

A Functional Addressing System for Africa: A Discussion Paper

**Background working document for the ad hoc
expert group meeting on
*Geographic data as a national asset: focus on
situs addressing***

CODI-Geo/DISD

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List of acronyms

CODI: Committee on Development Information

ECA: Economic Commission for Africa

GIS: Geographic Information Systems

GPS: Global Positioning Systems

GSDI: Geospatial Data Infrastructure

NACS: Natural Area Coding System

PI: Property Identifier

SDI: Spatial Data Infrastructure

TI: Thoroughfare identifier

Definition of terms

Addressing system:	Mechanism for creating a mental association between the physical location of a building, plot, dwelling, business and similar premises and an abstract code that represents it, providing its unique identification.
Address prefixes and suffixes:	Prefixes refer to a word or words preceding a street name. It typically indicates directionality (e.g., North, South, West or South as in North 22 nd St, South 22 nd St, etc.). Suffixes are used after street name. Like prefixes, they may be used to indicate directionality as in 22 nd St Northwest. They can also be used to indicate the type of Street, as in Bole Rd.
Geocoding:	The process of assigning coordinates to features in a map file or database, enabling geometrically consistent representation of the objects, relative to a standard coordinate system.
Geographic or Positional Address:	a pair of geographic coordinates based on a coordinate reference system (map projection) to represent the geographic location for an address. A GIS environment translates an address into a set of geographic coordinates through a process called “geo-coding” or “address matching”. The GIS actually uses the geographic address to map the location of a building or parcel, so addresses must be geo-coded before a GIS can map them. Coordinate based geographic addresses will become even more important given the increasing use of Global Positioning Systems (GPS) and cellular telephones that enable location based emergency and retail services to a mobile public (WVSAMB, 2004).
Landmark:	Any popular place name (tangible or intangible) that an area is commonly known as.
Metadata:	Data about the content, quality, condition, and other characteristics of data.
Parcel identifier:	A unique identification code that is assigned to a feature and does not change unless the existence of the feature does.
Situs or physical address:	The complete set of a street and parcel number and name in urban and rural area indicating the permanent and position of a specific location of a fixed site such as building or parcel (occupied or not), utilities, landmarks, telephone booth, etc.
Spatial Data Infrastructure (SDI):	Also referred to as Geospatial Data Infrastructure (GSDI). the technology, policies, standards, and human resources necessary to acquire, process, store, distribute, and improve utilization of geospatial data. The SDI is an umbrella under which organizations and technology interact to foster activities for using, managing, and producing geographic data.
Standard:	Way to express the content, applicability, data quality and accuracy of a dataset or data element.

Thoroughfare designations: Indicate linear features' importance or ranking within a communication network (river, railway or street), not only motorways. Such ranking may be based on size or function. Designations typically used in this connection include, avenue, street, boulevard, parkway, court, drive, highway, lane, path, place, road, trail, way, loop, circle and footpath.

Executive summary

The capacity of the general public, business, community organizations and governments to communicate easily and efficiently at a range of geographical levels is paramount if effective social and economic development is to take place. In considering the best communication modes however, local realities and conditions must be taken account of, as well as how they are affected by global drivers/factors such as economic, environment, rapid urbanization, and technology advancement.

In this context and considering this paper's focus on developing an effective addressing system, African countries need to keep pace with a wide range of developments, especially in communication technology to maintain and improve their social and economic conditions and opportunities. When developing better communications techniques in relation to addressing system, African countries therefore need to consider how accessibility, location and navigation are negotiated at the country and local community levels and are influence by global trends and changes.

This report highlights the benefits of implementing situs addressing systems in African countries. These benefits include the support of land administration, development of real estate markets (as economic assets), economic choice optimization, development of capacity and environment to attract and locate investment, establish a foundation for efficient urban planning and management, create wealth generation opportunities as well as open up vital opportunities for the economic development. The report also argues that a standard situs addressing is important and feasible because there are common features in African countries and around the World such as thoroughfare and parcel designation and numbering that makes the implementation of a system possible.

This document aims at (1) explaining the benefits and importance of situs addressing; (2) addressing the challenges that countries could face when implementing an addressing initiative, and (3) providing a series of recommendations and standards to assist country to establish or improve on their situs addressing project. The paper examines the current status of addressing in African countries, past experiences and new trends in information technologies in respect to addressing. The focus, therefore, is in highlighting the benefits of a functional addressing system. The technical and financial component of establishing the system will be further developed at a later stage. A multi-purpose addressing system is ultimately proposed, that can be used by various stakeholders including the general public, private organizations and businesses, utilities as well as postal and delivery services.

Through this proposal, the Economic Commission for Africa (ECA) invites African countries to subscribe and participate to the addressing initiative. By participating, interested countries will take

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advantage of the benefits described in this document (access, navigation and location, social and economic development), and receive support from the ECA, which includes this workbook, training, development of standards, access to expertise and the opportunity to participate in the addressing project's development via meetings, etc.

1 INTRODUCTION

The most spectacular change in Sub-Saharan Africa over the last few decades has been the dramatic demographic shift from rural areas to cities. As a result, more than 50% of the city streets in the region have no names or addresses, and the problem is particularly acute in the poorest neighborhoods.

Farvacque-Vitkovik et al., 2005

In general terms, an address is a primary means to identify and locate a unique object. Three main types of address are commonly used: geographic, mailing and physical. Geographic or positional address uses geographic reference systems (e.g., longitude and latitude) to describe the exact, permanent and unique location of an object on earth (e.g., 12°, 34' 54" Latitude North and 19° 18' 44" Longitude East). The mailing or postal address uses information on the exact location to deliver an item or parcel (e.g., Post Office Box or street address). The physical address or situs address refers to the precise, complete, permanent and unique location of any spatial object (e.g., thoroughfare and property addresses) using a system of identification such as name, number or descriptor. This paper focuses on physical address, which allows people to navigate, identify and access desired location.

This paper argues that it is becoming critical to optimise ways and which people localise places, mostly because a poor or absence of a functional physical address system induces lost of revenue due to limited revenue collection strategies (taxation and billing, location based services activities), discourages foreign direct investments, negatively impacts on regional and global economy, wastes time and resources, increases transaction costs, upholds poor governance, poor performance of emergency and security services, etc. This situation prevails in many parts of Africa with a poor or inexistence functional address system.

Street and property numbers and names are often missing and do not always follow a logical order. It is clear that many African cities and towns do not have intuitive situs addresses. As a consequence, streets (where they exist) and properties in most African cities are poorly named and numbered. Thus, streets and parcels (in both rural and urban areas) are often characterized by a lack of physical address, lack of logical and sequential representation, poor signage and 'name-posting', an absence of or poor numbering systems as well as a duality of 'official' and 'popular' naming practice. Even in planned areas with more conventional layouts, there may still not be functional street naming and numbering systems. That is, sometimes streets may be planned, well-laid out, named and sign-posted, but still lack a functional numbering system for place finding for example. As a result, locating, accessing to and navigating through urban areas remain a major challenge for residents and visitors of African cities.

This situation has far reaching and significant negative implications for social and economic development, poverty reduction, city governance, tourism, social security, safety and emergency services. The lack or incomplete addressing system constitutes a major challenge for African countries. Many countries have disparate address systems and there have been recent calls for a unified system, not only at the national level, but also at regional and global level. Adopting an African situs addressing standard could help improve many countries capacity to access to new economic opportunities and improve its stake in the global market.

Location-based services (Global Positioning Systems applications, mobile telecommunication, intelligent ambulance response, cable television, etc.) are new and rapid areas of economic and technology developments. Locations based-services require a functional addressing system, that is, the general public and business community, including visitors, be able to easily navigate, locate and access to places of interest. Moreover, in the context of a globalizing economy, rapid geo-information development and the importance of easy and accessible local, regional, country and international communication, African countries need to speed their entry into and share of the global information and knowledge economy and markets. In this context, there is an urgent need to bridge the technological divide between Africa and the rest of the World, through standardization of practices and the appropriate use of information technologies to instil social and economic developments.

Situs addresses provide a means for addressing this type of location-based navigation issue, without relying on memory or extensive local knowledge. Unlike other parts of the World, urban and other 'built-up' areas in Africa do not often have direct access to a thoroughfare. The conventional expression, *street addressing*, does not necessarily apply to the African context. Instead, *situs addressing* is a more appropriate method that provides a framework for accounting for all types of parcels, thoroughfares, buildings and property types. Nevertheless, this paper seeks to unify physical, postal and geographic addresses.

This document aims at:

1. discussing the rationale for a standard situs addressing in Africa context
2. explaining the benefits and importance of situs addressing;
3. addressing the challenges that countries could face when implementing the an addressing project, and
4. providing guidelines and standards to assist country to establish or improve on their situs addressing systems.

The paper examines the current status of addressing in African countries, past experiences and new trends in geoinformation technologies in respect of addressing. The focus, therefore, is in highlighting the benefits of a functional addressing system and presenting viable approaches to implementing the system. In doing so, the paper first discusses the rationale for, and the benefits of an addressing system in the African context, especially in relation to its overall economic development. Then, the benefits and needs of a functional addressing system are discussed, followed by major challenges for the design and the implementation of addressing systems that recognize the African realities. Finally, the challenges identified are used to make appropriate recommendations on how to implement an addressing system in the African context.

This addressing background paper fits within the general mandate of the Committee on Development Information (CODI) to raise awareness of emerging issues in geoinformation technologies. CODI will serve as an ideal forum and platform to discuss, refine and endorse the recommendations presented in this document. Countries will then take advantage of the proposed addressing framework to improve their overall public and private communication methods, governance, economic performance, services and security delivery and data reliability.

