of conventional geo-spatial information resources, where the trend is towards privatisation to the highest bidder under market rules. Even the "patrimonial" information of foundation and framework geo-data sets, including topo data, public and social infrastructure, census data, etc. is being sold off to exploit the GIS value-added. Even more so, the spatial data about the natural physical and bio resources of a nation. Under globalisation, not only the resources of South countries, but the fundamental knowledge about them, are up for grabs in the global market.

A very strong position on ownership, and therefore on limited and limiting access, of 'secret', sacred, spatial, knowledge is taken by Harmsworth (1997) with regard to Maori peoples. These protectionist views towards a culture, found also in the US (c.f. Makokis & Buckley 1991, Madsen 1995, Laituri 2002, Online 1999), could be interpreted also as protecting the privileged position of a small elite class of resource rentiers who thrive on the restricted knowledge of resource types, locations, exploitation potentials, etc., privy only to themselves. The biggest group of people likely to be disenfranchised are women.

Asserting and ensuring confidentiality of IK data are always a concern, even when not taken as far as the NZ case. The very first stage of the Nunavik Mapping Project was to

¹ Common examples: men's secure control of NR knowledge and the consequent exclusion of women become legitimised by 'community traditions'; senior men (socially and economically) retain physical control over resources which they then dispose of, by calling upon the traditions of 'reserved information'; e.g. forest resources in Solomon Is. (McKinnon 2001)

develop protocols for participation and Inuit control of confidential mapped information, (Kemp & Brooke 1995); similarly amongst Canadian First Nations (Johnson 1997). [1]

A related question is whether ownership of knowledge includes the right to prevent others from using it. Amongst First Nations in N. America and Maoris in Aotearoa there are legal-political moves towards a 'communal right of privacy' (Madsen 1995) [2] This means customary leadership responsibility for data protection, and thus control over GIS data layers such as sacred sites or resource use; Colville Confederacy leaders assert that spatial data on hunting and gathering areas also have tribal spiritual significance. (Marchand & Winchell 1994); and US and NZ indigenistas rightly fear vandalism of sacred sites by souvenir-hunters. (Online 1999; Harmsworth 1997). Moreover, the rights of indigenous peoples can be asserted to be free of 'wanton exploitation' of their natural resource data from over-flying aerial photography or RS space platforms.

It has been argued that Canadian Indian Band Councils and Tribal groups in the US have a right and a duty to set their own data protection codes. (e.g. Madsen 1995; Laituri 2002). Landcare Research in NZ offers three protection options for sensitive, confidential layers: 1) recording the information as concealed files linked to a GIS and needing a permission, 2) recording the information as an overlay e.g. grid, at a crude scale which prevents specific site identification, 3) providing a hyperlink via a Maori iwi (clan) authority to a recognised responsible to answer queries as needed.

Access to Spatial Information

Whatever the actual ownership, as a basic condition for good governance, people must have rights of access to the information stocks held by the state, and also by the commercial sector. There are limits to these rights, set by national security, commercial and customer confidentiality, and there are vast differences between what states 'allow' their citizens access to - Harris et al. (1995) instance the South African legacy of distorted information under apartheid.

People without the appropriate training or 'intelligence' to use [the internet] have been termed the 'information underclass', the off-line goats separated from the on-line wired sheep. But lack of resources and access to the Net are more important hindrances than being untrained; thus, the argument that governance obligations require states to provide access to (geo-)information for their citizens, moreover with "... an obligation to facilitate this access at affordable prices." (Georgiadou & Groot 2001) It is not only a question of 'who has financial resources', but broader issues of 'accessibility'. Most people are in

¹ Examples of ISK data layers to be protected with increasing intensity –:
from e.g. USA (Makokis & Buckley 1991), and NZ (Harmsworth 1997).

