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# **Using digital mobile GIS tool for occupancy audit, beneficiary administration and maintenance of data base to improve Human Settlements in Ekurhuleni Metropolitan**

Mabaso, Molatelo<sup>1</sup>, Innocent Musonda<sup>2</sup>

## **Abstract**

An perception exists that the Human Settlements Department in most municipalities are unable to meet the increased demand for delivering sustainable and integrated Human Settlements. The many service delivery protests that are experienced in the previously disadvantaged areas/townships in South Africa are an indicator of the underlying problem of not being able to meet the commitments to eradicate or upgrade all informal settlements. Despite some of the achievements in delivering subsidised housing by the Department of Human Settlements, the housing backlog still remains at more than 2, 1 million housing units. The other indicator is the number of informal settlements. This research assesses the benefits of using digital mobile GIS tool for occupancy audit, beneficiary administration and maintenance of data base to improve Human Settlements in Ekurhuleni Metropolitan Municipality. The study has revealed that the use of the digital mobile GIS tool is beneficial for addressing issues related to data required for conducting Occupancy Audits, beneficiary administration and House Inspections in Informal Settlements upgrading projects.

**Keywords:** South Africa, Housing Backlog, Data Base, GIS, Occupancy audit

## **1. Introduction**

The right to housing in South Africa was enshrined in the new Constitution. Section 26(1) of the Constitution, stipulate that every person has the right to access adequate housing. Section

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<sup>1</sup>Project Manager; Human Settlement; Ekurhuleni Municipality; Email: [molatelo.mabaso@ekurhuleni.gov.za](mailto:molatelo.mabaso@ekurhuleni.gov.za)

<sup>2</sup> Senior Lecturer; Construction Management and Quantity Surveying; University of Johannesburg; P.O. Box 17011; Email: [imusonda@uj.ac.za](mailto:imusonda@uj.ac.za)

26(2) of the Constitution squarely lays the responsibility on the state to realise this embedded right, subject to available resources (Constitution of the Republic of South Africa, 1996). The above sections of the Constitution place huge demands on the state to deliver housing. The government department tasked with providing housing is the National Department of Human Settlements (National Department of Human Settlements 2009c:1).

The process of housing delivery is complex. Many sources within and outside the Government administrations report that the rate of growth in housing demand exceeds delivery (National Department of Housing 1994:8; Cohen 1997:149; National Department of Housing 2004:3–4; Hutchinson 2006:30; Chenwi 2007:21; National Department of Human Settlements 2010c:1). The Submission for the Division of Revenue 2010/11 sheds light on the rate of growth in the demand for subsidised housing, attributing the growth to declining household sizes, migration, unemployment and an increase in the population (Financial and Fiscal Commission 2009:58). Where subsidised housing delivery is not accelerated in line with the growth in housing demand, the subsidised housing backlog will increase.

In September 2004, the then Minister of Housing, Lindiwe Sisulu, announced a new plan, which was published as *Breaking New Ground (BNG)*: a comprehensive plan for the development of sustainable human settlements (Current and future building activity in South Africa: 2006–2015, 2006:62; National Department of Human Settlements 2010c:1). At the time, the BNG plan was hailed as a crucial initiative and became part of the national policy for the delivery of subsidised housing because it changed the emphasis from the delivery of numbers of houses, schools and roads, to a more holistic qualitative and quantitative drive to build communities (Lombard 2004:2). The strategy of the BNG plan emphasises the “development of sustainable settlements and quality housing” to bring dignity to the recipients (Dyantyi 2007:1). As envisioned in the BNG plan, the housing subsidy was to be increased annually so that it was aligned with increased costs. The subsidy provides for a 40 m<sup>2</sup> house (National Department of Housing 2008e:1) with an open plan living room and kitchen, two bedrooms, a bathroom with a toilet and shower (Maleke 2008:1). The unit is also supposed to have electricity (Dyantyi 2007:1). The quality of building materials used for the BNG houses is substantially better than before and the houses are larger than the previous houses, some of which were only 24 m<sup>2</sup>, with no running water and no partitions (Maleke 2008:1).

At the time of the launching of the BNG plan in 2004, Housing Minister Sisulu believed that the new plan would eradicate all informal settlements within 10 years which was to be 2014. According to the Accounting Officer’s Overview (National Department of Human Settlements 2010c:1), the prime objective of the BNG plan was the “eradication and upgrading of all informal settlements by 2014/15”. Yet, even though the greater part of the housing policy framework had been in place by 2004, along with facilitators, and the BNG plan had been applied since September 2004, delivery has not accelerated as anticipated. It appears that the BNG plan merely halted the growth in the number of informal settlement households, but made no inroads in the backlog. Hutchinson (2006:30) quotes Lindiwe Sisulu, as saying that by 2005, 2,4 million families were living in informal housing structures, a figure quoted again in 2007 (Chenwi 2007:21) and 2009 (SabinetLaw 2009:2).

