# PARTICIPATORY GEOGRAPHIC INFORMATION SYSTEMS AND LAND PLANNING
## *LIFE EXPERIENCES FOR PEOPLE EMPOWERMENT AND COMMUNITY TRANSFORMATION*

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***« I cannot think for others,through others,without others"(P.Freire)***
*To Abet, Ana, Andres, Ating,Barbara, Baudouin, Belle, Bernard,Cesar, Cherie, Ching, Denise,Frédérique, Gérard, Gussy, Eric,Gwénaël, Ian, Iris, Jean-Paul, Jo,Joel, John-Paul, Julie, Laurent,Lito, Liza, Louie, Minmin,Noel, Ophélie, Pedro, Pierre,Popoy, Rachel, Riggs, Rita,Robert, Rom*
*Thank you for your sharing.Thank you for your friendship.Thank you for embracing our common cause.*
*Françoise*

# Chapter 3. Can Neogeography and GIS/2 satisfy PGIS?

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The understanding of Participatory Geographical Information Systems (PGIS) is not as contested as, say, the concepts of participation, or community, or local knowledge. But the boundaries of PGIS are always disputed, and here we take a broad view: "PGIS is an emergent practice in its own right. It results from merging Participatory Learning and Action (PLA) methods with Geographic Information Technologies (GIT). PGIS facilitates the representation of local people's spatial knowledge using map products in decision-making processes, and supporting communication and community advocacy. PGIS practice is geared towards community empowerment through tailored, demand-driven and user-friendly applications of these geospatial technologies. Good PGIS practice is flexible and adapts to different socio-cultural and biophysical environments. It relies on the combination of 'expert' skills with local knowledge. Unlike traditional GIS, PGIS places control on access and use of (culturally sensitive) spatial data with those communities who generate it." (adapted from Rambaldi, Chambers, et al., 2006a)

This chapter examines whether some of the new tools and techniques of neogeography, cybercartography, etc. and GIS/2 can be seen as helping or hindering the development of PGIS. The first two sections review what is meant by PGIS, what are the requirements for good practice in a PGIS process, and what the warnings are. The next section examines the potential value added by applying tools and techniques from neogeography and GIS/2, and the final section draws some conclusions.

## *3.1. What does Participatory GIS need?*

### *3.1.1. Framing Participatory GIS and Participatory Mapping*

Epistemological and methodological comparison of PGIS with standard GIS includes differences in methodology (e.g. the relative value of qualitative information), methods and tools, ways of representing space, appropriate spatial scale, time and other inputs, and – importantly – ideological, political, power and ethical dimensions. (e.g. Barrera, 2009; Kahila & Kytta, 2010; Dunn, 2007)

Strict definitions have little value; they will be interpreted differently, anyway. Here we summarize that PGIS, is an umbrella term for a diversity of community interfaces with GIS and geographic information technologies and systems more generally. PGIS practice is based on using geo-spatial information management tools ranging from ephemeral and sketch maps (including drawing mental maps), to scale mapping (overlay drawing of spatial information onto existing topographic base maps), and adding spatial information via overlays onto aerial photographs or satellite images, or creating participatory 3-D models

(P3DM). PGIS encompasses community surveying of new information using global positioning systems (GPS), and incorporating this spatial information into GIS (Geographical Information Systems) format. Dynamic and web-based GIS/mapping, e.g. in Google Earth or OpenStreetMap, and Google Maps / My Google Maps., or dedicated sites, is growing fast in PGIS, and other media like photography, (participatory) video, audio recording, etc. to compose peoples' local spatial knowledge in the forms of virtual or physical two- or three dimensional maps.

The community information input itself ranges from the classic community meetings, to focus groups, semi-structured interviews with key informant individuals, etc., via traditional questionnaire and field surveys. Also, rapidly growing are local knowledge inputs delivered via the World Wide Web (WWW), text messaging, social networks, etc. (often constructed within Volunteered Geographic Information/VGI frameworks).
All these are used as interactive (or potentially interactive) vehicles for discussion, information exchange, analysis and support (adding authority to local knowledge and community confidence) in advocacy, decision-making and action taking. On the whole, currently, PGIS is used mainly as participatory computer cartography with limited GIS functionality. Users are employing the outputs mainly as media to support their arguments, thus they are demonstrating again 'the power of the map'!

### *3.1.2. Downsides of working with PGIS*

There are methodological issues dealing with, for instance, the appropriate scale for PGIS, appropriate accuracy and sensitivity, and handling of dynamic processes. There are questions regarding the positioning of PGIS in participatory development-transformation activities, their political-legislative contexts, and the degree of local involvement. Many critiques of using PGIS derive from theoretical concepts of participation. They concern different conceptualizations of participation in planning and decision-making, of local spatial knowledge and the linking of different knowledge systems; and concepts of good governance. And because the justification and the epistemology of PGIS are participationbased, it naturally follows that much attention is paid to the ethical issues (Rambaldi, Corbett et al., 2006). Ethical values enter the whole PGIS process, the selection of cases and topics, the choice of specific methods, involvement of whom in the PGIS activities, and above all in the ownership and dissemination of the outputs, and of the whole process.

Critiques of the PGIS practice and approach raise issues, which need to be addressed, though some are straw men (e.g. Elwood 2006; Kwan 2002; Pickles 1995):
• The intensity, authenticity, and veracity of 'participation' - a core issue which challenges the alternative interpretations and contested discourses of participation.