- traditional gathering, hunting, trapping, fishing, grazing, fuel collection lands.
- outer boundaries of culture areas, clans, tribes, etc.
- customary property delineations/demarcations within the cultural boundary, e.g. by clan, lineage, bands, household, intra-household, male and female areas.
- historic places, battlegrounds, old villages.
- sacred sites, burial grounds, ceremonial areas, shrines, buried art.
- indigenous place names, cosmological locations.

² Madsen quotes from a US legal opinion of Olmstead v. U.S. (1928) when Justice Louis Brandeis "called the right to be let alone 'the most comprehensive of rights and the right most cherished by civilized men.'" Madsen suggests that the 1993 UN Draft Declaration on the Rights of Indigenous Peoples responds to this "right" by its statement: "the urgent need to respect and promote the inherent rights and characteristics of indigenous peoples, especially their rights to their lands, territories and resources." (Madsen 1995)

lower income countries/classes and are not on the WWW – they walk or bus to obtain public geodata.

The flip side of accessibility is exclusion – despite the improved wired access of many, eventually a majority, a very significant minority will become more marginalized, “adoption also implies non-adoption or inability to adopt.” (Harris et al 1995, 202). ‘Access’ should be explicitly for all people, or civil society representatives, and not restricted to a cultural, scientific elite. For instance, all countries have EIA legislation requiring public participation, but a typical situation (southern Sri Lanka) finds a lengthy environmental impact statement - in scientific English, but plenty of maps! - lying dusty and unread in a District office for the statutory six weeks, after which the government can legally conclude that, if no public reactions to the document, then obviously no objections to the project.

Even with a degree of ‘open government’, information nevertheless accrues to those already with most resources, thus accumulation of power. This is equally true for processed ISK, the ‘customarily-owned information’ within First Nations can likewise be controlled by an older, male, clan or class elite. Information is a resource whose value is *realised* only in combination with other social/political resources, especially power and access to policy instruments. Therefore, the development and installation of improved (spatial) information capabilities (such as GIS) has to run parallel with improved institutional safeguards for reasonable public access and use.

The issues of public and state access to information held by the large-scale, especially trans-national private sector must equally be addressed in public debate and be subject to public policy determination, and not left camouflaged under commercial confidentiality.

6. Does GIS Represent ITK? or, is GIS Technology-driven and Distorting ISK?

Technology-driven

Conventional projects [¹] to promote or disseminate GIS have commonly been driven from ‘outside’ as a ‘solution looking for a problem’, as recognised even by many GIS professionals, e.g. Hutchinson & Toledano (1993). “GIS and RS demonstrations [in general] are ‘technology-driven’ rather than ‘demand-driven’.” This raises questions of the **legitimacy** and **respect** dimensions in relation to governance.

GIS approaches, especially those built on RS data, may place unnecessary or misleading emphasis on spatial accuracy or preciseness of the output information. Most rural development activities do not need a high degree of spatial exactitude. (cf. Barndt 2002). They are concerned with interventions at the level of communities or agro-ecological zones, etc. which are relatively large spatial entities, and may not have precise boundaries. Many social interventions are aimed at communities of people who do not have a unique or fixed location anyway (women, pastoralists, students, the “poorest 10%”).

Preciseness is needed for special situations, especially legal actions in court for land rights (vs. the state or forestry concession, etc.) But as shown by a recent Malaysian case, the legal requirements threshold may be set too high for feasible P-GIS anyway (AMN 2002 Sarawak)

¹ This statement is focused on standard GIS, as opposed to local-level, participatory GIS. However, some P-GIS projects are also criticised as technology-driven.

The governance dimensions of technology- (supply)-driven local planning should be **legitimacy**, **competence**, and **accountability**, i.e. non-transparency.

GIS Representing ISK?

A primary strength of GIS and P-GIS with respect to ISK is its layering capabilities. Multiple perspectives always demand multi-mappings. It has been argued that this capability is the reason why GIS can significantly represent a holistic, i.e. non-reductionist, *weltanschauung* of indigenous peoples. In more technical terms, the use of layering has a synergistic result in that the combinations of themed information, - from different social perspectives, eras and sources, and both quantitative and qualitative, - create a whole which is greater than the sum of its parts.

