



Municipal asset management or mismanagement? A six 'Whats' perspective on current practices and challenges in Ethiopia's urban water sector

*Managementul activelor municipale
sau managementul defectuos? O perspectivă bazată
pe șase "Ce" asupra practicilor actuale și provocările
sectorului apelor urbane din Etiopia*

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Abstract

Effective systems of asset management can strengthen the performance of a local economy and community significantly. Despite the existence of new and interactive technologies for recording and communicating assets and asset management, many local authorities across the developing world have not taken advantage of the emerging revolutionary ways in which technologies may benefit municipal asset management. The analysis reviews the current practices, challenges and policy options for Ethiopian cities with regard to the state of the art technology for Municipal Asset Management (MAM) in the water and sanitation sector. Empirical evidence relate to a number of independent studies carried out in a sample of Ethiopian cities and towns. The pooling together of these findings was achieved through the Comparative Studies framework. In addition, data was also solicited from a panel of experts dealing with water and sanitation issues. The overall analysis was done within the context of the six Whats? Framework. Results indicate that, the water sector has gone through a number of reforms that have not cascaded into improved infrastructure asset management. Lack of financial resources, human resource expertise and appropriate organizational strategy has constrained the adoption and application of system software for effective asset management.

Keywords: asset plan, system software, strategy, infrastructure, maintenance.

Rezumat

Sistemele eficiente de gestionare a activelor pot consolida semnificativ performanța unei economii locale și a comunității. În ciuda existenței noilor tehnologii interactive de înregistrare și comunicare a activelor și de management al activelor, multe autorități locale din întreaga lume în curs de dezvoltare nu au profitat de modalitățile emergente revoluționare în care tehnologiile pot fi folosite în managementul activelor municipale. Lucrarea analizează practicile actuale, provocările și opțiunile politice pentru orașele etiopiene cu privire la utilizarea tehnologiei de ultimă oră pentru Managementul Activelor Municipale (MAM) în sectorul de apă și canalizare. Dovezile empirice se referă la un număr de studii independente efectuate asupra unui eșantion de orașe din Etiopia și

orașe mari. Punerea în comun a acestor constatări a fost realizată în cadrul studiilor comparative. În plus, au fost solicitate date de la un grup de experți care se ocupă cu problemele de apă și de salubritate. Analiza globală a fost făcută în contextul unui cadru bazat pe șase întrebări tip Ce? Rezultatele indică faptul că sectorul de apă a trecut printr-o serie de reforme care nu au determinat o mai bună gestionare a infrastructurii de active. Lipsa de resurse financiare, de expertiza resurselor umane și lipsa unei strategii adecvate de organizare au îngreunat adoptarea și aplicarea unui sistem de software pentru gestionarea eficientă a activelor.

Cuvinte-cheie: planul activelor, system software, strategie, infrastructură, întreținere

JEL Classification: R51, R53, C82, C88, L86

Introduction

Effective systems of asset management can strengthen the performance of a local economy and community significantly. Strategic Municipal Asset Management (MAM) is increasingly becoming important in view of increasing worldwide trends towards decentralization, devolution of authority and service provision to municipal levels of government, higher rates of urbanization, emphasis on good governance, and new forms of empowerment of local communities (Fernholz and Fernholz, 2006). Specifically, new demands for better service provision, trends towards decentralized systems of public sector management in developing economies, potential synergies and changing roles in the public and private sectors in many countries are creating a greater need for better management and accountability of municipal resources. Requirements for operational efficiency have seen MAM becoming an increasingly important area for decision making for the majority of municipal governments across the globe (Fernholz and Fernholz, 2005).

This heightened interest in MAM has (in successful cases of municipal management) been paralleled by efforts targeted at providing better living and working conditions for rapidly growing urban populations through better service provision and improved access to amenities. The main benefits of an effective MAM are extensively reviewed in Fernholz and Fernholz, (2005). These include among others:

- Providing local residents with improved services based on municipal asset use;
- Helps boost the revenue base of local governments;
- Improves the overall credit rating for the municipal governments;
- Attracts more domestic and foreign investors;
- Improves land valuation that make land assets attractive for productive and real estate purposes;
- Enhances the environment and improve the quality of life.

Asset Management optimizes the life-cycle value of physical assets (Figure 1). It can apply to a wide range of infrastructure types, including municipal water, wastewater, roads, bridges and building assets through effective management and rehabilitation programs that will ensure ongoing integrity and sustainability.