2 SCOPE OF WORK AND OBJECTIVES

2.1 Background

ECA has been working in related areas, such as cadastral and land information systems and spatial data infrastructures (ECA, 1998 & 2001). The need for addressing in Africa has been raised either directly or indirectly in these previous activities. For example, the document on the future orientation of Geographic Information Systems in Africa noted:

Governments, professional organisations and industry groups should encourage the spatial data industry to invest in road network data sets. These data sets are also used in delivery and collection services, like package delivery and utilities billing and customer services. However, some major African cities, even some national and State/Provincial capitals, do not have street addresses. Some of these cities may have unique plot numbers, which while very important for cross-referencing information in parcel-based databases, ... are not suitable for giving directions. In other jurisdictions, the two systems complement each other. Municipal authorities and planning organisations in Africa should be well advised to review their street numbering system for digital data applications.

ECA-DISD, 2001, p.17

The ECA position paper (2001) on spatial data envisions that “spatial data permeates every aspect of society and that they are available to people who need them, when they need them, and in a form that they can use to make decisions with minimal pre-processing”. This current activity is under the broad theme of ‘Geographical data as National Assets,’ in the context of the core data sets for Spatial Data Infrastructures (SDIs). The Development and Information Division Services (DISD) at ECA encourages African countries to take advantage of the data collection technology to improve on their sustainable development and economic decision performances. Measures to achieve such result include the development of metadata and clearinghouse standards in Africa, which will eliminate effort duplication, inconsistencies in data collection and sharing, effort duplication, waste scarce resources, the development of dynamic mapping, development of spatial data infrastructure (including addresses), etc. Even though there are data sets that would be expected to be included most of the time, it is still jurisdiction dependent. The exact contents will depend on the social and economic realities of the country. With the importance of addressing and the urgent need for action to be taken in Africa, and considering the expected user community for the service – which is almost the entire community – it is therefore argued that the data and information resources needed to implement and maintain addressing systems should be part of the core data sets in SDIs.

2.2 Rationale

Street and property in most Africa countries are mainly characterized by an incomplete and inaccurate system of identification represented by a lack of naming, sign-posting and numbering. In terms of address and communications, P.O. Box and landmark identification are widely used but they have obvious shortcomings: for instance, they are not related to precise and accurate physical addresses. Furthermore, when official street names exist, they sometimes contradict how the local residents relate

to them. For example, one of the main characteristics of African cities and villages is that many dwellings do not have direct access to 'street' and informal and customary properties are not recorded. This constitutes a serious shortcoming for effective urban and rural management. The incompleteness and largely informality of the system causes severe location problems, as it is so difficult to navigate and easily identify addresses.

With globalization, products and services from 'local' activities and industries being integrated into national and global economies, such a system will reduce Africa's capacity to make the most of its local and regional social and economic links as well as participate at the international level. For example, economists and entrepreneurs from national and overseas locations are increasingly interested in the source of the goods and services as investment options. Their interest creates opportunities for foreign direct investment, which has been credited with improving economic development and reducing poverty. One of the factors considered by non-local investors is the logistics and ease by which communication and transport of goods can take place. This includes the ability to move goods and services from, to and within areas of interest. It is therefore necessary to develop a standard addressing system that can serve multiple purposes from assisting and guiding investors, visitors and residents, improving private and public services performance and delivery, ameliorate census enumeration, electoral roll records to improving general mailing systems and increasing emergency responses from fire, ambulance and police.

Similarly, there is an urgent need to move from what are often 'fuzzy' and 'proxy' directions, large sign posting showing direction or a reliance on lengthy descriptions of the location in media, local knowledge and landmarks; to a systematic and comprehensive addressing method. Such move would have significant benefits for government, local council, public and private companies, emergency services, utilities companies, mailing system, foreign investors, tourists, visitors, etc.

This paper therefore seeks to provide some answers to questions such as how will mail and freight go from A to B across local, regional and country boundaries without relying on local knowledge or being impeded by political boundaries? How will communication be able to cut the costs of access, location and navigation in Africa? How can a functional situs addressing system improve the socio-economic development and data reliability in Africa?

This paper will therefore, look at how to design a functional addressing system that will foster the location of all parcels (including building in rural areas) and thoroughfares (including footpaths and other means of access available). In particular, the situs addressing standard proposed in this report will be flexible not only because built-up areas in various countries are laid out differently (generic, square, quadrant, etc.), but also because countries or cities might be at different stages of their situs addressing or have various financial capacities, level of political will, etc. Luckily, the development of such a functional addressing system for Africa is becoming more attractive and feasible, thanks to the recent development in the area of geo-information technologies and the global market. In that respect, this background paper shows how countries can use geospatial technology to develop a standard that will not only take advantage of best practices in urban and rural addressing system, but more importantly will incorporate local knowledge and practices for a functional naming and numbering of properties and buildings. This paper will therefore, not only advocate for the participation of all countries across the continent, it will also suggest that in order to be a success, a bottom-up approach of understanding and implementing a system must also be adopted which includes the participation of local communities and residents.

2.3 Objectives

The overall aim of this paper is to propose a functional framework and set of guidelines for recording and implementing an African standard for situs address in the context of core data sets for spatial data infrastructures. Specifically, it will:

1. Highlight the rationale for a functional parcel/property and street addressing system in Africa, with a view to increasing awareness of the benefits of implementing a functional and unified addressing system
2. Define and propose a common set of standards an addressing system that is flexible, easy to understand, easy to implement and promote data consistency, economic and social developments, governance, public participation and sharing with all participating entities.
3. Advocate for modernizing land records and addressing systems in African countries, and promote and generalize the development of an Area Identifier (e.g., postcode or zip codes).

2.4 Scope of this discussion paper

This background paper is limited to situs addressing. Nevertheless, situs addressing encompasses thoroughfares and parcel and/or property naming and numbering systems. Given that not all parcels and buildings in Africa have direct access to a street, the broad understanding of this concept of situs addressing is critical to the present work.

In this paper the term *thoroughfare* will be often used to designate any communication means people use to gain access to physical entity such as building and parcel (by vehicle, foot any other means). Thoroughfares could be street, river, or rail lines. Therefore, thoroughfare is not restricted to motorway, even when the term *street* will be used. The terms *parcel* and *property* encompasses land or plots with unique or shared (communal) ownership, public or private properties, planned or unplanned land, registered or non-registered property/land, etc.

This paper also recognizes that countries are at different stages of achieving street or situs addresses. Therefore, country accomplishments and progress in that area should be acknowledged and respected. Although both rural and urban areas in Africa need addressing, the emphasis is on urban centers and other densely populated areas, because of the increasing difficulties associated with location, accessibility and navigation without a system of address. The current paper will build upon existing experiences and practices with the view to standardize to the wider African context. This supposes that countries should review the status of their addressing system to ensure that they will meet the higher standards proposed in this workbook. The contribution of experts from various parts of Africa will assist in understanding the issues that might be specific to each country as well as reviewing countries' experiences and practices in situs and street addressing.

The role of ECA is to develop the addressing framework, provide technical advice on addressing and facilitate its implementation. Funding addressing projects are the responsibilities of participating countries.

The focus of this background document is to recognize the central role and socio-economic benefits of addressing for African governments in order to raise awareness on its adoption and implementation. In so doing, a general framework for designing and operating an addressing system is advocated. As a

policy document, the technical specifications of the implementation of the situs addressing are discussed in general terms. A technical and financial session may be convened to discuss the contribution of geospatial technology in designing and managing situs address database. In particular, the technical and financial aspects of the project including geospatial technology to support situs addressing operations and management as well as funding mechanisms will be detailed analysed.

3 ADDRESSING SYSTEM FOR THE AFRICAN CONTEXT: ISSUES

In the West for example, most formal property can be used as collateral for a loan; as equity exchanged for investment; as an address for collecting debts, rates, and taxes; as a locus point for the identification of individuals and commercial, judicial and civic purposes; and as a liable terminal for receiving public utility services, such as water, sewage, telephone, or cable services.

de Soto, 2000, p.51

The lack of, incompleteness or conflicting use of physical addresses to locate and access property and buildings in many African countries constitute a serious shortcoming for its overall development. It is worth noting that some countries have an established or embryonic addressing system upon which the present proposal will suggest possible areas of improvements. With such consideration, the following description will underscore the general patterns of situs addresses in African context. Such patterns will be supported by the addressing 'best practices', experiences and case studies in Africa and other parts of the World. This section first presents the prevailing addressing condition in rural and urban Africa, and then discusses ways to address potential challenges in the African context.

3.1 Situs addressing issues in Africa

There are several facets that define the inconsistencies in the location, accessibility and navigation in urban and rural Africa. Unlike developed countries where almost each parcel and building has a known physical address, their African counterparts are generally difficult to find and there is a high reliance on local knowledge. This section presents some common features of the current addressing system in Africa in order to highlight their negative impact on the development and access to global economy.

One of the most common problems associated with navigation and location in Africa is the poor thoroughfare addressing. Nameless thoroughfares or ones with similar names, the absence of sign posting are the norm in cities and rural areas in Africa. In some areas, street signs are in local language. While this is sufficient for local activities and residents, in the context of globalizing economy, it is important to consider a commonly used international language so a wider range of individuals and groups can find and deliver goods and services. Furthermore, there are often additional costs associated with relying on other means (local residents, memory, use of guides, phones calls, etc.) to locate an exact address. The poor addressing system is often translated in cost and methods of advertising in Africa. The current advertising strategies consisted in using multiple words and lines of text to locate and guide customers (cost of advertising in media), attempts to use maps drawn on separate page to sketch out the direction (waste of resources), multiple signs posts at intersections to enable people find place (cost of the metal or timber sheets), etc.

There are also several instances where a duality of streets and places name prevails. The common feature is the ambivalence between the 'official' name (or less known and used by local residents but often recorded in official documents) and the 'unofficial' name (or popular one) used by the local population. Considering the current role that local knowledge plays in navigating and locating places in most African countries, it is important to be acquainted with the popular names of thoroughfares or places. Njoh (2003, p.237) reports that "for instance, to go by taxi to the point in the city (Yaoundé-Cameroon) officially marked as *Boulevard de l'OUA* points 4.015 and 8.035, one must tell the cab driver to drop her/him at *Ancien Aéroport* or *Base Aérienne*. This is because that specific location is better known by its popular names rather than its official name".