Notwithstanding that participation is an idealized concept, always criticisable for not living up to the purity of the intent ("a straw horse");
• The technical problems of the hardware, software and systems support, which might be needed for implementing PGIS. A valid point in that the supporting tech system is frequently deficient in the communities and NGO, which may want to use PGIS. A perennially insoluble issue, because inevitably the innovative developments out of

the universities and research centers must always be ahead of the game. On other hand, the technology in-use is always catching up and sometimes overtaking it (e.g. cell phones in Africa;

- PGIS systems, as they are now, cannot authentically represent the 'mental maps' of people, which exist within non-Cartesian, non-positivist, ambiguous, fuzzy, nondiscrete spatial ontologies. This is a serious issue, raised specifically vis-à-vis indigenous people by Rundstrom long ago. However, even technical devices are improving to cross the divide between mental maps/naïve geography, on one side, and digital interpretations (e.g. innovations in cartography, visualization, and data structuring, etc.), on the other. The problem is authentic, but there are many incremental steps being taken towards marginally alleviating it - 'the planets are coming in alignment'.

## *3.2. Three Perspectives on Participatory mapping and PGIS*

PGIS (and P mapping) should be able to handle content and processes in terms of three perspectives of 'real space', 'real people', and 'empowering the community' in authentic social development.

**CRITERIA FOR GOOD PRACTICE IN A PGIS *Space People Community***
**PRE-CONDITIONS, INITIATING THE PGIS PROCESS**

Participatory Design of the process
Inclusivity, Equitability in inputs
Represent the local Spatial knowledge.
Create respect for the richness, validity and value of local (spatial) knowledge
Good governance criteria: accountability, legitimacy,
Transparency

**PGIS PROCESS – THE 'WORKS'**

Participatory Implementation of the process; especially to support more disadvantaged, less articulate actors
User-friendly tools and procedures
Ethics – do not cause unwarranted harm to any actors
Validation of the process in a participatory manner
Competence – reasonable efficiency of the process



**PGIS RESULTS – THE OUTPUTS**

Empowerment as an outcome - create and support more autonomous initiatives within the actors and community, and thus raise the potential of being sustained,
Participatory Ownership of the output
Results are enlightening to outsiders
Equity in results - support the more disadvantaged, less articulate actors
Equity in results - satisfy the majority of the actors
Provide concrete useable output - relevant geospatial information and map-making

**<u>Table 5 - Criteria for Good Practice in PGIS</u>**

### *3.2.1. Seeing Real Space*

PGIS needs the capability to elicit, represent and validate local and indigenous spatial knowledge (LSK), but which is rarely available on official maps or GIS. LSK describes home and action space; focusing on knowledge about the land, land cover and resources; it is innate (often embodied) and continuously augmented and sustained; it identifies issues of immediate significance; and encodes the information about the environment in a language a region's inhabitants understand (often incorporated rather than inscribed; after McCall, 2003 and Duerden and Kuhn, 1996). This may indeed be considered the most significant and valuable component of PGIS actions. LSK is a multi-leveled concept:

**1. Specific local spatial 'technical' knowledge,** that is similar in structure, purpose and cognition to regular 'scientific' knowledge. But, only (or only in detail) the local people do have the local knowledge of soils, plants, water sources, hazards, vulnerabilities, etc. This type of LSK is equivalent to the spatial component of local people's ITK (Indigenous Technical Knowledge) about resources, events, and activities. This is conventional information and the least controversial application of PGIS to recording and assessing technical spatial knowledge of specific resources, or natural resource management systems, or risks.

**2. Knowledge that actually represents different viewpoints**, priorities, interests and problems of different local actors. This LSK is different from the dominant 'official' view, and most likely different also from other local actors. The knowledge of local actors' needs, interests, priorities and values includes local configurations of land and resource ownership with complex multiple user rights and communal property regimes, etc., that are frequently misunderstood by external researchers. These different viewpoints can be reflected in '***counter maps'***. (Peluso 1995). Counter maps have been applied to mapping gendered spaces, especially women's maps of resource access, ownership or control (Rocheleau et al., 1995). Children, the landless, the resource-poor, subordinate ethnic



groups or castes also merit dedicated counter maps. This type of LSK includes, a fortiori, the special cases of knowledge of secret or sacred sites, historical sites, cultural artifacts, treasures, and holy locations which local people frequently do not want to become universal knowledge for several reasons – cultural heritage, physical preservation, and prevention of material theft.

**3. A more specialised LSK is the spiritual or mystical spatial knowledge** associated with cultural spaces, and particularly with specific landscapes or certain land resources, and thus often belonging to indigenous or long-settled peoples. There are urban and 'industrialized' situations also, found especially in larger and older conurbations, and the subject of films and artists and atmospheric writers such as Peter Ackroyd or surrealist Paris. These mental maps are related to psychogeography (Coverley, 2006) and maybe 'mythogeography' (Smith, 2010). This LSK is apparently qualitatively different from scientific knowledge. It is symbolic, metaphoric, and visionary, thus, mystical in 'scientific' terms, and especially related with the land and land features. Knowledge of the landscape is the embodiment of the people's identity (see Rundstrom, 1995 on hunting areas and water management from North American first peoples.). This LSK may also be interpreted as cosmovisions incorporating the origin or creation myths of cultures, therefore more usual among indigenous, natural resource-dependent, less globalised peoples. This deep knowledge frequently holds obligations of stewardship of the land, together with specialized, location- and resource-specific, problem-oriented technical knowledge.

