“Digital Namibia’’ — a National Geographic Portal data for urban planning

Ntwala Vanessa SIMATAA, Laina Ndategako ALEXANDER, Mario SIUKUTA, Penehafo RICARDO, Menare Royal MABAKENG, Jennilee KOHIMA, Malcon MAZAMBANI, and Elvena HAYFORD, Namibia

Keywords: GIS, Land administration, Namibia, National Geographic Portal, National Spatial Data Infrastructure, NSDI, Spatial planning, Urban planning, Informal Settlements

SUMMARY

Geographic data for planning can help address rising informal settlement challenges in Namibia. Land delivery for housing has been a challenge due to the increase of urban population and slow delivery of land for housing coupled with unaffordability of land. Informal settlements emerge due to limited access to affordable housing, weak governance and exclusion of poor and low income in development interventions. The Namibian government recently declared informal settlements a humanitarian crisis due to precious conditions of limited access to water, sanitation and tenure security. The second National Land Conference led to the prioritisation of urban land reform. The use of spatial data in planning is central to effective project implementation. Spatial planning is the coordination of the relationship between space (including land), people and the space-based functions that influence the living conditions of people. It is the management of change, a political process whereby a balance is sought between all stakeholder interests. It also enables the visualisation of geographical locations’ attributes and metadata (such as terrain and demographic information, etc.) in reading, comprehending, and disseminating scenarios in a spatial development process. This information enables relevant authorities or institutions to implement evidence-based policy decisions and activities. Spatial data is managed in a Geographic Information System (GIS) , which is an important tool in spatial planning as it allows for storing, analysing, and visualizing spatial data to better understand current needs for spatial units (be it urban, peri-urban, or rural areas). The Namibia Statistics Agency (NSA) is the coordinating agency for the establishing of the National Geographic Portal (NGP). The National Spatial Data Infrastructure (NSDI) is managed by the NSA. The NGP host a varied geographic information generated by government agencies that can be accessed and used for planning, socio-economic development, and effective administration of government services. This paper will provide an analysis on the NGP, focusing on efficiency and effectiveness of spatial data retrieval. The paper highlights recommendations for the improvement of the Digital spatial ecosystem for efficient land use planning and land delivery.

“Digital Namibia’’ — a National Geographic Portal data for urban planning

Ntwala Vanessa SIMATAA, Laina Ndategako ALEXANDER, Mario SIUKUTA, Penehafo RICARDO, Menare Royal MABAKENG, Jennilee KOHIMA, Malcon MAZAMBANI, and Elvena HAYFORD, Namibia

1. INTRODUCTION

Land use planning is initiated to ensure proper use of space, natural resources, space-connectivity and a balanced environmental development. Geo-data is important for spatial planning, as it is affordable when available and can inform the design and planning of rapid growing cities (Imwati and Odhiambo 2015). Planners use geographic information to inform designs (van Maarseveen, Martinez, and Flacke 2018) and provide solutions to spatial challenges. The use of geo-data in planning provides opportunities for land management and can support the attainment and measuring of SDG 11. Spatial Planning is a key instrument in establishing long term sustainable frameworks for socioeconomic and environmental development both within and between countries (United Nations, 2008). It is an important tool that drives proactive planning and coordination which improves the processes of social, economic, and environmental changes promoting sustainable development (Yoshida, 2020). It enhances the integration between sectors such as transport, housing, and industries for the purpose of improving rural and urban development. With the growth of cities, it is vital in urban and rural land management.

Approximately 60% of the world populations now reside in urban areas (UN-Habitat, 2020). Urban areas are expanding worldwide as the demand for urban space is increasing. Urban areas are now demanding more surface areas and open spaces due to the ever-growing demand for land (Buhaug & Urdala, 2013). To curb these challenges, National spatial planning frameworks have been introduced to mitigate these challenges. National spatial planning has strongly influenced the urban development and preservation of open spaces in urban areas (Claassens, Koomen, & Rouwendal, 2020). Developing spatial plans provides for direction and guidance for future development and employs policy instruments to actively facilitate developments (socio-spatial activities) and effectuate changes in the field (Louwsma, Konttinen, Chigbu, & Zhovtonog, 2020). Although spatial planning was developed as a tool to control the negative impacts on urban areas, urban sprawl, which has often been characterized by low-density residing housing has been extending on the peripheral of urban cities. The informal urban growth on the outskirts of urban areas represents a defect in urban development in cities. The uncontrolled growth has led to unplanned and undesirable (social, economic, and environmental) consequences in urban areas. These

problems are the results of the absence of infrastructures, facilities, and services (Koroso, Lengoiboni, & Zevenbergen, 2021). The lack of adequate services and infrastructures creates new risks of disasters which threatens to erode the current development gains of an area.