There could be several reasons for the non-usage of official street names. First, the street naming and numbering process does not involve the participation, consultation of and contribution from local residents and users. In the past, addressing system in some African countries, especially naming and numbering streets, has been the exclusive domain of bureaucrats and planners. This top-down approach has, for example, led to street names (when they do exist) that are not always used by taxi drivers or the local population. Second, streets, which have official names or numbers, can often have poor sign posting. Third, there is sometimes a tension between the local residents and what planners and bureaucrats might designate as a street name. If local residents don't like or relate with a particular name, they might 'boycott' a name, particularly if it is perceived to be 'foreign'. Finally, addressing projects sometimes propose a system that is both difficult for visitors and residents to easily understand and remember, such as the case of some names in Yaoundé, Cameroon. Numbers were assigned to both buildings and streets instead of an association of street naming and building numbering (e.g., 33 *Boulevard de la Paix*) properties and parcels.

The complete lack of situs (parcel and thoroughfare) addressing system in slum areas in Africa is a common feature of most informal settlements and constitutes a serious challenge. Considering that slums are one of the dominant urban landscapes in Africa and constitute up to 90% of some urban areas (UN-Habitat, 2003), it is imperative to understand how a functional addressing project could be implemented while at the same time be beneficial for the residents and the urban management as a whole. Addressing shortcomings in slum areas include negotiating unregistered land (often associated with the lack of security of tenure), the lack of physical addresses, an impression of 'chaotic land occupation, unnamed streets and paths and limited or no direct access to thoroughfares. Notwithstanding, it is important to note that many residents of slum areas have their own means to navigate, access and locate properties in the area. The visitor, however, often finds it challenging to venture into slums for fear of getting lost and not being able to deliver their goods or services.

This paper aims to provide an answer to question about how a functional addressing system could effectively reconcile the needs of the residents and visitors in slums and rural areas? Questions that must be answered include how local knowledge (of location and orientation) can be incorporated into a functional addressing system? How to register and localize houses and properties (not necessary the legal status) in slum as well as existing thoroughfares (including footpath) used to access dwellings and place of interest?

Most African countries have a cadastral system in place, at least for the 'planned' areas or registered (urban) land. An ECA (1998) commissioned study indicated that reasons for poor performance of cadastral and land information systems in Africa include a lack of cadastral surveys, inefficient land information management systems combined with cumbersome and bureaucratic procedures to register land, an ignorance of non-formal or customary land tenure, a lack of systematic and sequential parcel or

property identification systems and the poor accuracy and reliability of cadastral data. As a result, cadastral system covers less than 10% of urban areas in most African countries (Farvacque-Vitkovic *et al.*, 2005). This could suggest that cadastral system as understood and practiced in developed countries, might not be suitable for land tenure system and management in Africa (Ezigbalike, 1996). Such difficulties constitute a serious setback in the efficiency of land information management, but could serve as base for further improvement of the land information management in Africa.

In this context, the proposed situs addressing system should not be perceived as a remedy to or replacement of formal cadastral and land registration systems (especially in areas not covered in the formal cadastral system), but as a support and facilitator to improve the current ones. Via this perspective, a functional addressing system could reconcile cultural relationship to and management of customary land with the cadastral system in Africa. This link could be made easy when local residents navigation and location practices are acknowledged and they are involved in the design and implementation of the addressing system standard. This paper recognizes that care should, therefore, be taken in the addressing designing process with the view that the ultimate goal is to harmonize all land administration activities (both formal and informal) under a single and broad-based spatial data infrastructure with the support of a land information system such as GIS.

The lack of a functional addressing system has largely contributed to the difficulties for African countries to provide accurate, shared, up-to-date and reliable data and records, which are critical for making informed decision on important matters such as the production and maintenance of national records, foreign investment and business growth. At the national level in particular, it is important that governments are able to establish a reliable registry for national identification cards, electoral records, taxation (personal, income, business and property), property and land registry and vehicle registration. It is common to find that various private and public institutions and utilities (e.g., census, electoral, cadastral, postal, police, electricity, etc) have their own data collection and management systems for the same spatial unit (e.g., household and village compound). Thus there are often a number of systems operating which create layers of administration. A functional addressing system could unify shared spatial database that could be used by various stakeholders, thus avoiding duplicity and redundancy.

In most African countries, spatial information is obtained by approximations (even extrapolation) with large error margins. This leads to a lack of trust in data and methods of collection are source of cases of mismanagement, manipulations, contentious cases and poor decision-making. Box 1 for example, illustrates the impact of the lack of a functional addressing system in getting a consensus on an electoral registry in Ethiopia.

Box 1: Lack of physical address causes controversy over voter registration

Ato Lidetu Ayalew, Public Relation Head of Coalition for Unity and Democracy (CUD), said Friday there were a number of irregularities in voter registration in the constituency he was running for election. The National Electoral Board (NEB), on its part, dismissed the allegation as "baseless and failed to take into account the realities in the area."

Ato Lidetu told The Reporter that the voter registration conducted at the Woreda 21/22 constituency of Addis Ababa was "unfair and incompatible with the electoral procedures and legislation." He said that out of 58,038 voters registered in the constituency, around 18,400 had no permanent address or house number that could validate their eligibility as voters.

Responding to this complaint, Ato Mekonnen Wondimu, Civic Education Training and Advocacy Senior Expert with NEB, told The Reporter it was true that the stated amount of voters had no house number. He, however, said "having a house number is not as such an important requirement because many people in the city and all over the country don't have it." He added, "One doesn't need to have a house number in order to vote and that is why we [NEB] never included it in the requirements."

Ato Lidetu, however, said he was not surprised to see people without house numbers registered as voters.

The surprise, according to him, was the size of the number for "no one with common sense expects to have a third of a Woreda's residents to have no permanent address."

Another issue of controversy that arose between NEB and Ato Lidetu Ayalew was the registration of 406 people under a single house number. Ato Lidetu said he wrote a letter of complaint to the Woreda electoral office stating that some 406 voters had registered as residents of house number 435 in Woreda 21, Kebele 14.

Ato Mekonnen said, "Those people registered under one house number are members of 220 households which all use the same house number - 435. Units they live in, however, are differentiated by successive slashes that run 435/1, 435/2 etc."

He further remarked that he and his colleagues had visited the area and monitored the activities carried out by the Woreda and Kebele electoral offices. He said the allegation put forward by Ato Lidetu was unfounded.

Ato Lidetu Ayalew, however, expressed doubts over whether NEB could look into the complaint he made within a short period of time. According to him, the investigating team should have included him or his representative while looking into the case.

Source: <http://www.ethiopianreporter.com/displayenglish.php?id=1946> (Access 24 February 2005)

Home delivery services (parcels, letters, goods, etc) are very limited in many parts of Africa. The Post Office Box method is often the common mean of contact, especially when sending letters and parcels via courier or postal services. Another method consists of using landmark and 'fuzzy' directions to provide an approximate location. This absence of a system of accurate and precise physical address leads to the use of lengthy description of the address (see Box 2).

Box 2: Samples of location description in local newspapers

Only candidates meeting the required qualifications are invited to send their applications including a detailed CV either through www.ethiopiajobs.net or on a floppy Diskette (returnable) to TALENT SERACH before: Monday, February 28, 2005.

Email: Cvsubmit@ethiojobs.net or in person to our office located on Debre Zeit Rd near Lancia, directly opposite to Embassy of Ireland, black and white gate.

Source: Capital, Vol.7 No 324 February 20-26, 2005

Address: From Dembel City Center, go 50 meters along Meskel Flower (Gabon) Road. We are on the right-hand side.

Source: *Addis Fortune*, Vol.5 No 251 February 20, 2005

The lack of a systematic building numbering system means that proxy descriptions are often used. Such proxy locators include expressions such as: *opposite to, behind, next to, 30 meters from, 5th house on your left, ask the shop owner on your right hand side, behind the avocado tree, front of the XYZ sign, call me when you get to the roundabout*, etc. An addressing system could go a long way to assist in the development of a uniform, precise location, which any person could use to access an address without necessarily attracting additional cost in time, money and lengthy description.

Another important consideration is the impact of poor addressing system in the expansion of economic activities and the emergence of new economic opportunities. For example, an accurate location of customers, competitors and suppliers would assist business operators in their ventures and targeted operations. Similarly, the current addressing system (or its absence) inhibits the emergence of home delivery services such as courier and customer billing as well as the expanding 3G telecommunication activities, fleet management, e-mapping, e-commerce, vehicle navigation and locations-based services.

The social component of situs addressing is vital to improve emergency responses in case of fire, ambulance and law enforcement dispatching. There are often delays in the deployment of emergency services, because the exact location of the incident cannot be conveyed to the relevant authorities.

3.2 Need for a standard addressing system in Africa context

In the recent years, there has been a push towards global standard (Østensen, 2001). The move is encouraged by the continuous globalizaton and the perceived benefits of data sharing and matching. In general, African countries do not have a well-organized and standardized addressing infrastructure (street with names and number).

In the context of geospatial technology in general, the benefits of establishing data standards (e.g., metadata and clearinghouse) are well recognized. For a situs addressing project in particular, designing and implementing standards will have several benefits including facilitate access to and sharing of geospatial data and information, reduce data redundancies, promote easy identification of land parcel, building and thoroughfare, eliminate data inconsistencies, avoid duplication of effort and achieve cost-saving and recovery. A generic and functional addressing system (with the supporting standards) would benefit census enumeration, especially its regularity, effectiveness and cost-effective data collection. Spatial data sharing amongst various institutions is often difficult, partly because each institution has its own system of tessellation (e.g., boundary delimitation), collection and maintenance of spatial information. An addressing standard will unify various addresses and standards such as taxation, billing, parcel and property, electoral, planning, emergency services and traffic management.

Several countries and regions are now moving towards address standardization (particularly in developed countries). Australia and New Zealand recently developed a series of standards for rural and urban addressing (AS/NZS, 2003) supported by GIS. The US are currently working on a national addressing mainstreaming to harmonize the site and street addresses (FGDC, 2003). The United Kingdom also launched the *ACACIA project* which proposed a generic addressing data infrastructure with broad-based used (see Box 3)

Box 3: Background of Acacia Project

The Acacia programme is a collaborative project run by a partnership of government agencies to investigate and define the requirements for a single national infrastructure of joined-up, consistent, high quality, well-maintained addresses and property information.

