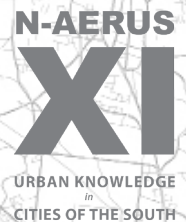


Knowledge production in local governance systems through qualitative Geographical Information System (GIS)



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Abstract

Urban local governance offers opportunities for more inclusive urban management and planning, incorporating tacit knowledge and citizens' preferences. However, the question is how to elicit such knowledge and preferences so that they are both inclusive as well as efficient. Current methods include participatory budgeting and planning and focus group discussions. Field visits to Indian cities have shown that a lot of effort is put into the implementation of E-governance tools and setting up Geographic Information Systems (GIS) databases, mostly for property tax collection, focusing on administrative interaction with citizens. However, little attention is paid to how GIS could be included in strategic local governance processes.

The main question here is how a mixed approach including qualitative GIS can make local embedded knowledge visible for inclusive urban governance. To answer this question, workshops were held in four Indian cities (Mysore, Hubli-Dharward, Kalyan and Mira Bhayandar) with participants from different urban local government departments and elected councillors and slum residents. GIS maps were used both as an input to the process as well as for visualizing outcomes. The workshops provided more understanding of the local context and enriched the knowledge obtained from local databases.

The workshops show that the use of GIS throughout the process can produce spatial knowledge not present in local databases, and can facilitate interweaving multiple forms of knowledge. Nevertheless, the outcome of knowledge generation depends greatly on the nature of input maps, the situated knowledge of workshop participants and map literacy.

1. Introduction

Urban local governance offers opportunities for more inclusive urban management and planning, incorporating tacit knowledge and citizens' preferences. However, the question is how to elicit such knowledge and preferences so that they are inclusive as well as efficient. Current methods that are used experimentally in India include participatory budgeting and planning and focus group discussions. Earlier research in Indian cities has shown that efforts are being made at different scale levels and to differing degrees to implement the use of e-governance tools; e.g. setting up Geographic Information Systems (GIS)-based databases for property tax collection and publishing land use plans; i.e. for administrative interaction with citizens. However, little attention is paid to how GIS could be included in more strategic local governance processes.

The main question here is how instruments of e-governance, in particular GIS-based approaches, can make local embedded knowledge visible for more inclusive urban governance. To answer this question, workshops were held in four Indian cities (Mysore, Hubli-Dharward, Kalyan Dombivli and Mira Bhayandar) with participants from different urban local government departments, elected councillors and slum residents. Thematic (GIS) maps were used both as an input to the process as well as

for visualizing outcomes. The workshops provided more understanding of the local context and enriched the knowledge obtained from local databases.

The workshops showed that the use of GIS throughout the process can produce spatial knowledge not present in local databases, and that it can facilitate interweaving multiple forms of knowledge. Nevertheless, the outcome of knowledge generation depends greatly on the nature of input maps, the situated knowledge of workshop participants and map literacy. It also depends equally if not more on the processes by which such knowledge is generated: the types of participants included in such exercises, the recognition of different types of knowledge in processing the results of discussions. The spin-off effects depend on the utilisation of the results.

1.1 Opportunities of including tacit knowledge in urban local governance; new forms of knowledge or new governance practices?

The question raised above fits into discussions on new forms of knowledge in urban development, which have emerged in recent years, particularly in the urban South. The move towards more strategic planning rather than planning from the drawing board, has made it important to have up-to-date knowledge on urban populations, the spread and use of services, and the uneven concentrations of particular phenomena – slums, poverty, quality of housing and services, and uneven spread of infrastructure. This implies recognizing various kinds of knowledge and new processes of producing knowledge that can feed into strategic planning processes.

