

# Proposed criteria for the evaluation of an address assignment scheme in Botswana

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## Abstract

An address assignment scheme identifies the components that make up an address and describes how values are assigned to these components. Address assignment schemes vary from country to country and there is often a strong cultural, religious and traditional connotation to them. We describe the current situation of addressing in Botswana, which is currently drafting a proposal for an address assignment scheme for location and postal addresses as part of the 'Addressing Botswana' project. The Universal Postal Union (UPU) has an initiative, 'Addressing the world – An address for everyone', which aims to raise awareness on the importance of addresses as an essential part of the socio-economic infrastructure of its member countries. Within ISO/TC 211, *Geographic information/Geomatics*, the ISO 19160, *Addressing*, project is developing recommendations for the development of international standards to facilitate address interoperability. Drawing on these initiatives, we initiated a research project that aims to support the Addressing Botswana project. Focusing on the address interoperability of the ISO 19160 project, we firstly look at address assignment scheme. Based on this, a unique address assignment scheme for Botswana will be proposed. In this paper we propose criteria for an address assignment scheme in Botswana: a single set of place or area names; different addresses types for urban, rural and farm areas; principles for address numbering assignment; integration of different referencing systems; and a single authoritative master database of addresses.

## 1. Introduction

An address assignment scheme identifies the components that make up an address and describes how values are assigned to these components (ISO 19160, 2011). Address assignment schemes vary from country to country and there is often a strong cultural, religious and traditional connotation to them. In many Euro-centric countries the address assignment scheme is based on thoroughfares or streets. It usually consists of a hierarchy of place name, street name and address number, with numbers assigned sequentially along the street. Japan has a different style of addressing: its address assignment scheme consists of a place name, block identifier and house number (Akeno 2008). In Africa, rural settlements, and sometimes even parts of cities, are not necessarily formally laid out in streets or blocks. A well-defined addressing system holds benefits to the economy, society and governance of a country (CODI-Geo/DISD 2005, Coetzee and Cooper 2007a, Farvacque-Vitkovic 2005, UN ECA 2011).

Botswana is currently drafting a proposal for an address assignment scheme for location and postal addresses as part of the ‘Addressing Botswana’ project (Makhupe 2010). The work reported in this paper is part of a research project that aims to propose an address assignment scheme for both location and postal addresses in Botswana. To address interoperability of the ISO 19160 project, we focus on the address assignment scheme. Based on this, a unique address assignment scheme for Botswana will be proposed. For Botswana it is important that parcels, thoroughfares, buildings and properties are addressed, even if streets are not formally laid out or named. We are participating in the ‘Addressing Botswana’ project and hope that the results of our research project will assist Botswana to adopt a scheme that conforms to international good practice, while at the same time being suitable for Botswana’s unique situation.

The ‘Addressing the world – An address for everyone’ initiative by the Universal Postal Union (UPU) aims to raise awareness on the importance of addresses as an essential part of the socio-economic infrastructure of its member countries (UPU 2009). This initiative confirms the importance of our goal to propose an address assignment scheme for Botswana. Our work is also relevant to other countries in Africa.

The review of existing address standards, as part of the ISO 19160, *Addressing*, a project within ISO/TC 211, *Geographic information/Geomatics*, shows that address interoperability is facilitated through one or more of the following (ISO 19160, 2011):

1. An *address assignment scheme*, i.e. how addresses are assigned in the physical world.
2. *Terminology* that is used to describe the address assignment scheme and/or concepts in the conceptual model.
3. A *conceptual model* that describes addresses, i.e. the meaning of concepts and relationships between them. The conceptual model usually reflects the address assignment scheme that is in use in the physical world.
4. *Metadata* that provides information about the address data, such as the custodian, lifespan, status, etc.
5. An *encoding* of the conceptual data model, i.e. the format to be used in data files or electronic messages when exchanging one or more address data records.
6. *Address data maintenance*, such as address data quality management, address life cycles and address aliases.
7. Specifications for the *rendering* of addresses for display on mail items, forms, maps, etc.

Currently our focus is on the address assignment scheme. Terminology in Setswana and English, as well as a conceptual model, will follow later.

The remainder of the paper is structured as follows: first we describe the current situation of addresses in Botswana and the ‘Addressing Botswana’ project; subsequently we propose criteria for an address assignment scheme for Botswana after we based on international good practice.