The Acacia partnership comprises Ordnance Survey (OS), Land Registry, Registers of Scotland (RoS), Valuation Office Agency (VOA), Improvement and Development Agency (IDeA), and the Royal Mail. They concluded a Memorandum of Understanding (MOU) (Ref 1), signed in September 2002, that documents the intention of each member to develop and implement the Acacia programme. This MOU has more recently been taken to describe the Acacia Vision. The main reason for the involvement of the Registers of Scotland was to ensure that the parallel initiatives being advanced under the Acacia programme and the Definitive National addressing - Scotland exercise, followed a complementary path.

To date, the Acacia pilot project has been essentially a 'bottom up' approach to the addressing problem. It has undertaken data matching trials and specific areas of addressing research. Acacia work has been centred upon England and Wales, but the aim taken together with other complementary initiatives has also been to provide solutions capable of supporting application on a United Kingdom basis.

To consolidate the results of the research in a business context, it was considered essential to establish the core business requirements for the Acacia vision. This study is a 'top-down' approach to identify and record the business requirements and define what the Acacia vision actually is.

Source: Rob Walker Consultancy Ltd, 2004, P.3

At a larger scale, establishing a common an integrated situs reference system confirms the current trend in developing and using standard for location, navigation and access. For example, a global addressing system is currently under development by the Natural Area Coding System-NACS (NAC Geographic Products Inc, 2005). The NACS combines geographic coordinates, areas codes, street addresses, postal codes, map grids and properties identifiers from any location on earth (see Box 4). The system also unifies maps, GPS and location-based services to display exact location. Up to March 2005, over twenty countries were participating in the project (none from Africa). One of the problems facing the proposed universal addressing system is that it relies on high ends technology devices (GPS, cellular phones and computers) and uses a complex combination of numbers (e.g., 8KDCPGFC) and letters that will be less suitable for access, location and navigation purposes in African countries. However, the universal addressing system is worth some consideration for its capacity for 'forward-thinking'. It could also be promising for countries, which already have a functional situs addressing system.

Box 4: Universal Address- A Revolution in World Address Systems

The Universal Address System developed by NAC Geographic Products Inc. introduces a highly efficient unified representation of an address, postal code, area code, geographic coordinates and map grid coordinates in the world. It connects all location related products, services and technologies. An eight character Universal Address can uniquely specify every building in the world. A ten-character Universal Address can uniquely specify any square meter in the world. They are easily remembered, can be pinpointed on all maps and navigated with GPS receivers. Using Universal Addresses instead of street addresses to specify locations can

- 1) reduce 80% of input keys,
- 2) avoid difficulties in inputting addresses with foreign characters,
- 3) eliminate errors from address databases, and
- 4) extend location based services to all locations no matter whether there are addresses or not.

They are especially significant on small wireless devices and car navigation systems.

Source: <http://www.nacgeo.com/nacsite/> (Accessed March 2005)

4 USE AND BENEFITS OF STANDARD RURAL AND URBAN ADDRESSING SYSTEMS

Developing an addressing system for African countries would bear several advantages at various levels. There is overwhelming evidence to support the benefits of developing and implementing a functional addressing system for African countries. This paper recognizes that although countries are at different stages of implementing situs addressing, it is of paramount importance to conceive and standardize situs addresses in a manner that prioritizes end-users and takes account of the realities of developing a system in the African context. This section discusses the advantages for countries, which implement a functional addressing system. These benefits include economic prosperity, social development, increased security and safety as well as gains for governance, planning and record keeping.

4.1 Addressing and economic development

A functional addressing system could help achieve and stimulate economic development by creating a climate of security and efficiency that would prove attractive to investors and thus create new activities and save money. Governments will be one of the prime beneficiaries of a standard addressing system, especially in relation to the improvement of various tax collections mechanisms (e.g., personal, residential, properties and businesses). Via such a system, governments would have the opportunity to improve not only their ability to increase state revenue generation through income, sale and property taxes, but also to establish a fairer and more equitable taxation assessment based on accurate residential or property data (e.g., size, value and ownership status) and the location of individuals. Unlike sale and income taxes that can be retained from the source, property or residential tax needs a reliable system to assess and collect rates. In creating such a structure, the addressing system will support land and real estate markets, which are currently underdeveloped (Wallace and Williamson, 2004). Addressing system is attractive to governments because it provides a comprehensive database for various taxation applications. Property tax for example, requires a highly visible, accurate, systematic and up-to-date cadastral or property assessment method, preferably administered by local authorities. A situs address database would also serve as a reliable source for local authorities (in the context of decentralization) to effectively operate fiscal initiatives and tackle tax evasion especially those directly linked to spatial entities (location) such as entertainment, commercial, parking, building activities, list of activities (formal and informal), street occupation, property valuation and asset management. One of the outcomes will be the economic empowerment of local authorities in terms of ensuring that taxes are collected in a fair and informed manner. This is particular important for local governments in Africa which have very modest budget and struggle to keep a registry of economic activities in their localities. Such move is important for the local governments to keep an inventory to local resources and assets: public, privates, services and goods.

It is worth noticing addressing system developed with the main objective to improve fiscal and taxation system poorly performed. It was the case in Nouakchott (Mauritania) where less than 15% of intended property taxes were collected (Farvacque-Vitkovic *et al.*, 2005, p.80). One of the explanations of the poor performance of property taxation and based on addressing was that it is often ill-adapted to socio-economic conditions of the intended population (e.g., too ambitious, cost too much to the population, not perceived return of the urban services, discriminatory, poor recovery mechanisms, reluctance of the population to pay, etc.) Other countries such Burkina Faso and Mozambique, have innovated in that area and have introduced a residential (or occupation) taxation system (not property tax), which means that all citizens are compelled to pay a modest fee.

A broad-based addressing system will also serve as a cost-effective means to collect and update statistics on population, resources and national assets. For example, census enumerations are irregular and costly, especially in countries without a reliable addressing system. At the individual level, the general public would save as efforts to locate exact addresses often incur unnecessary and additional cost for fuel, time, energy, etc. Moreover, individual and businesses will save money for advertising (e.g., cut down on large billboards indicating the direction) and the cost of advertising in the printed press (e.g., long description for audio and video presentation as well as reduce the length of adverts for printed presentation).

Finally, a functional addressing system will have far reaching positive impacts, not only in revitalizing economic activities, but more importantly, in generating 'downstream' socio-economic activities and job creation such as producing up to date street maps and various guides, 3G mobile communication, encouraging tourism, e-mapping and e-addressing (e.g., map quest on the internet), improving street directory sales (hardcopy and online), and the use of local material and personnel. All these activities, which engage everyday people across Africa, will thus contribute to alleviating poverty.

4.2 Addressing and governance

Developing a uniform addressing system supported by geoinformation technologies will improve the management and planning of public services that rely on spatial data, and thus serve in improving decision making and planning. Such efficiency in government services performance in Africa is currently lacking because information is not shared between agencies, and thus duplication of efforts occurs and resources under utilized or wasted. A uniform addressing system will help strengthen public services). In Africa, various government bodies and utilities have different systems (or none at all) to locate and provide services. For instance, postal services, telecommunications, police, health, emergency services and electoral divisions vary across each country. Such variations make undermine data sharing efforts and any efficiency in data management, thus rendering it difficult to implement new communication technologies such as 'e-government' technologies. A functional addressing system could improve the capacity of the state or municipality to collect, store and efficiently use reliable and accurate data on its citizens. Land tenure in Africa is also a critical issue, not only for economic development, but also for effective governance. An addressing system would bring positive changes to land tenure issues, as the government will be able to track land ownership more effectively and thus reduce (or diffuse) land disputes. Situs addresses would provide reliable information about land tenure for example and would thus provide the government reliable records on important matters such as census results, population and property ownership, etc. The addressing will also facilitate improved matching of different data by enabling, for example, land records to be matched and then shared between government, utility companies and the private sector.

Finally, an addressing system has the potentiality to improve town planning management and practices, thus national infrastructure and service development. An accurate location is vital for services and infrastructure planning because it improves knowledge and information on the structure, density and distribution of the population, especially when the addressing system is correlated with census enumeration. Also, an appreciation of various land uses for long-term development planning (master, urban or regional plans) is critical for the analysis of infrastructure maintenance history (e.g., water, sewage and roads), waste management as in the case in Conakry.

4.3 Addressing and service delivery

As already suggested above, an improved local and regional addressing system will help achieve effectiveness and efficiency in individual country's service delivery in both private and public sectors. For example, businesses and community organizations will locate customers much easily, which will ultimately improve utilities billing system and fee collection, accelerate goods deliveries, reduce the cost of transactions, facilitate the update of company records, extend taxi operations, track utilities breakdown and frauds (e.g., telephone, water and electricity), expand personal or home mail and courier delivery and help in the general organization of service delivery and logistics. In many countries, service providers sent agents (with local knowledge) to the neighborhood to distribute bills to their customers. In other instances customers have to go and collect their bills at the service providers' offices. In Addis Ababa for example, telephone customers have to call the telephone company to query about their bills or queue to check a published list whereas such information could easily be sent to the customer, should an address system were available.

4.4 Addressing for records production and maintenance

Improving the addressing system will progress the production and maintenance of record keeping of deeds (e.g., maintain accurate legal documents such as individual identification cards, electoral records, property records, vehicle registration, driver licenses, etc.). Record keeping derived from a common database for example, is very important to speed up e-government capacities as well as provide the framework for cross-referencing with utilities companies and other governmental agencies. A functional addressing system can easily incorporate cadastral database, and therefore unifying property and make thoroughfare data readily available to be shared amongst private, public and general users. Such data sharing capacities will help eliminate the duplication of data collection by various bodies and more importantly, will enrich urban and rural database.