The implications for sound PGIS of needing to handle ‘real space’ are these:

- Represent what is important about place, the spatial specificity of information about local interests and priorities, values and perceptions. P mapping/PGIS is driven by and focused on spatial information about local interests and priorities. The significance of mapping local knowledge, such as of land rights and resource entitlements is shown by Nietschmann’s (1995) succinct aphorism - “more land is lost by the map than by the gun”.

- Related to this is the need to represent mental maps or cognitive maps of people. PGIS has a strong potential to represent mental maps / cognitive maps of people including, but not exclusive to, indigenous peoples. Cognitive maps are not confined to spatial dimensions within the sense of sight; in the human construct of mental space there are also the senses of sound and smell and feel.

- The sense of place which is associated with particular localities by many actors, especially indigenous groups, in their perceptual mental maps is qualitative, fuzzy, metaphorical, - it is not necessarily in Euclidean space, nor vectorisable. Whereas, as in Rundstrom’s (1995) interpretation, standard GIS layers and relational databases, etc. are distorting ‘constructions’, or even purposeful re-assemblies of the original spatial knowledge.

- Translation of cognitive maps includes appropriate representation of ontological fuzziness and ambiguity. The PGIS should be able to handle the appropriate degree of ‘precision’, to understand the question ‘precision for whom?’, and to distinguish ‘representational’ vs. ‘positional’ accuracy (McCall, 2006). And just as important, is the need to recognize and to legitimize this ontological fuzziness. Uncertainty and fuzziness



should not be (mis)understood simply as a lack of knowledge, or as a deficiency of good data collection and measurement, they are intrinsic and profound.

- It has been argued that GIS and LSK are inherently incompatible because of the dichotomies between, on the one hand, the reductionism, positivism, ultra-precision, (oftentimes, linearity and stationarity) of digitized geo-data, and on the other, the fuzziness, ambiguity, organic-synthesis, emotionality, (and often spirituality) of ‘natural language’ spatial knowledge. This is a contrast Varanka (1996) identified as ‘masculine vs. feminine’. In particular, Rundstrom (1995) expressed extreme skepticism that standard GIS can work with indigenous peoples using their cognitive concepts and ‘incorporative’ communication modes of LSK.

### *3.2.2. People demand for good governance and respect*

PGIS practice is intended to be ideological; the politics are progressive and interventionist. PGIS does not pretend to be objective; it takes a stance, which can simply be summarized as promoting ‘good governance’. Good governance is related to multiple dimensions of

legitimacy as ownership, inclusiveness and thus participation, respect for a wide range of human rights, equity (not simply equality), empowerment which follows from those preceding, and competence (including greater effectiveness and efficiency).
These dimensions can be broken down towards identifiable criteria significant for assessing PGIS approaches. These are translated into components, criteria and measures in PGIS and community mapping:

**1. Inclusiveness** means the representativeness of regional, ethnic, tribal, class, religious, age, gender interests; (degree of) subsidiarity in decision-making. Related to devolution and participation; appropriate attention paid to 'participation'; and "spatially-grounded", which means recognizing spatial specificity (UNDP, 1997).

**2. Respect -** by the governing for the governed – for basic human rights - women's rights, freedom of expression, religion, sexual orientation, racial-ethnic equality, etc.; the Universal Declaration of Human Rights; citizens' rights, civil liberties, freedom from arbitrary detention, etc.; workers' rights, working conditions; cultural group and regional rights; indigenous (technical) knowledge, (indigenous spatial knowledge); and laws, entitlements & property rights – fairly and impartially enforced.

**3. Equity** between governing and governed - and amongst and within the governed: access to basic needs; equitable development; an important focus on gender equity; 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; degree of open access to market; and laws, property rights, etc. impartially enforced for all individuals.

**4. Empowerment:** "ownership" of decisions; ability to make independent decisions; participation; democracy; enabling powers; access to basic resources needed for making decision; and self-belief, and confidence.


**5. Social Inclusivity**: PGIS should be representative of the interests, values and priorities of communities, as well as individuals. A requirement is to translate group 'space value maps' (local spatial knowledge) into GIS-compatible constructs that are on a level with the legal or policy playing field with other more powerful stakeholders (Peluso's counter maps, 1995).

**6. Integrated knowledge** – Local and indigenous knowledge, sacred knowledge, gendered knowledge, values and perceptions - that is, knowledge that doesn't necessarily conform to state visions of place. This LSK needs to be integrated equitably with scientific knowledge, for example in the fields of adaptation to global climate change, globalization and urbanization, loss of rural livelihood, over-exploitation of resources; and scientists' knowledge of, for instance, soils, pests, hazards.
PGIS should manage and analyze LSK information by combining data from many different fields (e.g. hazards, socio-economic), using different formats (e.g. images, digital, paper) and consolidating different sources (e.g. local, external, scientific). Multi-sourcing involves multiple processes of people's participation in knowledge identification and selection. There are many opportunities for X-checking and validating. Kyem (2002) noted

that PGIS reduced reliance on individual speculation and subjective memory by bringing individual actors together to confront their different perceptions to seek evidence acceptable to the group.

### 3.2.3. Empowering Community – societal development

This perspective of PGIS refers to the implications for community and society, rather than just the individuals or households involved.

