Integration of Participatory GIS methods in UN-HABITAT's urban Environmental Management Information System (EMIS)
- the example of NakInfo, Nakuru (Kenya) -

(Summary)

DIPLOMARBEIT

Humboldt-University at Berlin
Geography Department

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Integration von Methoden des Partizipativen GIS in das städtische
Umweltinformationssystem (EMIS) von UN-HABITAT
– am Beispiel von NakInfo, Nakuru (Kenia)

Maike Christiansen

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Acknowledgement

1 Introduction, research question and methods used

The 21st century has opened what is already called the urban millennium. For the first time, there are an equal number of people living in cities and in rural areas worldwide. At the beginning of the 20th century barely an eighth of the global population was living in urban areas (13.6 %) (BÄHR 1997:79). Since then, the number of urban dwellers has steadily increased and is still rising - predominantly in developing countries. Cities are *Magnets of Hope* (theme of the *World Habitat Day 2006*). In less developed countries, the young in particular flee from rural areas to the cities seeking work and a better future. Additionally, the comparatively youthful age structure leads to high natural growth rates, which add to the fast growth of the urban population.

Annual urban growth rates of four percent and more lead to an uncontrolled urbanisation process, especially in Sub-Saharan Africa. Traditional planning instruments become ineffective as i.e. guidelines in master plans cannot be met. Therefore, institutions like the UN-HABITAT focus on alternatives such as bottom-up planning. One of the key components of these approaches is the participation of the community concerned, so that they are involved in the planning and management of their urban environment. One of these UN-HABITAT programmes is the Sustainable Cities Programme (SCP). It targets the improvement of living conditions by setting up basic infrastructure and reducing urban environmental degradation. To improve the flow of information among the different stakeholders, and therefore fulfil one of the basic requirements for their participation in urban planning, some SCP partner cities set up an EMIS (Environmental Management Information System). EMIS is not a software programme; instead, it is rather a generalised description for the systematization of capturing and gathering existing data on environmental issues and socio-economic data concerning the urban area. Furthermore, it includes functional aspects enabling data management, data analysis and data visualisation. Adapted to the local situation, EMIS can be set up in an analogue or digital format, but the digital data storage and manipulation using a GIS (Geographical Information System) is the normal case, today.

Due to local habits and levels of democracy, the idea of public participation in planning and decision-making tends to be interpreted in different ways among the SCP partner cities. In order to guarantee a high level of participation in all partner cities, this aspect should be strengthened within the EMIS. In the EMIS handbook – the key instrument for the EMIS setup – it says right at the beginning: „*What makes EMIS special is its participatory approach*" (UN-HABITAT/UNEP 2000:6). In the descriptions that follow, it is explained in detail and illustrated with case studies how to setup the EMIS. However, the handbook does not cover the possibilities of strengthening community participation, nor does it introduce methods to improve participation in the EMIS toolkit (UN-HABITAT/UNEP 2000).

Development in other fields of planning show that there already exists quite a number of tools and methods for ensuring a higher degree of public participation than it is taking place in the EMIS at the moment. For example, the methods of the so called Participatory GIS (PGIS) have been increasingly used in recent years. When the EMIS handbook was compiled, the concept of PGIS was already being applied in rural areas in developing countries but in urban areas these methods are still rarely adopted, even today. This might explain why the PGIS practice and its methods are not yet mentioned in the EMIS handbook. However, some of the fundamental participatory ideas of the EMIS correlate with those of the PGIS (BUHREN 2005:8 and 2006).