Figure 1. Life cycle value of physical assets with and without asset management

Many local authorities across the developing world are grappling with the challenges of fostering an effective MAM system. This is because many municipal governments own, and / manage substantial amounts of infrastructure and real estate. In some case this also covers almost all land in their jurisdiction (Urquhart and Busch, 1999; Kaganova *et al*, 1999; Kaganova and Stone, 2000). While the control or use of these assets is directly vested in the hands of local governments, they may be managed directly or indirectly for the benefit of their local constituencies in the attainment of service delivery goals.

Despite the existence of new and interactive technologies for recording and communicating assets and asset management, many local authorities across the developing world have not taken advantage of the emerging revolutionary ways in which technologies may benefit municipal asset management. New technologies, however, have the potential to ease information accessibility by government stakeholders, help them check on its accuracy, can enhance partnerships for effective services, and foster a higher level of accuracy and service, and improve the service life of assets.

The water and sanitation sector of Ethiopia has gone through a number of reforms following the promulgation of the Ethiopian constitution in 1994.

The objective of the decentralized reform was to bring about managerial revolution to make service provision companies in the sector efficient, competitive and customer friendly (van Dijk, 2006). In this paper we review the extent to which the decentralization induced reforms have translated into improved asset management in the water and sanitation sector. More specifically we evaluate the status of Infrastructure asset management vis-à-vis the state of art GIS based system software.

Analytical framework

Linking strategic MAM with the new state of the art technology requires that we adopt the six “whats” of asset management as an analytical framework. This analytical approach has alternatively been described by other scholars (Vanier, 2000) as the six levels of implementation methodology. This approach has extensively been used by many organizations both in public and private circles in the implementation of effective asset management plans.

Overview of the Six “Whats” of asset management

Vanier, (2000a) describes the six “Whats” of asset management as in figure 2;

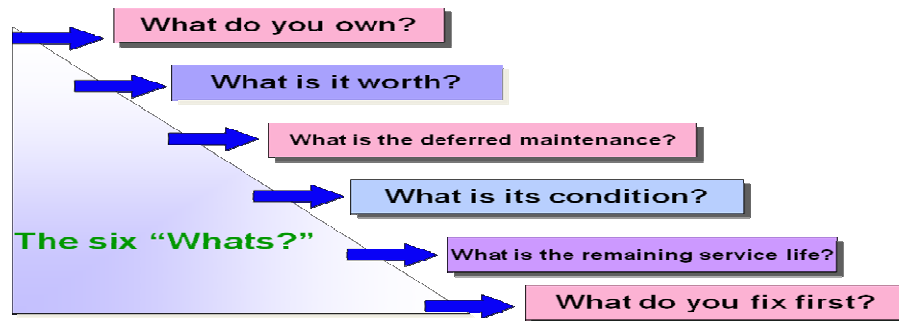


Figure 2. The six “Whats” of Asset management

Adapted from Vanier, (2000a)

In practice, the six “Whats” should be seen as a sequential implementation schedule for organizations wishing to implement strategic asset management. A brief discussion of these is given below:

- The “What do you own?” questions what is in stock. Many local authorities do not know the extent of their infrastructure portfolio or the percentage desegregation in various disciplines. Having an accurate picture of the extent of the asset base is an initial prerequisite for sound asset management planning (particularly if the planning horizon extends beyond five years).

- The “What is it worth?” question requires asset owners to assign realistic values to their asset portfolios. Once the actual value of portfolio has been established, then it can be broken into various asset disciplines and maintenance budgets can be assigned accordingly. This information can later be combined with other metrics to establish priorities for decision-making purposes (Lemer, 1998).
- The “What is the deferred maintenance?” Question seeks to establish information that will provide an additional metric for maintenance fund allocation. Having an appreciation of the amount of deferred maintenance provides decision makers with a snippet of the amount of money required to bring the maintenance and repair under control. The output value can later be used in the computation of other metrics for maintenance prioritization such as the Facility Condition Index (FCI) – which is calculated as the amount of deferred maintenance divided by the Current Replacement Value (NACUBO, 1990).
- The “What is its condition?” question is a simple an extension of the “What is it worth?” and is another tool to prioritize maintenance, repairs and renewal. Given that knowledge of the technical condition metrics is still at infancy, a mix of the FCI and technical condition indices can be used to identify the condition or level of infrastructure (Vanier, 2000a).
- The “What is the remaining service life?” questions seeks detailed information about the ‘technical and / economic service life’ of infrastructure that will determine when capital renewal should occur (HAPM, 1995).

