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Seeking good governance in participatory-GIS: a review of processes and governance dimensions in applying GIS to participatory spatial planning

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Abstract

The adoption of participatory spatial planning (PSP) approaches has been partially supported by developments in participatory-GIS (P-GIS), as seen in applications both in local resource management in developing South countries, and in community neighbourhood planning in the urban North. Such applications provide a basis for examining the relationship between the use of geo-information and governance, as many P-GIS initiatives claim to foster accountability, transparency, legitimacy and other dimensions of governance. Examples from recent literature illustrate the strengths and weaknesses of utilising P-GIS, and in particular, the implications for greater participation, empowerment, and ownership of and access to spatial information, and for governance in general. Some new developments in GIS technology, like 'mobile-GIS', have the potential to strengthen these impacts. While P-GIS is not an essential component of PSP, if used with an adequate regard and sensitivity for issues of ownership, legitimacy and local knowledge, it can contribute to the empowerment of communities in solving spatial planning problems.

Keywords: Participatory-GIS; Governance; Participatory spatial planning; Spatial knowledge

1. Introduction

Over the past decade, 'local-level' and 'participatory-GIS' (P-GIS) have been applied to participatory spatial planning (PSP) mapping community space—whether urban neighbourhoods

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or ancestral domains, analysing and ameliorating land and resource conflicts, participatory land use planning, awareness-raising, and efforts to build people's empowerment.[1] The geo-information tools used in these applications include collaborative spatial data collection using RRA/PRA methods,[2] participatory maps, aerial photos and remote sensing images; and P-GIS analyses and representations.

There is an implicit, sometimes explicit, assumption that using GIS at this local level is both efficient and effective, in that it is believed to simultaneously deal with the planning content, answer the questions asked of the geo-information, and also address and satisfy the local stakeholders' underlying interests. P-GIS is expected to be implemented in a participative manner and make use of local information, within which indigenous spatial knowledge (ISK) is a special category. As such there is an often-made assumption that this use of GIS is a tool for better governance.

This paper raises questions for investigating the validity of these assumptions.

- Can the goals of good governance be met in such applications of GIS?—with the governance criteria of accountability, legitimacy, respect for rights, equity, and competence?

To answer this, needs supplementary questions:

- What degrees of 'participation' are found in participatory mapping (P-mapping) and P-GIS?
- What motivations lie behind the promotion of P-GIS?
- Is local knowledge/ISK applied to better governance?
- Who has access to ISK? Do access and use respect cultural rights and 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? What difference does GIT (GIS technology) make to the distribution of power?

The paper begins in Section 2 with an inventory of local-level GIS applications.[3] Section 3 discusses the criteria behind 'good governance' and some spatial aspects of governance measures. Section 4 looks at the difficulties faced by P-GIS in practice, including the character of indigenous and gendered spatial knowledge. Section 5 questions ownership and accessibility of this knowledge, particularly in the context of good governance. Section 6 considers strengths and weaknesses of P-GIS—operational issues and whether GIS can 'represent' ISK. Section 7 draws some conclusions about the potential and promise of new GIT for P-GIS, tempered by the

[1] A major driver in recording and analysing urban/community PSP has been the Varenius initiative of the National Center for Geographic Information and Analysis (NCGIA). Varenius studies were concerned with issues in power, control, and access in geo-information, mainly in the USA, including the impacts of unequal access to GIS technology and data, the feasibility of representing a 'community knowledge base' within GIS, the potential distortion of local knowledge by the GI format, and ultimately whether P-GIS can actually lead to empowerment in decision-making (cf. http://www.ncgia.ucsb.edu/varenius/ppgis/ncgia.html; Weiner et al., 2002).

[2] RRA refers to rapid rural appraisal, while PRA is participatory rural appraisal.

[3] For reviews and references in P-GIS employment—for urban community planning and management, see Craig et al. (2002); and, for local-level rural development and NRM, see McCall (2002) and King (2002).

realities of power and other governance dimensions. The way in which P-GIS is actually used will always reflect the power situation.

2. Local and indigenous communities using local-level mapping and participatory-GIS

Beyond the indistinct ideals of P-GIS like empowerment and participation, there are particular purposes behind local-level geo-information acquisition, analysis, and representation. General categories[4] are given below, together with typical references for urban examples.

In a representative, though probably incomplete survey, Sawicki and Peterman (2002, Chapter 2) identify 67 organisations (educational institutions, NGOs, government departments and private companies) in 40 cities in the USA claiming to have some form of PPGIS.[5]

In rural and natural resource management (NRM), P-GIS is applied frequently amongst indigenous peoples of Canada, USA, New Zealand, and Australia. A British Columbia survey showed 44% of 109 'First Nations' currently using GIS, with another 36% interested, with the commonest applications being "Traditional Use Studies", treaty processes, and NRM (AMN, 2002a, b). Poole (1995) found multiple examples of P-mapping or P-GIS outside these big four, only in Brazil, Philippines, Indonesia, Peru, Thailand, and Kenya, and 15 other countries. ESRI's PPGIS websites (ESRI, 1997) list one application each from six Asian or African countries, compared with about 75 cases from North America.

2.1. Claiming 'our land'—demarcation of community and neighbourhood, or legal recognition of customary land rights

Demarcation of customary tenure and traditional use areas in the rural context are most notable in Canada and USA, with their 'First Nations' constitutional status. New Zealand, Australia, and increasingly, the Philippines also designate ancestral domain. Conventionally, GIS is deployed in formalisation and commodification of land and property rights, although there are likely serious negative implications in this for common property regimes and the people dependent on them. The mapping/GIS process needs to follow procedures known and acceptable to local communities and in accordance with traditional decision-making. Concomitantly, the spatial (map) products must satisfy the formal, legal land tenure requirements for accuracy, reliability, and legitimacy.

In the urban context, 'claiming our land' is unlikely to be in legal rights terms, but a socio-cultural, or psychological claim. Communities, or at least their concerned, motivated, and capacitated members, demarcate and define the boundaries and contents of the place that they live in (e.g. Elwood, 2002, Chapter 6; Craig & Elwood, 1998). This 'community/neighbourhood mapping' may include 'historical mapping'. The mapping processes may remain very conceptual and abstract as befits mapping people's perceptions and feelings, but they can be more systematic,

[4] Categories are based on Weiner et al's (2002) overview of urban applications; and Poole's (1995) seminal review of ISK mapping in rural and NRM mapping contexts.

[5] The distinction between P-GIS as the tool, and PPGIS (public participation GIS), as the planning context, is not always straightforward. This paper uses both.

for instance by maintaining a public record GIS (e.g. Casey & Pederson, 2000; Craig, Harris, & Weiner, 2002).