Therefore, the target of this paper is to identify PGIS methods which could be integrated into the existing EMIS concept. As theoretical PGIS concepts drawn from practical experiences in urban areas in developing countries are still very rare, the information system of the Kenyan city of Nakuru (NakInfo) is introduced. The first research question will be answered using a SWOT analysis (Analysis of Strengths, Weaknesses, Opportunities and Threads) to identify the existing internal and external strengths and weaknesses of this participatory information system. Based on these findings the second research question - regarding the identification of possible participatory methods which could be integrated into the urban environmental information system EMIS of UN-HABITAT - will be answered, with the aim of strengthening the EMIS' participatory character. The SWOT analysis is based on semi-structured expert interviews with representatives of the public, private and community sectors in Nakuru as well as international organizations and research institutions in Nairobi and Bern accompanying the NakInfo setup. When choosing interview partners, it was crucial to cover a broad range of perceptions and opinions on the software and its advantages for increasing participation. The interview partner agreed that the interviews were not anonymous as it seems important to link their statements to their professional and institutional situation. In total, 14 semi-structured interviews were carried out. They took place in November 2006 in Kenya and at the beginning of April 2007 in Switzerland. The duration of the interviews varied between 30 minutes and two hours, in general between 40 and 60 minutes.

2 Geographical Information Systems and Participatory GIS

Geographical Information Systems are computer-based information systems which serve to capture, store, modify, analyze, model and visualize spatial information. In contrast to information systems in general, data with a spatial reference is manipulated and stored in a GIS. This means that the thematic features of this geo-data can be linked directly (i.e. through geographical coordinates) or indirectly (via city names, postal codes or street names) to a position on the Earth's surface.

In the 1990s, Participatory GIS (PGIS) was developed as a special form of GIS in the USA. Among scientists and GIS technicians a discussion started on the potential negative impacts of the increasing application of GIS in public planning sector. Scientists were concerned that the widespread use of GIS could further reduce the political influence of already marginalized groups. To follow up on this discussion and find evidence of whether the concerns evoked in this so-called *GIS and Society* debate are justified, they agreed on an empirical project evaluation during the following years (SHEPPARD et al. 1999:814). Today, there exist a number of case studies and practical examples of PGIS projects from different regions of the world. Unfortunately, these case studies focus predominantly on experiences in the rural and urban areas in North America as well as European cities. In the rural areas of the USA and Canada, PGIS is mainly used to strengthen the position of indigenous groups in questions regarding land ownership and land use. In cities, PGIS methods are used in neighbourhood projects to improve residents' identification with their areas. Case studies from developing countries are derived nearly solely from the rural areas concerning the management of natural resources or the fight against environmental hazards. In urban areas of developing countries, so far, PGIS methods have not been used. Existing examples are limited on issues as management of informal settlements (SLIUZAS 2004, KOTI and WEINER 2006) or slum upgrading initiatives (KUFFER et al. 2006). In 1998, at Durham University, a workshop was organised on the experiences and potential of PGIS. In the conclusions, *„Proposals for future developments included a call for implementation and evaluation of practical case studies of participatory GIS; [...] and considering the use of participatory GIS in urban settings in the 'South'"* (ABBOT et al. 1998:31). This paper seeks to respond to this research request.

PGIS itself refers to the philosophy and the methods used in the *Participatory Rural Appraisal* (PRA). Furthermore, it strengthens PRA by combing its methods with geo-information technologies (GIT) – as GIS, Global Positioning Systems or remote sensing image processing software. This integration of GIT into existing PRA methods was advanced by the decreasing costs of computer hardware and software as well as the development of more user-friendly software interfaces in the 1990s. Additionally, the continued development of the internet weakened governmental control over large scale topographic maps as well as aerial and satellite images – especially in developing countries (RAMBALDI et al. 2005:1).

PRA evolved in development projects in rural areas during the late 1980s. As a response to *"missing or mis-communication with local people in the context of development work"* (WORLD BANK 1996) at that time, when „*outsiders*" (= researchers, development worker) attempted to collect as much information as possible on the local population (= "*insiders*"), PRA tries to collect data and information in collaboration with the local communities or even by the communities themselves. By doing so, the local communities also gain access to the raw data and the processed information. The data is gathered by preparing, among others, „*sketch maps*" (= hand-

drawn paper maps according to observations and memories without geo-referenced objects or a fixed map scale) (CORBETT et al. 2006:14), 3D-models of the region or through *"transect walks"* (= Mapping the terrain and its objects located along a certain line). The insights gained during this exercise are not only benefiting the *„outsiders"*. It is rather a two-way approach empowering the community at the same time. Furthermore, the local community has the prior claim to access and use the data (ownership of information). Therefore, PRA and PGIS methods encourage local communities to examine their environment. It strengthens their self-confidence as they learn that local, traditional knowledge is valuable and worthy of protection (RAMBALDI et al. 2005:3).