Materials and methods

Empirical evidence relate to a number of independent studies carried out in a sample of Ethiopian cities and towns.

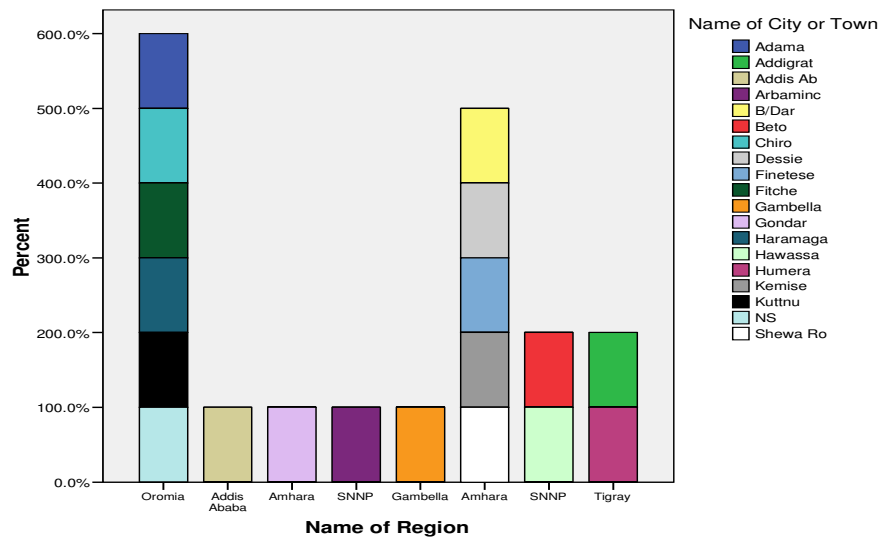


Figure 3. Towns and Cities enumerated in the study (N=47)

The pooling together of these findings was achieved through the *Comparative Studies framework*. In addition the study relied more on data solicited from a panel of 47 urban management experts drawn from a number Ethiopian towns and cities in the various regional states (Figure 3). Owing to its relative size, the majority (40.43%) of the panel experts came from towns and cities in Oromia regional state.

Results and discussion

The analysis reveals that the bulk (53%) of the enumerated towns and or cities do not have an asset management plan for the effective management of infrastructural assets and / or facilities in the water and sanitation sector (Table 1).

Existence / non-existence of an Asset Management Plan (N=47)

Table 1

	Does the LA have an Asset Management Plan?				
	Yes	Yes, but	No, not at all	No, but plans underway	Don't know
	Count	Count	Count	Count	Count
Adama	1	0	0	0	0
Addigrat	0	4	0	0	0
Addis A	2	3	0	0	1
Arbamin	0	0	2	0	0
B/Dar	0	1	0	0	0
Beto	0	0	2	0	0
Chiro	0	0	3	0	0
Dessie	0	2	0	0	0
Finetese	0	2	0	0	0
Fitche	2	2	3	0	0
Gambell	0	0	0	0	2
Gondar	0	0	1	0	0
Harama	0	0	1	0	0
Hawass	0	0	0	2	0
Humera	0	2	0	0	0
Kemise	0	0	0	0	1
Kuttnu	0	0	2	0	0
NS	0	0	5	0	0
Shewa Ro	0	1	0	0	0

The state of asset management plans in 47% of the towns and / cities, including cities such as Addis Ababa, Addigrat, Bahir Dar, Dessie, Finetesse, Fitche, Humera and Shewa Robit is reportedly not encouraging. Eight nine percent of the panel experts who acknowledged the existence of asset management plans in their cities expressed concern over the effectiveness of the blue print documents (refer to Yes, but category in Table 1). Challenges mentioned range from lack

of qualified personnel to manage the implementation process of the plans, lack of commitment from the authorities to lack adequate technologies such as the computers and the absence of integration between the various sectors of the local authorities.

A six 'Whats' perspective

The analysis also reveals that the water and sanitation sector of many Local Authorities (LAs) are not performing well on the six “Whats” (Figure 4) with obvious consequences.