Types of knowledge range from the expert knowledge generally used in urban planning and management, to technical knowledge embedded per sector, to embedded cultural knowledge, and tacit knowledge from local residents and communities (VAN EWIJK *et al.*, 2009). Each type of knowledge provides its own insights and the issue is how they can be combined strategically to make urban management more focused, efficient and effective. Currently, opportunities of combining such knowledge with a spatial perspective (mapping) provide new insights on uneven patterns of urban development (JOSHI *et al.*, 2002; HOYT *et al.*, 2005; MARTÍNEZ-MARTÍN, 2005; BAUD *et al.*, 2008; BAUD *et al.*, 2009). The main advantages of such mapping results are that actors involved in decision-making on allocation of scarce resources, or assessing political demands, have instruments with which to validate their decisions (PFEFFER *et al.*, 2008; MARTÍNEZ, 2009). This implies that we should integrate the knowledge from local communities, their representatives as well as that provided by local governments themselves. The knowledge that researchers can provide should also be recognized in its own right, as they work as disinterested observers, or consultants to specific actors in local governance (e.g. as trainers). They use sources of knowledge outside those used by local government officials, make different combinations and types of analysis, and provide a relatively open access source to knowledge as well.

The extent to which different types of knowledge are recognized and appreciated varies a great deal; it depends particularly on the extent to which *urban local governance* has made the turn to more *participatory processes*. As the issue of participatory local governance has been discussed widely, here we focus mainly on how knowledge can be included in and produced through processes of participation and negotiation. Approaches to this question have used examples of various forms of mapping; transect walks, focus group discussions producing knowledge, community-based mapping, and NGOs producing knowledge in contested local governance processes (in India: JOSHI *et al.*, 2002; Gururaja Budhya, personal communication; HOYT *et al.*, 2005). The authors of this paper have taken theoretical approaches to livelihoods and produced multiple dimensional deprivation maps in Indian cities using Census indicators, showing concentrations of deprivations there, as well as using remote sensing images to analyse different types of informal areas in Delhi (BAUD *et al.*, 2008; BAUD *et al.*, 2009; BAUD *et al.*, 2010). In Argentina, Martínez (2009) explored the potential of GIS-based indicators in supporting urban policy formulation concerning spatial inequality.

This suggests that the spatial perspective can add several dimensions to existing knowledge: 1) the visualization of spatially expressed inequalities within cities (MARTÍNEZ, 2009; Baud et al 2009), 2) utilizing administrative databases for more strategic urban management and sociological analysis (e.g. utilizing Census data for analysing social inequalities)¹ and 3) analysing remote sensing images to identify further heterogeneity (SLIUZAS, 2004; BAUD *et al.*, 2010; SLIUZAS *et al.*, 2010).

The next issue is how such new types of knowledge can be incorporated into local governance processes for decision-making. Much less has been written about this issue, and what has been written often provides little information on the embedded context and the opportunities and limitations it poses on the processes included². Therefore, this paper makes a contribution to this discussion by analyzing (or describing) the experimental processes used by the authors, based on concepts of qualitative GIS, to introduce new knowledge and elicit existing tacit knowledge from actors in local governance processes, focusing on local government officials and political representatives of different local communities. Before the analysis of the experimental processes we will provide a selected overview of spatial knowledge and forms of participation in (local) governance processes.

1.2 Spatial knowledge in local government in India

In India, several initiatives were launched concerning the more 'technical' knowledge production to support urban development. For cities, the government of India has come out with the "Information System Infrastructure Promotion under the JNNURM (Jawaharlal Nehru National Urban Renewal Mission)". In this programme spatial knowledge is supposed to be generated in each of the selected (63) Municipal Corporation as part of the urban reform process. A second initiative, and the most important one at the country level, is the "National Urban Information System", also initiated under the JNNURM reform agenda. The main purpose was to build an urban information system, both in terms of mapping and statistics, and develop some kind of an urban portal for knowledge sharing. This is supposed to cover all the 5000+ urban centres in the country in terms of maps at ward level to city level, city statistics, etc. The third initiative is the establishment of e-governance systems as a part of more transparent government at the local level. Funded initially on experimental basis by the Department of Personnel and Training of the Government of India, the e-governance programme became a part of the JNNURM's reform agenda to be followed by the states and local authorities for more efficient and transparent public administration. Most of the local authorities under JNNURM have followed and implemented this e-governance programme seriously. The fourth initiative is the "Public Information Infrastructure (PII)" based on broadband connectivity of urban as well as rural areas of the country – connecting all the villages and cities of India, covering all government programmes. This is funded by the Universal Service Obligation of the Telecom industry, which has been granted licenses in various regions. It is supported by geographic information technology (GIS) that tags all the places and their unique identification.