## 2. Addresses in Botswana today

Botswana, officially known as the Republic of Botswana (Tswana: *Lefatshe la Botswana*), is a country in Southern Africa. It used to be the British protectorate of Bechuanaland and Botswana adopted its new name after becoming independent within the Commonwealth in 1966. The country is predominantly flat and approximately 70% is covered by the Kalahari Desert on the western side. It is bordered by South Africa to the south and southeast, Namibia to the west and north, and Zimbabwe to the northeast. It meets Zambia at a single point.

Botswana has a population of just under two million people. When it gained independence, it was one of the poorest countries in Africa, but since then it has transformed itself, moving into the ranks of middle-income status to become one of the fastest growing economies in the world. Western influence is most prevalent in urban areas, while many traditions, differing from region to region, persist in rural areas and influence the layout of rural villages (Botswana Tourism 2011).

Botswana needs a proper addressing assignment scheme. Currently the country uses the cadastre data as the main means for identification, location and orientation (DISD/ECA 2005). Although the system is useful for administrative purposes, it is less effective for identifying and locating places of interest. Saghir's (2008) analysis reveals that people in Botswana use all kinds of road side prominent structures to describe the location of the address, and plot numbers are used as house numbers, a trend that appears to be used in many African countries. After an area has been surveyed by the land departments, some maps exist. However, the plot number is still used as a reference for a piece of land, based on a sequence number assigned in sequence of when the house was built. This has led to unsequenced plot numbers in the same street, for example, house number 50611 might be found next to number 263 (Saghir 2008). In some villages and rural areas, no plot numbers or street names exist due to the non computerized processes used for the allocation of plots by the Land Boards. The Land Boards administer land in villages and rural areas, while urban areas are administered by city and town councils.

In urban areas, utility companies or service providers (e.g Botswana Power Corporation, Water Utilities Corporation, Independent Electoral Commission (IEC) and others) each created their own numbering systems to locate and identify a household. Street names rarely exist, sometimes there are no signboards on the streets where names do exist and therefore they are not used, and in other cases, the names are duplicated in the same area because of separate data repositories.

In Figure 1, the first picture (Figure 1.A) is an example of a locally designed road name to Guma village. Typically, the roads are started by tourist vehicle tracks (the 4x4 vehicles are the recommended mode of transport because of sand) and later transformed into official roads. The description of where to turn off the road or track is often given by a description such as 'the old car door hanging in a tree' or 'the green bucket with a tyre on a pole' or 'boy scarecrow' as indicated by the second picture (Figure 1.B). These street address signposts best describe what one can encounter when on safari in some parts of Botswana. Finally, the last picture (Figure 1.C) indicates that street names and signposts have been erected in cities and towns. In the villages and rural areas, names might have been given to the major roads but for the most part, people seem to be unaware that they do now have names, because of the lack of signposts.

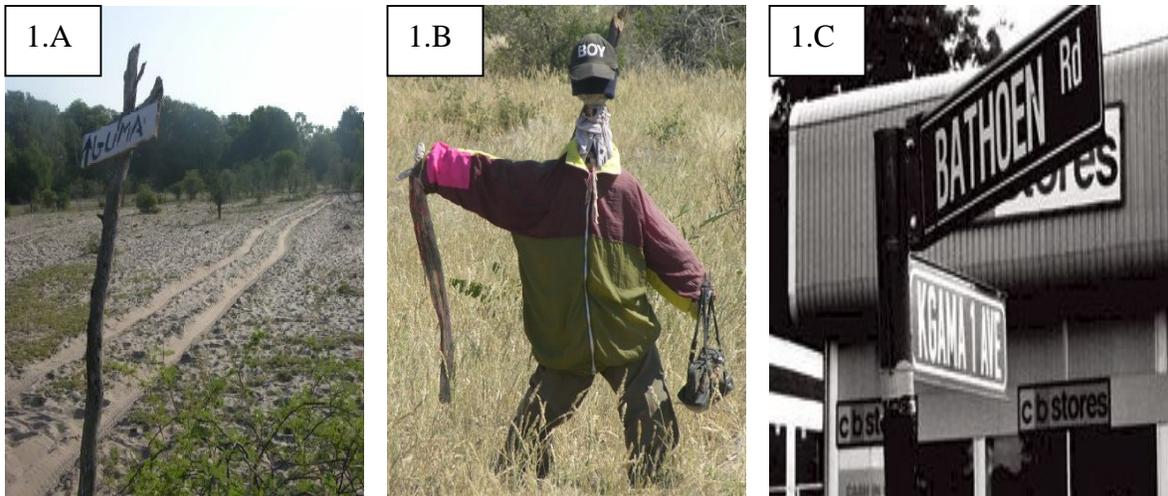


Figure 1: Address signboards or street names seen at Botswana (Sabirdstamps, 2005; Grant, 2011).