An addressing system will also contribute to the development of a stable, standard and reliable public property record-keeping system (titles, deed, securities, and transactions that reveals the evolution of the economic value of the property, etc.), which can be monitored through time. A good knowledge of an address database will improve efficiency in the issuance and tracking of building permits as well as achieve better codes enforcement regulations such as health inspections, building standards, zoning, and housing. Given information contained in the property documentation is vital for a range of new businesses ventures such as real estate, mortgage brokers and insurance companies for example, the absence of a functional addressing system could result in an underdevelopment of such businesses which ultimately could undermine local, regional and national economic development.

Finally, a functional addressing system, conceived with the large number of stakeholders interested in spatial database in mind, will go a long way to facilitate and harmonize access to critical data necessary for informed record keeping decision-making processes that relate to planning in particular. In so doing, the addressing system could not only improve the reliability of and up-to-date data on population and properties, but more importantly, would significantly enhance urban and regional planning and governance in Africa that rely on the accuracy of such information and records.

4.5 Addressing for safety and security

A functional addressing system will improve safety and security standards in many African countries. For instance, a functional addressing system will assist in enhancing speedy emergency responses (for

fire, police and ambulance) and improve crime prevention. For example, accessibility to a functional thoroughfare network associated with easily and quickly location (thoroughfare, property or landmark-considered here as an alias address-) will increase law enforcement capacity. The knowledge of a standard physical address will help prompt and provide the correct report of the exact location of crimes or incidents, which can then trigger a more rapid response and dispatch of response units and thus improve on the overall response time. Without a functional addressing, it is difficult to operate a system of automatic location identification, which is critical for emergency services. With such system in place, however, when there is a call, the phone number is displayed on the screen along with the exact location of the caller-enabling emergency to address an issue with increased precision and timeliness. An addressing system should safeguard citizen privacy, trust and confidentiality. This is to say that citizen should not perceive an addressing project or initiative as a security control or policing instrument. There should be series of mechanisms and strategies to build local population's confidence and cooperation. One way to improve this trust is to involve local residents and civil society in the addressing process and to develop accountability, copyright and clearly defined rights and responsibilities of users and providers.

A shared addressing system will also enable social issues investigations and research such as crime mapping, poverty mapping, accident mapping, employment and sales trends to be more effective. Research in the field of land use and urban zoning studies for example, could lead to the better implementation of infrastructure and services planning, and overall coordination of development projects and thus improve safety and security for all citizens. A functional addressing system will foster better impact assessments studies (e.g., social, economic, environmental and disaster).

Provide a consistent and systematic addressing system, which is free from duplicity, redundancy, overlapping and inconsistency in thoroughfare identification and property numbering in African countries. This will resolve the problem of the duality and erroneous thoroughfare addressing with numbers and/or names, or streets that are known by two different names: 'official' and 'popular'.

4.6 Addressing and citizen participation

A clear benefit of improving the addressing system across Africa (and thus communication in general) is the potential to increase citizen participation in public life, which in the long term, will aid in improving the social and economic development and vitality of many countries. Improved participation for example, in local and community life (whether socially or economically) has the corollary effect of improving individual and community sense of belonging and hope for the future and thus the important framework for people to take risks and develop new economic businesses etc and thus attract prospective residents, visitors and investors. Moreover, it could also have the potential to improve voting districting, which will make the electoral system more transparent (especially eliminate irregularities in voter registration as well as facilitate the implementation of an electronic voting system), thus improves citizen participation in the democratic process. Additionally, an addressing system could facilitate the security of tenure and provide a unique opportunity for the local population to have a land valuation.

In modern democracies, such systems are part of the fundamental rights for each citizen who expects to be located (having an address) and accounted for. An addressing system that discriminates along the lines of accessibility to thoroughfare, location, income and legality in relation to the land (formal/informal), reduces individual and community's sense of security and thus effects economic opportunities and growth for businesses and local residents. Thus the inclusion of local populations in

any associated street addressing system projects is paramount. Local residents without address would no longer be considered as anonymous inhabitant of the area. Their needs could better be accounted for in order that the system can be 'owned' and utilized by everyday people so long term and widespread social and economic gains can be made. One of the measures to achieve an everlasting impact and appropriation of the addressing initiative is to foster awareness, education participatory campaigns targeting schools, community groups, civil society and stakeholders (public and private).

5 GEOINFORMATION SUPPORT FOR ADDRESSING

Although not exhaustive, the above examples make clear both the immediate and the long-term benefits of an urban and rural addressing system at various levels. Notwithstanding, there are several foreseeable challenges that might jeopardize a rapid and smooth development and the implementation of a functional addressing system in Africa. A key issue to be resolved is how to manage and represent the data, which is required for an effective addressing system. Spatial location services (including situs address) are vital for the links to be established between Geographic Information Systems (GIS) technology and the data, which is collected, stored and used by governments, private sector, utilities and civil society. GIS can provide an ideal interface upon which to design the database that will store the address information, manage the contents (performing functions such as capturing, editing, deleting, querying and updating) and visualize the output (e.g., mapping).

This section first discusses the central role GIS could play in supporting the design and operation of a functional addressing system. Second, the components of a broad-based geo-information addressing system are presented. Finally, some key characteristics of a well-designed situs addressing system are highlighted.

5.1 The role of GIS in building and maintaining addressing system

A geographic information system can play a central role in designing a functional data model that allows the user to integrate data from several sources. In that respect, it makes it possible to query, locate and match address based of several entries such as thoroughfares, buildings, parcel or property and landmark. The GIS is an important tool to automate, manage and maintain the spatial and aspatial data, organize property or thoroughfare locator indexes and serve as the repository (database) for all urban and land addresses. The contents would include exact address and metadata, as well as historical information on land, property or building and transaction records. The capacity to make a range of address database queries (e.g., name, area, property identifier, zip code, etc.) could be enhanced and found useful for many applications.

Another important advantage of using GIS as the support tool for a functional addressing system is its capacity to generate positional or geographical addresses (Lind, 2000 & 2001). That is, each address can be defined not only by its physical location, but also by its geographical position, which can be expressed in a standard coordinate reference system. Also, points of interest or landmarks (commonly used in Africa as address locator or its proxy) can be accommodated within a GIS. For example, data collected with a GPS can be entered in the system as address aliases. Such flexibility makes the GIS technology an attractive tool, especially when cross-referencing parcels, properties, homesteads, landmarks, thoroughfares, intersections and other features. This is of paramount importance when the end goal is to create a non-political, standard and matching database. It is therefore advantageous to use

a common agreed coordinate reference system, e.g., WGS84, NAC -Natural Area Code- (<http://www.nacgeo.com/>).

Moreover, an addressing system that seeks to achieve multipurpose and multi-user applications ought to facilitate access to, exchange and sharing of the information available in the database. Such facilities will ultimately add value to the data and information of thoroughfare and properties as well as generate potential interest for new economic and research activities and applications. GIS technology (especially its internet based applications) can support this new development and the growing trend of digital and internet users in Africa should type into these new areas. Additionally, in the context of multi-user application of a situs addressing, GIS is a useful technology that can support the management of the metadata base. In particular, an addressing information system could tract historical records of changes, queries and updates, which are critical for further investigations such as dealing with error propagation and monitoring users behavior.

It is also essential that at the conceptual level, a functional addressing system considers the technology to support its management before reaching the implementation stage. For instance, GIS can facilitate the structure and maintenance of address databases, provided that the data are captured and stored in readily available GIS formats and standards. In this sense, house numbering, street naming and property identifying could be consistent and logical. Similarly, considering the importance of effective address data sharing and matching, the addressing data infrastructure should pay particular attention to the issues of cross platform factors (e.g., interoperability and TCP/IP) and flexible database management systems (e.g., integrating spreadsheet applications-Excel, Access, SQL and Oracle- with GIS framework) and the efficient management of complex addressing database.

Geospatial technology (e.g. GIS) is an efficient tool to support the development of a thoroughfare Identifier (TI) and a Property Identifier (PID) number as a permanent referencing key to relate urban and rural parcel, property and thoroughfare descriptions for all participating countries in Africa. Similarly, GIS is an appropriate tool which could provide technical solutions to achieve cross-reference, harmonize and integrate TI and PI numbers with both existing maps (polygons, lines or points) and parcel and property addresses within a single spatial data infrastructure. Such information could be used by various stakeholders (services providers and companies, government, general public (i.e. residents and visitors); user-driven in situs addressing system which integrates formal and informal navigation systems.

GIS technology could also support the visualization of the components of addressing database. For example the quality of the output data should not only respect principles and standards (e.g., cartographic for hard and soft copy maps, and static and dynamic mapping), but also provide options for multiple outputs: texts, graphics, statistics, tables, reports (e.g., historical evolution of land transaction in an area). Although, these principles may not be a priority for some stakeholders, it is important to be aware of the capabilities of the spatial information technology, especially in relation to its impacts on economic development opportunities and the ranges of addressing applications.

There are now emerging addressing software that are either built in-house or available as adds-on applications from commercial GIS software. For example, ESRI has compiled a various addressing models and software applications that are worth considering if ESRI products were to be used in the design of an addressing data infrastructure (see ESRI models at <http://support.esri.com/datamodels>). Other addressing software include Cadix, Cityvia, Urbavia and Viziroad (Farvacque-Vitkovic *et al.*, 2005, p.46).

5.2 Spatial Data Infrastructure for a situs addressing system

One of the main advantages of a functional addressing system is its capacity to accommodate a range of spatial and aspatial data, which the country deems relevant. This versatility constitutes a serious advantage for various addressing stakeholders who can adapt and expand on the existing address database according to their individual needs while at the same time, being part of a standardized, countrywide system or framework. The composition of a situs addressing system discussed in this section takes into account a broad spectrum of potential users. The composition discussed below, encompasses aspects of thoroughfare, cadastre (and more specifically land information system) and census. Box 5 lists the potential contributions of a land information system to a functional addressing system. The geometrical information could be of high relevance in the context of e-addressing and e-land administration. Street and/or land parcel can be visualized to appreciate the location as well as to perform interactive mapping, evaluate the distance or size, access property report, get an updated on the property valuation, obtain sales information, etc.

