

The value and role of GIS to planned urban management and development in cities in developing countries

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GIS Participation combines GIS and other methodologies to give local government the most effective basis for policy formulation in partnership with stakeholders, says John Forrester of the Stockholm Environment Institute and colleagues Howard Cambridge and Steve Cinderby. Whilst GIS-P use is still rare in the developing world, it offers an area of real potential for development.

Abstract

A need exists within urban planning for techniques to promote sustainable policies and developments - for this to become possible, we need to enhance and facilitate stakeholder understanding and involvement in decision making and in monitoring the impacts of management policies.

GIS (Geographical Information Systems) are commonly used as planning and analysis tools in developing countries, while parallel work has been investigating sustainable development and the future of cities. GIS-P (GIS-Participation) combines GIS and other methodologies of social and environmental assessment in a new set of techniques that meet the aims of sustainability. The methodology includes developing a spatial database of environmental and social information to assist in the formulation of available options and jointly holding citizen inquiry groups with stakeholders from within the community and statutory and non-statutory organisations to provide input in the formulation of options.

Examples of GIS-P in developing countries are hard to find and are often the subject of research papers rather than application. However, examples presented here illustrate how GIS-P has been used effectively for sustainable developments. Urban management and development is shown to work best with participative and inclusive methods which GIS-P can provide and thus a suitable framework for its inclusion in city planning in developing countries is advocated here.

Introduction

The idea of systemic planning is becoming more prevalent in many issues of urban management and development. GIS is commonly used as a tool to simplify this process: 'City planning is a classic application of GIS, in which common data is used to co-ordinate activities and reduce duplication of effort' (Von Rimscha 1997). However, we argue that as well as being a planning tool GIS can also be used to meet another planning need - the need for stakeholder involvement.

Since the actions of the public are almost without exception an aspect of the reality planned, and since plans are often implicitly intended to influence public behaviour, it is therefore important that the public are involved. Public involvement may include: influencing which issues are addressed and with what prioritisation (choices and rationales may differ from those of the planners); inclusion of lay knowledge; and the public as end-users of dissemination of results and proposals. The requirement of public involvement is enjoined by the Local Agenda 21 process: '... the effective participation by civil society, are [*sic.*] also an essential part of the necessary foundations for the realization of social and people centred sustainable development' (UNGASS 1997: paragraph 23). Involvement of the greatest number of people is therefore imperative for the success of sustainable development and is at the heart of Agenda 21 and particularly Local Agenda 21. Participation in *planning* implies that there should be involvement from the outset. Many of the European Commission programmes, for example, already have the principle that policies and projects should, from beginning to end, involve groups affected. Not only is this a fundamental principle of

democratic government at every level, it is used as a test of successful policies. This genuine involvement of citizens, leading to perceptions of public ownership of policy options, is seen as critical in ensuring sustainability, legitimacy and democracy. Further, the appropriateness and policy relevance of plans can be enhanced when the public can lay claim in some way to planning outcomes (Kuper 1997): furthermore, lay persons have been shown to have information about specific local processes and practices (Wynne 1996) and even about 'gaps in expert knowledge' (Petts 1997: 373) which would otherwise have been either overlooked or disregarded in a solely expert planning process. By the inclusion of local and lay data in any planning process it may be made more location-specific (Bailey, Yearley and Forrester 1999), and, the same inclusion of lay perspectives may add to the public legitimacy and consequently the public uptake of plan (Forrester 1999a).

Differing methodologies for involving the public have been adopted by planning and statutory agencies around the world, ranging from public inquiries and citizen juries to focus groups and consultation documents (see Forrester, Yearley and Bailey 1999, Renn, Webler and Wiedermann 1995) but these have, for the most part, proven to be unwieldy and unable to engage the public sufficiently or provide standardised, useful data for planners. El-Shakhs has pointed out that cities in developing countries present their own particular problems (El-Shakhs, 1998) and, while this undoubtedly provides problems, and responsibilities, for the professionals (Middleton 1998: 156), professionals alone cannot provide all the solutions. Thus, citizen involvement in solving problems that directly affect them is widely advocated (Deshingkar and Cinderby 1998, McGranahan, Songsore and Kjellén 1996) yet there are still many gaps in knowledge and experience of how such involvement may be achieved. Increasing technology in the assessment and prediction of local environmental conditions and formulating policy responses may at first sight appear to exclude lay involvement (Yearley 1999), however, using techniques such as GIS-P it is argued that citizens may contribute effectively to such exercises by providing complementary knowledge, reviewing the technical work and commenting on the (subjective) assumptions and validity of the world-view that underpins so many planning decisions. As has been demonstrated in the developing world, such use of GIS provides a unique opportunity to examine the differences between perceptual information and hard data in terms of content and presentation (Cinderby 1999). The production of spatially referenced perceptual information allows non-expert insights to be incorporated in a more direct manner than previously attempted.