What do you own? The majority of the experts for instance (76.6%) indicated that most LAs do not know about how much assets they own. Only 17% indicated that some LAs (In cities such as Addis Ababa) know how much they own. The rest of the experts were not sure. These results show that many local authorities do not know the extent of their infrastructure portfolio in the water and sanitation sector. This paucity of knowledge on what is in stock has often hindered effect asset planning and management in the water and sanitation sector.

What is it worth? The picture is also not encouraging when one considers the “*what is it worth?*” Approximately 68% of the panel experts indicated that their local authorities were not aware of the *value* the water and sanitation infrastructural stocks. About 25% of the experts however indicated they LAs were aware of such issues. Knowledge of the actual value of asset portfolio is indispensable in crafting maintenance budgets schedules and this information can later be combined with other metrics to establish priorities for decision-making purposes (Lemer, 1998). Establishment of decision priorities and budgeting for maintenance in the majority of the sampled LAs has however not benefited from such knowledge.

What is deferred maintenance? About 91% of the panel experts indicated that their LAs are not knowledgeable about issues relating to deferred maintenance of water and sanitation infrastructural assets. Only a small fraction of experts (1%) acknowledged that their LAs knew about deferred maintenance issues as they relate to the management of water and sanitation infrastructure assets and / or facilities. It has been mentioned earlier that having an appreciation of the amount of deferred maintenance provides decision makers with a snippet of the amount of money required to bring the maintenance and repair under control. The resultant output value can later be used in the computation of other metrics for maintenance prioritization such as the FCI (NACUBO, 1990). Available statistics on this matter reveal that existing funding schemes (if any) for maintenance and repairs of water and sanitation infrastructure assets (of many LAs) has not benefitted at all to any meaningful objective criteria.