Box 5: Potential contributions of a land information system to a functional addressing system

Geographic references (or coordinate references); point coverage or landmark; city name; municipality or sub-division; region; postal or zip code; parcel or property unique identifier; size of the plot; survey identifier; accuracy indication (margin of errors); easements or right of way; structure visibility from main road (for emergency and fire); status of the property or building (empty, occupied or abandoned); source data; type of land use (business, residential, public, etc); size of the plot/property and dwelling; title number; land market value (or valuation number); land taxable value; improved land market value; land taxable value; most recent sales date, second, third, etc.; sales dates; number of living units; storey height; basement; year built; year remodelled-renovated; total rooms; number bedrooms, number of bathrooms; building material; utility billing numbers (e.g., water, electricity and gas); information updated; plan of the plots (as an image) ; emergency access; building frontage; building centroid.

Thoroughfare information for an addressing system database include names, road centreline, type (Rd, Hwy, etc.), level (national, local, etc.), material (e.g., asphalt, gravel), width, length, number of ways, traffic conditions, unique road identifiers, prefix direction, suffix direction, road segment identifier name, thoroughfare locator (as a number), link to the thoroughfare associated map or nearest landmark, vehicle restrictions (e.g., tonnage) and thoroughfare segments with embedded address ranges (address range to left, address range from left, address range from right, address range to right), which could be useful for navigation purposes. It is also important to address public and private infrastructures of interest such as traffic lights, taxi stand, telephone booth, water and fire hydrants, escape roads, emergency exits, water holes, etc. Emergency services for example could use addresses such as emergency exits, fire hydrant and water holes for their operational responses.

Relevant census and population attributes relevant for an addressing data infrastructure may include personal information (owner's contacts, telephone, emails, profession, etc), information on the composition of the household (e.g., age, gender, marital status, education, health, occupation and income, employment, mobility, etc.), billing address, etc.

The flexibility of the system and its capacity for country specific modifications according to a range of factors is important to note. An individual country, for example, can populate or select relevant entries for their respective addressing database according to their priorities. At the same time, it should be stressed that the more information an addressing database contains, the higher the likelihood it could be used by

various stakeholders (e.g., governments, civil society, business community, utilities and emergency services) to overcome their shortage of and need for accurate and up-to-date land and thoroughfares information for improved decision making process. For safety and security reasons, some information in the addressing database can be restricted to specific users with defined disclaimers, copyrights and standards on their access, use and transfer.

5.3 Desirable Features of a Good Situs Addressing System

It is important to understand the determinants of a good situs addressing system. Such an understanding will increase users' knowledge and serve as a 'checklist' when designing and operating a functional addressing system. While the ten criteria discussed below are not exhaustive, they would serve as a good benchmark to improve on the existing situation in several Africa countries.

- A good addressing system should be easily **identifiable** (facilitate the location), understood, informed by and ultimately useful and accepted by the users. For example, sign posting should be representative of the local culture and place, be legible as well as visible. The respect of this principle will eliminate the prevailing superimposition of 'popular' and 'official' names, and also promote a clear identification with the system (e.g. name, number and sign). Similarly, eliminating same-sounding names will facilitate easy address identification, especially when background noise or interference is likely to occur.
- The addressing system should promote **accuracy and reliability** of the data and information. The information in the database should be frequently updated and its accuracy checked.
- The information and database should be **accessible**. For example, participating stakeholders (including public, private and general user) should be able to not only access the system but to understand and utilize it as well. In doing so, there will be a good probability that users will remember the parcel or thoroughfare identifier and thus the information they need. Similarly, the personnel responsible for maintaining the system should be able to assign, update and edit the database (thoroughfare and parcel).
- The **simplicity** of the addressing system should be emphasized. For instance, the situs database should be easy to understand and maintained, the sign posting and naming should be reasonably permanent and easy to identify by both locals and visitors alike.
- The **uniqueness** principle should be applied on both parcel and thoroughfare identification. For example, to avoid identification errors (omission, commission, mis-identification and non-identification) and facilitate database query and management, it is important that each parcel and thoroughfare has a unique identifier and/or name (Ezigbalike, 1996). It is highly recommended that, whenever possible, thoroughfare should maintain a single name, even when it crosses various communities. However in developing a name, again, it is important that local knowledge and ways a thoroughfare or place is identified and taken into account. If this occurs and a single and mutually agreeable name is developed, the address database will eliminate confusion, dualities, overlapping and the necessity to know local subdivision to navigate and locate a property or an address.
- **Consistency** is one of the key principles of an effective situs addressing, which facilitates identification (e.g., avoid thoroughfare names with similar sounding names: Fehta St and Faetah

St). For instance, a vital starting point for thoroughfare numbering is that it should be assigned the same way throughout the addressing area. In particular, the numbering system should be coherent, independent of the region, suburb or municipality. An association of odd and even numbering system is encouraged. The common practice is to assign odd numbers on the left side of the street and even numbers on the right side of the street, from the point of its beginning. In doing so, it becomes automatic to mentally capture and localize on which side of the thoroughfare a property could be located. The odd/even numbering system should, however, accommodate intermediary number (in case new dwellings were to be added or in case of re-parcelling). Similarly, the parcel numbering system should follow a set standard. Developing a set of situs addressing standards is an effective way to achieve consistency. Such standards include thoroughfare numbering and naming, signage design and posting, numbering design and posting, property numbering, area identifier (zip code or postcode) and database.

- A good situs addressing should have a **broad-based approach, homogeneous and can be transferable to various stakeholders**. It is important that the public, private and general public be able to use the same database for instance to locate, navigate and access any physical address in the area. A multipurpose addressing system will be used by a variety of stakeholders and participating institutions and bodies.
- An addressing system should also be **logical, sequential and practical**. The consecutive numbering system is important for an easy identification of an address. Similarly, the respect of a spatial ordering reinforces the functionality of the addressing system. For instance parcels, which identifiers are close to each other in sorted sequence, should also be close on the ground.
- The **flexibility** of an addressing system facilitates its maintenance (e.g. updates, changes and deletes). Properties and thoroughfare can evolve rapidly and the system should be able to readily accommodate updates such as name and number, use, classification (from agriculture to residential), subdivision (new dwellings, buildings or re-parcelling), owner, occupancy, etc.
- The addressing system should be **cost-effective** and promote **public participation**. The implementation and maintenance of the situs addressing should be tailored to the financial capacities of the municipality or country. As already mentioned, with a strong awareness campaign, it is beneficial to involve local residents, general public and stakeholders in the addressing process. Local residents can actively participate and contribution at various in various ways including thoroughfare identification and naming, production and posting thoroughfare and property signs (using local products) and financial contribution for property sign posting.

These ten key principles are useful pointers to consider when developing a situs addressing system. While some of these suggestions are based on the experience of developing countries, they have relevance to the African context, especially when assessing current practices in some parts of Africa.

6 ADDRESSING SYSTEMS IN AFRICA: COUNTRY EXPERIENCES

As a discussion paper, contributions from interested stakeholders are sought. In particular, this section will be filled with contributions from experts and country representatives at the ad hoc experts' group

meeting. Relevant experiences and case studies discussed during the expert group meeting will enrich this section. Anticipated African country's reports include Nigeria, South Africa, Morocco, Botswana, Cameroon, Ethiopia, Burkina Faso, Republic of Congo, Zimbabwe and Benin.

7 ADDRESSING IN AFRICA: MAIN CHALLENGES

This section outlines some of the key challenges that African countries may face in their quest to develop and implement a sustainable national and cross-continent addressing system. In order for a situs addressing initiative to succeed, it is anticipated that some key factors have to be taken into consideration. This section attempts to account for these difficulties and proposes guidance to ensure that they have been mainstreamed in the addressing project. There is also a hope that comments and input from various stakeholders, interest groups and experts will also help formulate practical solutions to address potential challenges. In the African context, these challenges include data, land issue, slum areas, technology, skills, political will and funding.

The issue of data availability and reliability constitutes one of the serious challenges that an African government could encounter when engaging in an addressing system. Although one of the outcomes of the addressing initiative will be to improve the availability and reliability of data, mechanisms to enact the process are currently underdeveloped and unclear. In the context of situs addressing in particular, it is vital that each country has a good understanding as well as clear answers about how to gather and store data. Table 1 provides an example of checklist to guide country in handling addressing the data issue.

Table 1: Addressing database checklist

Address data	Yes	No	Comments
The type of data to be used and their relevance are defined			
An appropriate data format is in place			
Methods of data collection and production are known. Similarly, data standards, core datasets and metadata are available defined			
Data for building the address database are readily available and accessible. Thoroughfare and property indexation systems are defined			
Mechanisms are available for sharing, matching and integrating address database as well as for making the information available and accessible are understood and clarified			
The issues of data use (e.g., copyright, privacy), custody are addressed Thoroughfare and property addressing plan is defined			
Methods to ensure data accuracy and reduce error propagation within the database are in place: [Mechanisms to identify, tract and correct errors (e.g., entries)]			
The addressing system is integrated into the National Spatial Data Infrastructure and e-strategies as part of the core dataset			
The decisions-impacts and cooperation benefits of address database output are assessed			
There is an effective data awareness campaign			
Methods of data dissemination (clearing house, geoinformation networks, web-mapping facilities, e-addressing, etc.) are clarified			

In Africa, land related issues such as cadastral, tenure land record and property rights are critical for a useful land information management. In the past, these issues were considered impediments to the implementation of a functional addressing system. It is now possible to overcome these issues and conceive of an addressing system that takes into account any parcel and building that can be identified. For example, plots, building or parcels without direct access to motorway thoroughfares (e.g., slums and rural areas) should be identifiable through an addressing system, mainly for navigation and accessibility purposes. Parcels and buildings accessible through stream or channels as mode of transportation, and railways as main thoroughfare should also be named and numbered. It is equally important that unregistered land or building and customary land is accounted for in an addressing system. There should also be a system in place to name and number multiple dwellings or households in a single 'compound'.