Fieldwork observation at the municipalities covered in our research, suggests that spatial knowledge at local level still exists in a context where GIS-based data is used for better coverage and for more efficiency in revenue collection, monitoring, etc, but not for strategic planning. Technical GIS knowledge application is restricted to Departments of property taxation in most Indian cities. This knowledge was popularised because of the initial success it has had in some cities, such as Patna, in enabling city government to mobilise major resources for development. Even now, some leading municipal corporations such as Pune, Nagpur, do not have infrastructure maps of their city (especially water supply and sewerage maps), or slum maps. However, statistical information is collected from ward level to city level, so that the potential is there to map existing information sources.

1.3. Examples of current forms of participation in India in the light of ICT

The 74th Constitutional Amendment Act (74th CAA) of 1992 created a space for participation in a decentralised environment in India. Since then much progress has been made in the process of decentralisation, participatory knowledge making and its application at city level. Participation has taken many forms in the new model of urban governance. Some of them are: government centred, government induced, and people induced participation in governance processes (SRIDHARAN, 2009). Sridharan (2009) has analysed the impact of participatory governance systems and how it has incorporated spatial knowledge production generated through public grievance mechanisms and how these can best be utilised for greater government efficiency in the future.

Government-centred participation refers to the participation process propelled by state Government and not by local government. State Governments such as Delhi and West Bengal introduced the concept of participation in various forms. In the case of West Bengal, the state government set up the Kolkata Metropolitan Planning Committee to manage governance mechanisms at the metropolitan level of Kolkata agglomeration. It is meant for participation by various local authorities within the metropolitan area. Both the elected representatives and bureaucrats are represented in the Metropolitan Committee. The committee raises local issues spatially and finds solutions for them. Spatial maps are prepared by the technical board in the Kolkata Metropolitan Development Authority. This authority provides technical support in preparing local and city plans. Participation is very restricted and local populations hardly have any say in the decision or plan-making process.

In the case of Delhi, the State Government made use of the existing 'Neighbourhood Watch Committees' of the Delhi Police set up during the aftermath of the 1984 riots. State Government encouraged the neighbourhood watch committees to form Resident Welfare Associations (RWAs) and provided access to the public grievances system of the government. While initially local governments were not taking part in this process, they are now also involved in the problem solving mechanisms of the RWAs. This form of participation improved on the Kolkata Model as it stimulated local residents to participate in the grievances redressal mechanism.

Delhi State Government also established for the first time Delhi State Spatial Data Infrastructure (DSDI) that brings together all the departmental information at one place. However due to security reasons DSDI has not been made operational. DSDI has already identified 27 administrative boundaries that co-exist in a conflicting way leading to overlapping governance processes.

In Kerala's people's participation model, both local government side as well as local citizens were involved in participatory development processes at local level. Spatial budget commitments were made by the State Government to all the urban local bodies in the form of a 60:40 ratio. This was placed before the citizen's committees at ward level (lowest level of governance system), which then decided on the programmes and projects at that level. Grievances on various public infrastructure and other issues were deliberated and funds allocated for better provision. Spatial knowledge and decision making processes operate in a much more decentralised environment in Kerala. Now these efforts are being scaled up at the district level through participatory plan making.

In the last decade, several 'new' forms of participation have emerged in the global South mediated by (Geo) ICT tools. Both government and citizens are the main actors involved in these participation processes. In many cases the government has promoted, regulated and filtered the participation of citizens through the implementation of e-government schemes (MARTÍNEZ *et al.*, 2009; VERPLANKE *et al.*, 2010). More bottom-up forms of participation also facilitated by ICT emerged with the advent of tools such

as Google Earth (2005), Google Maps and the Web2.0 (ELWOOD, 2010). It is in these new patterns of interaction and the increasing “wikification” of mapping (ELWOOD, 2010), that citizens are transformed from consumers of information into producers of information (prosumers) (BRUNS, 2008). Volunteered geographic information (VGI) and human sensors (GOODCHILD, 2007) are terms that clearly describe this new form of participation and volunteer production of local knowledge through ICT, although it remains exclusionary due to its dependence on ICT access³.