The task of solving problems related to informal settlements are growing fast in cities of developing countries. In Namibia, these tasks range from identifying suitable new residential areas, formalization of land tenure and resettlement of areas where individuals must be relocated (Nordin, 2004). But since the informal settlements do not form part of the formal land management system, there is a lack of readily available reliable information for planning purposes, and the formulation (and implementation) of policies and programmes. If available, these reliable information (which are required for effective decision making in urban planning) would enable relevant authorities or institutions to make and carryout specific data-informed and evidence-based policy decisions and activities. The Namibia's Statistics Act No. 9 of 2011 prescribes a functioning National Spatial Data Infrastructure (NSDI) to improve the disseminating, producing and the utilization of spatial data for urban planning. The Namibia Statistics Agency (NSA) thus established the National Geographic Portal (NGP) in the country. The objective of the NGP is to make geographic information available and accessible for usage in planning, socio-economic development, and effective administration of government services. However, the usage and implementation of the NGP has not been fully effective and efficient.

This paper explores a potential integration of open-source Geographic Information System (GIS) application with the NGP in Namibia. It does this by investigating and analysing how often stakeholders within government and private institution make use of the platform; and the effectiveness of the application and identifying associated gaps. These findings led to recommendations on ways to improve the digital system of Namibia and thus promoting sustainable spatial planning through the utilisation of GIS applications in Namibia. The paper, excluding the current section (i.e., the introduction), is structured into four sections. The next section (second section) introduces spatial planning and its benefits to urban planning. The third section deconstructs the National Geoportal of Namibia, its functionality, and its decentralization at regional level. The third section outlines the Geoportals' challenges and gaps. Finally, the fourth section provides recommendations.

2. DECONSTRUCTING GIS FOR URBAN PLANNING

2.1. THE IMPORTANCE OF SPATIAL DATA

No matter what your interests are or what field you work in, spatial data is always being considered whether you know it or not. Spatial data, also known as geo data, is a term used to describe any data related to or containing information about a specific location on the Earth's surface (Safe Software, n.d). Spatial data relates to information that identifies a geographic area with several characteristics of natural or man-made features or geographical boundaries. Urban planning is one of the main applications of GIS. Urban planners use GIS both as a spatial database and as an analysis and modelling tool (Yeh, 2005). The applications of GIS vary according to the different stages, levels, sectors, and functions of urban planning. Yeh (2005) further states that with the increase in user-friendliness and functions of GIS software and the marked decrease in the prices of GIS hardware, GIS is an operational and affordable information system for planning. It is increasingly becoming an important component of planning support systems. The main constraints in the use of GIS in urban planning today are not technical issues, but the availability of data, organisational change, and staffing.

2.2.THE BENEFITS OF GIS AND HOW IT IMPROVES URBAN PLANNING

One of the reasons why GIS is important in urban planning is the ability to better understand current needs for a city, and then design to fulfil those needs. By processing geospatial data from satellite imaging, aerial photography and remote sensors, users gain a detailed perspective on land and infrastructure. According to Olamide (2021) as urban populations grow and spread, the importance of GIS lies in its ability to pull together the vast amounts of information necessary to balance competing priorities and solve complicated problems, such as optimizing new building placement or determining the feasibility of a waste disposal site. These powerful tools help planners understand the needs of densely populated areas, but they also adapt to examining smaller towns and even informal settlements. Olamide (2021) further states that the ability to run a variety of queries and analytics on GIS data means experts can evaluate how new construction will fit in with existing infrastructure and meet regulatory demands. Users may spot opportunities for improved resource use, identifying the best locations to harvest solar, wind or geothermal energy.