'Claiming the neighbourhood' is usually the precursor to participatory community planning (see Section 2.2).

2.2. Management of traditionally held territory and land systems

P-mapping and P-GIS have been applied to recording and analysing the whole gamut of indigenous NRM based on people's indigenous technical knowledge (ITK), from simply exploiting a resource or eco-unit, through maintaining a resource over time, to the complex level of managing the ecosystem nurturing the resource. Poole (1995) provides numerous local examples, whilst there are systematic approaches like 'Traditional Use Studies', and 'Bioregional Mapping' in Canada (e.g. Aberley, 1993), and 'Land Literacy' (environmental appraisal) in Kerala (e.g. Chattopadhyay et al., 1996). Mapping local knowledge of hazards is a particular focus (e.g. Drew, 2002; Bitter & Mathias, 1998).

The local, participatory management of urban neighbourhoods usually follows on from 'claiming the territory', and has to be made compatible with national or local authority regulations on administering, managing and planning urban territory. PPGIS applied to participatory Community/Neighbourhood Planning has been examined by, among many others, Howard (1999), Carver, Evans, Kingston, and Turton (1999), Leitner, McMaster, Elwood, McMaster, and Sheppard (2002, Chapter 3), and Talen (1999). Specific attention has been given to applications such as housing issues (e.g. Elwood, 2002, Chapter 6) or neighbourhood revitalisation (e.g. Craig & Elwood, 1998). Spatial databases along with the P-mapping are used to maintain a public records GIS or community land information systems (e.g. Ventura, Niemann, Sutphin, & Chenoweth, 2002, Chapter 9).

Participatory decision-making in neighbourhood management supposedly is furthered by interactive, real-time, web-based participation in approaches such as the 'electronic town hall' (see Section 2.5).

2.3. Managing competition and conflicts

In employing P-GIS in handling spatial competition and conflicts, the map outputs from territorial claims and local-level management are applied in spatial conflict analysis and management. The outputs are applied to delineating boundaries (not necessarily *clean lines*) between competing groups, or, initiating negotiation efforts between competing groups though mutually acceptable 'mapping' of actual or dormant spatial conflicts (competition) over resources, or, reducing conflicts by mediation or negotiation by using GIS, ultimately a real-time, interactive P-GIS.

P-GIS contributions to participatory, community conflict management are found in, for example, location choice for a utility transmission line (Towers, 1997); spatial housing choice (Elwood, 2002, Chapter 6); assessing impacts of traffic flows and accessibility (Schulte, 1999); and environmental mapping of hazardous areas and hazardous materials (Drew, 2002).

2.4. Mapping equity and inequalities

P-GIS has demonstrated strong potential as a tool for analysing and mapping indicators of 'poverty', 'exclusion', or 'discrimination' within rural and urban communities. The disadvantaged groups of society can be mapped as distinct spatial sites, or as zones of deficiency.

Applications from PPGIS practice and research include: mapping "environmental racism", i.e. the spatial correlation between environmental degradation and the distribution of ethnic or socio-economic groups in urban areas (e.g. Aitken, 2002, Chapter 27; Kellogg, 1999); social equity mapping, i.e. the identification of socio-economic groups that are relatively disadvantaged by economic class, employment status, ethnicity, language, caste, gender, age, or, by location; analysing differential mobility and people's access to services according to social categories; a significant component of this item is the gendered differences in mobility and access (e.g. Hall, 1997; Kwan, 2000); empowering marginalised groups through supplying them with appropriate geo-information (e.g. Sawicki & Burke, 2002, Chapter 7; Poole, 1995); and utilising GIS to promote transparency in decision-making (e.g. Drew, 2002).

Mapping social equity status frequently does not end simply with participatory maps, but applying them in development action plans (e.g. Carver et al., 1999; Talen, 1999; Howard, 1999). An innovative example in PSP was in Kerala, where Panchayat groups evaluated human and natural resources and thus, local development potentials (Chattopadhyay et al., 1996).

2.5. 'Building community'—promoting community awareness, institutional strengthening; empowerment

P-GIS is applied to developing community awareness of local situations, and to strengthening community institutions as an element in promoting people's empowerment. In specific cases, it is often difficult to distinguish between these, the 'empowerment' is usually though not always the ultimate intention behind the awareness-raising or institution-building.

As with other P-GIS applications, there are more cases in rural development, than in urban situations. There are numerous examples of eliciting, structuring and guarding ITK and ISK in local NRM (e.g. Poole, 1995); a component of which is P-mapping of cultural–social spatial resources of indigenous peoples, such as sacred lands, burial grounds, and ancestral tenure (e.g. Harmsworth, 1997).

In the urban field, public GIS is maintained to build community feeling (e.g. Casey & Pederson, 2000; Craig et al., 2002); to promote transparency in decision-making (e.g. Drew, 2002); or to empower marginalised groups (Sawicki & Burke, 2002, Chapter 7).

Web-based, interactive, 'electronic town hall' developments towards "digital democracy" are reviewed by Kingston (2002, Chapter 8) for the UK, and Ventura et al. (2002, Chapter 9) for USA. A well-developed case is "Virtual Slaithwaite" from PFR[6] (Kingston, Carver, Evans, & Turton, 2000; Carver et al., 1999; Carver, 2001).

[6] 'Planning for Real'® exercise in Slaithwaite village, West Yorkshire.

2.5.1. Geo-information tools used

Geo-information acquisition and analysis tools used in PSP and P-GIS range from traditional mapping tools of participatory sketch maps and ephemeral maps in an RRA or PRA setting, to 3-dimensional (3-D) models[7] and air photo interpretation (small-format oblique or vertical), to satellite images and GIS.

The analytical tools applied are mainly from participatory, interactive, communication and decision tools in collaborative planning—public meetings, Delphi models, gaming simulations, or scenario assessment. They are, however, increasingly being used in distance-settings via email and internet.

Representations are made from the maps, images, 3-D models and GIS outputs working with new visualisation software. A focused tool which should be employed in PSP is 'countermaps'—maps explicitly displaying the needs and requirements of groups who are usually excluded from scientific surveys because they are socially and institutionally marginalised. Rocheleau, Thomas-Slayter, and Edmunds (1995), for example, contrasted gendered countermaps of resource management constructed by and with rural women, with 'conventional' planners' maps made by men.

The modalities for delivery of P-GIS to relevant urban public stakeholders have been classified by Leitner et al. (2002, Chapter 3) as community-based in-house GIS or NGO-based GIS centres; university/research institute–community partnerships; publicly accessible GIS in institutions; map rooms; and web-based internet map servers. Usually projects and communities use a mix of these.