There are some examples of VGI and “humans as sensors” in the Indian context. *Fixourcity.org* facilitates volunteers in reporting problems with their respective geographic location and forwards the report to the local authority. At the same time citizens can visualize the state of the problem and discuss it with others. The site is operational since mid-2009 and by looking into the complaints submitted in Chennai it is clear that low income groups are not represented among the “volunteers”⁴ (figure 1). *Foursquare.com* is a clear example of VGI where prosumers and volunteers are privileged citizens commenting on trivial issues such as the quality of the coffee in a specific geographic location of the city; as this comment uploaded by a volunteer in one Indian city shows: “my stress free zone ...u gotta try the latte ... Rich cold coffee”⁵. With respect to the role of VGI in urban governance processes more insights need to be gained concerning the digital divide of new forms of participation (e.g. e-grievance clearly more middle class orientated), who sets the agenda and “map legend” and who participates.

This problem has been fixed.

Garbage not collected for many days

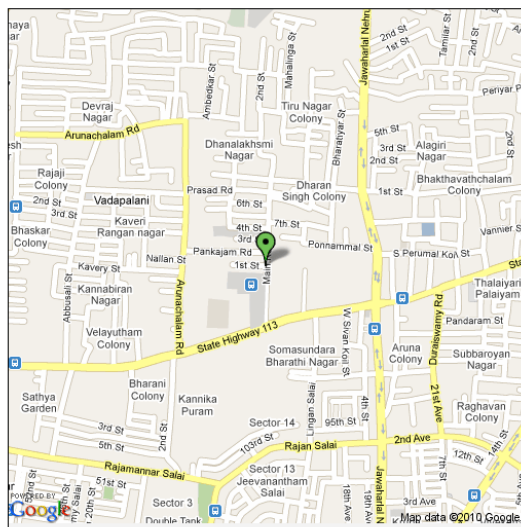
Reported in the *Uncollected Garbage* category by Shankar Krishnamurthy at 16:51, Thu 8 October 2009. Please note the pin location is approximate.

Severity: **4**

At 2nd main road, Vegeeswarar nagar, Vadapalani, garbage has not been collected for many days in a row. Any request from the residents is met with unpolite response from the sweepers/cleaners. Please fix this issue ASAP.



[Offensive? Unsuitable? Tell us](#)



[More problems nearby](#)

Updates

[Email me updates](#)

Posted by *FixOurCity Volunteer* at 18:11, Wed 21 October 2009, marked as fixed

Severity: **3**

Problem resolved. Below is confirmation mail from complainant.

"I sincerely thank your efforts and the garbage is cleared..

Thanks & Regards Rtn Shankar Director-Community Services (Health) Rotary Club Of Madras Nungambakkam (Dist 3230)"

[fig. 1] Post by a volunteer at *Fixourcity* www.fixourcity.org/report/91

2. Mixed-methods approach for unravelling local embedded knowledge

One of the recognized utilities of mixed methods approaches is that they “provide the opportunity for presenting a greater diversity of views” (TASHAKKORI *et al.*, 2003: 674). This is strongly related to the possibility of triangulating and contrasting different sources of knowledge and visualizing divergent and convergent views. Two other utilities mentioned by the same authors are that “mixed methods research can answer research questions that the other [purely quantitative or qualitative] methods cannot” and that “mixed methods research provides better (stronger) inferences (TASHAKKORI *et al.*, 2003: 674). In a similar way Knigge and Cope (2009) indicate that mixed methods advantage lies in the “productive tensions that can arise in allowing data from different methods to rub up against each other, conflict, complement, or even raise new questions”. Geo-visualization like GIS mapping is seen as one of the approaches that allow for that possibility (COPE *et al.*, 2009; MARTÍNEZ *et al.*, 2009).

This approach of combining both quantitative and qualitative methods with a spatial perspective has been reflected in the last decade as a separate strand within GIS studies under the name of Qualitative GIS (QGIS) (see e.g. COPE *et al.*, 2009). Several authors have used this mixed approach to capture - usually from a critical perspective - the perceptions of space from particular groups (KNIGGE *et al.*, 2006; KWAN *et al.*, 2008). The capacity of GIS in combining different data sources and types allows for the integration of knowledge on both the “objective” (i.e. technical knowledge) - usually measured through official databases like the Census - and “subjective” or expressed quality of life conditions, needs and deprivations (MARTÍNEZ, 2009; TESFAZGHI *et al.*, 2010).