GIS technology empowers urban planners with enhanced visibility into data. They monitor fluctuations over time, evaluate the feasibility of proposed projects and predict their effects on the environment. GIS software can also show all relevant stakeholders exactly what the changes on the ground will look like to help them make better decisions. For example, GIS software may

generate visualizations of an area's current environmental conditions and allow users to draw comparisons between the anticipated results of proposed development plans. Moreover, GIS can be used in the implementation of urban plans by carrying out environmental impact assessment of proposed projects to evaluate and minimise the impact of development on the environment (Schüller, 1992). Some of the key benefits of GIS in urban planning are described below.

a) Improved mapping - With a single repository for current and historical data and maps, GIS can improve map currency (whether or not a map is up-to-date), increase the efficacy of thematic mapping, and lower expenditures for data storage

b) Increased access to vital information - Desktop GIS makes it easier to store, manage, and access data from a variety of sources. Cloud GIS offers that same benefit, while enabling access from any device.

c) Improved communication - With a unified system for data storage and management, internal parties can access the information they need immediately - rather than sifting through documents, hard drives, or trying to track down data across departments.

d) Increased quality and efficiency for public services - GIS can be used to create a public facing portal (like this one), opening the flow of information between government organizations and the public. Government officials can share information quickly, while members of the public have self-serve access to the information they need.

e) Increased support for strategic decision making - With speedier access to a wider range of important geographic information, planners can create informed strategies more effectively. More than that, they can explore a wider range of 'what-if' scenarios - ideally leading to stronger, more effective long-term strategies.

3. THE NATIONAL GEOGRAPHIC PORTAL OF NAMIBIA

The Namibia Statistics Agency (NSA), established in 2012, has the mandate of collecting, sharing and providing awareness on the use and benefits of spatial data in Namibia (Republic of Namibia, 2011). Furthermore, the *National Spatial Data Infrastructure (NSDI) Policy* was promulgated on the 6th of March 2015 as guided by the Statistics Act No. 9 of 2011. Under these laws, the *Ministry of Agriculture, Water and Land Reform together* with the NSA were made responsible for the development of the policy for the improvement in producing disseminating and the utilization of spatial data. Non-governmental institutions, governmental institutions and the public serve as both users and producers of spatial data for planning, socio-economic development purposes and for a

more effective administration of government services. Spatial data is also important to promote and implement regional integration at both local and national government level whilst promoting international cooperation (Namibia Statistics Agency, 2022). The NSDI Policy mandates the NSA to ensure that instruments are established to provide spatial data freely accessible. Geographic portals are internationally used to access spatial data, the NSA thus established the National Geographic Portal on the 21st of August 2017. A geographic portal is a web portal through which geographical information can be accessed. The main objective of establishing the NGP is to have a geoportal (or a web portal) for searching and finding geographic information (and related data) services to improve the existing national repository of official statistics managed by the NSA.

3.1. TECHNICAL ASPECTS OF THE NATIONAL GEOGRAPHIC PORTAL

The National Geographic Portal consists of three (3) main components namely the Metadata Catalogue, metadata Editor and map Browser (Digital Namibia). Metadata pertains to data that provides attribute information of a specific shape file. A shape file is a storage format that stores geographic information that relate to the location, shape and attributes of a specific geographic feature. Users of the portal can search for spatial data by using keywords whilst base maps are also provided through open layers and the NSA's topographic map. The Digital Namibia platform allows for users to view metadata and generate reports. The platform also allows users to conduct spatial analysis on datasets provided by government institutions. Users of the portal have access to download data in different formats, (shp,kml,cvs) making it easy to integrate the data onto local GIS systems or value addition.

The National Geographic Portal therefore aims to assist government and private institutions an opportunity to access spatial data for evidence-based planning and decision making to be undertaken. Below, Figure1 shows the landing page of the National Geoportal.