When examining the address formats used by the national post office and location addresses, there are no clear guidelines or addressing standards from the Botswana Bureau of Standards. In most parts of the country, addresses have not been assigned and access to postal services is limited to some parts of the country. This hampers service delivery.

### 3. Addressing Botswana project

Botswana is currently drafting a proposal for an address assignment scheme for location and postal addresses as part of the 'Addressing Botswana' project. It is a combination of two projects: firstly, the national system for unique referencing of land parcels and location addresses by the Land Administration, Procedures, Capacity and Systems (LAPCAS); secondly, a postcode and addressing system analysis by Botswana Post. The key stakeholders of the project are the Councils (the local authorities in urban areas), Land Boards (local authorities in rural areas), Botswana Post, the Department of Surveys and Mapping (DSM) and the Ministry of Agriculture. The proposed flow of address data is shown in Figure 2: district, town and city councils provide uniquely referenced land parcels and location addresses for a central database. Botswana Post continuously updates the database with postcodes and postal delivery addresses (Coetzee *et al* 2011).

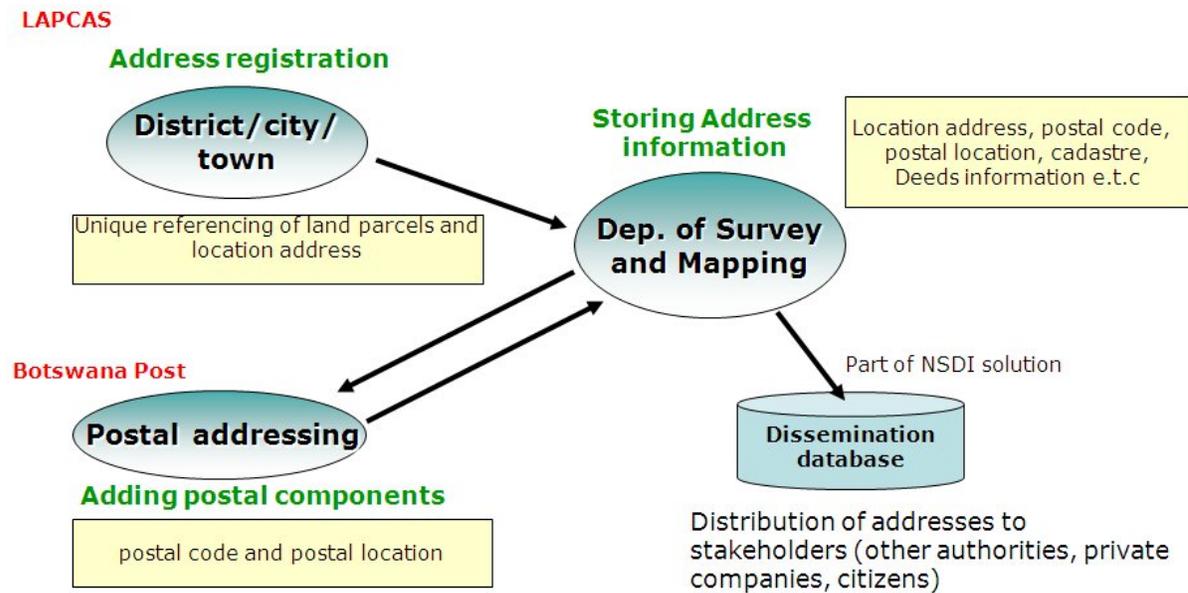


Figure 2: Proposed address flow, Addressing Botswana project (Adopted from Makhupe 2010)

Location addresses, such as those proposed by the LAPCAS project, do not provide a complete answer. This paper proposes criteria for the evaluation of a comprehensive address assignment scheme for Botswana that is suitable for location and postal addressing.