It is within the context of Qualitative GIS that participatory GIS methods, including participatory mapping, in particular have been used to integrate community, local or tacit knowledge (e.g. JOSHI *et al.*, 2002; HOYT *et al.*, 2005; MCCALL *et al.*, 2005; CHAMBERS, 2006; DUNN, 2007; PURI, 2007; PETERS GUARIN, 2008; PFEIFFER *et al.*, 2008; CINDERBY, 2010).

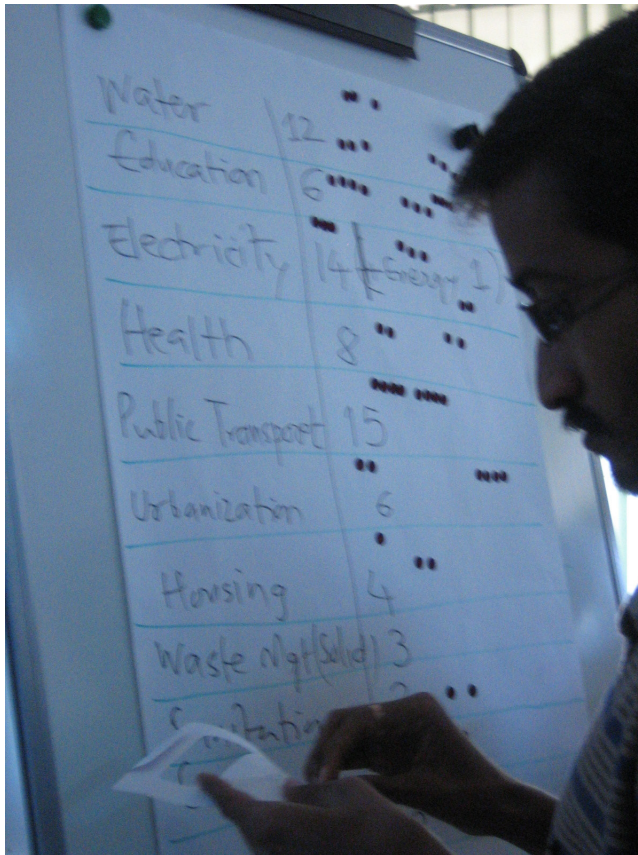
The participatory knowledge generation described in the following section follows this mixed-methods approach characterized by the triangulation and interweaving of different sources of knowledge. One of the challenges of integrating “multiple realities” (KNIGGE *et al.*, 2009) is that “official data” such as the Census (represented in this case by the electoral ward boundaries) is usually aggregated at a scale that local communities might not perceive as their lived space or at a boundary that local authorities may not use in their planning practice. Nevertheless, it is through this participatory and mixed approach that these divergences can be communicated and allowed to surface.

3. Participatory knowledge generation

In the context of the 5-year research programme on the role of Spatial Information Infrastructure (SII) in addressing urban deprivations in Indian cities (PFEIFFER *et al.*, 2008) we held participatory workshops with administrators and councillor from the in the programme participating municipal corporations, specifically Kalyan Dombivli (KD), Mira Bhyandar (MB), Hubli Dharwad (HD) and Mysore (MMC)⁶. The aim of the workshops was to unpack the participant’s spatial knowledge on which sectors and which areas of the city should get priority in improving service provision and to compare and confront their local knowledge with (technical) knowledge derived from poverty maps constructed on the basis of the Indian Census (BAUD *et al.*, 2008; BAUD *et al.*, 2009) or other data collected in the field⁷. The workshops were hosted by the municipalities⁸, who also took care of the basic arrangements like inviting workshop participants and other logistics; the content of the workshop was determined by the researchers facilitating the workshop.