3   NakInfo and Local Urban Observatory Project (LUO) in Nakuru

In the following, the *Local Urban Observatory* project and the NakInfo software will be introduced, before summarizing the results of the empirical part of the thesis.

Nakuru is the fourth largest city in Kenya. It is located in the north-east of the country, around 160 kilometres west of the Kenyan capital Nairobi. The city is located at an important railroad and highway intersection (LOECKX 2004:33). Due to this ideal traffic connection, the city became capital of the District of Nakuru as well as the Rift Valley Province. As a result of a high immigration from all over the country, the number of inhabitants increased from around 38.000 inhabitants in the year before Kenya's independence (1962) to roughly 360.000 in 2003. The consequences of this development are uncontrolled urban sprawl and a growing pressure on the National Park and the Lake Nakuru at the southern edge of the city. Sandwiched between Menegai Crater in the North and the lake, valuable agricultural areas are turned into urban settlements in the eastern part. In the West, the population settles in geologically instable areas.

For a better development control of the city, a *Local Urban Observatory* (LUO) was created in 2003. Using indicators based on the *Habitat Agenda* from 1996 and the *UN Millennium Development Goals* LUO analyzes and records the city's development status. *„Urban Observatories aim at strengthening decision making capacities regarding urban policies at national and municipal levels through a consultative and participatory process between the local authorities, elected assemblies and the civil society. [...] These tools are supposed to improve the decision making process with a view to plan, implement and monitor more effective poverty reduction policies and practices"* (ERIKSSON 2006:3). Additionally, an information system was set-up to centrally store the collected data - NakInfo. It is the key element of the LUO project in Nakuru. By setting up this information system

–   up-to-date and precise data and information covering various themes regarding the development of the city are stored centrally in a database. This database is accessible

  –   on the one hand, to **local authorities** and **district authorities** in order to improve town planning and management by applying software and spatial data to enhance communication and exchange of existing data and information between the departments, and

- on the other hand, to **Non-governmental Organisations** (NGOs), **Community-based Organisations** (CBOs) as well as the **citizens** of Nakuru. By providing this access to information, these groups are encouraged to participate in planning and decision-making processes. Furthermore, it provides them with an instrument to safeguard the implementation of publicly funded development projects;

- the **stakeholders** and the **staff of the MCN** (Municipal Council of Nakuru) should improve their technical knowledge and skills, amongst others and

- a monitoring system with indicators should be initiated, to monitor Nakuru's urban development progress (MBUGUAH 2006).

The NakInfo setup is based on the SMURF software *(System for the Monitoring of Urban Functionalities)*, which was developed for another LUO project in the Senegalese city of Thiès (REPETTI 2004:19). The development of the LUO was supported by an international NGO in cooperation with the MCN. The project received financial support from the Swiss government through a Swiss North-South Research Programme. A PhD-student from Bern University assisted the LUO project between 2003 and 2005. Currently the LUO is in its third phase of operation. Organisation-wise it is integrated into the MCN framework, supervised by the Environment Department. Since 2006 the LUO team has is own office on the MCN's compound.