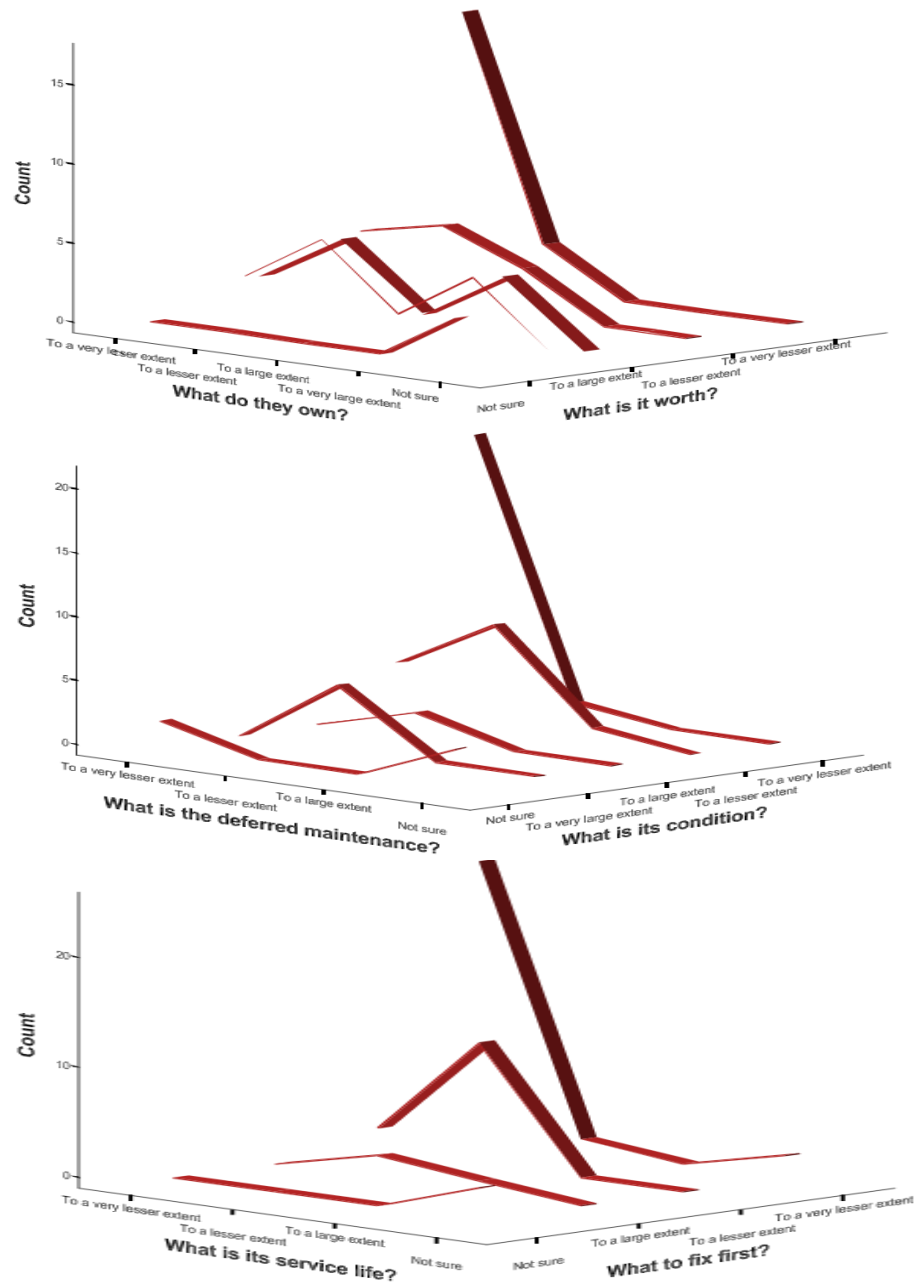


Figure 4. Performance of LAs on the six “Whats” (N=47)

What is its condition? This component is simply an extension of the “*what is it worth?*” question and can be used as an alternative tool to prioritize maintenance, repairs and renewal (Vanier, 2000a). Results again reveal that the majority of the sample LAs do not have knowledge about the precise condition of water and sanitation assets. 74.5% of the panel experts concurred that their respective LAs were not aware of the condition of their water and sanitation assets. Related statistics for those who were aware and not sure are 14.9% and 10.6% respectively.

What is the remaining service life? Detailed information about the ‘technical and / economic service life’ of infrastructure is very crucial in determining when capital renewal should occur (HAPM, 1995). Results reveal that such knowledge is limited. The bulk of the sampled experts (87.2%) acknowledged the existence of limited knowhow on the service life of infrastructures in the water and sanitation sector.

What to fix first? Infrastructure maintenance has been severely hampered by a lack of knowhow of when repairs or rehabilitation is supposed to be done. 87.2% of the panel experts concurred that it was virtually impossible to know what and when to fix troubled infrastructure. Only 6.4% were knowledgeable and came from a few cities where sound asset management plans existed.

Infrastructure asset management system software

Many new techniques and software solutions have been developed in an attempt to improve the infrastructure asset management process. Significant advances have been made in developing software tools to support activities in various domains, such as water sewer management, and water supply management (Halfawy *et al*, 2005). The analysis reveals that, a significant proportion (36.2%) of sampled cities have had no access to some of the available system software (Table 2).

System software for infrastructure management employed (N = 47)

Table 2

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Synergen	6	12.8	12.8	12.8
Other	1	2.1	2.1	14.9
City works	20	42.6	42.6	57.4
MIMS	1	2.1	2.1	59.6
None at all	17	36.2	36.2	95.7
Don't know	2	4.3	4.3	100.0
Total	47	100.0	100.0	

For those who have had access, the commonly used software City Works, Synergen and Municipal Infrastructure Management System (MIMS). A taxonomy of cities and / or towns and the respective system software that have been accessed is given in Figure 5.