Each workshop was set up, in principle⁹, in the following way. After a short introduction round the research team provided a general introduction to the wider research

programme and the aim of the workshop. This was followed by three rounds of participatory activities; 1) identification of sectors; 2) ranking of sectors, and 3) mapping. In the first round we asked workshop participants to indicate 5 relevant sectors that should receive priority in being tackled by the local government. In KD, the municipal corporation in which the workshop could be carried out fully, this brainstorm resulted in 11 sectors, namely health, education, water, sanitation, solid waste management, housing, employment, electricity, food, finance and sewage. Similar sectors were also mentioned in the other municipalities. In MMC, also infrastructure, environment and transportation were added to that list. In the second round participants were encouraged to rank all listed sectors according to their importance. In Kalyan, health, water, food and housing were the top priorities. In Mysore, however, the major issues were transportation and traffic, electricity, water and health, in this order.



[fig. 2] Ranking of identified sectors in MMC; Source: Authors

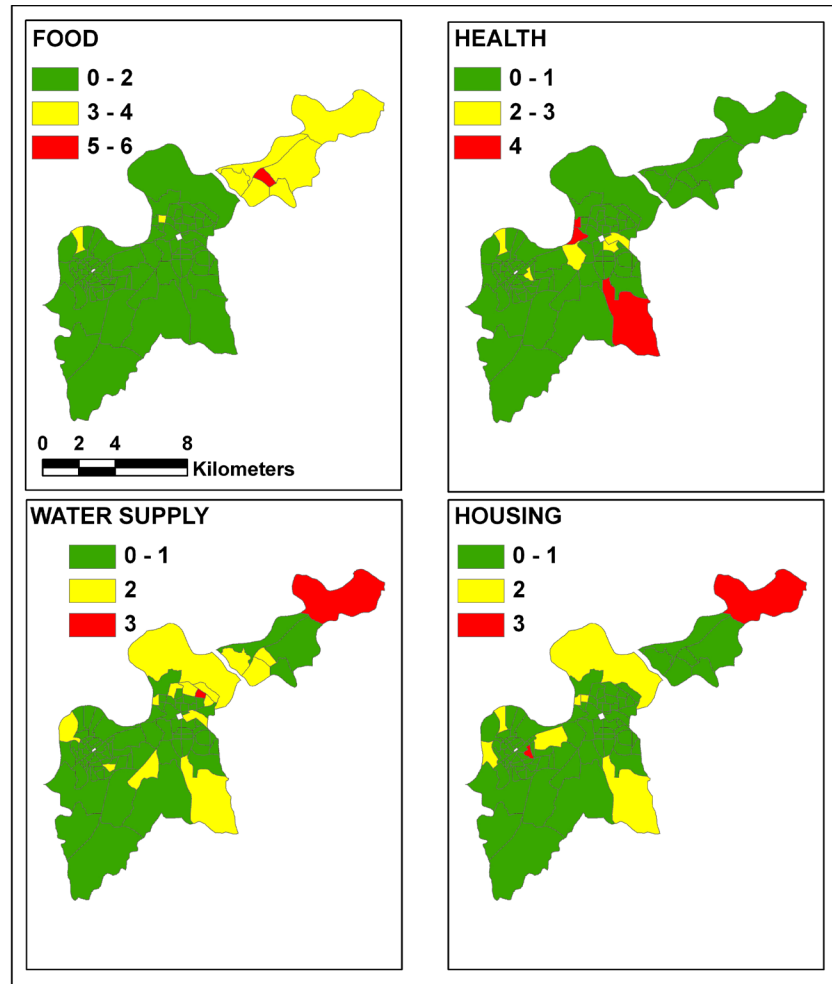
Rural immigration and its associated population growth as well as water provision were considered as the main issues in MB, while in HD it was mainly water supply. In the third round we distributed paper maps showing the boundaries of the electoral wards and the ward number. Participants were asked to shade the wards that should receive priority with respect to the four most relevant issues, using one map per issue. Finally the paper maps were collected and converted into GIS maps during the workshop, showing how many times a ward had been indicated as a priority ward with respect to a particular sector. Figure 3 displays the outcome of the GIS mapping for KD with respect to food, health, water supply and housing¹⁰.