4   Outcome of the SWOT-Analysis

In order to answer the first research question (the strengths and weaknesses of the NakInfo regarding its participatory approach), a SWOT analysis of the LUO project was carried out. This analysis is also the main focus of the empirical part of this paper. It shows that – even if strengths dominate in the internal project setup – negative external factors can seriously harm the successful development of this project. Widespread corruption and its after-effects within the MCN – such as a lack of cooperation and exchange of information between departments beyond the corruption syndicates as well as the low value of objective information – represent a principal threat for the sustainable development of the project. The NakInfo software is barely used within the MCN - one of its main project partners. Additionally, widespread use of the software within the local administration, while much needed, is limited due to a lack of computers and computer skills among administrative staff as well as the lack of a commitment on the part of the decision-makers to broadly use the software within the council. All attempts to institutionalize and centrally locate the LUO project and the software within the council have failed so far.

Internally, the LUO team is well set up. The staff was trained in working with computers and GIS software for several years. They also attended courses on community development. Furthermore, they benefited from direct support of the locally based PhD-student. Hardware and software are functioning. All LUO team members are able to work with the technical equipment and reply to requests in an efficient and competent manner.

The NakInfo software not only includes data gathered through participatory methods (a survey was carried out to identify the priorities in terms of data needed; local experts and community representatives took part in the mapping exercise and data gathering). Also, the software allows the community to influence decision-making through either updating the existing database according to their knowledge or even adding new data. In contrast to the mapping exercises, data access to the NakInfo software is not limited to representatives and local experts but rather open to every member of the community (as long as they are literate and speak English). There are no comparable instruments to enable such extensive participation in urban areas in developing countries. The level of direct participation is limited in so far, as the data gathered is validated by a small group of local and official "experts" only to guarantee conformity of the proposed data updates. Despite these ideal prerequisites in regard to the software, large parts of the population are not aware of the existence of the NakInfo software. Hence it is rarely used by Nakuru citizens. Due to this low level of application among the community, it was not possible to evaluate its actual utility at this point of time.

The insufficient application of NakInfo can be explained by the limited number of public access points. Former access points (cyber cafés, libraries) do not exist any more, while others (community centres, church facilities) have not been taken into consideration by the LUO team. The idea of accessing the NakInfo software in cyber cafés sat uneasily with the commercial interests of internet café owners, as visitors have to pay the time using the computer. Therefore at the moment the only location where the community can actually access the NakInfo software is the Nakuru Information Centre – the office of the LUO team.

Up to today, the NakInfo data is predominantly used by the NGO Practical Action – a former partner of the LUO during the first project phase. The NGO also adds data to the database retrieved from further mapping exercises. Other users of the NakInfo are students from neighbouring universities as well as, occasionally, members of CBOs or the MCN. The private sector – represented in the interviews by a member of the Nakuru Business Association (NBA) – does not use the software. According to the NBA representative, the data included in the NakInfo so far focuses too much on the needs of NGOs and CBOs. Nevertheless, the NBA provides the LUO team with its own data for the NakInfo database. Despite this, the NBA could also initiate the gathering of data or collect data needed itself in order to improve the NakInfo database so that it can meet the NBA's needs in the future. Unfortunately, it was not possible to give more detailed information on the demographical and socio-economical composition of user groups or participants of the mapping exercises due to lack of information.

Theoretically, the LUO team is able to train users in NakInfo. This would also enhance a broader range of application of the software. However, the team cannot access financial resources when it needs them due to a high level of bureaucracy in the MCN. Therefore, the LUO team necessarily has to learn how to deal with the bureaucratic obstacles created by the MCN. It

has to come to an arrangement with this system through anticipatory thinking and smart planning (EHRENSPERGER 2007).

One of the project's severest limitations is the question of sustainable financing. Setting up a GIS in a developing country always incorporates the risk of creating a certain project dependency on external donor organizations (TAYLOR 1991:80). Although the LUO project is embedded in a network of supporting institutions as the NBA or the NGO, the project does not have a source of continued financing when the current project phase comes to an end. During the three project phases the MCN did not provide the LUO project with its own budget. This circumstance can be explained by the initial set up of the LUO project. It was started independently from the local government administration. This might explain the lack of acceptance of the NakInfo in the departments of the municipal authorities. However, without financial means, it is doubtful that the project will continue.