In rural and NRM P-GIS applications, the linkages are primarily through citizens' groups, traditional leadership or customary law authorities, NGOs, and CBOs (community-based organisations), with limited input as yet from institutions and professionals (e.g. Poole, 1995; Gonzalez, 2000; Rambaldi & Callosa-Tarr, 2000).

3. "Good GIS for good governance"—dimensions and criteria of good governance

Good governance is not just about *accountability* although accountability provides the general context.[8] Accountability can be expressed in terms of the transparency and visibility of government decisions and policies, accountability mechanisms, and responsiveness to lower levels—community involvement being a means to generate accountability.

Accountability (open government) is not the end in itself, it is a means of supporting higher-level social–political goals of:

- Legitimacy, Participation;
- Respect for Rights, Empowerment;

[7] The popularity of 3-D physical hardware models raises questions as to whether it is the tactile manipulability of the device that has a special depth of meaning? e.g. the participatory 3-D models (P3-DM) of Rambaldi and Callosa-Tarr (2000), or the PFR which used a 1:1000 3-D scale model of Slaithwaite.

[8] Governance dimensions are developed from among others, Goetz and Gaventa (2001), van Kersbergen and van Waarden (2001), Riggs (2000), and UNDP (1997) which defines about 15 core characteristics of good governance, including: participation; rule of law; transparency; equity; effectiveness and efficiency; accountability; strategic vision; legitimacy; ecological soundness; empowering; partnership; and, spatially grounded in communities.

- Equity (not simply, equality); and
- Competence (including efficiency).

3.1. Legitimacy (of the governing over the governed)

Do GI (geo-information) tools support or detract from good governance in PSP, in terms of the representativeness of regional, ethnic, class, religious, age, or gender interests of the 'governed'?

'Ownership' by the governed, and 'participation' of the governed, are central elements of legitimacy in governance terms. Ownership as a totality implies owning the key sources of information, plus the processes of making the product, plus the final products. Allocating ownership is an element of building trust between governed and governing. A symbolic, but practical crux of 'ownership' is in the choice of the 'map legend'.[9] Even then, there are the questions of '*who* provides alternative names of legend items?', and 'what questions are asked to initiate the naming?'. Maybe not just the legend, but the whole 'map', has to be liberated. Empowerment is provoked by transferring legend and output ownership from the powerful to the disadvantaged with countermaps that challenge the (spatial) views of the powerful.

If the GI tools and approach build communicability between outsiders and insiders, this can legitimise the value of endogenous knowledge (ISK) and language, and make the tools more acceptable to local users.

Legitimacy demands *active participation* at all stages of PSP, and therefore, at all stages of the mapping processes, by '*all* stakeholders', implying government agencies and the private business sector, as well as civil society (community representatives, traditional leaders, NGOs and CBOs.) *Partnership* is a characteristic of good governance (UNDP, 1997).

3.2. Respect (by the governing for the governed)

Do GI tools support or detract from good governance in respecting basic human rights, civil liberties, women's rights, workers' rights, cultural and regional rights; indigenous (technical) knowledge; laws and property rights, and not least, people's rights to livelihoods? Among the first clients for improved spatial information are the tax collectors and police.

PSP using GI tools respects people's rights by demonstrating that it has the ability:

- To elicit and handle *local perceptions and conceptualisations of space and spatial values*:
  This would involve capturing and translating spatial concepts ('mental maps') of boundaries, locations, zones into mappable outputs; building GIS into local knowledge process; and considering future times and future generations by providing a strategic vision;
- To handle *ITK and ISK*:
  This implies promoting respect for ITK/ISK; presenting spatial output (maps and GIS) in such a manner that local people can recognise and interpret all relevant features; and taking into account the heterogeneity of local populations and the diversity of their knowledge.
- To operate at an appropriate resolution of output:

[9] Point stressed by G. Rambaldi (May 2002, pers. comm.).

This implies a scale "relevant to the local space" for local-level manipulation, therefore at a large scale, 1:5000–1:50,000. There seems to be a window of 'natural' scale appealing to users, which meets competing desires for coverage, comprehensiveness, and inclusion on the one hand, and on the other hand, information digestion, not information overload, simplicity, and comprehension.

3.3. Empowerment

The technology should be giving voice to local people, to the extent of putting local people on a more equal footing with external experts and decision-makers, such as claimed for P-GIS used in land reform in South Africa. A GI tool is more empowering when it has the asset of being convincing to external decision-makers, which strengthens the validity of the tool per se and its outputs, across both the governing and the governed groups. Furthermore, an effective visualisation of the outputs renders them more 'attractive' for insiders and outsiders and raises the transparency of the tool.

GIT can open the horizons of local users. Some argue that this enlargement of perspective is an aspect of 'modernisation' with negative consequences for the community, though others credit it for mainstreaming and empowering local peoples. Nevertheless, a 'respectful' GI tool would not unrealistically raise empowerment expectations of local communities—the 'governed'—by proffering a pretentious technology that promises more than it can deliver.

3.4. Equity, between governing and governed, and within the governed

Do GI tools support, or detract from, equity goals of good governance in terms of the distribution of, access to, and take-up rates of public and private services for disadvantaged groups, or in terms of access to markets, laws, and property rights? Do GI tools support spatial equity by strengthening objectives of devolution or decentralisation, and following the subsidiarity principle? Do the GI tools reflect the reality of local-level PSP as 'multi-actor, multi-objective, multi-sector, multi-scale, dynamic planning and decision situations' dealing with competition and conflicts?

In resource-poor and low budget areas, planning and management are likely to be problem-driven and re-active, rather than pro-active. In these same conditions, there is an absolute scarcity of resources to be shared and overall poverty is the norm. In such cases, investing time and effort in P-mapping and GIS are probably luxuries beyond sensible behaviour.

Can the GI tool *map* equity? In Kiepersol, South Africa, the work of Harris and Weiner on 'regional political ecology' aims at representing local conceptualisations of environmental and health risks and spatial inequalities, especially post-apartheid access to land with 'integrated' equity mapping (Harris, Weiner, Warner, & Levin, 1995, Chapter 9; Weiner & Harris, 2002). Similar equity objectives lay behind the 'mapping for local development' programme in Kerala's socialist rural community planning (Chattopadhyay et al., 1996).