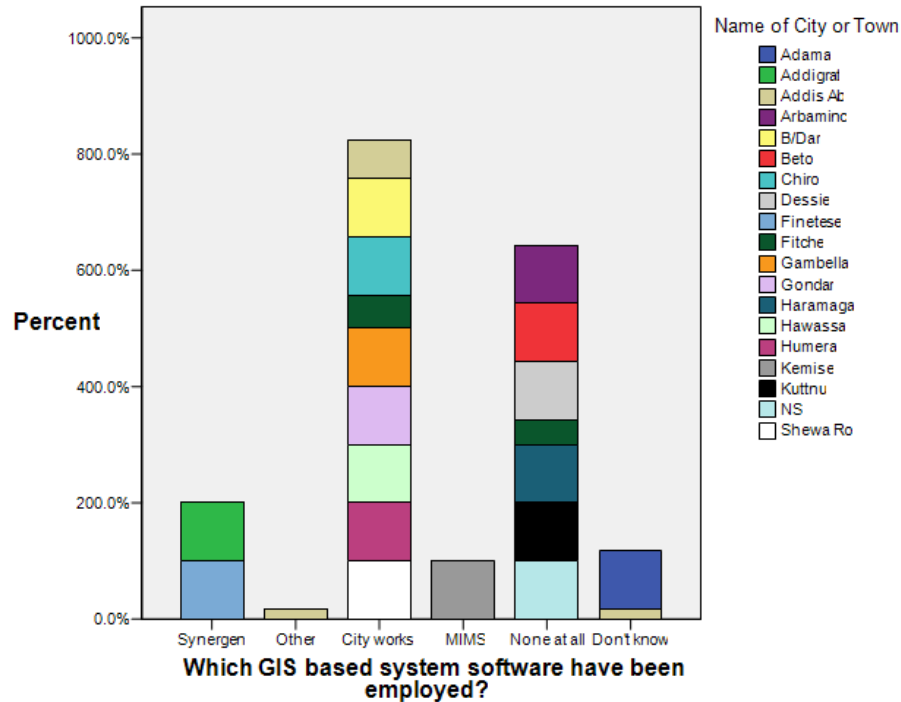


Figure 5. Use of available asset management software by a sample of cities / towns (N=47)

It was also possible to obtain details relating to the extent to which the water and sanitation sector had benefited from GIS based solutions. Results are portrayed on Figure 6. Despite a number of cities and / or towns having access to some GIS based system software, the water and sanitation sector has not benefited owing to a number of hurdles ranging from lack of qualified personnel, lack of computer equipment to insufficient asset management plans and a lack of commitment from the officials at both the national level and the local authority level.

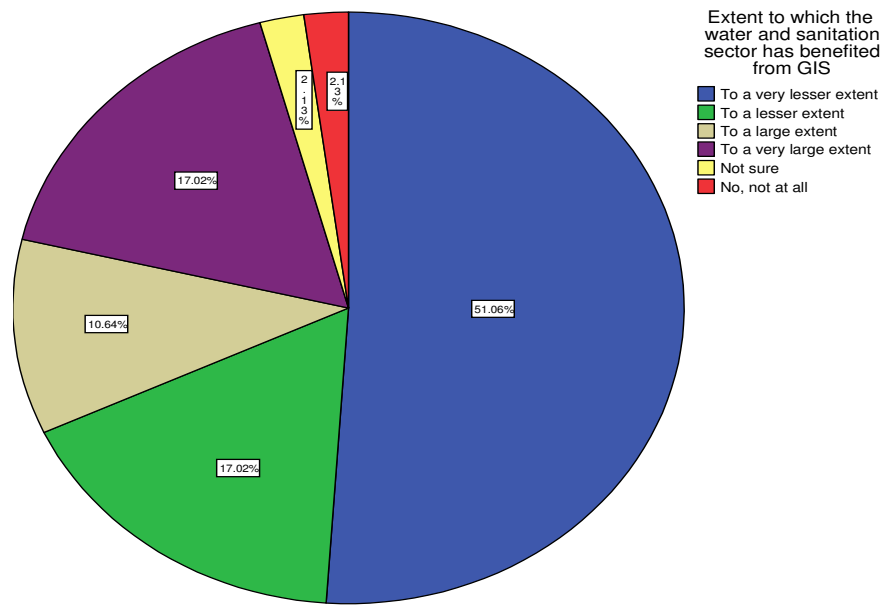


Figure 6. Extent to which the water and sanitation sector has benefited from GIS based system software (N = 47)

Computer ownership and usage have remained relatively low in all sampled cities and / or towns (Figure 7).

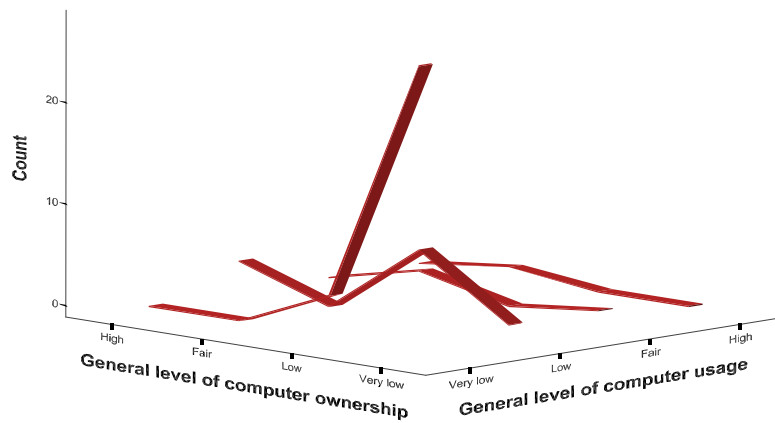


Figure 7. Perceived computer ownership and usage (N = 47)

Figure 8 shows a very limited relationship between those cities and / or towns that have access to system software and have experience marginal gains in asset management. Chi-square results revealed a no association between the two variables ($\chi^2 = 91.266$, $df = 25$, $p < 0.002$).