It can be concluded that the external conditions of the NakInfo have to be improved in order to increase the number of users, in particular within the public administration. Furthermore, new local public access points to the NakInfo free of charge should be installed for community members. Former access points should be reopened. An evaluation providing more details regarding the user friendliness of the NakInfo software will be possible as soon as it is adopted by a greater number of users.

5 Tangible possibilities of integrating different aspects of NakInfo into EMIS

5.1 Integration of NakInfo's PGIS methods in EMIS

The results of the SWOT analysis suggest a rather negative and discouraging situation for the LUO project. However this evaluation cannot be considered as equally applicable to the EMIS. EMIS is a general concept implemented in different cities all over the world. In these cities individual local framework conditions can be responsible for a successful or unsuccessful implementation of the EMIS. It is for this reason that to answer the second research question (Which participatory elements of the NakInfo software could also be integrated in the EMIS?) the focus will be on the internal strengths and weaknesses of the NakInfo and the LUO project alone. The analysis of the participatory elements differentiates between the two aspects: On the one hand there are the PGIS methods used to identify data themes and methods suited to information-gathering. This part is software-independent. On the other hand the analysis covers the modules included in NakInfo as well as the public access points.

Let us turn to the PGIS methods used: Initially, the most urgent development problems of the city of Nakuru were prioritised by community members in a survey conducted at the beginning of the project. This measure could also be integrated into the SCP of which EMIS is a part. One occasion to carry out the survey is the *City Consultation* – the opening conference of the

project taking place in the partner city with over 200 participants lasting several days. In contrast to the survey of the LUO project, this questionnaire probably would not focus on possible data layers and public access points for the software, as EMIS is predominantly set up for public administrative staff and members of the *Working Groups*. The general public are not yet considered as EMIS users. In addition, this survey could be used for the data inventory in order to prepare the *Environmental Profile* (description of the SCP-partner city and its specific urban development and environmental problems in the initial phase of the SCP) or during the *City Consultation*.

The second PGIS method used by the LUO project is the participatory mapping exercise with high resolution satellite images overlaid with a transparent slide. On the slides data and information gathered can be visualised. The data is subsequently digitized and geo-referenced. This method is not very complex and can be easily realised after the participants have had a short introduction to image interpretation. Due to time and financial constraints this mapping exercise can be predominantly used in areas with environmental hazards identified during the *City Consultation*, instead of mapping the entire city. The data gathered on these mapping exercises will then help the Working Group members to develop strategies and action plans to improve the environmental situation.

5.2 Integrating NakInfo's participatory software functionalities in EMIS

While the integration of this mapping exercise and survey in the setup phase of an EMIS or the SCP appears to be comparably easy, it seems that the adoption and application of the NakInfo software itself has still to comply with some prerequisites: for example, the SCP cannot afford any training for EMIS officers, as the LUO project did. Any required computer or GIS training has to be covered by local financial resources. Additionally, close mentoring during the initial project phase cannot be covered by the programme budget. These aspects in particular had a great impact on the positive development of the NakInfo software. However, EMIS can be set up only with the financial and personnel resources available at local level. Thus, even if the NakInfo software were accessible for application in these EMIS cities, it is doubtful that the locally available GIS experts would be able to work with the software independently: they would need to modify and reprogram parameters to adjust NakInfo to their own city. Furthermore, they would also have to be capable of maintaining and further developing the software.

Considering the EMIS setup, the participation of the general public is not the main incentive. This is also the case in most of the other urban PGIS projects. Instead, the EMIS teams work in close collaboration with the representatives of various interest groups. In urban areas this seems to be the most appropriate method of coordinating different positions and propositions. But the case of NakInfo shows that it is (theoretically) possible even to integrate ideas, recommendations and the knowledge of individual city dwellers: through the NakInfo software, individuals can access data for spatial planning and decision-making purposes; they can modify

and update them, add their comments or enter a new project on the map. By installing the software in cyber cafés throughout the city, the LUO team intended to give access to NakInfo, even to those who cannot afford their own computer and also do not have the possibility to access a computer elsewhere (i.e. at work). Unfortunately, the implementation of this aspect of the project was not successful and therefore does not seem to be a good solution for the EMIS unit. Nevertheless, the LUO team should consider community centres, local universities etc as access points for the general public – even if those institutions have not played an important role for the distribution of the NakInfo so far.