On the basis of these figures, it appears that the launching of the BNG plan has not resulted in “drastic and paradigm shifting measures” in the delivery of housing, as was initially intended when it was launched in 2004. Despite all the actions described above to ensure that housing delivery is accelerated, the National Housing Goal for delivery, which was set in 2000 at 350 000 units per annum until the housing backlog has been overcome (National Department of Housing 2000c:3), has not yet been reached. It appears that one of the main reasons for the delayed backlog eradication is the inefficiencies in the resettlement of the people in the informal areas. The inefficiencies and barriers can be attributed to the difficulties in data capture and cost associated with it. The current study therefore looked at the benefits of using digital mobile GIS tool for occupancy audit, beneficiary administration and maintenance of data base to improve Human Settlements in the Ekurhuleni Metropolitan area.

## **2. The Study (Method)**

The purpose of the article was to illustrate how the GIS system is being used to address the administration problems associated with the delivery of and the eradication of housing backlog within Ekurhuleni Metropolitan Municipality, Human Settlements Department.

The paper will attempt to describe the use of the Mobile GIS tool being used by the Department of Human Settlements in the Ekurhuleni Metropolitan Municipality, process of data capturing and the associated benefits.

Therefore the objectives of the paper include inter alia to:

- Analyse the use of the Mobile GIS tool in conducting Occupancy Audits, Beneficiary Administration and house Inspections in Ekurhuleni Metropolitan Municipality;
- Identify the benefits of the Mobile GIS tool in collecting and capturing data for Occupancy Audits and Beneficiary Administration in Ekurhuleni Metropolitan Municipality;
- Identify the challenges of the Mobile GIS tool in conducting Occupancy Audits, Beneficiary Administration and house Inspections in Ekurhuleni Metropolitan Municipality.

The study therefore followed a case study that used a qualitative method of data collection. Qualitative research, broadly defined, is any kind of research that produces findings not arrived at by means of statistical procedures or other means of quantification (Golafshani, 2003).

The case study looks documents the management of Balmoral Extension 4 which has been identified for Human Settlements Development by the Ekurhuleni Metropolitan Municipality Human Settlements Department.

Ekurhuleni Metropolitan Municipality has over 114 informal settlements which need to be developed and therefore contribute to the achieving of the BNG goals. The plan for Balmoral Extension 4 was to develop an integrated sustainable Human Settlement and achieve the

projected yield of 1150 housing opportunities. The occupancy audit was therefore needed in order to assist the Ekurhuleni Metropolitan Municipality achieve the relocation strategy for the informal settlement.

At the end of the project, a total of 3092 households were captured in 17 days in the Balmoral Extension 4 area. With such an unexpected yield of over 100% in terms of households captured namely from a targeted 1150 to 3092, the current study was conceptualised to compare the common method of collecting and capturing occupancy data to the method of using a web based Mobile GIS tool. The comparison was in terms of cost and time implications of the two methods. The other comparison related to data capturing and occupants' interaction issues.

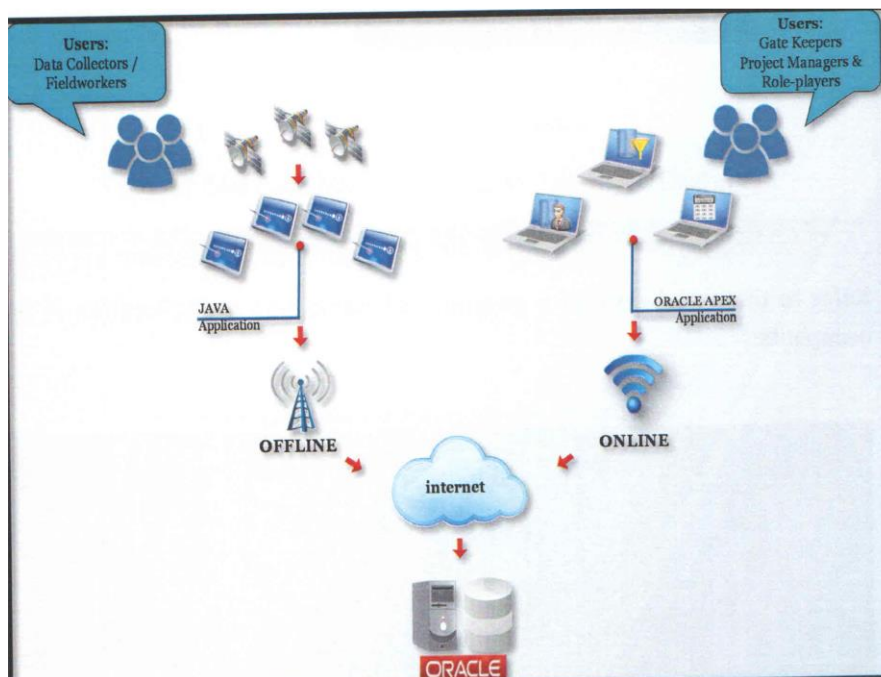
## **2.1 Web based GIS solution Data Capturing process**