3.1 Local knowledge generation

The maps, projected on a large screen, evoked a lively discussion among administrators and councillors. This is interesting because they reflect the tensions between the political and executive side of government. In KD, the prioritisation of 'food distribution' in the first round of discussion, led to an excited discussion between the staff from the poverty cell who decide on the eligible BPL households and a councillor who was not convinced that the household survey done for such determination was correct. In MB,

the presentation by the researchers showed that mapping locations of water wells could be done by a student. When a councillor realized that such capabilities were available from public sector universities as well as private sector companies, he demanded to know from a Department Head, why this possibility was not being used instead of an expensive private sector consultant. Finally, in HD, the SPA team presented a rich report on HD based on maps, Census data, and other data collected through fieldwork interviews. The councillors and Department staff were very interested in the results, and could find areas of agreement (water sourcing) in the subsequent discussions. The Commissioner found this a potential instrument for reaching agreement in council meetings, rather than the usual political tensions.

[fig. 3]: Priority wards in Kalyan Dombivili with respect to the most important sectors food, health, water supply and housing. (Source: participatory mapping process in KD)



3.2. Verification of technical knowledge

In addition to the maps produced during the workshop – and with the objective to triangulate different sources of knowledge - we also displayed the spatial pattern of the index of multiple deprivations and its underlying capitals, constructed on the basis of the Indian Census of 2001 (c.f. BAUD *et al.*, 2008). In MMC, for example, one of the local governors could not agree with the spatial pattern of the index of multiple deprivations. According to him, some wards in the south have been shaded as highly deprived areas, while these have already been targeted after 2001; hence it would be important to have more recent data on the households and its residents. In Hulbi Dharward, councillors found it useful to see the spatial representation of the various issues in their ward, and brought up reasons why some wards popped up as highly deprived wards (more rural areas between the two city centres; wards not provided with development plans).

These results from the workshops show several advantages of a mixed method approach and in particular qualitative GIS, since it allows the visualization of divergent and convergent views.

4. Opportunities and limitations of qualitative GIS to use and produce knowledge

The aim of the workshops was to introduce 'new'¹¹ (technical) knowledge derived from the Indian Census and other local data sources, and, at the same time, to elicit existing tacit knowledge from actors in local governance processes in order to mutually enrich the variety of knowledge and reduce knowledge gaps. The Indian Census, for instance, attempts to be as complete as possible. However, it only acts as a proxy of the actual situation on the ground at the time that the Census took place, and it does not cover the dynamics within the census period or the dynamics of floating populations. Likewise, some e-governance tools such as the grievance redressal system and more recent VGI tools only comprise expressed needs of those who have access to the system or know how to get access, and are therefore more reflective of middle-class concerns, and exclude other marginalized groups. By combining various knowledge sources, knowledge gaps can be reduced, convergent and divergent perspectives can be visualized and elicited leading to a more comprehensive visualisation of the situation on the ground.

The mapping of the various knowledge sources was received well in the sense that many of the participants found it useful to see the spatial perspective of governance issues, and would welcome a repetition of the mapping of these knowledge sources. Nevertheless, because of the lack of capacity and technical expertise, but also due to the natural inclination of urban governors to measure administrative efficiency (ie Urban Local Bodies have administrative incentives for measuring performance) rather than effectiveness, there is little hope that the GIS mapping will be incorporated in a strategic analytical way. Other problematic issues relate to the lack of interdepartmental integration where databases are not integrated into ULB – level databases; and problems of data collection and standardization, where database production at different scale levels of government (local and state levels) are not coordinated (RICHTER *et al.*, in press). So, to make the integration of various knowledge sources work in current urban governance processes the co-operation with the scientific/expert community would need to be strengthened. This would not only lead to benefits from the knowledge produced by this community, but also provide required data and information with respect to the production as well as the fine-tuning of the knowledge; examples are relevant boundary maps to which urban knowledge can be matched, or verification of mapping outcomes. Alternatively, engaged administrators could be closely involved, and hence trained, in knowledge production processes¹². All the workshops held by us in various cities promoted official participation rather than street or lane level or ward level participation. A further step could be to co-operate and integrate CBOs and those who have no access to ICT and the knowledge mediated by it¹³.

However, using GIS for the analysis of the workshop data on the spot did engender interest in learning GIS for local purposes. Examples of GIS maps made by students made government officials think whether it would be more profitable to establish a link with academic institutions for data collection and digitization instead of being dependent on the private sector.