There exist a variety of tools in the NakInfo software to add data, modify them or create projects. However, the level of public awareness is too low and the access points for the community too limited for the software to be actually used. Despite this, the NakInfo module „*Data Modifier*" could also be interesting for the EMIS. This model allows the user to update existing data and also add new information. It could be used, i.e. during the *City Consultation*. This could give the EMIS unit the chance to introduce its work and the EMIS with its tools to a greater number of people, so as to increase the level of awareness.

During the phase of the *Working Groups* and the development of strategies and action plans to tackle environmental issues, the module "*Project Editor"* could also be applied. By using this module, demo projects and other activities of the various *Working Groups* could be visualised on maps. Potential spatial overlapping of different *Working Group* activities could be identified quickly on the maps and activities could be joined. Furthermore, previous projects of the same area could be identified easily on the map. This opens the possibility of exchanging experiences between old and current or future projects.

6   Recommendations for the future developement of NakInfo

6.1   Possiblities for an improved application of NakInfo within the local administration

The outcomes of the SWOT analysis show that the fundamental problem for the LUO project – and therefore also for NakInfo – is the awkward external situation precluding the broad application of the software. Apart from attempts to promote the software among the community, the LUO team has to aim for the broad application of the NakInfo within the MCN. The MCN should use NakInfo to store all the existing data related to the city and use it as a platform to analyse and exchange the existing data among the different council departments. The distribution and the effective application of the NakInfo software within the council departments is also the greatest chance to fight corruption. The application of computers and GIS software rationalizes decision-making processes and therefore enhances the transparency of information flows and decision-making. The case of NakInfo underlines that the effective application of a participatory instrument might require an order from the top level of the local administration, if the pressure needed to implement this instrument cannot be created at the political grassroots. The

population is not yet in a position to exert pressure on the council staff to actually use this instrument. A reason for this is the comparatively low level of democratic awareness among the Kenyan population due to colonialism and a long period of dictatorship.

In contrast to NakInfo, the EMIS concept has the advantage of being set-up as an integral part of the SCP. Right from the start, the EMIS is assigned a certain task: its objective commences with the gathering of data on the city's development and environmental situation forming the basis for the *Environmental Profile* and continues with data-capture to support the work of the problem and issue-specific *Working Groups* in a later stage of the programme. Therefore, the application of the data stored in EMIS is guaranteed from the beginning of the project. In contrast, NakInfo is just an additional instrument whose application is not binding for the local administration. Additionally, it is an information system, introducing a new type of working process leading to a more transparent decision-making process. By doing so, it counters a well established and individually arranged system of corruption and clientelism within the MCN. Therefore, it seems to be easier to achieve a broad-range EMIS application compared to NakInfo because these SCP cities already agreed on changing their traditional habits of planning and decision-making by participating in the SCP.

To enhance the use of the NakInfo software within the MCN, the software should be assigned a task that underlines its uses and demonstrates its broad fields of application. A concrete example for every citizen in Nakuru directly linked to every-day life is the LATF *(Local Authority Transfer Funds)*. These funds transferred from the national government are dedicated to infrastructural projects prioritised by the local community. Corruption and mismanagement can be held responsible for the incompletion or not even start of construction work although it is paid. Up to today, these projects are listed in a table, accessible to certain persons only. Therefore, the population cannot retrace when and where which kinds of projects are implemented. In NakInfo, this table could be easily integrated as a database and the locations of the designated projects could be visualized in a map (see CARLSTROM 2006). In the *Project Editor* modul of NakInfo every step of every single project could be recorded. Additional information as the total amount invested, the enterprise involved, the planned and the real date of completion could be added. This data would then be available for every member staff of the *council.* The population could access it via the *Nakuru Information Centre*. By doing so, the information on the spending of the LATF would be accessible and transparent for all – the public administration and the community alike.