The initial process of data capturing when using the web based GIS solution followed in the Balmoral Extension 4 area before the work of conducting the Occupancy Audit, Beneficiary Administration and House Inspections could commence was to get a buy-in from the Ward Councillor, the Local Political Structures and the Community. This process was considered to be critical to the success of the project.

The second step was to collect data from the designated area using the web based GIS Solution. The tool has been configured to collect information on occupancy audits, beneficiary administration and house inspections. The software architecture with GIS functionality is based on two platforms namely:

- On-line application (Oracle Apex Web Based Application) and
- Off-line application (JAVA application on mobile device or tablet with Android Operating System).

The fieldworkers are able to access the off-line capturing module (JAVA application) on the mobile device (tablet with Android operating system) and record the GPS coordinates household information and photographs of supporting documents from the occupant.



**Figure 1.0:** Software architecture.

The On-Line Oracle Apex Web-based application is accessible to all the role players where information is immediately available (real-time reporting). The module allows for the role players to view geographic data, attribute data, supporting documents and reports.

The set-up of the GIS Database at project phase, serve to ring fence the working area, where the families currently reside informally on the site, to set boundaries to ensure that only occupants residing within Balmoral Extension 4 Settlement were included for the data collection, beneficiary administration and the household inspection phases.

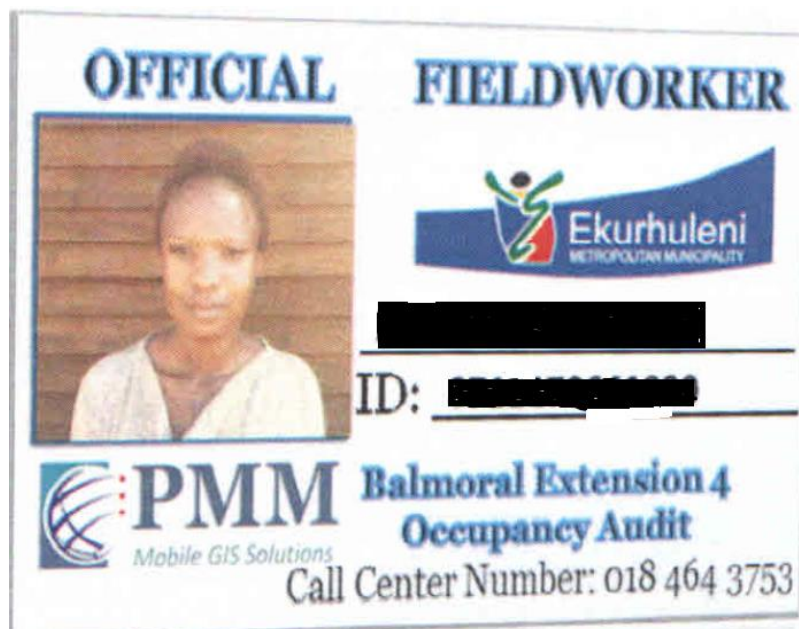
Dynamic Reporting techniques make data come alive. Data may be exported in digital form for transfer to other software packages to allow statistical analysis, desktop publishing or further analysis. However, most GIS output is in the form of maps to illustrate trends. GIS is an excellent application for visual and progress reporting. Spatial analysis distinguishes GIS from other types of information systems. All attribute data and images of supporting documents are accessible via the web in real time.

The electronic shape file (ring-fence) served as the backdrop on the mobile device (tablet) and the application only opened when the data collector was within the pre-created ring-fence of the area in order to continue with interviews of the occupants. The pre-created electronic ring fence was loaded onto the mobile devices and fieldworkers were not permitted to conduct data capturing outside of the identified area boundaries.



**Figure 2.0:** Pre-created electronic ring fence loaded to the mobile devices.

The Mobile GIS tool enabled 13 fieldworkers to conduct occupancy audits for 3092 households within 17 days.