In terms of content the workshops showed that the selected municipal corporations have both common problems (i.e. water provision) as well as issues that are specific to the locality or the workshop participants (e.g. transportation in Mysore, in particular missing sidewalks; mainly brought up by students, who participated in the workshop in Mysore), This shows the importance of recognizing the particularities of localities and groups when devising new programmes and urban schemes. The interaction between

administrators and councillors brought out existing conflicts and priority issues.

While participatory mapping and QGIS carried out in the four municipalities was a first attempt in linking various forms of knowledge types, more emphasis needs to be put on the situational context in which it takes place, and the practical difficulties in implementing the process locally. For example, the base maps used for identifying priority areas should be maps that are used in daily practice, annotated with the ward name and not only the ward number. Also more facilitation is needed to assist in developing the spatial perspective - often workshop participants were only in charge of one particular ward - and to overcome the language barrier. Most of the administrators and councillors did not feel comfortable with the English language, and some research team members had little or no knowledge of the local languages. An alternative to facilitate the understanding of the spatial perspective in the first round could have been preceded by a transect walk where councillors rate or rank the areas. This can be also carried out with portable GIS devices and open source software such as cybertracker. Finally, if workshops have to be organised by academic institutions, it is difficult to guide the selection of workshop participants, because this depends highly on daily and unpredictable local issues; the success of the workshops is closely linked to the commitment and interests of the actors involved.

In conclusion, the workshops showed that new types of knowledge can be fruitfully brought into the arena within which councillors and local executive staff from Municipal Corporations meet and discuss issues of local governance. It can elicit tacit knowledge from both local communities (councillors) and potentially statistical information collected by local government (e.g. Census or local grievances). However, the extent to which it can be integrated into local urban management and planning requires more in-depth research on the extent to which digitized information systems are used as source of information, who sets the agenda of knowledge exchange processes and the capabilities of different groups to participate, as well as the up-scaling of the process.

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Endnotes

- 1 Tufte has written several well-known books on the importance of visualisation of data, and the extra knowledge it provides (TUFTE, E. 2001, *The Visual Display of Quantitative Information*, Graphics Press).
- 2 An exception is the article by S.K. PURI and S. SAHAY, *Information Technology for Development*, Vol. 13 (2) 133–160 (2007)
- 3 For an exhaustive list of collaboration models such as crowdsourcing and virtual communities see Albors et al. (2008)
- 4 Other examples are <http://votereport.in/> ; www.mapunity.org; www.openstreetmap.in / www.openstreetmap.org
- 5 <http://foursquare.com/venue/922497>
- 6 This programme is an Integrated Programme, funded by the Netherlands National Science Foundation – NWO-WOTRO, with partners University of Amsterdam, Governance and inclusive Development Programme, ITC Enschede, the Urban Management Department, the School of Planning and Architecture Delhi, Department of Regional Planning, and the Tata institute of Social Studies (TISS), Mumbai.
- 7 In each city the School of Planning and Architecture held an intensive studio in which students have collected local data on urban services and facilities. In the case of Hubli Dharward the collected data were also processed by means of GIS to construct a poverty index, together with data derived from the Indian census.
- 8 Due to local elections in March 2009 the workshop in Hubli Dharward had to be shifted to April 2010 and the workshop in Mysore had to be held outside of the municipality with minimum attendance of local government and a dominance of students of the Information Management school which had provided the venue..
- 9 The original set-up of the workshop had to be adjusted to the varying local circumstances.
- 10 Figure 2 shows the cumulative priorities with respect to the priority sectors in MMC
- 11 We label the technical/objective knowledge as 'new' knowledge because fieldwork has shown that there is little to no expertise in terms of the spatial perspective and the analytical use of existing (spatial) databases (see also Martinez et al., 2009).
- 12 In one municipality there is a strong commitment to and close involvement in the wider research programme. This resulted in active participation in and even facilitation of certain parts of the workshop in another municipality.
- 13 This approach was carried out by Tara van Dijk and a local NGO in Kalyan Dombivili with self-help groups in one slum area, and elicited quite clear priorities by the slum dwellers, in terms of communal toilets for children and pavement of side streets in their area (based on author's participation).