The 'thematic layers' of sectoral, functional information easily created in GIS mapping can "... represent landscape as an integrated whole, a view that is reflective of native environmental images." (Duerden & Keller 1992, p.14; Goes in Center 1999; et al.). Johnson (1997) points out how this application of GIS reflecting an indigenous world view is the keystone link for land claims in the modern Canadian court system. Thus, *layering* has a fundamental relationship with **respect for rights**, and to some extent with **equity** categories. [¹]

As counter-claim, the sense of place, described earlier, which is associated with particular localities by particular groups of people, (in perceptual or mental maps) is qualitative, fuzzy, metaphorical, mystical, - not reductionist, not necessarily in Euclidean space, nor vectorisable. The distortions forced on perceived space by being embedded in a logical, positivist procrustean GIS bed may be throwing away too much natural information (ISK). Not only the analysis of ISK, but also its visualisation, is a major challenge, calling for new forms of representation with innovative software.

Hall (1997) takes the argument further with her identification of GIS as a "masculinist technology" which is materialist and positivist, handling only discrete bounded units of analysis that are often pre-defined, avoiding fuzzy concepts, etc. Her call is for work on the "feminisation of GIS". Similarly, Varanka (1997) interprets the stress on the principles of 'Plain style' in cartography - the simplicity of context by eliminating competing viewpoints, emphasis on mathematical accuracy, utility, lack of iconography, plainness - as "manly"; as opposed to other objectives of recording ambiguity, fuzziness and spiritual values that are seen as "feminine and juvenile". Varanka (p.1) proposes that the "unacknowledged consequences of Plain style mapping are [masculinist] cultural .. repression [of] emotive statements and abstractions such as worldviews and spirituality."

Visualisation and Technical Flim-Flam

It is impossible to overestimate the visual impact of GIS output, RS images and, to a lesser extent, maps. (cf. the classic Monmonier, 1991). It is not only the quantity of bits of information that can be summarised in an image (compared with a written report or data tables), but the quality of the information imparted is also different - the "clarity", the simplicity of "distinguishing", and the ease of making comparisons.

As many observers have noted, GIS displays can have too strong a convincing impact on the audience - the ease of layering, the ease of changing and comparing maps, the apparent objectivity and scientific content of the display can have a blinding effect. (cf.

¹ In conventional planning approaches, layering is anyway used to improve **competence** / **efficiency** of delivery.

Abbot et al. 1998; Obermeyer 1997.) 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). “Spurious” could be added to the quote.

There are concerns here for **accountability**, as well as for **efficiency** in a practical sense. Flashy GIS images create in fact non-transparency and non-visibility, so that representations and decisions are distorted or confused by the image.

7. Some Technical Issues (related to Governance) ^[1]

Affinity with GIS re. Training

A positive outcome of experience of P-GIS is that an affinity – ‘feeling comfortable working with GIS and computers’ – is not difficult to stimulate. Techno-professionals have come to the appreciation that untrained people, with local ISK, can work effectively, easily and happily interpreting aerial photos, of which there are many instances, (see e.g. Groten 1997; Fox 1986; Jordan & Shrestha 1998.)

Similarly, 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. Although most packaged GIS training or capacity-building is geared to computer literates, there are alternatives, as shown by the experiences of AMN and ESRI, and by the extremes of Gonzalez’s (2000) intensive training experience with Ifugao, (c.f. Harris & Weiner; Powell), and that of McKinnon’s (2001) more rapid MIGIS. ^[2] Attitudes towards participatory implementation and appropriate training mechanisms are both **equity** issues in Governance parlance.