It is common that landmarks and proxy addresses are used in Africa as a default address location. A functional addressing system should make use of such name and places of interest so that the

population can easily connect to the system. It is, therefore, recommended that landmarks (e.g., as alias address) be incorporated in an addressing database along with standards for thoroughfare and property naming and numbering. Similarly, 'popular' thoroughfare names should take precedent of 'official' names.

The technology to support a comprehensive addressing system may not be readily available in several parts of the continent. It is therefore important to approach the addressing system with the view to acknowledging that there are technological limitations and constraints for some participating countries. For the addressing information system and its database development, these limitations could be expressed in terms of access and availability of software and hardware.

This paper advocates that the emphasis should be on the end-user of the addressing system. The technology should serve as the support (not the means) for the addressing system that can work in an Africa context. A comprehensive framework and system (e.g., address database management system) should be put in place to ensure the recording and updating of addresses, while controlling error propagation within a shared and multi-users database. Similarly, depending of its level of technology and resources, each country can use various means to make the address and land records: paper maps, computerized data and internet (e-land). There are several database management systems now available ranging from low to high cost. It is, therefore, important that each country assesses and selects a system that suits its technical and financial capabilities.

A country should also carefully consider the referencing system to be used. It is recommended that a commonly used system such as WGS84 been used for data sharing purpose (ECA, 1998). It is critical to develop common and shared expressions and terms as long as these can adequately reflect the countries that constitute Africa.

Similarly, particular attention should also be taken when choosing the address hierarchical model (e.g., names, alias definition and reference). To improve the flexibility, this paper recommends a hybrid model that could accommodate names, aliases and geographic references. A careful choice of a common geographic referencing system (e.g., WGS84), ontology and the hybrid model will ensure greater data sharing and matching ability.

Designing and implementing a functional addressing system also requires a strong and capable workforce. Most countries have a skilled workforce that could successfully implement the addressing project in their respective municipality or country. Some staff members may need additional training to strengthen their ability to undertake the project. The capacity for long-term education training personnel to operate and re-engineering the system (in public, private and professional organizations) should also be sought. In Mauritania for example, specific school programs have been developed to foster the use of awareness of addresses. There could also be a need to train mainstream and target users (ambulance services, taxi and transport operators, law and order agencies, etc) in the use of situs address in their respective operation. Nonetheless, each country should be able to identify those needs and could use a range of instruments to encourage and foster the use of a standard address. This background paper contributes in the process of building the knowledge around the addressing initiative and supporting its implementation in participating countries.

As discussed previously, another challenging issue is to ensuring local residents are engaged and citizen participation maximized. It is important to design and implement a national addressing system with the broad-based users (residents, utilities, governments) in mind. That is, an addressing system that could

be used by the majority of the citizen, including those with low literacy. The addressing system should therefore be relevant to local people as well as being sensitive to their cultural identities and needs and literacy levels. To achieve such sensitivity, it is imperative to implement a development process that is 'bottom-up' and an addressing system that is also reflective of local residents realities. An awareness campaign on the issue of communication could be used to support the addressing project for example. One of the positive corollary effects of engaging citizens is a reduction of user and public resistance to the addressing project and greater long-term ownership of the system adopted. Local residents can resist or oppose to the project partly because they are not well informed and involved in the process. Some business activities might prefer the prevailing system and would perceive additional cost of conducting their activities. These possible costs include re-advertising, printing new signs and business cards, informing customers and relatives). Highlighting the benefits for their business could also diffuse the resistance

A critical factor to the overall success of an addressing system and citizen participating is the introduction of appropriate institutional arrangements by the central government. Such arrangements may entail new regulations, legislations and the clarification of relationships, roles and responsibilities between the government (public) and other stakeholders (municipalities, private sectors, partners and professional bodies). It may also require new forms of cross-country communication to ensure state boundaries are not barriers to the addressing system's success. Regulations should also be put in place to deal with enforcement mechanisms, and legal and financial responsibilities. Governments should be proactive take the lead on ensuring the development of a system and all land administration activities should be concentrated into one government body or department to ensure efficiencies (providing the right checks and balances and consultation mechanisms are also put in place). The nominated department should have the data custodianship, thus the authority to maintain and manage address related database, perform periodic update (monthly, weekly, etc.) according to set mechanisms (e.g., internet, fax and courier), assure quality control, and liaise with addressing partners and interest groups.

For institutional arrangements to succeed, addressing system needs strong political will and commitment, which can be achieve through democratic process but also good internal and external communication methods. The ability of a situs addressing project to overwrite political party self-interest can be seen as an example of its success. For example, one way to avoid renaming a thoroughfare after a 'regime change' is to avoid naming thoroughfare after a living figure (person) or with partisan connotation.

It should be recognized that in discussing the importance of developing improved systems, and encouraging citizen participation, that the cost of implementing an improved addressing system is overlooked. This report recognizes that the financial cost can constitutes a serious deterrent for the implementing a functional addressing system for many African countries. However, considering the overall benefits for various stakeholders the initial investment cost should be seen as a strong incentive. Government should provide, not only a conducive environment (e.g., legal, political, governance, etc) for an addressing system to proceed, but more also consider an address as a key public development strategy and infrastructure in its budget. Besides, a well-conceived situs addressing could have several cost-recoveries mechanisms (e.g., services with fees, advertising on sign posts) that ultimately offset the expenses. Once local community and private businesses (e.g., services providers and postal services) are well informed and aware of the benefits of a functional addressing, they will be more likely to contribute and fund the project. There are also several financial partners and business interested in funding addressing project. The French Cooperation and the World Bank have fund several addressing projects in (mostly French speaking countries) in Africa. (Farvacque-Vitkovic *et al.*,

2005). A list of potential partners is available in appendix 3. It is also important to build up a strong addressing network in Africa and around the World so that the goals of social and economic prosperity can truly be pursued.

Implementing addressing project requires guidance on practical aspects such as sign posting, thoroughfare and property numbering formats and naming codes. Appendixes 1 and 2 make recommendations on such specific aspects. One component of this addressing initiative consists of selecting a pilot area to implement the project and evaluate its performance in order to improve the overall recommendation. The test case, along with country experiences will help improve the standard addressing project.

8 RECOMMENDATIONS AND THE WAY FORWARD

This section provides general recommendations for a successful functional situs addressing system in African context. Recommendations discussed in this section are derived from the above analysis of the characteristics of a well-designed addressing system, and lessons learned from other situs addressing experiences. Considering the broader understanding of situs addressing in Africa and the need to develop a standard to support the implementation, the paper recommends the development of a **situs address ontology** (semantic) to harmonize the common understanding.

Another important consideration is the development of a strong **awareness and publicity campaign**. To seek input from all sectors, including both public and private, will achieve greater adherence and support. Such a campaign could use a variety of media and formats (wherever appropriate) which include radio (talk back), map guides, post maps of the neighborhood with thoroughfare names on the notice board (e.g., Ivory Coast and Niger), television, video and short films, letters, newspaper and newsletter, public notice, logos, banners, posters, volunteering, rallies and meetings.

As suggested a number of times in this report, the situs addressing guidelines and the subsequent standards should **reflect Africa realities** and in doing so, gain widespread public support. They should also develop easy to follow procedures, be cost effective and promote economic development. The standard situs addressing system should provide the general framework, and yet should also be flexible enough to accommodate countries' specificities, diversities and dynamics such as culture, land administration or cadastral system, stage of development, development priorities, relationship of citizen to land, and existing addressing system.

For a situs addressing project to be successful, strong **institutional arrangements** are recommended, particularly in government and between the range of private and public stakeholders with clear responsibilities outlined for each. An addressing authority (with a technical committee) can be put in place to oversee the project, including developing standards, validation naming, managing the addressing database, ensure that the major principles of property and thoroughfare numbering and naming are followed (e.g., consistency, uniformity, uniqueness and accuracy). The role of local municipalities in a decentralized management system could contribute to reduce some bureaucratic bottlenecks. At the same time, accountability measures should also be put in place to ensure outcomes are prioritized and met. To achieve such aim, it is critical to develop and strengthen accountability and governance mechanisms, as well as encourage stakeholders partnership and to ensure public participation.

The addressing project should also develop a **series of comprehensive policies and standards** and a clear methodology to define, document and maintain a thoroughfare and property address system which will be used, for example, to assign origin and direction of increasing house numbers, thoroughfare frontage intervals (whenever appropriate), thoroughfare sign post, naming, mapping, and odd and even numbers convention (within a GIS framework). It is also important to define a flexible method of boundaries and allocate an easily recognizable unique identification system (e.g. postcode or zip code) to municipalities. In particular, it is advisable to devise a standard area identifier, which may take the form of coding systems by suburbs for example with postcodes, zip codes or municipalities with unique ID, and thoroughfare identifier. There should also be a provision to develop a national standard for situs unique parcel and property identifier associated with geographic location (exact coordinate). The system should be flexible to allow changes and updates, facilitate data sharing so that a tax parcel layer is considered as a spatial information (property location), not only as legal representation (deed description).

There should also be provisions to establish a situs addressing expert group to provide guidance, support and training, and assist countries to implement the addressing system.

9 CONCLUSION

This paper aimed at highlighting the rationale and the necessity for a standard situs addressing in Africa. In doing so, the benefits of situs addressing and the importance of standards were discussed. The review of current addressing status in Africa has shown that despite the various advantages of a functional addressing for the development of the continent, it remains a challenge to navigate in urban and rural Africa without relying on local knowledge. Experiences from selected countries indicated that they are at different stages of addressing implementation. The role of geospatial technology to support the various components of a broad-based addressing system was discussed to demonstrate that at the conceptual level, a functional addressing system should consider the means to support its management before reaching the implementation stage. It was noted that achieving a functional addressing system entails several challenges, which include data, unplanned developments, funding, political will and technology. Several measures were identified to address those challenges. Recommendations were also made to ensure a satisfactory implementation of a broad-based, multipurpose and multi-user functional addressing system.