An important equity consideration in assessing GIS approaches for PSP is their practical *manageability at local level by local people*. This also covers the 'sustainability' of the tools and approaches, i.e. whether they continue to function after such a GIT project terminates. 'Manageability' covers a range of factors:

- Feasibility—whether the tool is adapted to local operating conditions, including cultural and social, as well as technical and climatic;
- Appropriateness of the spatial scale of input data and outputs for the local users;
- Breadth of (community) participation in the enterprise, not just using ''key informants'' who are likely to be educated, adult, senior, Anglophone, males;
- Comprehensibility and simplicity of use by participants; literacy, numeracy and computer-literacy requirements;
- Cost effectiveness;
- Maintenance of the currency of the data—updating information sets is costly, time consuming and liable to be overlooked in the enthusiasm of applying new tools; and
- Ability of civil society to use GI tools for scenario building to visualise their alternative futures.

3.5. Competence—efficiency and effectiveness

Do the GI tools support or detract from the 'competence' dimension of good governance? This can be simply re-interpreted as the questions:

- Are the tools efficient, and effective, for the delivery of services?
- Do they add to administrative competence?
- Can they effectively translate between indigenous and scientific spatial knowledge?
- Do the tools understand and somehow handle 'imperfect data'?—or, are they befuddled when coping with imprecision, incompleteness, fuzziness, and ambiguity?
- Can the tools handle dynamic and flow data?
- Can the tools handle knowledge about power relations?

4. Where is 'participation' in participatory-GIS? How does participatory spatial planning relate to governance and to indigenous spatial knowledge?

Participation in spatial planning is clearly related to legitimacy as a governance criterion, but a strong participatory approach also supports other governance imperatives of equity and respect for people's rights.

4.1. 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. Four intensities of PSP, from the least to the most 'participatory' level of the ladder, are recognisable:[10]

- PSP as 'Information Sharing' implies one- or two-way communication between 'outsiders' and local people, and is primarily technical information, such as needs assessment. The topics and most information-gathering techniques are set by the outside agencies.

[10] *Sharing of Benefits*—receiving goods and services or even political clout is sometimes considered a form of participation, but that is 'recipient participation', conceptually different from involvement in 'doing'.

- In PSP as 'Consultation', external agents refer certain issues to local stakeholders for refinement or prioritising, but it is the outsiders who pre-define the salient problems, and analysis is controlled by outside.
- If all local and external actors are involved in 'Decision-making', they jointly identify priorities, analyse current status, assess alternatives, and implement. 'Participation is seen as a right, not just as the means to achieve project goals'.
- PSP as 'Initiating Actions' means that independent initiatives are made and 'owned' by empowered local people, e.g. people self-mobilise to perform community activities; a different situation from simply implementation with their own labour inputs.

There are critical differences in the underlying *purposes* or *intentions* of the parties (external or internal) which are 'pushing' PSP as a strategy and/or promoting P-GIS (McCall, 1988):

- *Facilitation*—'PSP is promoted' in order to ease outside interventions and interests to improve external project efficiency, or to pass a share of the cost burden onto the ''beneficiaries''.
- *Mediation*—PSP is promoted to link (mediate) outside demands and local people's priorities in order to increase programme effectiveness, to build up local community capacity, or to modify outside interventions towards local aspirations and needs.
- *Empowerment*—PSP is promoted to reinforce local decision-making and responsibilities towards community empowerment, to support equitable social redistribution, and to empower weak groups in resource access and control.

There are significant obstacles to putting the 'empowerment' intention into practice. Frequently there is high-level external political resistance to 'allowing' local empowerment or devolution, local elites do not give up their power easily, and there are degrees of apathy or fatalism among the community based on their historical experiences (cf. Carver, 2001).

4.2. Communities are not homogeneous

There are critical divisions in communities related to gender, age, economic class, socio-cultural status, tribe and caste, life-style, etc., which lead to an extensive range of needs, opinions, and interests between types of actors. Highly significant is the unequal distribution of access to power for the ultra-poor, elderly, children, handicapped, inarticulate, minorities—e.g. ethnic groups, castes, nomads. Women especially are frequently excluded from structural decision-making.

Therefore, the essential questions to ask of the degree of 'participation' in PSP or P-GIS are:

- *Who* is participating? Who handles data and decisions? Who controls the process? Who uses the outputs?
- Who has accessibility to GIS tools and techniques? Is there 'open access to the device'? Who has accessibility to the outputs?
- How do the GI tools behave in terms of the *intensities,* and the *purposes,* of 'participation'?

4.3. Cost efficiency in participatory approaches

The properties of information supply important to a decision-maker include speed and simplicity. Participatory approaches are seriously time consuming and often costly, all participatory data collection methods have a huge appetite for time and patience, and, solutions (*any* solution) are needed too urgently.

Eliciting local (confidential) knowledge from key informants means firstly, trust, built on lengthy discussions. For this reason, the typical senior decision-maker will acquire information from the 'embodied knowledge' of known and trusted subordinates, rather than from an impersonal, passive database. Of course such information is biased, but the decision-maker can adjust more easily for that than for the built-in biases of a geo-database. The underlying governance issues here are respect for citizens, and legitimacy.

When GIT is involved, the output may be fast, but the inputs certainly are not. Acquiring, checking, and inputting the spatial data in the GIS process is very time consuming, and commonly diverts time away from field activities, defeating the original purpose of the project. Similarly, a 'limiting factor' in a PSP process is simply the ''restricted time'' of the key informants. From a good governance position therefore, competence and efficiency are compromised.

The technology of *On-line Participation* extends the scope for decision-making and policy support. Although it is not yet widespread even in North countries, it is being developed for example in Bengal and Karnataka in India, and in Brazil (Goetz & Gaventa, 2001).

Some strengths of on-line participation are that spatial accessibility and geographical location are not constraints, there is universal access via the internet, and with 24/7 there are no time barriers. Anonymity can cut down cultural and psychological barriers of gender, status, ethnicity, age, and shyness (cf. Carver, 2001). The weaknesses however must also be clearly recognised. There is access *only* where people can use internet, and because, as recognised in diffusion-of-innovation research, this is not face-to-face, it is likely to lead to 'awareness' rather than 'conviction'.

4.4. Indigenous knowledge and scientific knowledge

Participatory approaches to planning must involve the elicitation and application of ITK. ITK is embodied knowledge to be seen as a local resource that belongs to rural and urban people both as individuals and communities. It should not be denigrated only as primitive, unassimilated, and outside of the market. ITK is a key to PSP (McCall, 1988, 1995), because it may be the only resource that the poorest groups control whilst their land, property, resources, or labour are rapidly appropriated; it is a resource needing little investment for realisation; it reflects the capability and competence of the local community and can put them on an equivalent footing with outsiders; and, because local knowledge is operational.

One definition, 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).