The constraints against local people or organisations working with GIS, if they occur, are due to exclusion – whether economic, social, and/or political, and not because of technical incapacity. (Obermeyer 1998; et al.) Technical and organisational compatibility is therefore a positive measure on the **equity** dimension, as well as for overall **accountability**.

Appropriate Choice of Software

GIS software marketed to community groups is often inappropriate, not just in its functionalities and data appetite, but maybe key hardware is missing, or electricity is irregular. A counter example is the systematic assessment of GIS packages made by the Shuswap Nation Council. Software and hardware companies first came together to a Council-controlled workshop, and the Shuswap then assessed alternatives on the factors

¹ Johnson (1997) examined 4 categories of operational ‘difficulties’ in 1st Nation implementation of GIS, based on Shuswap experience, but applicable to most others in North America.

Two documents on the AMN website, “Insight and Advice” on implementing a GIS; and, “A Survey of GIS in the Aboriginal Mapping Community [in Canada]” (AMN 2002). Other reviews of practical problems: Gonzalez (2000, Chap. 4); van der Vegt’s (2001) review of municipal GIS, her cases from Cebu and Lilongwe.

² To avoid fast turnover of trained GIS staff to richer jobs, a pre-condition is a local Civil Society group, e.g. the I.T.C. in Ifugao.

important to them: ease of learning, analytical capability, information interchange, usability, support, and primarily - ease of use, application development capacity, and cost. (Johnson 1997) Software decisions relate to **accountability** in simple terms, and to **competence / efficiency**.

Funding and Finance

GIS activities are often treated as short-term, limited projects, rather than as on-going processes, despite being marketed as structural investment programmes. Where the financial benefits of GIS to a powerful stakeholder quickly outweigh the costs, there is little need for promotion and support, such as when GIS output is directly connected to financial returns, as with cadastral information for tax revenues, or utility line management and maintenance. Thus, **competence** and **efficiency** issues.

In most NRM applications, however, the benefits are neither fast (participation always places lower values on time resource), nor necessarily in a financial currency. More important, where there are financial returns from P-GIS used for community NRM, they do not usually accrue to the big commercial players who could fund high-tech GIS.

8. CONCLUSIONS

Indigenous Knowledge and ISK

The paper argues both that IK and scientific knowledge are not so different; that IK has been denigrated for political control, not scientific, reasons; and simultaneously maintains that I(S)K has unique features which give it a number of advantages over scientific knowledge.

These two positions are not contradictory. Much indigenous knowledge of land uses, pests, soil & water conservation, ethno-veterinary and ethno-medicine, etc. is similar to scientific knowledge. In many respects, it is better because it embodies years, if not generations, of specific practical knowledge which often also has the benefit of being interactive, holistic and not reductionist, thus incorporating the real linkages – consider crop testing under controlled conditions on an experimental farm, and in the actual farming system with real people.

Beyond this, there is indigenous knowledge that is apparently qualitatively different from scientific knowledge. This IK is symbolic, metaphoric, and visionary, (mystical in 'scientific' terms), and especially related with the land and land features. [1] This deep knowledge, with its obligations of stewardship of the land, together with the specialised, location- and resource-specific, problem-oriented ITK, provide the basis for local people's participation.

Ownership of ISK

Poole (1995) made an interesting distinction between *mapping* and *geomatics*. “[Local/ community] mapping signifies what is happening *within* communities” and “geomatics serves ... communities in responding to *external* pressures and concerns, ...”

The challenge is to integrate the insiders', sometimes abstract, knowledge (ISK) which reflects local needs, with the external demands which are ratcheting up fast as effects of globalisation. The rationale behind the integration is analogous to seeing 'community participation' as a 'third way' between facilitating external projects, and, autonomous

¹ Often enough there are actual functional connections with 'scientific' explanations, as in traditional restrictions on using 'sacred land' which is also a protected forest or dry season grazing reserve.