As a broad application of NakInfo in EMIS partner cities seems to be premature, the EMIS handbook should at least cover the project in a case study. This would enable partner cities interested and provided with the personnel and technical resources to integrate the NakInfo software in their project or at least give them the chance to take up the NakInfo concept and exchange ideas and experiences with the LUO team. For other cities it could be enriching to learn

about new concepts – apart from EMIS enabling also individuals in local urban decision-making processes.

6.2 Possibilities to improve the application of the NakInfo among the population

Not only within the council but also on the side of the community, the LUO team has to aim at a broader use of the software. Future tasks of the project should therefore focus on marketing the software and broadening its free access combined with user-training: So far, the high investment costs, the personnel and temporal input in the set-up of the software as well as the data hitherto stored there, can only be justified by their effective application. ABBOT et al. already criticized that, in general, the application of PGIS methods emphasises the gathering of data, and the use of the data in the interest of the community afterwards is often forgotten. According to them (ABBOT et al. 1998:5), this second PGIS component is as important as the first one. Unfortunately, this problem seems to occur in Nakuru, too.

PGIS projects in urban environments – compared to villages – are not able to personally inform every single inhabitant. Generally speaking, the idea of introducing representatives of CBOs and NGOs to NakInfo and to train them in the software seems to be the most efficient starting point – assumed that trained persons pass on their knowledge to other members of their organization. Unfortunately, this was not the case when the first NakInfo version was released in 2004. When these training sessions were taking place, NakInfo was accessible only in private cyber cafés charging for the use of the computers. Therefore, access to NakInfo was unaffordable for a large part of the population. If the community can access the data free of charge – as it is possible today at the *Nakuru Information Office*, the content of these training sessions might spread more easily through the community. Moreover, the setup of additional decentralized software access points should be kept in mind. For example, the software could be reinstalled in the public library as well as in community centres of churches and CBOs (in the event that they have a computer). Considering the locations proposed the library access point can be realized the quickest: a computer was set up some time ago and the NGO *Practical Action* currently plans to acquire a new computer for this place. Furthermore, CBOs, who already have a computer in their centres, could easily install NakInfo too. Due to their size and the available funds, cooperation with churches should be considered by the LUO team in the long run. However, in those centres, competent personnel are required, who could regularly offer training for the local community and would be present to answer questions that might occur when using NakInfo. The acquisition of computers for CBO community centres in the different parts of the city in order to provide free access to the NakInfo software will only be realized with the support of external donors in the medium-to-long term. The same conditions and time frames will probably apply in the case of software installation in public schools.

Another important factor is the marketing of the software and the introduction of its basic tools. This should be realised using simple and relatively inexpensive ways of advertising. To

better market the software, posters, as already used after the launch of the first NakInfo version, could be used again. They could be put up at the council's notice boards, in the library as well as in rather decentralised community centres of CBOs and churches. In addition, the *Nakuru Information Office*, which is currently the only free access point of the software, should call attention more visually to this offer in its office.

The training of representatives could be carried out by staff of the LUO teams. This training should include the introduction to the four software modules by using a memorable example of the participants' daily life. CARLSTROM proposed the inventory of the street lights (number, condition, location) as an example. This would be easily manageable and visualisable in NakInfo (CARLSTROM 2006). The proposed example can be closely related to security issues. An overview of areas that are still not covered by street lights combined with the budget required to set up the lamp post could be prepared within a few steps. Using this data, the council could - without difficulties – install the lamp posts or delegate this to a private company. By using the corporate social responsibility budgets of East African mobile phone providers a number of Kenyan streets was already illuminated.