Local ITK may be distinguished from scientific knowledge because:

- its derivation from close and long relationships between people and a specific land area give ITK its 'localness', or local focus;
- ownership by the local community integrates ITK with social priorities, even though ownership is not homogeneous; and
- classifications in ITK are likely to be based on the functionality of the objects, and/or the purposiveness of the actors; due to this, ITK depends more on holistic, combinatorial explanations than on reductionism.

Nevertheless, local ITK has more elements that it holds in common with scientific knowledge:

- Dynamism—the interest and ability to incorporate new knowledge from other (outside) sources, notwithstanding they may contradict held beliefs;
- Taxonomies as the building blocks of explanations;
- Identification of specific conditions under which general 'laws' will hold; and
- Knowledge is unevenly distributed within a community of experts.

4.5. Indigenous spatial knowledge

Much of ITK has spatial connotations. Consider for instance the locations of indigenous resources and local resource management activities, environmental hazards, ecosystems relationships, spatial correlations between local groups and resource units. This type of local knowledge can be termed ISK. 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).

But beyond these easily identifiable, material items within ISK, there is a more slippery concept of spiritual or mystical knowledge associated with space, and particularly with specific areas of land (or certain land resources).

There are propositions about basic spatial cognition, or "naïve geography",[11] that may be valid as generalisations about ISK, and therefore relevant to applying GIT. These propositions include:

- Real space is "tightly coupled" with time in people's conceptualisations. Urban landscape perception examples go back at least to the work of Kevin Lynch; whilst Egenhofer and Mark (1995) name old European land units in which farming areas are related to time requirements.
- Reasoning about geographic space deals with incomplete information, i.e. people have to interpolate much missing information using 'common sense' rules.
- Multiple levels of detail correspond to different conceptualisations of space; some cognitive spaces are continuous, and some discrete.
- Boundaries are not necessarily discrete entities, and not necessarily seen by neighbours as symmetric; consider the boundaries in natural resource conflicts, or in the perceptions of urban 'neighbourhoods'.
- Distances are more likely than not asymmetric, depending on the means of overcoming 'friction of distance' or movement hindrances.

[11] "Naïve geography is the body of knowledge that people have about the surrounding geographic world" (Egenhofer & Mark, 1995).

- "Community" Maps are distorted when they are only simplistic agglomerations of individual mental maps. Group representations of space are needed, using PRA methods.

Land has strong spiritual and cultural values for many peoples, especially for indigenous peoples very long settled in a unique location. For one example, of Maori values in New Zealand, Harmsworth (1997) puts it that land units have specific characteristics of *tapu* (respect [for resources]), *mana* (authority), and *mauri* (life force, life energy). Therefore, 'land' cannot be simply defined as an economic commodity, and placed in narrow categories of 'high value', 'marginal', or 'wastelands'.

The ISK of land resources therefore incorporates customary laws and ancestor-directed objectives in spatial decision-making processes. 'Naming' of sacred places and symbology in spatial representations are elements of this. Such values are identifiable in the concepts of probably all peoples who retain a spiritual feeling for land (e.g. Bartolo & Hill, 2001, for Australia; and the AMN website for North America, www.nativemaps.org). In the modern urban context, some PPGIS practitioners are emphasising similarly a 'sense of urban place' as a form of ISK (cf. Casey & Pederson, 2000; Carver, 2001).

4.6. Gendered spatial knowledge

Gendered space refers to several dimensions: specialised gendered knowledge of distributions in space, the differential access to and ownership of resources with their nested scales, and cultural landscapes/townscapes associated with life experiences of men and women.

The gender component of ISK is often invisible. Much literally, *cannot be seen*—in NRM for example, women's use of forest resources is likely to be the collection of foods or medicines under the closed canopy and forest gardening, rather than large-scale lumbering or agricultural clearing, usually done by men. Satellite imagery is not sensitive enough to show the vital elements of women's specialised agriculture and natural resource use. "They may, in fact, be limited to particular resources, or even particular products…, certainly much smaller than a single pixel in most land use or property images…" (Rocheleau et al., 1995, p.64). Thus, women's lands are often denigrated as 'unused wastelands', and the products they make are not recognised as having economic or even livelihood value. Moreover, the gender aspect *is not recognised*—because census survey data do not show the richness of women's real lives (nor much of men's), because of the focus on monetised activities, and the restrictive assumptions made about the roles and capacities, and thus the spatial activity patterns, of women. The 'no market value' designation is often elided into labels of 'primitive' or 'worth-less' activities (cf. Scott, 1995).

National employment or labour force participation data tend to ignore the labour for 'reproduction of the household'—care of children and elderly, or housework, and a result of this is 'misogynistic' distortions of economic space. It follows that the mapped versions or other spatial databases are unable to show gender distinctions. Gender differences in levels of mobility are seen in the restrictions, and thus in the "invisibility", of the large proportion of house-bound and non-car owning women in the US (Hall, 1997). Additionally, there are the 'real' and perceived spatial restrictions due to personal safety, security, or harassment locations. Kwan (2000) expects that

GIS tools will help planners to identify and understand urban women's constricted spaces and 'fixity constraints'.

5. Ownership and accessibility in indigenous spatial knowledge

5.1. Ownership of indigenous (spatial) information

The ownership of ISK may be following the path of conventional geo-spatial information resources, where the trend is towards market rules, even for "patrimonial" information in foundation geo-data sets, including topo data, infrastructure, and census data. Spatial data are being sold off to the highest bidder to exploit the value-added of GIS, fuelled by the growing powers of the WTO and World Intellectual Property Organisation (WIPO).

At the local level, issues of ownership of intellectual property rights also appear in relation to privacy of land parcel information (e.g. in the high resolution PPGIS Slaithwaite case, Carver et al., 1999).

A very strong position on ownership, and therefore on limiting access, of 'secret', sacred, ISK is taken by Harmsworth (1997) in relation to Maori peoples. These protectionist views towards indigenous culture, found also in the US (e.g. Madsen, 1995), could however be interpreted also as protecting the privileges of an elite who thrive on the restricted knowledge of resource locations or uses, privy only to themselves. The commonest group to lose out are women, when men's secure control of resource knowledge and the consequent exclusion of women become legitimised by 'community traditions'. In urban settings, the confidentiality/secrecy of ISK is not only related to illegal activities, although it would include such as drug dealing locations. But there are numerous 'traditional' activities which fall under varying labels of anti-social or immorality, because they are not sanctioned by the majority society.