**Figure 3.0:** Fieldworker ID card





Figure 4.0: Fieldworkers appointed on the project

### 3. Findings

The differences in using the web based solution and the traditional method of data capturing methods were appreciable. It was immediately notable that more housing units were documented and the web based system also attracted a significant amount of questions from the occupants. A breakdown of the differences on the above mentioned factors are elucidated upon in the following sections.

#### 3.1 Cost Implications of using the two systems

The cost implication of using the traditional method of resettlement data management, which methods are currently being used by the Ekurhuleni Metropolitan Municipality is illustrated in Table 1.0 below. The traditional method entails performing three distinct operations namely; occupancy audit, beneficiary administration and maintaining of a beneficiary database. The estimated cost for each of these activities is as tabulated in table 1.0. The costing information was obtained from the Instructions to Perform Work (IPW) issued for work on other similar projects. The estimated cost of settlement data management for the Balmoral Extension 4 was estimated to be a total of R1, 443,720.00 (Table 1.0) if they had used the traditional method of data management.

On the other hand, the number of activities required to be performed reduced from three to one when compared to the traditional system. The resulting cost for using the Mobile GIS tool

was also found to be far much less when compared to the traditional methods. The actual cost incurred for the data management, was R504, 621.00 (Table 2).

**Table 1.0:** Estimated cost- Traditional data management method

<b>IPW</b>	<b>Amount</b>	<b>Total Cost</b>
<b>Occupancy Audit</b>	R 350,000.00 per project	R 350,000.00
<b>Beneficiary Administration</b>	R 285-00 per @ 3092 units.	R 881,220.00
<b>Maintaining of a Beneficiary Data Base</b>	R 212,500.00 per project	R 212,500.00
	<b>TOTAL</b>	<b>R 1,443,720.00</b>

**Table 2.0:** Cost – Web based GIS Data management solution

<b>IPW</b>	<b>Amount</b>	<b>Total Cost</b>
<b>Occupancy Audit, Beneficiary Administration, Maintaining of a Beneficiary Data Base and House Inspections.</b>	R 504,621.00 per project	R 504,621.00
	<b>TOTAL</b>	<b>R 504,621.00</b>

### 3.2 Findings on time implications

From the study, it was found that the entire exercise of conducting an occupancy audit, beneficiary administration, maintain of the beneficiary data base and house inspections using the web based Mobile GIS tool, took 17 days for 3092 housing units. The activities included the collection of household data including the capturing of documents and reporting. In addition, when using the web based GIS solution, access to information is in real time.

At the moment records from the Ekurhuleni Metropolitan Municipality show that traditional methods of data collection, document capturing and reporting take up to four months for a similar number of households.

### 3.3 Beneficiary administration issues

Although the benefits are clear in terms of cost and time as illustrated above, a number of challenges were observed during the deployment of the tool. The challenges included inter alia:



- Households refusing to participate in the programme and to provide the information to fieldworkers;
- The proof of income was not always available - the information was sometimes taken down but the photo of the payslip was not;
- Identification documents were not readily available at all households for spouses or dependants- the occupancy audit is still recorded with the information but the photo of the supporting document is omitted.

The challenges associated with the traditional method of occupancy data collection, and reporting were gleaned from data obtained in the Moleleki Extension 1 project, an existing informal settlement in Ekurhuleni Metropolitan Municipality which used the traditional beneficiary data management method. The occupancy audit was conducted in April 2014 and the following challenges were observed:

- Difficulty in appointing capable fieldworkers. The project experienced difficulty to recruit fieldworkers from the area who could read, write properly and fully understand the questionnaire in order to avoid duplications and misinformation;
- Numbering of the housing units (shacks). The numbering on the documents needed to correspond to the physical numbering of the existing housing units;
- Managing the expectation of the occupants. Most of the occupants wanted to know when their houses would be constructed;
- The records of the occupancy audit are only available on hard copies. This constituted a major risk and could impede the process of eradicating the housing backlog.

## 4. Conclusion

The study identified that the use of the Mobile GIS tool has the ability to improve the methods and efficiency which Ekurhuleni Metropolitan Municipality in general and the Human Settlements Department in particular are using to conduct their occupancy audits, beneficiary administration and maintenance. The benefits of using the Mobile GIS tool have been appreciable and include:

- Cost saving;
- Time saving;
- Accurate data capturing and
- There is no need for trained personnel

The unreliable data that is obtained through the old system can lead to and perhaps has led to poor service delivery. Use of the GIS tool which does not need overly trained people can eliminate this problem and contribute to the eradication of the housing backlog currently being experienced in South Africa.

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