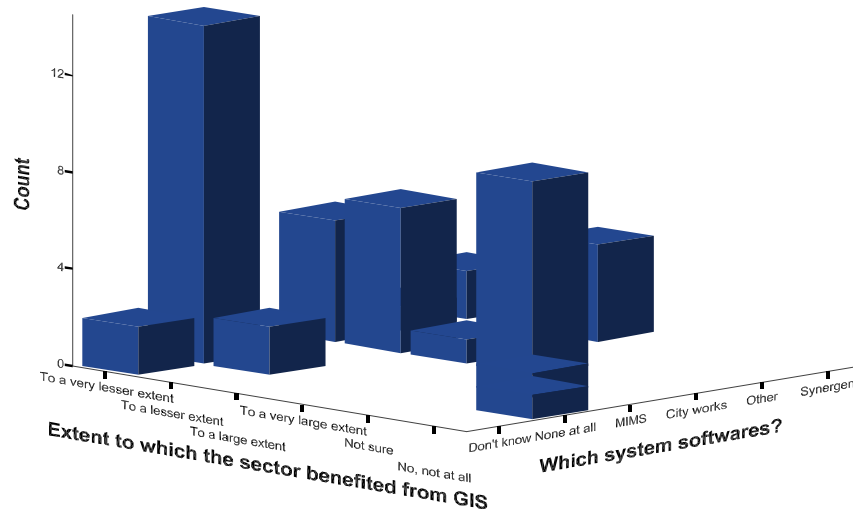


Figure 8. Perceived status of asset management and GIS based software in water and sanitation sector (N = 47)

Options

The Ethiopian LAs stand to benefit from a number of new developments in system software for managing water and sanitation assets. Such are extensively reviewed in Halfawy *et al.*, (2005). They make a distinction between General Purpose and Asset Specific system softwares. General-purpose systems typically offer generic functionality that need to be customized and adapted for specific data and work processes related to specific classes of assets. Asset-specific software solutions provide a set of built-in data models and processes to support the management of a specific class of municipal assets (including facilities, sewers, roads, bridges etc.). In addition to City Works, Synergen and MIMS (refer to samples pictures in Figure 9a & b) that are currently used by some local authorities, the following is a snippet of some other softwares that can be employed in the management of water and sanitation infrastructure assets.

Hansen

- Hansen is a major application developed by Hansen Information Technologies to provide capabilities for managing government operations including asset and property management, utility billing, permits, financial and human resources management.

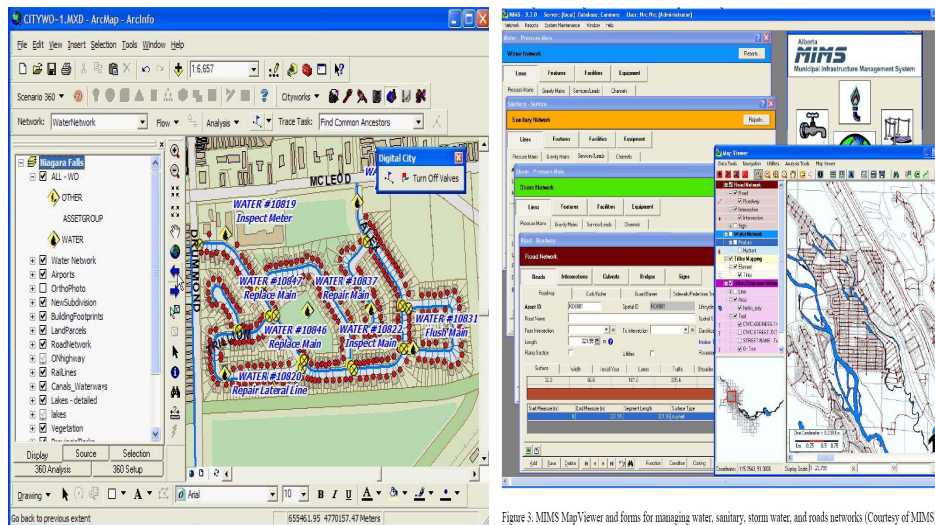
- It includes inventory collection, valuation, and determination of deferred maintenance, condition assessment, estimating remaining service life and prioritizing maintenance and rehabilitation (M&R) options.