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

(Spatial) Information, Power and Participation in Local Development & NRM

Rural development and natural resource management are directed much more by relative power and access to and control over resources, than by (geo-) information. [1] Typically, in evaluating why a GIS ToT project in India was unsustainable, no deficiencies in GIS and computer capabilities were found - "no computing problem seemed beyond their ability to solve." That is not where the problems lie, "the problems of development are related more to agriculture or NRM, driven .. by socio-economic considerations". (Hutchinson & Toledano 1993)

Carver (2001) begins a review of 'participation and GI' with the pessimistic idea that possibly the general public do not want to be ".. more closely involved in decision-making.."; but he then adds the more significant question of whether policy-makers and power-brokers actually value public input. Development always has an equity dimension (in addition to productivity and sustainability); therefore it is not only the amount and quality of additional information which is significant, but its distribution. A necessary, if obvious point is that wherever some actors gain from introduction of GIS, other social groups will lose out, becoming yet more marginalized. (cf. Harris et al. 1995; Rundstrom 1995). Only if and where (geo-) information shifts the balance of powers and changes access to (natural) resources, can it be considered to affect rural development. A condition often neglected even in participatory planning, is that the local society, whether urban community or rural village, is rarely homogeneous, and 'participation' has to struggle to reach the power-poor marginalized and inarticulate.

There is moreover a yet unburied myth about 'value-neutral GIS' - "a GIS reflects the mandate [and the values, goals, biases, imperatives] of the agency that operates it." (Harris et al. 1995). GIS is no more value-neutral than statistics or bulldozers, it all depends on what it is being used for, and on who is controlling it. It is axiomatic that good governance rests not on the tools but on who uses them and how. The Varenus initiative on P-GIS [2] was concerned about several issues to do with power, control, and access in geo-information, mainly in North countries. These included the impacts of unequal access to GIS technology and data, the feasibility of representing a 'community knowledge base' within GIS, and likewise the potential distortion of local knowledge by the GI format, and finally whether P-GIS can actually lead to empowerment in decision-making.

GIS and maps are not enough by themselves for local development; they are a necessary but not sufficient condition. They must be definitively embedded in participation, not just as an operational mechanism, but as one of the tools for empowering local people. Without those conditions, it cannot be Participatory-GIS.

¹ Critiques along these lines are not new – e.g. Rundstrom 1995; Harris et al. 1995; Pickles 1991; debates in the Varenus project; Gonzalez 2000.

² "Varenus" was the US NCGIA Project "to advance geographic information science". It supported relevant NCGIA initiatives:

- I-19 The Social Implications of How People, Space, and Environment are Represented in GIS. also:
- I-17 Collaborative Spatial Decision-Making.
- I-21 Formal Models of the Common-Sense Geographic World.

Governance and (P-)GIS

Given the message that (geo-) information is the servant of the power structure in the status quo, in what respects can P-mapping and P-GIS support good governance? For the geo-information scientist, the aim must be to identify those features that make P-GIS using ISK more compatible with the tenets and measures of good governance.

Legitimacy:

P-GIS (and P-mapping) create opportunities to visualise the interests, needs and potentials of groups disparate in terms of region, ethnicity, gender, class, etc. Therefore, they work towards better governance in that the governing recognise and appreciate representations of the legitimacy of interests.

Most significant is that P-GIS implies 'people's participation', at least to some degree [¹] which forms the basis for legitimacy.

Respect for Rights:

The P-GIS identifies and systematically analyses and represents the spatial rights of people with respect to land and other resources, in terms of ownership, access, use and management.

Explicitly, P-GIS provides a framework for legal, political and administrative (planning) legitimacy, as with P-GIS/P-maps used for registering and legalising customary land claims.

Implicitly, the application of P-GIS respects the value and integrity of indigenous knowledge as an essential element in participatory planning. P-GIS works to operationalise ITK/ISK by locating, analysing and presenting it.