Examples of, what are to varying degrees, protected or confidential rural and urban ISK data layers:

- Traditional hunting, fishing, grazing, medicinal herbs collection; areas used by urban groups for livelihoods or life-style activities.
- 'Traditional', vulgar activities (e.g. hunting, drag racing, raves, street betting, prostitution, dog fighting), which are currently anti-social or inappropriate.
- Customary boundaries and subdivisions of culture areas—tribes, neighbourhoods, customary property, *eruvim*, street gangs, male and female, gay and straight spaces, personal space.
- Historic places, neighbourhoods, Holy sites, burial grounds, ceremonial areas, buried cultural objects.
- Indigenous sacred place names, cosmological locations, sacred pathways, songlines.

A related question is whether ownership of knowledge includes the right to prevent others from using it. Amongst First Nations in North America and in Aotearoa there are legal–political moves towards a 'communal right of privacy'. This means customary leadership taking responsibility for data protection, and thus control over confidential GIS data layers.

Moreover, the rights of indigenous peoples can be asserted to include freedom from 'wanton exploitation' of their natural resource data from aerial photography or RS platforms. In this context, Madsen (1995) quotes from a US legal opinion, *Olmstead v. US (1928)* when Justice Brandeis "called the right to be let alone 'the most comprehensive of rights and the right most cherished by civilized men'". There is similar concern over the surveillance and policing capabilities of GIS used in combination with hi-tech spatial data collection (e.g. Harris et al., 1995, Chapter 9; Pickles, 1995, Chapter 1).

Landcare Research in New Zealand offers three protection options for sensitive, confidential layers: recording the information as concealed files linked to a GIS and needing a permission; recording the information as an overlay, e.g. a grid at crude scale, which prevents specific site identification; or, providing a hyperlink to a recognised (Maori iwi) authority responsible to answer queries (Harmsworth, 1997).

5.2. *Access to, and exclusion from, spatial information*

Whatever the actual ownership, people must have rights of access to the information stocks held by the state, as a basic condition for good governance. There are limits to these rights, set by national security or commercial confidentiality, and there are vast differences between what states 'allow' their citizens access to—Harris et al. (1995, Chapter 9) instance the South African legacy of distorted information under apartheid. The issues of public access to information held by the large-scale, private commercial sector must equally be addressed in public debate and be subject to public policy determination. There is a strong tendency to hide relevant spatial data in the business sector camouflaged under commercial confidentiality.

Lack of financial resources however, is more persistent than are institutional hindrances. At larger scale, the wealth (tax base) of communities is a determining factor in development of PPGIS in the USA. Haklay and Harrison (2002) examine the financial differences between utilising PPGIS in the UK and the USA, in terms of costs, ease of access and familiarity with geo-data, such as OS maps and digital data. At the individual level, governance obligations not only require the state to provide access to (geo-)information for their citizens, but at a reasonable price Casey and Pederson (2000) look at the real costs of the time involved to acquire primary data or visit databases. Accessibility is not only price-related, there are physical transportation and communication constructs. Most of the world is in lower income countries/classes and not on the web—even in urban areas, they must still walk or bus to obtain public geo-data.

The flip side of accessibility is exclusion—despite the improved access of many, a very significant minority will become more marginalised—"adoption also implies non-adoption or inability to adopt" (Harris et al., 1995, Chapter 9, p. 202). There are two levels of the exclusion impacts, related to the 'intentions' of promoting participation for facilitation, mediation, or empowerment (see Section 4).

Initially, there is the persistence of an 'information underclass' excluded from the decision loop by the 'digital divide (e.g. Carver, 2001). Because they are without the appropriate technical training or 'skills', the off-line goats are separated from the on-line wired sheep. In these situations, the role of information handler or interpreter will be taken by the professionals—whether they be GIS experts, consultants, planners, or professional-level NGOs. There are many critiques of this in PPGIS in the USA. In reviewing alternative locations for a power line in West

Virginia, citizens' groups complained that the planning professionals hi-jacked the GIS and multimedia tools and excluded local concerns over data categories and weighting of impacts (Towers, 1997; King, 2002). Technocratic planning models replaced 'neighbourhood discourse' in a Minneapolis Neighbourhood Association and introduced alien terminology, concepts and decision approaches which excluded the marginalised and less articulate—the elderly, blacks, and renters, whereas those who could adopt the jargon and the GIS milieu felt more empowered (Elwood, 2002, Chapter 6; Aitken, 2002, Chapter 27). Of course this phenomenon is just as pervasive where GIT is inappropriately introduced into rural, indigenous, 'non-technological' societies (e.g. Rundstrom, 1995; Abbott et al., 1998).

Beyond this, is the elemental lack of resources and access to power, which creates more implacable hindrances than being untrained (see Section 7).

6. How well can GIS represent ITK? Strengths and weaknesses of p-GIS

6.1. GIS distortions of perceived space

GIS outputs are liable to distort and trivialise spatial reality because they present patterns, not processes, even flows can be difficult to represent. They can only describe but not explain; alternatively, they examine but do not provide understanding. GIS can provide answers to the 'what?', 'when?', 'who?', and of course, 'where?' questions, but not much of the 'how?', or 'why?' questions. Economic and social power, which is fundamental to explaining 'why'?, rarely appears in GIS—though that is as much due to the ownership and objectives of most conventional GIS, as it is to technical limitations.

The sense of place associated with particular localities and by particular groups of people in mental maps is qualitative and fuzzy, metaphorical or mystical. It may not be reducible to Euclidean space. The distortions forced on people's perceived space by being embedded in a procrustean logical positivist GIS bed may throw away too much cultural information belonging to ISK. A minimal requirement is that the names used for objects/people/places should mesh with individual and community knowledge (Brodnig & Mayer-Schonberger, 2000).

Hall (1997) extends the argument to identify GIS as a "masculinist technology" which is materialist and positivist, handling only discrete bounded units of analysis that are often pre-defined and avoid fuzzy concepts. Her call is for work on the "feminisation of GIS". In a similar vein, 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 (1997, 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".

6.2. 'Preciseness'

Much of what is significant in spatial patterns in PSP, relating for instance to neighbourhood planning, cultural zoning, or local-level NRM, has spatial characteristics of fuzzy, multi-layered

zones and zonal information (areas, polygons, raster grids); blurred, flexible, and multiple boundaries (line data); uncertain, hidden or restricted spatial locations (point data); and dynamics—flows of physical resources, information or memes, flows of influence, power and control.

GIS approaches, especially those built on RS data, may place misleading emphasis on spatial accuracy or preciseness of the output information. Most development activities, especially in rural settings, do not need a high degree of spatial exactitude. They are concerned with interventions at the level of communities or ecological zones, 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 (women, pastoralists, students, the "poorest 10%"). Precision is needed for special situations, especially legal actions, such as customary land rights vs. the state or a forestry concession.