PGIS needs to be capacity enhancing such that communities and groups can be empowered by involvement in PGIS processes, thereby improving self–confidence and technical/ political capacities. PGIS should place GIS at the disposal of local people, which legitimates their choice of techniques and variables; that is their understanding of space and place. PGIS should empower communities by developing their technical, social and political capital and building confidence to:

- Utilize local and indigenous spatial knowledge (technical, livelihood, cultural and spiritual) in a respectful manner.
- Equitably record, analyze and value the local knowledge of different groups in the community, including women, children, the resource-poor, the elderly, the disadvantaged and less articulate.
- Record and conserve local natural resources and cultural practices. Advocate for community resource rights (especially for native indigenous communities).
- Provide an entry into and control over handling technologies used in GIT; this builds capacity and confidence in the community.

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### 3.2.4. Participation and Empowerment in PGIS

The principle of 'legitimacy' in good governance calls for active participation, by all actors at all stages, and therefore at all the stages that involve geographical information technology. (cf. Abbot et al., 1998). '*All actors*' implies a partnership of the tripartite of government agencies, the private commercial sector, and civil society (community representatives, traditional leaders, NGOs, CBOs). It is misleading though to model rural or urban 'communities' as homogeneous, when there are always significant divisions by gender, age, economic class, cultural status, tribe or caste, religion, historical circumstances, and lifestyle.

In participatory-GIS terms, the essential questions are:

- *Who* is participating? Who controls the types, inputs, analysis, and uses of data and knowledge?
- Who handles and analyses the data and information? Who has access to tools and techniques?
- Who uses, or has access to, the outputs?

A PGIS approach should not raise the expectations of the local communities unrealistically or unfairly by proffering a pretentious technology promising more than it can deliver. Rather, PGIS tool for good governance should have the capacity to promote empowerment by opening up the horizons of local users in the community. This enlargement of perspective is an aspect of 'modernization', which could also have negative consequences for the local community, but Gonzalez (2000) and others credit it for integrating and empowering local communities by mainstreaming them further into national society.

The GI technology should therefore be giving voice to local people to the extent of putting them and their local (spatial) knowledge on an equal footing with external 'experts' and decision-makers and their 'official' information. This was the intention behind the pioneering work on PGIS for land reform in South Africa. (Weiner et al., 1995).
The communication challenge is to bridge the gap between indigenous and scientific spatial knowledge by providing a translation capability between local stakeholders and external decision-makers. By building communicability between outsiders and insiders, PGIS not only legitimizes the value of endogenous knowledge, but should also make the technical GIS tools more acceptable to the local users.

## *3.3. Does GIS/2 and Neogeography add Value to PGIS?*
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### *3.3.1. GIS/2, Neogeography, Cybercartography*
**GIS/2** is a set of methods and instruments emphasizing (the participatory) process (of a GIS activity), and oriented towards communication about representations as much as toward the representations themselves (based on Schroeder, 1996). Note that this was written in 1996 at the beginning of the development of the concept.
A GIS/2 would emphasize the role of participants in creating and evaluating data; and equitably represent diverse views, preserving contradictions, inconsistencies and disputes. GIS/2 would be more capable of handling time components than existing GIS. Outputs would reflect the standards and goals of the participants, rather than closeness of fit to measurable accuracy; and it could integrate data components and participant contributions from the one interface. Finally, there is reflectivity - GIS/2 would preserve and represent the history of its own development.

The concept of **neogeography** is given as "geographical techniques and tools used for personal activities or for utilization by a non-expert group of users; not formal or analytical" (Turner, 2006), and now in Wikipedia.
This appears very similar to Tulloch's interpretation of PGIS. "[P]PGIS refers to the uses and applications of geo-spatial information (GI) and/or GIS technology used by members of the public, individually or as grassroots groups, for participation in public processes that affects their lives (data collection, mapping, analysis, and/or decisionmaking)" (Tulloch, 2003; Tulloch & Shapiro, 2003).

Neogeography is partly then just a response to the need for academic invention, but it also allows for a wider range of tools and methods and deliveries using spatial information.
It is not necessarily standard GIS-based, and there is a generously broad interpretation of both 'spatial' and of 'information'. Roche (2010) call this the development of the "geospatial democratization process", which he breaks into 3 'dimensions'-- new types of information, new technologies and standards (Web 2.0, wikis, API); new "user-creators"; new practices and forms of materialization (like Google, VGI, geoblogs, geo-wikis, geo-tagging, mashups, etc.).

Moreover, there is overlap with the idea of **cybercartography** defined as "the organization, presentation, analysis and communication of spatially referenced information on a wide variety of topics of interest to society in an interactive, dynamic, multisensory format with the use of multimedia and multimodal interfaces" (Taylor, 1997; cf. Taylor & Caquard, 2006; Tulloch, 2007). Cybercartography has developed via innovative atlases such as the 'Living' Cybercartographic Atlas of Indigenous Artifacts and Knowledge. These atlases are on-line dynamic, interactive, multimedia and multi-sensory, using many formats in addition to maps. According to Taylor, "atlas" is used as a metaphor for the representation of both quantitative and qualitative information organized through location and is part of the social computing revolution of Web 2.0.
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The questions here are how and to what extent and how some of these interesting innovations in GIS/2 and/or neogeography cope with the needs of PGIS as examined in the first part of this chapter. Do they satisfy the requirements? Are they 'fit for purpose' for dealing with the salient components of 'real space', 'real actors demanding good governance' and societal development?