#### 4. Criteria for an address assignment scheme for Botswana

In order to design a suitable address assignment scheme for Botswana, we propose the following criteria:

##### 4.1. A single set of place and area names for the whole country

A single set of place and area names for the whole country (either postal name or place) should be used in an address assignment scheme. This is important so that the entire stakeholder community such as Botswana Post, the IEC, Central Statistics Office and others use a common name to render services to people precisely. The problem of having more than one name results in confusion for address users. This is evident in the case of South Africa, where a place, suburb and post office name can be used in an address. For example, a postal street address for mail delivery and a residential street address for directing someone to the same house. 'Glenstantia' in the postal address below refers to the name of a post office, while 'Constantia Park' in the residential address refers to the name of the suburb, which appears on road signs (Coetzee and Cooper 2007b):

42 Rover Street, Glenstantia, 0181, South Africa (postal address)

42 Rover Street, Constantia Park, Pretoria, South Africa (residential address)

In Botswana, village names are allocated in a participatory process. The chief usually calls the community to a *Kgotla* meeting to suggest the names for the new proposed development of a place or street, and from the caucus, the names will be agreed upon and then submitted to the Land Board for administration purposes. In urban areas, town and city councils are responsible for street naming and numbering and also for erecting signposts on the entire road infrastructure.

#### **4.2. Different addresses types are needed for urban, rural and farm areas**

Different addresses types are needed for urban, rural and farm areas to cater for the different physical layouts of these areas. Further, different address types are needed to facilitate the correct data structuring required for the development and implementation of the address assignment scheme. In cities and towns, the data is already available because of the good infrastructure that is in place. Currently, for villages and rural areas, work is still being done through the LAPCAS project to identify properties from the Land Boards file-based system and also to survey new development areas is in progress. For farm properties, data is available in various formats because the different service providers who were tasked to survey the farms did not follow any standards or guidelines for the data to be interoperable. This is essential so that other stakeholders can use the data. Efforts are being made by the LAPCAS project to convert to a more common platform, for example, the data from the service providers who used computer aided drawing (CAD) software to draw the boundary layouts is not interoperable with that of the Department of Surveys and Mapping, which uses the ESRI ArcGIS Suite for digitizing data.

#### **4.3. Address numbering assignment principles**

The address assignment scheme should make provision for the future expansion of the address numbering system. Addresses are deemed to retire or may be renamed as the number of households in a certain area increases. People in villages and rural areas place their dwellings anywhere they like within certain proximity of their relatives and later report the location to the Chief (the Chiefs work with the Land Boards), who vouches on their behalf so that they can be certified as plot owners. The numbering system is not sequential most of the time; it depends on when the house was built. When a new road is being constructed, people who have dwellings in the new road reserve are relocated to the outskirts of the area resulting in the old addresses being retired and new addresses being assigned. Geo-coding of existing dwellings from topographic imagery data is necessary so that a proper house numbering system can be implemented and the precise coordinates can be stored in a master database. When people leave villages and rural areas, their dwellings are often dismantled and hence the associated addresses should be retired in the addressing system.

#### **4.4. Integrating different referencing systems**

The address assignment scheme needs to integrate different referencing systems, such as physical addresses (street and site addresses), postal addresses (PO Box and Private Bag addresses), the cadastre (land parcel identifiers) and village or rural addresses, such as those described by Rossouw (2009). Delegates from the 'Addressing Botswana' project visited Sweden's Lantmäteriet and the Gävle Municipality in May-June 2010 on a study

trip to a country with an established address assignment schemes. In October 2009, they visited the South African Post Office on a “look-and-see” exchange programme to investigate the possibilities of implementing the South African rural address assignment scheme in Botswana. They plan to benchmark their implementation against their South African counterparts, as their landscapes are similar.

The UPU S42 standard includes rendering rules for addresses on mail items. For example:

- The last line contains the postcode.
- The second last line contains the post office , place or area name, depending on what is decided in terms of criterion 1 (refer to 4.1).
- The third last line describes the delivery point, e.g. the PO Box or Private Bag number; or the address number and street name.

Such rules from the international standards should be taken into consideration in an address assignment scheme for Botswana.

#### **4.5 A single authoritative master database of addresses**

Finally, it is important to have a single authoritative master database of addresses covering the whole country. The database has to be maintained to reflect the most recently assigned addresses. Such a database will reduce the duplication of effort, eliminate redundancies in address data and improve the accuracy of addresses.