6.3. *Visualisation and technical flim-flam*

Conventional projects to disseminate GIS have commonly been driven from outside, as a 'solution looking for a problem'. "GIS and RS demonstrations [in general] are 'technology-driven' rather then 'demand-driven'" (Hutchinson & Toledano, 1993). This raises questions of the legitimacy and respect dimensions of governance.

GIS software marketed to community groups is often inappropriate in its functionalities and data appetite, and key hardware or reliable electricity may be missing. Community customers have learnt to preview software options; for example, the Shuswap Nation in Canada assessed pertinent factors of learning, information interchange, support, ease of use, as well as cost (Johnson, 1997). On governance criteria, software decisions relate both to accountability and competence/efficiency.

It is impossible to overestimate the visual impact of GIS output, RS images and, to some extent, maps (cf. Monmonier, 1996). It is not only the quantity of information bits 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 note, GIS displays can have too convincing an impact on the audience—the ease of layering and of changing maps, the apparent objectivity and scientific content of the display, can have a blinding effect (cf. Abbott et al., 1998; Obermeyer, 1994), although this should decline as decision-makers become more familiar with the techniques. Even proponents of GIS applications, point out (in the context of land claims) how "…GIS can provide an air of scientific objectivity required within the legal system" (Johnson, 1997). "Spurious" could easily be added to the quote.

GIS activities are often treated as short-term, limited projects, rather than as on-going processes, despite being marketed as structural investment.[12] In most PSP applications, however, the benefits of participation are neither fast, nor necessarily in a financial currency; and where there are economic returns from P-GIS used for community development, they are not accruing to the commercial players who could fund high-tech GIS.

[12] Compare experiences of municipal GIS in Cebu and Lilongwe (van der Vegt, 2001).

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.

6.4. Layering

On the positive side, a great strength of GIS and P-GIS with respect to ISK is the performance of the layering capabilities. Multiple perspectives always demand multi-mappings, and it is arguable that this capability means that GIS can significantly represent a holistic, non-reductionist, *weltanschauung* of indigenous/local peoples. The thematic layers easily created in GIS mapping can reflect the social or environmental images from different groups. Layering has a synergistic result in that the combinations of themed spatial information, from different social perspectives and sources, and both quantitative and qualitative, create a whole greater than the sum of its parts. Thus, layering has a fundamental relationship with respect for rights, and to some extent with equity categories. Moreover, layering is anyway used to improve competence/efficiency of delivery even in conventional planning approaches.

Multimedia and interactive web-based mapping/GIS can show multiple views and voices, layers of information, and layers of time. Typical spatial and temporal constraints of standard map or GIS representation are removed by using multimedia or a web presentation (e.g. Weiner & Harris, 2002 in South Africa; Kingston et al., 2000 in UK; Shiffer, 1998 in USA). The easy ability to click on a map to find a magnification, or a photo or sketch, or written information, helps even the inexperienced user to overcome map-reading problems (Kingston et al., 2000).

6.5. Operational issues—can 'civilians' work with (P-)GIS?

Positive experiences with P-GIS show that an affinity—'feeling comfortable working with geo-spatial information'—is not difficult to stimulate. For instance, techno-professionals have appreciated for a decade that untrained people, with local ISK, can work effectively, easily and happily interpreting aerial photos (e.g. Groten, 1997; Jordan & Shrestha, 1998). Working with GIS software and hardware 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 experiences both, of long-run intensive training (e.g. Gonzalez, 2000; Weiner & Harris, 2002; Sawicki & Burke, 2002, Chapter 7), or, of more rapid PRA exercises.

Where there are constraints against local people or organisations working with GIS, they are due to exclusion—whether economic, social, and/or political, and not because of technical incapacity (e.g. Obermeyer, 1994; Johnson, 1997). On the other hand are the sceptics who consider that the public should know their limitations (e.g. Casey & Pederson, 2000; maybe Carver, 2001). GIS is too 'complex a beast' liable to distortion of its results, and amateur applications of GIS are at least prone to ridicule, at worst, dangerous.

Loss of skilled staff from P-GIS units is a related issue (Casey & Pederson, 2000; van der Vegt, 2001). To avoid fast turnover of trained GIS staff to more lucrative jobs, a pre-condition is a strong local organisation.

7. Conclusions—(spatial) information, power, and participation in spatial planning

7.1. Indigenous spatial knowledge and its ownership

Much ISK in agriculture and NRM is equivalent to scientific knowledge, in many respects better, because it embodies decades or generations of specific practical knowledge which is interactive and holistic, thus incorporating real linkages. It is harder to argue similarly for ITK/ISK in urban settings, though consider our familiar acceptance, and the impact of, non-professional, local knowledge of travel patterns, locations of life-style activities, or safety/security, for instance.

Beyond this, there is indigenous knowledge that is symbolic, metaphoric, and visionary, though often functionally related to land and land features. This deep knowledge, with its obligations of stewardship of the land—as in customary restrictions on using 'sacred lands' which are also a protected forest—together with the location- and resource-specific, problem-oriented ITK, provide the basis for local people's participation.

The challenge is to integrate the insiders' pragmatic, if sometimes also mystical, knowledge (ISK) which reflects local needs, with the external demands that are ratcheting up with globalisation. The rationale behind this integration is analogous to seeing 'community participation' as 'mediation', the 'third way' between facilitating external projects, and, autonomous empowerment. ITK/ISK are keystones in this process, because they are a measure of the capability and competence of the local community, and their ownership has the potential to place the community on an equal status with outsider 'experts.

7.2. Ownership or control of ISK can empower the community

Empowerment is the deepest of the intents of participation, and promoting ISK by, within, and for, the local community is a major instrument towards this. P-GIS should provide the potential for a more equal exchange of information and values and understanding between the parties involved, as frequently asserted (e.g. Aberley, 1993; Poole, 1995; Gonzalez, 2000; Weiner, Warner, Harris, & Levin, 1995). Carrying out a GIS exercise with the proper involvement of local parties affects empowerment, and strengthens the capabilities of those parties. Being involved in a GIS means that "the stakeholder parties are being taken seriously…[through]…greater openness and accountability on behalf of decision makers" (Carver, 2001).

However, if the input data or (GIS) output are not participatorily processed in situ, the empowerment benefits may be lost, because an alienation between people and 'their' data can arise (Jordan & Shrestha, 1998). This is overcome when the GIS per se is integrated into, and is seen as, a vital component of, the whole process of decision-making in PSP; thus the importance of using participatory research as the methodological approach, and GIS as the technical tool. Conversely, GIS and maps are a necessary but not sufficient condition by themselves for local development. They must be definitively embedded in participation, not just as an operational mechanism, but deliberately as a tool for empowering local people.