### *3.3.2. Real Space – gaining Local Spatial Knowledge*

Standing out among many developments in Web 2.0 for geospatial applications are Google Earth (GE) and its currently hundreds / thousands of mash-ups on Google Maps (Google My Maps). The strong technical basis for GE is the building block of KML programming language which allows information to be uploaded on the GE image, spatial information as photo images, links, names, metadata which can all be geotagged or georeferenced. (Miller, 2006; Goodchild, 2007, Bugs et al., 2010; Google Earth Mashups http://googlemapsmania.blogspot.com/, and Google Earth hacks website www.gearthhacks.com.
"My Maps is a feature of Google Maps that lets you create and share personalized, annotated maps of your world." Once a map is created, descriptive text can be added, including rich text and HTML, photos and videos embedded, the map can be shared, and viewed in GE. http://maps.google.com/support/bin/answer.py?hl=en&answer=62843
Flickr is geo-referencing literally millions of photos uploaded by ordinary people, and the OpenStreetMap project is reaching to cover the whole world with local inputs of volunteered spatial information. (Goodchild, 2007, 2008, 2009; Tulloch 2007, 2008; Rouse et al., 2007). The billions of bits of information embodied in social networking like Facebook and Twitter may not yet be geo-referenced, but they will be, and this will mega-multiply the geo-information explosion overload and all the locational - ethical issues below. (Elwood, 2009)

#### *3.3.2.1. VGI (Volunteered Geographical Information) and HS (Human Sensors)*

VGI is the harnessing of tools to create, assemble, and disseminate geographic data provided voluntarily by individuals (Goodchild, 2007, 2008; Tulloch 2008; Elwood, 2008). Some examples of this phenomenon are Wikimapia (in about 90 languages including Anglo Saxon!), (http://wikimapia.org/wiki/Main_Page; http://blog.wikimapia.org/)

OpenStreetMap (http://www.openstreetmap.org/), and Google Maps / My Google Maps. VGI can also be seen as an extension of critical and participatory approaches to GIS and as a

specific concern within online or web credibility. These sites provide general base map information and allow users to create their own content by marking locations where various events occurred or certain features exist, but aren't already shown on the base map. VGI is a special case of the larger Web phenomenon known as user-generated content and Web 2.0. With the proliferation of cellular phones and the Internet, there has come the
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acquisition technique of 'human sensors' (HS), which also accommodates VGI and 'citizen journalism' such as blogs. A growing acquisition technique is 'human sensors' (HS) and HS webs, which can also accommodate volunteered geographical information (VGI). The VGI platforms (Internet and GIS-enabled smartphones), and the virtual globes have radically changed the scene, with enormous potential as easy, cheap, sufficiently detailed, relatively transparent tools to acquire, analyse and present spatial information from a community point of view.

There are innumerable examples of many innovative mashups and VGIs.

- Many examples in Rouse et al. (2007); Bugs et al. (2010), Roche (2010), on Google Earth Mashups (see above), and earlier examples described in Goodchild (2007).
- CommonCensus - a web-driven new regionalisation of the USA based on public's affiliations with sports teams (Tulloch, 2007)
- Ownership of forest carbon rights and (ethno-) botanical knowledge associated with indigenous land claims in Brasilian Amazonia (Butler, 2009);
- Community PGIS for monitoring of land invasions, land claims and pollution from oil exploration in Amazonian Peru (Orta, 2010)
- Citizen monitoring of domestic water services in Zanzibar (Verplanke et al., 2010)
- Noise Tube, initiated in Paris: noise sensoring using a smartphone as a noise metering device with a free app to upload the readings. www.noisetube.net
- Delhi women locating, reporting and shaming 'Eve teasing' on Delhi busses via Twitter and Facebook, organised by Blank Noise, a women's NGO. (external summary in http://www.comminit.com/en/node/270751)
- Real-time monitoring of Katrina floodwater depths in New Orleans, 2005 (Tulloch, 2007)
- Smellscapes on the New York Metro system http://gawker.com/maps/smell/
- Emotional Cartography; http://emotionalcartography.net/ (Nold, 2010)

A more traditional form of working with LSK is the Green Maps project (www.greenmaps.org) with volunteers and local NGOs producing counter maps (paper and webbed) in hundreds of cities in over 60 countries devoted to environmental and social issues usually overlooked by municipal planning authorities and official maps, such as urban safety and women's security, child-friendly spaces, greenness and bicyclability.

A more radical approach is utilizing virtual reality as in Second Life, to explore alternative visions of e.g. community spatial developments, services and functions using people's inputs, priorities, preferences, like community inputs to urban park design, NYC (Tulloch 2007, 2008). It is open 24/7 and it is fun, but the obvious drawbacks are the limited access, and the balance between costly detail and over-simplification of the environment

#### *3.3.2.2. Taking LSK into cyberspace – the doubts*

The $9.99 questions here for the mash-ups, VGI, geotagging, and all the cybercartography / neogeography are:

1. *Who is involved in it?* Who are the 'volunteers' providing information? Obviously, they are people who have access to the Internet or smartphones or other platforms for uploading, but very significantly, they are also those people who have the other resources and skills needed: time Is paramount of these, operational skills, some basic awareness of the phenomena in question – crime, hazards, social hotspots, the music scene, demonstrations, raves, restaurants, bargain shopping, noise and pollution spots, traffic jams – the range is limitless. Beyond this is the motivation to get involved in uploading or adapting or sabotaging the spatial information, even though the activities require far less motivation than e.g. working with traditional media like Green Maps or participating in a PGIS mobile GIS activity,

The answer still at this stage of development of neogeography is more likely to be young e-savvy males with low time constrictions, whether or not they are nerds. In a recent discussion about 'who can or should be the volunteers?' for local hazard reporting in Georgian Caucasus, some worries were voiced that the uploaded reports would be from a very small sample of local people, - even visitors with smartphones, or kids – with shallow local knowledge, and would not at all be representative of local needs and priorities. The conclusion was that it is better for the 'volunteers' to be selected and organized as in NGOs, i.e. not uncontrolled volunteers. It may be argued that HS is not strictly participatory, since it is usually a one-way individualistic information flow without feedback and knowledge development. On the other hand, HS represents a form of empowering people, in that the imparted information is voluntary and bottom-up.