GIS-Participation: its scope and methods

Examples of the use of GIS in developing countries are varied in application but tend to demonstrate how professionals, for example town planners, have embraced GIS technology, created their own spatial databases (from sources such as aerial surveys, satellite images and census surveys) and applied methodologies or models sometimes without recourse to the needs or requirements of local populations. The output from the GIS is typically a map which may be biased towards the particular perception, belief or wish of the GIS/town planning expert, development (*i.e.* often also the funding) agency, or politician. Examples of GIS-P in developing countries are harder to find and are often the subject of research papers, not applications. This is not surprising as GIS-P is still an evolving technique. Examples presented here are not exclusively from urban management case studies but do illustrate how GIS-P has been used effectively for sustainable development.

Corbley (1999) describes an example where participatory GIS has successfully been employed in the Republic of Congo in order to plan the sustainable development of villages. The project involved anthropologists, biologists, GIS and remote sensing experts along with the local inhabitants *producing* plans for sustainable resource utilisation. Ainslie and Cinderby (1997) describe rural livelihood and natural resource management in semi-arid South Africa and Namibia which illustrates the GIS-P approach for local planning. There are, as yet, no examples of GIS-P in an urban context in developing countries.

Other examples of user-interface GIS which are available include the use of GIS in World Wide Web pages (Evans *et al*, 1999). These uses range from simple location of recycling facilities on a LA21 page (<http://www2.brent.gov.uk/recycle.nsf>) to more a sophisticated index of polluters (<http://www.foe.co.uk/factorywatch/index.html>) and may even be used for

interrogation of planning (<http://www.wicklow.ie/planning/>). Much useful work is being done on web-based use of interactive mapping by Steve Carver and colleagues at the University of Leeds (see: <http://www.ccg.leeds.ac.uk/mce/> and <http://www.ccg.leeds.ac.uk/vdmisp/>), and other web-based interrogative facilities are also available in the USA (see <http://gis.mit.edu/projects/>). However, the participative aspect of GIS-P is more concrete and, unlike these developed country examples, does not depend on the participant having access to their own PC and is, therefore, particularly suited to the current situation in many cities in the developing world.

GIS-P is a means for the inclusion of subjective non-expert data into both qualitative and quantitative expert planning processes and models. This enhances effective communication and understanding, facilitates greater stakeholder involvement in decision making, and assists in monitoring the impacts of management policies (Abbot *et al.*, 1998). The techniques include the incorporation within a GIS of individuals' or groups' mental maps of the local environment and data about how they interact with that environment. The use and analysis of the type of spatial data which it is possible to include using GIS is important to a wide variety of planning activities both for data collection and also for storage and display of user-comprehensible information. GIS-P also allows for comparisons between factors and identification of sites of special concern or areas of potential conflict which need to be flagged as requiring possible arbitration. A variety of indices (including, for example, socially related indices such as traffic flow figures, air pollution data, health statistics (both epidemiological and incidence rates), poverty data and crime statistics) are suitable for display. GIS-P allows for correlations between maps of different data to be investigated; it also permits analysis of relationships between mapped data and other inputs from citizen groups; in other words, not only the physical environment but the social environment as well can be recorded, thus revealing new information or criteria which could influence possible management patterns for assessing the sustainability of urban environments under various development scenarios.

An additional aspect of this methodology is that it is possible to look at the public perception of different issues at the same time. It is thus likely that the GIS-P methodology will reveal systematic spatial similarities of outputs which can be integrated when presenting data to community leaders and members of the public, as well as raising potential conflict issues which need to be addressed. In this way a policy-relevant consequence of using GIS-P can be innovations in the way planners and practitioners relate to each other within the professional and policy communities or affect the way they present their data to the public. This reinforces the systemic approach by including different parts of the system: sociological, ecological, and environmental (see Forrester 1999b for a fuller exposition of this argument).