7.3. Power

This positive spin on ISK and empowerment must be countered by the idea that 'information per se is *not* power'. Social-economic development and implementation are directed much more by relative power and access to and control over, resources, than by (geo-)information.[13] The nexus and delivery mechanisms of social–political power are formed by "…'things like the political process, the property market, property development'…" according to the London respondents quoted by Haklay and Harrison (2002, p. 15). These same respondents demonstrated their "…healthy scepticism of the ability of PPGIS to alter power relations". Similarly, in evaluating why a GIS transfer-of-technology project in India was unsustainable, no deficiencies in GIS and computing capabilities were found, "no computing problem seemed beyond their ability to solve". That is not where the problems lie, "the problems of development are driven…by socio-economic considerations" (Hutchinson & Toledano, 1993).

Wherever some actors gain from introduction of GIS, other social groups will lose out, becoming yet more marginalised. (P-)GIS simultaneously both 'empowers and marginalizes' (Brodnig & Mayer-Schonberger, 2000). Only where (geo-)information shifts the balance of powers from the "strong publics" to the "counter-publics"[14] and changes differential access to resources, as well as to information, can it be considered to progressively re-orient development.

There is a relationship here with the 'exclusion' of the information underclass (Section 5). The GIT-literate are anyway the economically and socially powerful, and though critical of government decisions, are unlikely to be upsetting the whole social applecart. Even with a degree of 'open government', information accrues to those already with most resources, thus further accumulating their power. Information is a resource whose value is *realised* only in combination with other social/political resources, especially power and access to policy instruments. This is equally true for customary knowledge within indigenous societies liable to control by an older, male, or class, elite. Local society, whether urban community or rural village, is not equitable, and 'participation' has to struggle to reach the power–poor, marginalised and inarticulate. 'We realised that some rich and powerful people in the community objected to the open and participatory uses of GIS' in rural Ghana (Kyem, 2002, Chapter 16).

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 adds the significant question of whether policy-makers and power-brokers actually value public input. Development and installation of improved (spatial) information capabilities (such as GIS) need to run in parallel with improved institutional safeguards for reasonable public access and use.

There is a yet unburied myth about 'value-neutral GIS'. GIS is no more neutral than statistics or bulldozers, it all depends on what it is being used for, and on who is controlling it. "A GIS reflects the mandate [and the values, goals, biases] of the agency that operates it" (Harris et al., 1995, Chapter 9). It is axiomatic that good governance rests not on the tools, but on how they are used, and by whom.

[13] Critiques along these lines are not new—e.g. Yapa (1991), Pickles (1995, Chapter 1), Rundstrom (1995), Harris et al. (1995, Chapter 9), debates in the Varenius project, Craig et al. (2002).

[14] Terms from Aitken (2002, Chapter 27, p. 363).

7.4. Dimensions of governance and (P-)GIS

Given the messages that on the one hand, 'ownership' and use of ISK can empower, and on the other hand, (geo-)information is the servant of the status quo power structure, in what respects can P-mapping/P-GIS support good governance? For the GIS proponent, the aim must be to identify those features that make P-GIS utilising ISK more compatible with the tenets and measures of good governance in PSP.

7.5. Legitimacy

P-GIS (and P-mapping) create opportunities to visualise the (spatial) interests, needs and potentials of groups disparate in terms of locality, ethnicity, gender, or class. Thus, they can work towards better governance, in that the 'governing' recognise and appreciate the representations of the legitimate interests of the 'governed'.

However, much of what terms itself 'P-GIS' and 'participatory planning' corresponds to the weakest of the participation intentions (Section 4) and is concerned only with 'facilitating' more 'efficient' implementation. In such applications, a lazy approach is taken in terms of what sorts of indigenous knowledge are collected, and there is usually very little 'triangulation' (cross-checking) which is a *sine qua non* of PRA.

7.6. Respect for rights

Explicitly, P-GIS provides a framework for legal, political and administrative (planning) legitimacy, such as with P-GIS/P-maps used for registering and legalising customary land or neighbourhood claims. P-GIS is capable of systematically identifying and representing the spatial rights of people to their land and land resources, in terms of ownership, access, use and management.

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

7.7. Equity

When P-GIS is applied to 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 a conventional GIS. Moreover the sources of information for these indicators are the people affected, not just the technical planners. It is pertinent that P-GIS implies 'people's participation' at least to some degree, which forms the basis for equity as well as legitimacy.

7.8. Competence (efficiency)

On this governance dimension, P-GIS is 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.

7.9. Accountability of the governing to the governed

Running throughout the P-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 and 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.

7.10. GIT developments for P-GIS

GIS, or P-GIS, is not a magic bullet for improved PSP, but it is by no means only a technical fix. There are real needs and opportunities for progressive developments in P-GIS and mapping.

Spatial visualisations (maps, GIS) can reinforce empowerment through scenario development—"GIS-based decision tools need to be exploratory rather than definitive". (Carver, 2001). Civil society groups can use P-GIS capabilities to explore decision spaces and play around with alternative futures, based on understanding of their own goals, constraints, preferences, as in the co-learning processes of joint development of GIS (e.g. Weiner & Harris, 2002; Gonzalez, 2000).

There are value-adding functionalities giving GIS strong advantages over paper mapping, salient of which is overlaying, along with spatial analysis capabilities, spatial scaling (scale comparisons, zooming-in), time series for temporal comparisons, and many visualisation options.

Significant technical innovations are entering more regular usage—GPS, already well-developed and more affordable, and Personal Digital Assistants (PDA), becoming cheaper, user-friendlier, and with sufficient functionalities to support mobile GIS, such as Compaq–iPaq featuring ArcPad. Innovative visualisation is being developed, more attuned to ISK characteristics—flexible and fuzzy in place of hard boundaries, multi-user transparent overlays, soft zoning, dynamic and interactive visualisations, using new mapping and presentation software such as FreeHand10 and Avenza MaPublisher4. Web mapping opens new potentials, with hyperlinks to information or other images, magnified maps or photos, interactive visualisation, or temporal animation.

The primary concern in PSP initiatives should remain the participatory planning per se and its implementation through good governance. The applications of P-GIS and P-mapping, and effective visualisation, are the tools to support and strengthen PSP. The potential for synergy in effective P-GIS remains, however—the proper process of making P-GIS products based on people's ISK, itself promotes empowerment, and thus strengthens the respect, equity, and legitimacy dimensions of (good) governance.

8. Uncited references

Harris and Weiner (1998); Weiner, Harris, and Craig (2002, Chapter 1)

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