2. *Who is checking the spatial information?* Where are the accepted procedures, criteria and parameters for checking the accuracy, precision and appropriateness of the scale, etc.? Who selects these parameters?
Cross checking VGI or HS webs is an issue. Laituri & Kodrich (2008) and Flanagin & Metzger (2008) discuss whether the 'Crowd Sourcing' of information in VGI results in 'Crowd Wisdom' or not, and is part of the same debate as who is checking the information and how. It is obvious that the growing ability to easily generate masses of local data from masses of local people means that verification, validation and crosschecking of the exploding input material is a problem. In other Web 2.0 fields like Wikipedia or even Wikimapia, the inflow of information is not such an avalanche, and peer reviewing and a hierarchy of managers can deal with it. (Goodchild, 2007, 2008).
The key value in this spatial information dilemma, as in other parts of life where we rely on other people's knowledge is reciprocated **trust.** Academics trust peer review and H factors; local rural communities may trust traditional leaders and some NGOs, but rarely trust Government, (do they trust academics?); mapmakers trust surveyors and satellite images; teenaged tweeters trust their own peer review of cool places; consumers too easily trust commercial websites. How do researchers and responsible planners know how to trust the volunteers in VGI? And how do volunteers in the community know they can trust that their uploaded delivered knowledge will be used safely, carefully and wisely? (Elwood, 2008; Flanagin & Metzger, 2008)

3. *Who owns the output products?* What are the geo-information outputs or products? What is the purpose of generating / analyzing / disseminating them? For whom are they useful? These are the ownership issues to be contended with, among others (Rambaldi, Corbett et al., 2006) The map / GIS products should be clear, understandable, testable, and convincing to the users and their purposes, as well as the usual information criteria of relevance, reliability, internal and external logic, replicability, and coherence. The current and future status of the ownership of local (spatial) knowledge must be clarified, taking into account liabilities for protection of indigenous Intellectual Property Rights. (cf. WIPO www.wipo.int). Zook and Graham (2007) have critiqued the rights conditions of Google Earth as an exercise in the privatization of cyberspace.

There is a perception that our growing acceptance of and nonchalance towards the GIS/2 milieu and its software combined with the explosion of CCTVs and other spy devices, including billions of smartphones with cameras, will expose us to unprecedented levels of surveillance and governing control (Zook & Graham, 2007; Elwood, 2009).
Roche (2010) further identified the geodata weaknesses of the VGI/virtual globe culture as in the homogenization and standardization (e.g. Google API becomes “the unique way” to represent and interact with earth), the over-simplification of cartographic representation, as well as the data quality, the misuse and misinterpretation, the ‘out-of context’ and verification issues, and non-expert spatial reasoning capabilities.
There is a natural reluctance amongst professionals – geographers, cartographers, spatial planners – to allow too much penetration into their professional worlds by the ‘civilians’, the amateurs (e.g. Roche, 2010; Tulloch, 2007; Goodchild, 2007, 2008, 2009) although there can be admiration also (e.g. Tulloch, 2007 for Common Census).

### *3.3.2.3. Visualization of cognitive / mental maps*

People’s cognitive maps work across multiple scales and topologies. Standard GIS already provides many opportunities for good representation of spatial scaling, multi-scaling, scale comparisons, zooming-in, moving/jumping scale, etc. Visual images can be considered as “spatial narratives”, since pictures are rich in information and shared understanding. And more general than just in GIS – there is incredible impact of visual images as communication and cartographic “spatial narratives”. A picture is worth 1000 words (a genuine cliché!) but more than that, it is not just a quantitative increase in information, but also qualitative. This is the ‘conviction’ factor of visual images, though it may have negative as well as positive implications. There is not as yet much application of concepts and tools from semiotics and semiology to understand or deconstruct geospatial images similar to content analysis in helping to understand intention and attitudes and voice in written or spoken texts. Still, there is much to learn (cf. Rose, 2001).

The valuable use of spatial visualizations (maps, GIS) lies in scenario development and exploration. Civil society groups can use the capabilities of PGIS 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. Gonzalez, 2000; Kyem, 2002). This is evident in P3DM with its alternative visual perspectives, including its bird's eye view, and the shadowing created by changing light sources, which allow for broad participation whilst walking around the long perimeter of the models. P3DM is effective in encouraging collaborative discussions about perceptions and priorities such as in buffer zone and community boundary disputes (Rambaldi et al., 2007). However there is the problem of the immutability of the representation. It is easy to change the point and line spatial data on the models, but it is much more difficult to re-cast the areal data. There are physical limitations of over-painting, but much more significant is the social psychological barriers of making the changes, after so much effort has gone into the model appearance. This is a constraint to scenarios of alternative futures, for instance.

A specific dimension in people's cognitive maps is the spatial signifiers of **sound**, and thus the mapping of noise, which had been ignored in regular urban or impact maps. There are exceptions, even early innovative examples, like Southworth's 'sonic environment of cities' (1969) mapping sound distress or noise pollution. Porteous (1990) had chapters on 'Soundscapes' and 'Smellscapes'. But VGI, HSW and virtual globe mash-ups have revolutionized the possibilities for including these, directly in the case of soundscapes, when links to recordings or real-time live sound pick-ups can be easily added. Likewise the use of music, songs, etc. is part of coloring mental maps and group associations with places. Smell cannot yet be directly transmitted via the Web or reproduced off-site, though computer hardware developers are working on smell generators. There are also websites, which provide surrogate geo-referenced information on smells via word descriptions and pictures.