A possibility not included in NakInfo so far is the potentiality to analyse stored data or to enter project proposals. Up to now, community participation concerns only the entry, manipulation and extension of the existing database. Therefore it is only possible to add missing objects to existing data layers (i.e. "the school on plot x is not yet stored in the database"). The entry of recommended actions and deficits as the result of database analyses is not possible yet. For example, when visualising the walking distance to primary schools, the NakInfo cannot identify areas or plots on which a school should be erected or where the community recommends the construction of a school. The lack of functionalities like this can be explained by the complexity of these analysis functions in a GIS. The NakInfo GIS was reduced to a basic set of principles so as to enable as many members of the community as possible to work with the software, although they have never used a GIS before. However, reduction always leads to the sacrifice of some aspects. Despite that, especially for NakInfo, it seems to be particularly important to include the community not only in the data gathering. The community should be enabled to communicate its wishes, ideas and critiques so that the different departments in the public administration in the council can better meet the needs of the local population. These recommendations could be visualized and located on a map and be commented upon in a similar way as with the current tools for the creation of a new objects within an existing data layer.

The possibility of individual community participation has to be stressed as the great strength of NakInfo. In other urban areas in developing countries (except the predecessor version of NakInfo in Senegal) this form of participation does not exist yet. The participation of individuals in society was limited to rather small villages in rural areas. In urban areas public participation in less developed countries focuses on representatives of interest groups and institutions

(see SCP, KUFFER, SLIUZIAS And LEMMA 2006). The possibility of on-line participation of individuals, as it already takes place in many cities in developed countries, is not yet applicable in developing countries due to the comparatively small number of internet users. It is therefore especially important to provide free public access points to data in these countries. This can be realized through libraries, community centres, schools or church institutions – but also in public administration offices.

Nevertheless, it can be assumed that with the progress of development and the spread of the relevant hardware, these barriers will be overcome in the future. For example through the integration of GPS capabilities in mobile phones, the coordinates of existing or missing objects combined with a command could be send via SMS (*Short Message Service*) to the LUO team or directly included in the software system. Also, the dissemination of computers will accelerate in the future. Today, the 100-Dollar-Laptop is already promoted by the international organization *„One Laptop per Child"* (OLPC 2007).

7   Final Remarks

Despite the existing local and territorial differences, many EMIS cities and the LUO project face common problems. The SWOT analysis shows that the LUO project is still not centrally located within the local administration. This also applies to EMIS partner cities. In the initial phase, the EMIS unit is set up temporarily and should be shifted to a more strategic location within the organigram of the public administration in the phase of institutionalisation. However, this step is rarely taken. Therefore, the EMIS, too, is in general not very well known by the public or even by the administrative staff, and the data is barely used outside the *Working Groups*.

A more central location for a GIS-based information system – regardless of whether this is EMIS or NakInfo – is crucial for it to be applied successfully. The information system can only meet its targets if many different users enter data into the information system and these data are taken into consideration during planning and decision-making processes. This requires a certain level of interest from potential users in exchanging information as well as the willingness to give up a certain level of control over databases to enhance mutual data exchange.

The results of the SWOT-Analysis show that also the cultural setting plays an important role when considering the application of PGIS methods in urban areas. This includes in regard to public administration and local governments a certain appreciation of these methods and the willingness to actually apply them. On the other hand, it requires a basic understanding of democracy in the community, in order to be able to put pressure on the government to use participatory methods and instruments. In Kenya, so far there exists no democratic tradition like this. The understanding of democratic decision-making processes is still at a learning stage. The NakInfo software can be treated as one starting point, EMIS could be another step. Probably there are a number of such attempts and projects needed in Kenyan cities to develop a feeling

for democracy and participatory decision-making processes among the community. It remains the hope that this NakInfo concept will be picked up, understood and applied by more and more people – both on the part of the community and the public administration. *„This [NakInfo] is a good suggestion and it is really feasible. It doesn't require anything. Everything is there. What it requires is the initiative to do it"* (CARLSTROM 2006).

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