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APPENDIX 1: SUGGESTED THOROUGHFARE NAMING AND CODING

Highway (Hwy)	Drive (Dr)	Plaza (Plz)
Avenue (Ave)	Court (Ct)	Village (Vil)
Boulevard (Blvd)	Lane (Ln)	Compound (Cpd)
Road (Rd)	Loop (Loop)	Square (Sq)
Ring Road (Rrd)	Circle (Cir)	Point (Pt)
Street (St)	Path (Pth)	River (Rv)
Freeway (Fwy)	Passage (Psg)	Stream (Stream)
Bypass (Byp)	Tract (Trak)	Railway (Rwy)
Expressway (Expy)	Trail (Trl)	
Parkway (Pkwy)	Terrace (Ter)	
Way (Way)	Place (Pl)	

APPENDIX 2: PHASES OF ACTIVITIES FOR AN EFFECTIVE IMPLEMENTATION OF SITUS ADDRESSING

Table 2: Designing and Implementing an Addressing System

	Tasks*	Responsibility
1	Define general framework	ECA, Respective governments
2	Enact addressing frameworks and guidance Developing standards and geospatial technology support	CODI- regional sub-regional and Respective governments-ECA
3	Institutional arrangements: policies, legislations, etc.	Ministry-governmental level: budget,
4	Implementation	Municipality and local government-financial partners
5	Follow-up and maintenance	Municipality-Governments
	* These tasks are neither exhaustive nor necessary in a chronological order	

Table 3: Addressing implementation phases

Tasks*	Comments
Commit to situs addressing project (ordinance?), budget, planning	Enact ordinance, allocate budget, planning
Adopt standards Enact addressing ordinance incorporating standards	Thoroughfare and property naming, numbering, sign posting, road signage, data, map, etc
Establish a situs addressing team/task force	The coordinator with duties including overseeing standardization of thoroughfare and parcel numbering, consistency, distribution of roles, timeframe
Clarify roles and responsibilities of participating institutions	Evaluate options/alternatives
Data preparation and residents involvement	Establish mapping unit, identify suitable data
Identify all thoroughfares and properties (survey)	Develop situs address database
Assign name and number according to the standards	
Sign design and posting	
Database maintenance (updates, deletes, additions, etc.) Production of maps	Create series of address maps
Cost recovery	
* These tasks are neither exhaustive nor necessary in a chronological order	

APPENDIX 3: RECOMMENDED AND ALTERNATIVE SOLUTION FOR SITUS ADDRESSING IN AFRICA

Table 4: Functional thoroughfare and property addressing system: a template

Activity	Recommended	Optional	Comments
Thoroughfare Naming	Unique name across jurisdictions (regardless the municipality boundaries) <20 characters Simple, easy to read and remember	Variant suffixes (St, Rd, Ave, Pth, Trl) Use historical considerations Suggest 3-5 names	Use same name and different suffixes e.g., Off Major Rd; Avoid same sounding names, living individual's names Develop naming standard and guidelines
Thoroughfare re-naming	Choose popular names	Suggest new names	Avoid re-naming Involved residents in suggesting new names
Thoroughfare as number system	Replace by a name	Unless chronological/numeric sequence (1, 2, 3, etc.) and easy to remember	Associate with local numbering system (e.g. Arabic): consistent Develop a standard
Thoroughfare name posting	Each intersection Legible, clear, visible, frequent and systematic Accessible Uniform	Reflective at night With municipality and/or landmark	Develop a standard (colors, size labels, arrows, lettering materials, heights, placements, type of thoroughfares, etc.)
Thoroughfare naming format	Name + Suffixes	Associate Prefixes+ name + suffixes	e.g., Menelik Ave, Avoid name duplication: e.g., Mango St and Mango Rd Develop standards
Material to use	Local material Durable	Imported and durable material	e.g. engrave names on the wall (carved techniques*)
Numbering	Sequential Consistent/consecutive Chronological Odd/even	Roman letter an numbering system (e.g. 1,3, 5, 7...and 2, 4, 6...) Metric (in planned areas)	Should allow update without altering the chronological numbering system
Sign posting	Bi-directional Each intersection with	Major intersection Use existing posts (power,	Involve local population Has St name and

	indicating Number	telephone), façade structures, etc.	Number Sign design standard
Choice of name	Resident choice	Propose names and for local to select	Easy to write, short (<20 characters)
Thoroughfare classification	By size (Hwy, Ave, Rd, St, trails...path)	Associate length and width/size	Add pathway to the classification to accommodate building without direct known road frontage
Beginning point	From the 'centre', CBD or main Rd (outwards)	From the main thoroughfare or landmark Divide the city in quadrant (E,W,N,S)	Consistent
Odd/even	Odd to the left (1,3, 5...) Even to the right (2, 4, 6...)	Consistent with existing allocation	Start from the beginning point
Number/frontage interval	Flexible (not fixed as parcel size varied)	Average size of parcels in planned areas	Consistent in planned areas with same plot size
Property numbering	Unique Consecutive Sequential	Vary across regions but different suffixes Metric	Establish a detailed standard
Posting property number	Visible from the main frontage (entryway)	On the main entrance if structure far away from the road right-a-way	Develop a standard (color, size, responsibility, etc)
Property identifier	Unique across the nation	Regional/local municipality code	Easy for national property and building database management
Landmarks and place/object of interest	Use as thoroughfare name Sing-posted	Associate with sign and name posting As prefixes or mixture or below the main name	e.g. Airport Transit St North Bole Ave Station Rd
Building with No access to known road	Use proxy or path	Associate with landmark	Use landmark
Parcel address	One address for one parcel record (Unique Property Identifier)	Multiple addresses for compound (or complex) with various households	Use suffixes (e.g. 34A)
Sub-lot or sub-parcel	Use Unique Parcel Identifier	Use Suffixes	
Allocation of UPI	By the municipality	Office of land	Following a national

		administration (with municipality involvement)	standard or general guidelines
Financial and technical considerations	Adapt to country capacity	Resident participation Bi/multilateral cooperation Private and utilities	ECA technical assistance (standards, ordinance, exchange experience)
* The carved technique consists in engraving the name and/or number of street on a frontage of a building using locally made tools and paints. This technique was developed by a group of unemployed youth in the Nouadhibou (Mauritania) and since then has been replicated in Mali (Farvacque-Vitkovic <i>et al.</i> , 2005, p.75)			

APPENDIX 4: POTENTIAL ACTORS, BENEFICIARIES AND PARTNERS IN AN ADDRESSING PROJECT

Institution type	Name
International financial institutions	<ul style="list-style-type: none"> • The World Bank • International Development Bank • African Development Bank • European Union (e.g. UrbAI programmes) • OECD (Organization for Economic Co-operation and Development)
Organizations and programmes of the UN	<ul style="list-style-type: none"> • UNECA (United Nations Economic Commission for Africa) • UN-Habitat • UNDP (United Nations Development Programme) • UNRISD (United Nations Research Institute for Social Development) • UNEP (United Nations Environmental programme)
Regional organization	Africa Union ECOWAS Etc.
Inter-agency programmes	Urban Management Programme (UMP) Municipal Development Programme (MDP) Cities Alliance
Bilateral cooperation agency	French, Dutch, British (Department for International Development-DFID), American-USAID, German (German Development Agency or German Technical Cooperation-GTZ), Japan (Japanese International Cooperation Agency), Norwegian (Norwegian Agency for International Development-NORAD), Swedish (Swedish International Development Agency-SIDA), Italian, Canadian (Canadian International Development Agency –CIDA), Finnish (Finish International Development Agency-FINNIDA), Danish (Danish International Development Agency-DANIDA), Swiss (Swiss Development Cooperation-SDI) etc.
Networks	<p>International associations and networks of local authorities e.g., International Union of Local Authorities (IULA), CityNet, The United Towns Organization (UTO), Metropolis, Shack/Slum Dwellers International-SDI, etc.</p> <p>Professional associations e.g., International Association of Town planners, the International Federation of Surveyors (FIG), Union of African Towns, World Assembly of Cities and Local Authorities Coordination, Network Association of European Researchers on Urbanization in the South (N-AERUS), World Federation of United Cities (FMCU), International Association of Mayors of Wholly or Partially French-speaking Capital Cities and Metropolitan Areas (AIMF), etc.</p> <p>Foundations (Gates, Clinton, etc.), associations and international NGOS (Care, Canadian International Development Agency, USAID, etc.)</p> <p>Experts, researchers and international networks</p>
National and local bodies	<p>Central government entities: e.g., ministries dealing with land, planning, infrastructure, services, administration, education, health, etc.</p> <p>Sub-regional entities e.g. states, regions, provinces, etc.</p> <p>Government agencies, authorities and statutory bodies such as land development agencies, Housing development authorities, roads and</p>

	<p>infrastructure development bodies, taxation office, tourism, electoral commission, census bureau, security and law and enforcement (police), ambulance, mapping, postal services, etc.</p> <p>City council, municipalities and local governments</p> <p>Local partners of international networks, associations (e.g. real estate), financial institutions, etc</p> <p>Local NGOs</p>
Private sectors	<p>ESRI and mapping agencies</p> <p>Utilities companies (Gas, electricity, water, sanitation and sewage, garbage collection, etc.)</p> <p>Chamber of commerce</p> <p>Real estates and land developers</p> <p>Advertising companies and insurances companies (estates) and banks</p> <p>Courier and postal services (e.g., DHL, EMS, etc.)</p> <p>Telecommunication (e.g., mobile telecommunication providers: MTN; vehicle tracking devices (recover stolen vehicle), customer management agencies, marketing agencies, emergency services, etc.)</p> <p>Taxi operators</p> <p>Transportation services and companies</p>
Grassroots level	<p>Community-based organizations and residents associations/groups</p> <p>Religious and community leaders</p> <p>Youth and women groups</p> <p>Local business interests</p>
Media	<p>Television</p> <p>Radio</p> <p>Newspapers</p> <p>Billboards</p>
Research	Health, crime and poverty analysis
Others	Fundraising through individual support, charity, etc.
Cost recovery mechanisms	Advertising on thoroughfare sign posts, services with fees, residential and properties taxations, cartography products, etc.