### *3.3.3. People demand respect and good governance*
The basis of this requirement for PGIS is the need for approaches and tools and techniques which represent the views, priorities, needs, problems, and demands of the people as citizens; and specifically in terms of their local spatial knowledge in its three aspects as discussed earlier. The ethical issues in PGIS (Rambaldi, Corbett, et al., 2006) are a part of this.

This component of valuing and respecting local people's LSK equitably with scientists' knowledge (that does not mean that they are at par in all aspects) is related to the concept of Citizen Science, with the idea that LSK has its own values and validity. (Tulloch, 2007; Goodchild 2007, 2009). To begin with, as a minimum, GIS and PGIS have powerful abilities to combine data from different sources (transportation, hazards, socio-economic), formats (satellite, paper) and sources (local, external, scientific). (P)GIS combines disparate data types and modeling different problems based on any purpose-of-the-day.
Cyber Tracker, a spatial information tool aimed at integrating local and external data and data sources, by which it also recognizes and delivers value to the local actors as data providers, illustrates this. Cyber Tracker geo-references data allow users to display icons and text in fast field data collection by local community members or school children. http://www.cybertracker.org/index.html. Cyber Tracker field data capture is by a PDA



connected via Bluetooth to a GPS unit; and lately in smartphones with built-in GPS antenna. Data entry can be programmed by clicking on icons following a predefined sequence (Beyers 2004; Peters-Guarin & McCall, 2011). Cyber Tracker was originally developed for wildlife monitoring in Southern Africa, and designed to be user-friendly for people unfamiliar with computers, even illiterate or innumerate. The interface is relatively straightforward, with its front end designed for ease of understanding, e.g. with a range of existing icons, thus relatively little need for programming skills. Cyber Tracker is open source for further development and free. When combined with free satellite imagery from virtual globes (Virtual Earth) and using open source free GIS software, such as ILWIS, there are major cost advantages over expensive or low resolution remote sensing, and commercial GIS software such as ArcPad.

Participatory video and digital photography record and analyze incorporative spatial knowledge. Working with photography and video allows for intensive participation, both in the filming and the subsequent stimulating discussions, in presenting actors' own sense of what is important, and the control of how they will be represented; 'in PV the subjects make their own film'. This is illustrated by e.g. children's perceptions of safe or friendly spaces in Nepal, (Plush, 2009) and Malawi (Baumhardt, et al., 2009); and the locations of social hazards for women and unsafe urban sites: 'through the eyes of women' photos, voices and participatory research tools for re-imagining place and women's spaces' in Belfast (McIntyre, 2003).

There are many more holistic and cognitive tools, which value local people's knowledge and enhance its expression through unconventional non-rigid, more holistic terms for community-based spatial planning. Thus they form part of PGIS, although not directly Web 2.0 or GIS/2, such as situational analysis, role-playing games, theatre (e.g. Kindon et al., 2007), and stories and imaginations e.g. in El Salvador, Guatemala, Peru, and Venezuela (Wisner et al., 2008; Kindon et al., 2007).

### *3.3.4. Empowering community - societal development*

The PGIS approach is intended and expected to empower communities and individuals, in terms of capacity-building, confidence-building and long-term strengthening of knowledge, skills and initiative. The question is whether communities and local actors gain in empowerment from using GIS/2 and neogeography tools in PGIS processes. Related to the framework of ethical issues in PGIS, this perspective is significant in terms of who participates - in what form - in the PGIS activities? Who decides who participates? And who will use and control the outputs?

Many of the specific tools and the examples promoted as the new golden age of GIS/2, or cybercartography because they are interactive and empowering, are more like traditional one-way search engines than an interactive inclusive knowledge building exercise. People can only search for information nicely geo-referenced, with hyperlinks etc. but not as a wiki, i.e. no opportunity to add / detract from the information. Or, they can post comments but they are only dropped in a box without much ability to dereference or link them (c.f. critique of Bugs et al., 2010). PGIS digital preservation of information is also a boost to participation, because it



enhances the ability to more equitably record, analyze and value the local knowledge of different actor groups in the community, including women, children, the resource-poor, the elderly, the disadvantaged and less articulate.

There is a reasonable assumption that a basic framework or patrimonial geospatial data is better measured, mapped and delivered by procedures other than PGIS or by neogeography tools. This is for several reasons for cost efficiency - the framework data are for a massive client base, to make use of experienced technical skills of cartographers, and for legal and legislative validity. But even this framework data can be critiqued and tested by the neogeographic community, an important instance being in toponomy – the nomenclature attributed to places and spaces is a strong factor in social cartography. Wood (1992) & Rundstrom (1995), among others, have long pointed out how naming of places and then the permanent recording of them on legal maps is a mainstay of cultural and economic control, by colonial or federal powers. Aside from naming used as a deliberate weapon of the powerful, it is common to find petty errors in map names and legends, which can be corrected by VGI.

Moving from their particular circumstances to the general, communities can use PGIS (as in web GIS) to mobilize for change, and better understand how local facts connect to wider (regional, national, international) issues. (Gonzalez, 2000) For example, PGIS can be used not just to map the local pollution impacts of toxic waste sites, but also to become aware of the sources of the wastes.