RIVA

- RIVA (Real-time Asset Valuation Analysis), developed by Loki Innovations (www.loki.ca), provides capabilities for long-term asset planning in a 10 to 200 year planning horizon.

- RIVA is a web-based application that can interface with most common applications. The data can be pulled from other databases, such as Hansen.

- It supports inventory data collection, valuation, determination of deferred maintenance, condition assessment, estimating remaining service life (RSL) and asset prioritization.



(a) CityWorks ArcGIS add-on showing a map of water mains and associated work orders (Courtesy of Azteca).

(b) MIMS MapViewer for managing water, sanitary, storm water, and roads network (Courtesy of MIMIS)

Figure 9. Sample City Works and MIMS GIS based applications

Source: Halfawy et al, (2005) [http://irc.nrc-cnrc.gc.ca/ircpubs/Infrastructure 2000](http://irc.nrc-cnrc.gc.ca/ircpubs/Infrastructure%2000)

- Infrastructure2000, developed by Vanasse Han-gen Brustlin Inc, provides capabilities for asset management planning, and is targeted to small to medium size organizations.
- Infrastructure2000 is client-server application that supports inventory collection, valuation, determination of deferred maintenance, condition assessment, estimating remaining service life and prioritizing maintenance and rehabilitation.
- The software can be integrated with popular GIS applications such as ArcGIS.

Harfan

- Harfan is a general purpose software that can be adapted to support and perform the following functions:
 - (1) extending the asset service life, and
 - (2) optimizing the long-term investments.
- The software can be applied to diverse areas, such as water and sewer networks, roads, gas and telecommunications networks, electricity networks, street lighting, buildings, marine assets, airports, and rail systems.
- Harfan philosophically recommends a five-step methodology that addresses typical asset management issues such as: what do you own, what is it worth, what is the condition, what is the remaining service life, how much should you invest to ensure sustainability, and what needs to be done and when.

Given the fact that these softwares are expensive and some smaller cities and towns may not be able to run GIS units because of lack of capacity and financial resources, national agencies may undertake inventories and mapping of all infrastructure assets in Ethiopia. This way, economies of scale may be taken advantage of as such a national agency produce mappings for all small cities and towns.

Conclusion

Results indicate that, the water and sanitation sector has gone through a number of reforms that have not cascaded into improved infrastructure asset management. Lack of financial resources, human resource expertise and appropriate organizational strategy and lack of political will has constrained the adoption and application of system software for effective asset management. Computer ownership and usage was found to be severely restricted.

Many local authorities do not have an asset management plan that is tailor-made for the planning and management of infrastructure assets in the water and sanitation sector. This and other factors have seen the majority of sampled cities

and/or towns performing poorly of the six “Whats.” In other words there is limited empirical evidence that indicate that local authorities in sample cities and/or towns know much about the following as they relate to infrastructure assets in the water and sanitation sector:

- What do you own?
- What is it worth?
- What is the deferred maintenance?
- What is its condition?
- What is the remaining service life?
- What do you fix first?

This situation has severely constrained efforts targeted at the effective planning and management of water and sanitation infrastructure assets. The limited access to the state of art technologies by a number local authorities has not helped much. Limited financial capacity to procure new computer technology and software and lack of experienced personnel to handle has seen some cities, including Addis Ababa and Adama city failing to realize maximum gains from such system software as City Works, MIMS, Infrastructure 2000 among others.

Any efforts targeted at improving asset management in the water and sanitation sector of Ethiopia, should start by addressing such hurdles as limited computer ownership and usage, absence of an asset management plan, limited financial capability by local authorities, shortage of experienced personnel, absence of a supportive organizational strategy and lack of commitment. The national government can also assist by extending capacity building programmes to their respective local authorities. The other options could be to provide mapping of infrastructure assets by a national agency funded by the government.

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