### **5. Conclusion**

We have described addresses in Botswana and the ‘Addressing Botswana’ project, which is expected to pave the way for implementing a comprehensive addressing system throughout the country. We discussed the current status quo of addressing in Botswana and how the absence of a standard and the lack of an address assignment scheme hampers service delivery. We reported here about work that is part of a research project to propose a suitable address assignment scheme for Botswana. As a first step to address interoperability of the ISO 19160 project, we focused on address assignment scheme. In this paper, we proposed the evaluation criteria for this review and for the proposed address assignment scheme. Subsequently, we will develop the Setswana and English terminology that can be used to describe the address assignment scheme for Botswana, as well as a conceptual model for the proposed address assignment scheme.

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### **References**

Akeno K, (2008). Japanese address system, ISO Workshop on address standards– Considering the issues related to an international address standard, held under the

auspices of WG7, Information Communities, of ISO/TC 211, Geographic information 25 May 2008 Copenhagen, Denmark. [Online 27 January 2011]  
[http://www.isotc211.org/Address/Copenhagen\\_Address\\_Workshop/workshop.htm](http://www.isotc211.org/Address/Copenhagen_Address_Workshop/workshop.htm)

Botswana Tourism website (2011). Available online at [http://www.botswanaturism.co.bw/about/geographical\\_info.html](http://www.botswanaturism.co.bw/about/geographical_info.html), accessed 4 February 2011.

Coetzee S and Cooper AK, (2007a). The value of addresses to the economy, society and governance - a South African perspective, *45th Annual Conference of the Urban and Regional Information Systems Association (URISA)*, 20-23 August 2007, Washington DC, USA.

Coetzee S and Cooper AK, (2007b). What is an address in South Africa? *South African Journal of Science (SAJS)*, Nov/Dec 2007, 103(11/12), pp449-458.

Coetzee S, Cooper AK, and Ditsela J, (2011). Towards good principles for the design of a national addressing scheme. Accepted at the *25<sup>th</sup> International Cartographic Conference*, 3-8 July 2011. Paris, France.

CODI-Geo/DISD, (2005). A Functional Addressing System for Africa: A Discussion Paper, available online at <http://geoinfo.uneca.org/addPresRes.htm>, accessed 4 February 2011.

Farvacque-Vitkovic C, Godin L, Leroux H, Chavez R and Verdet F, (2005). *Street Addressing and the Management of Cities*, Washington DC, US: The World Bank.

Grant S, (2011) Heritage, Recently there has been an interesting interchange of views about street signs in Francistown, [Online 27 January 2010]  
<http://www.mmegi.bw/index.php?sid=6&aid=468&dir=2011/January/Thursday27>

ISO 19160, (2011). Draft review summary of project 19160, Addressing, 1 February 2011, [Online February 2011] <http://www.isotc211.org/address/iso19160.htm>

LAPCAS, (2010), Summary Report for LAPCAS Component 1: National systems for unique referencing of land parcels and location addresses, Addressing Botswana Project, November 2010, Botswana. Contact: Andreasson Kristin, LAPCAS Project Leader, Mogoditshane Sub-Land Board, P.O. Box 2, Mogoditshane, Gaborone, Botswana

Makhupe. E, (2010). Location addresses in Botswana, LAPCAS Component 1 and Addressing Botswana Project presentation, Addressing Botswana Project, Botswana. Contact: Mr Edwin Makhupe, National Operations Control Centre Manager, BotswanaPost, P.O. Box 100, Gaborone, Botswana

Rossouw, (2009), International address standard compliance for SA Post Office EE Publishers, [ Online 14 January 2011] <http://www.eepublishers.co.za/article/international-address-standard-compliance-for-sa-post-office.html>

Sabirdstamps, (2005), “A trip through Botswana and the Caprivi” Articles on Birds and Bird Stamps, [Online 27 January, 2010] <http://www.sabirdstamps.com/articles.htm>

Saghir Al Essam, (2008) “Postcode and addressing system analysis” Universal Postal Union, International Bureau, Project Ref: 7502(DCDEV/PAF)

UN ECA (2011). Getting there without getting lost, United Nations Economic Commission for Africa, [Online 4 February 2011, <http://geoinfo.uneca.org/addressing.htm>]

UPU (2009). Addressing the world – An address for everyone. Universal Postal Union, 20pp. [Online 31 January 2011] <http://www.upu.int/en/activities/addressing/addressing-the-world-initiative/documents.html>