There are technical strengths over pre- or non-GIS methods like the ability to handle multiple data layers for analysis and presentation. Overlaying (e.g. different types of land use), is already known as a major 'value-adding' functionality, which GIS has over paper mapping, with the ease in overlaying multiple data sets ('what is where?'). GIS handles spatial Queries (where is …?, what is at …?). GIS capabilities handle spatial analysis e.g. proximity, threshold distances, routes, land uses, networks, simple analyses such as calculating areas and drawing boundaries; and complex analyses such as geo-coding and dynamic simulations. This is furthered by the capabilities for secure storage and ease of communication for recording, protecting, exchanging, and sharing spatial information in digital or analogue formats.

The accelerating speed of adding new information is far faster than in previous technical generations. Consider at present Wikipedia, Wikimapia, and the granddaddy of them all, Google Search. Of course this is a potential loss as well as a gain. The massive countering problem is how to validate and crosscheck this information, cf. Wikipedia's hierarchy of peer review vs. Google Earth (Goodchild, 2007, 2008, 2010).
New hardware technologies for PGIS, like PDAs (iPaqs), Tablet PCs, TomTom GPSs, and smartphones add to accessibility (user friendliness); ease in mapping, portability, for determining locations (using GPS; being able to ask 'where is?'); they also allow numerous types of output, not just maps. As example, the advantages of employing GIS within participatory land assessment (a tool called MIGIS) have been given as: it is highly visual; it stores (quantitative) data efficiently, data are credible and quantifiable; and that they are easily updated and facilitate monitoring. Although, other claims made for the benefits of the

PGIS (MIGIS) are dubious: “data stored within the GIS is accessible to all” (what about access and ownership?), it “can be used to answer an infinite number of questions, only limited by ability to ask”, and it helps address conflicts. (McConchie & McKinnon, 2002).

## *3.4. Conclusions - satisfying the requirements of PGIS*

How do we know if GIS/2 and neogeography with its array of tools and gadgets is successfully addressing the needs of PGIS? Does GIS/2 give satisfaction?
Practitioners point out that PGIS has or may have greater value in facilitating and promoting progressive changes (towards equity, empowerment, etc.) - not through the output products, but through the drawn-out process of creating the PGIS, using the PGIS within and as part of the participatory inclusion of ‘multiple forms of knowledge’. Elwood calls this ‘qualified GIS’, and emphasizes cartographic spatial narratives with the visual as a form of communication. This issue is significant in the well-grounded debate on understanding ‘participation’ as being both process and position. In practical application of thousands of “participatory projects” in rural or community development, there has always been tension between the concrete outputs of the project, and gains made in terms of participants’ capacities, confidence, and empowerment. Table 6 shows some new tools for practitioners linked with the established criteria for good practice of a PGIS.

### Tools Examples *Space People Community*

### Accessible Geospatial Information Sources.
### Ease of Access to base / patrimonial geodata

Virtual Globes
Google Earth; Virtual Earth; OpenStreetMap

### Participatory creation of new geospatial data

Volunteered Geographic Information.
Flikr; Wikimapia;
OpenStreetMap; Google My Maps; Green Maps; dedicated WWW sites
Human Sensor Webs HSW: organized subset of VGI (e.g. Noise Tube)
Geotagging GPS coordinating;
Geotagging
Mobile GIS iPaqs with GPS (e.g. ArcPad); CyberTracker
P3DM (manual)
Participatory Video VideoCam; Cellular phone
Soundscapes, Smellscapes Noise Tube; Gawker


### Participatory (Spatial) Analysis

P3DM, P. video, Mobile GIS, etc.
MIGIS; VideoCam;
Cellular phone; 3DMap

### Effective Presentation and Delivery

Visualization Graphics software: Adobe Photoshop; Corel Paint shop
P3DM, P. video etc. 3Dmap; Video tape
Geotagging on websites GE Tag

Interactive websites (with feedback)
GE; HSW

**Table 6 - Tools and some applications from Neogeography - GIS/2: Addressing PGIS criteria.**

What people may call a ‘successful’ situation to a PGIS project is itself debatable.
Some actors in a community PGIS activity may be pleased with the outcome, perhaps they get employment from it, or they get access to external resources, or they exploit it to monopolize internal resources (‘elite capture’), whereas other actors may be unhappy because their priorities and preferences may be excluded in the final maps (cf. Minang & McCall, 2006; Fox et al., 2006).

This question is of course a subset of the universal discourse on what is ‘community’?
Who belongs? And why? How are they selected? Whilst others are not? What must they be, or do, to remain in the community? Individuals belong to multiple communities geographical-spatial, social-cultural, age, interest or problem or functional groups. The whole thrust of Web 2.0 and the VGI etc. off-shoots is that anyone’s community does not need to be a coterminous geographical unit. Nor is it static, people shift in and out of real and virtual communities as they change lifestyles and change interests. Facebook and other social networking sites are a definite part of the reality of communities, though not the only part.

We cannot and should not define very concretely what is a ‘successful’ conclusion to a PGIS or a community mapping process, but we can identify key widely accepted criteria related to participatory approaches generally (as in Table 1). As with all participatory processes, there are criteria based on developing a satisfactory outcome - these are maps and spatial displays such as GIS which represent people’s alternative spatial realities in the PGIS case; and, equally important, the criteria which are related to the processes of working in a participatory, collaborative manner – that is, creating respect for people and empowering communities. A PGIS or participatory mapping activity, which achieves (most of) these objectives, we can agree, is ‘successful’.