The GIS database provides a structure for storing, interrogating and analysing other data sets thus enhancing their use and value. The potential to combine different perceptions allows for the investigation of 'multiple realities'. GIS-P can therefore help to promote bottom-up policy development by incorporating local concerns and knowledge, all stored within a single database in a similar way to conventional spatial databases. Field experience suggests that the greater shared understanding of the various stakeholders' perceptual information achieved by this process can be useful in highlighting and resolving conflicts (Deshingkar and Cinderby 1998) and that the combination of existing environmental information with that obtained from the users of the local resources allows greater insight into the limitations and possibilities for development (Ainslie and Cinderby 1997). This enhanced knowledge helps to facilitate increased communication both internally within planning and policy agencies and externally with the wider community. The process of quantifying local knowledges can also enhance the position of communities when negotiating with outside agencies. Further, by repeating the collection of perceptual maps over a period of time, GIS-P allows for the monitoring of resources and impacts of planning and management decisions on local areas through time. This process has proved useful in assessing the success or failure of action plans and policy initiatives - for example the Department for International Development (UK) is currently reviewing similar techniques (Quan, Martin and Pender 1998) - and for reaching consensus on the state of local urban environments and on arriving at targets for land use planning.

Briefly, GIS-P operates by being an *integrated* assessment (see Bailey *et al.*, 1996); thus generating both understanding and mutual trust between the producers of data and the publics for whom data is produced. Consequently, there are several sub-aims to running GIS-P groups, which can be held with significant community members such as leaders, elders, representatives, and so on. It is here that the systemic and inclusive nature of GIS-P benefits solution-led planning as the different sociological, legal and political frameworks which need to be appreciated are included in the analysis.

The initial use of GIS-P maps and their development into a spatial database is required to form the basis of the subsequent data sets needed for more in-depth analysis; here the interests of the stakeholders largely drives the direction of the development of the spatial database (additional data sets may be collected on the most important factors identified in the initial phases). Thus participants are used to partly set the agenda both in terms of topics and how they are framed (they may choose to concentrate on, for example, transport, health, exclusion from planning and so on). The actual agenda can thus be a negotiation between lay expertise and the perspective of professional insiders who know the technical possibilities and policy structures and targets. Areas of concern will be drawn, by participants, onto pre-prepared basemaps. In this way GIS-P fulfils a second function: by allowing the members of the group to interact and engage with the creation of the data sets in this visible manner feelings of ownership of the final product can be increased and, further, the use of a GIS as a storehouse for information allows for information to be presented in a consistent and simple manner. The findings can be presented in a wide variety of different formats including traditional maps, graphs, tables and reports, but also posters or pages on the World Wide Web. This is an area which is still being developed and it will be more prevalent as technology (computing capacity and power as well as internet connectivity speeds) improve. The example of Evans *et al.* (1999) demonstrates how GIS-P on the WWW can be achieved. Technology in developing countries lags a little way behind that in developed countries, however, the technological differences between cities is less noticeable than between rural areas. This will make Internet-based GIS-P an exciting prospect for city planning in developing countries. The use of simple maps (comparable to those produced by the groups themselves) makes results accessible and appealing to a wide variety of different end-user groups including local representatives and leaders, the media, and community and educational groups.

Conclusions, and the way forward

Planning and policymaking for sustainable development requires citizen participation for several reasons including access to local knowledge, quality assurance and for revealing the values and agendas of all actors; experts, policymakers, and citizens.

GIS-P applies novel methodologies for the integration, comparison and utilisation of local environmental knowledge. This approach builds on insights from the input of citizen panels into environmental and land use assessment. The GIS-P methodology has already been shown to be a successful vehicle for presentation of lay and public perceptions around land use, the methodology thus provides a model for the integration of public insights not only into the policy process around urban management and development issues but also into computer simulation of scenarios. This benefits both local people and local government and brings about improvements in the dissemination of information from local government and governmental agencies to the wider community. Finally, the approach taken by the methodology relates to concerns over sustainable development and citizen participation. As the European Commission, among others, enjoin development programmes and projects to involve the groups affected by them *from the beginning*, not only is participation a fundamental principle of democratic government, therefore, it is the chief test of successful management and development policies. This genuine involvement of citizens leading to perceptions of public ownership of policy options is seen as critical in ensuring both legitimacy and sustainability.

GIS-P builds upon our understanding of how people participate in the management of their area, not just through behavioural and lifestyle changes, but through contributions of knowledge and understanding of the local social and environmental conditions. By using

systematic and participative approaches to evaluation, environmental and social improvements in cities in developing countries will not only meet national requirements for LA21 strategies but also develop better understanding by citizens.

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Bioblurbs

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