Equity:

When P-GIS is applied to specifically, equity, mapping, it reinforces a respect for minorities, the inarticulate, and the resource- and power-poor.

The distribution over space of services, functions and resources (from government or private sector) are highlighted in P-GIS indicators, more than in conventional GIS. Moreover the sources of information for these indicators are the people affected, not just the technical planners.

Competence (Efficiency):

Not so different from conventional GIS, but the participatory element in P-GIS adds the factor that the efficiency and effectiveness of the governing towards the governed, in terms of service provision, response to needs, can be transparently tested.

Accountability of the governing to the governed:

Running throughout the participatory mapping approaches and procedures are the improved transparency and visibility of the relations between governing and governed that are shown up by P-GIS outputs.

The lengthy, intensive, enlightening process of developing a GIS in a fully participatory manner is itself capacity-building and empowering, and therefore adds considerably to devolution and responsiveness measures.

Good Practice Guidelines for P-GIS

There are real needs for progressive developments in P-GIS and mapping, GIS is by no means only a technical fix. Overlaying has already been seen as a major 'value-adding' functionality which GIS has over paper mapping, along with: spatial analytical capacities

¹ "Community participation is the cornerstone of PPGIS." (Craig et al 2002)

(unexamined in this paper), spatial scaling (multi-scaling, scale comparisons, zooming-in), time series for temporal comparisons, and, visualisation.

The valuable use of spatial visualisations (maps, GIS) lies in scenario development and exploration. [1] Civil society groups can use the capabilities of P-GIS to explore the decision spaces and play around with alternative futures, based on not-necessarily-consistent perceptions of their own goals, objectives, constraints, preferences; as in the 'co-learning', 'empowering' processes of joint development of GIS, (e.g. Powell 1999; Harris & Weiner; Gonzalez 2000). An essential technical requirement is to translate 'group space preference maps' (ISK) into GIS-compatible constructs that are on a level legal or policy playing-field with other more powerful stakeholders.

There are important technical innovations coming into more regular usage – GPS, already well-developed, but becoming more affordable; and Personal Digital Assistants (PDA), becoming cheaper, user-friendlier, and with sufficient technical functionalities, e.g. Compaq-iPaq featuring ArcPad and Palm OS with RDBMS mapping, both with GPS compatibility.

Furthermore, significant innovative visualisation software is being developed, more attuned to ISK characteristics – e.g. flexible & fuzzy in place of hard boundaries, multi-user, transparent overlays, soft zoning, dynamic and interactive visualisations (Flash features), etc. It is time to explore the appropriateness for ISK of alternative scales, colours, accuracy, definition, content, symbols, pixel size, etc., using new mapping and visualisation / presentation software such as FreeHand10 and Avenza MaPublisher4. (p.c. vd Worm)

A 'Good Practice' sequence for implementing P-mapping / P-GIS would follow:

- PRA and Participatory-RRA principles and methodology, especially their information needs assessment; and not just blindly use the tools of RRA.
- Make use of indigenous knowledge and local experts; seek to understand local society, livelihoods, and NRM; especially a historical perspective in IK and ISK.
- Use local spatial ISK concepts of boundaries, core areas, conflict and risk zones, resources, priority areas, time-distance relations, etc.
- Utilise spatial PRA tools – participatory joint interpretation of air photos, RS images; ephemeral maps, participatory sketch maps, time-space diagrams, transects, etc.
- Identify and record with GPS and mobile GIS.
- Transfer participatory maps directly into appropriate visualisation software, e.g. FreeHand10, MaPublisher, more attuned to ISK characteristics.
- Thence, where appropriate for specific purposes, translate into user-friendly GIS software, e.g. ArcPad.
- Make use of interactive visualisation software for further development and participatory planning with user groups.
- All the above, not only with short-term, functional, participation, but with sustainable, local capacity-building to carry them through, as the empowerment objective.

¹ "GIS-based decision tools need to be exploratory rather than definitive." (Carver, 2001)

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