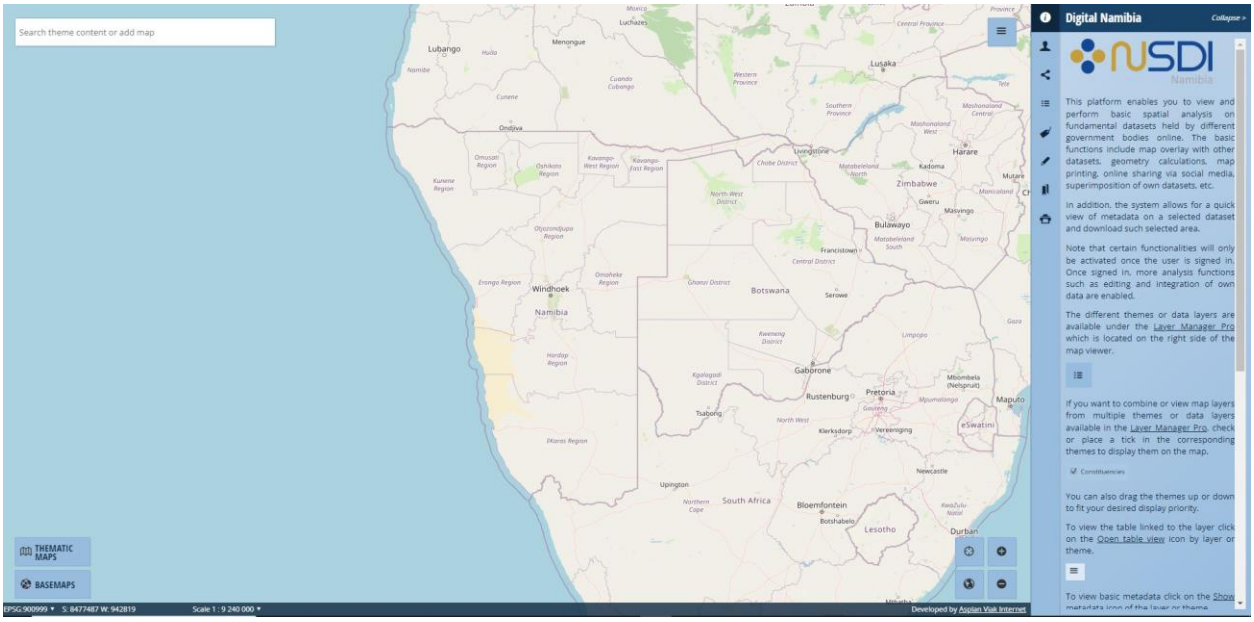

Figure 1:Namibia National Geoportal web page

3.2. ROLL-OUT OF THE NATIONAL GEOGRAPHIC PORTAL REGIONALLY

To socialise government institutions on the use of the NSDI, the NSA initiated training workshops. Since 2015 the NSA has conducted training workshops in the Kunene, Oshana, and Oshikoto and Zambezi regions with the aim of introducing the NSDI to the respective regional councils. The NSA also initiated dialogue within the regions on the decentralization of the NSDI and the use and benefits of spatial data coordination functions to respective regions. Lastly through the training workshops, the NSA assessed the readiness of the regional council's information technology infrastructures. Institutions were trained and introduced to QGIS (Quantum GIS) as an open source GIS application (Namibia Statistics Agency, 2021). The use of the NSDI is currently being hindered by a lack of information technology infrastructure capacity at local level. This hinders the availability of spatial data which is critical in the process of integrated planning and implementing sustainable development in the country as whole. The NGP consists of three main system components. These are the metadata Catalogue[1], the metadata editor, and the map browser[2] (NSDI, 2017). These components are explained in the *Quick Manual - Version 1.0* of the NGP

[1] At *GeoFind*: www.geofind.nsa.org.na
[2] At *Digital Namibia:* www.digitalnamibia.nsa.org.na

published by the NSA (see NSDI, 2017). As the objective of this paper is to identify the challenges faced by the NGP in Namibia, the following section is important.

4. CHALLENGES FACING THE NATIONAL GEOGRAPHIC PORTAL

Although the platform enables one to view and perform basic spatial analysis on fundamental datasets held by different government bodies online, it is limited to certain functions. It can be noted that certain functions only become active once the user is logged in. Registering as a user enables more analysis functions such as editing, and integration of own data. The portal offers basic functions which include map overlay with other datasets, geometry calculations, map printing, online sharing via social media and superimposition of own datasets.

An analysis of the Portal discovered the following challenges and areas for improvement:

- The portal is always experiencing some downtimes as reported from some users.
- Loading layers under the Layer Manager takes time and sometimes results in unsuccessful outputs.
- The system/platform is generally slow in terms for editing.
- Data on the portal is not complete nor is it up to date. This might be a result of how data is integrated.

5. BRIDGING THE GAPS AND WAY FORWARD

Local Authorities and national government agencies who are the custodians of the data are obligated to share the data with the NSA for integration in the portal. Since the inception of data integration, data has been shared manually by agencies and cleaned by the NSA. Currently the NSA is working on implementing the data quality standards and will apply the elements (Table 1) to all data custodians before the loading of data on the NDSI.

Spatial Data Quality Elements	
Completeness	This measures the degree with which a dataset is detailed e.g. level of omission, aspect of fitness of use (Guptill& Morrison, 2013).
Logical consistency	Datasets should be logically consistent with the real world and encoded geographic data (NSA,2022).
Positional accuracy	The accuracy of the measurement of horizontal and vertical numerical of the feature. After transformation has been performed on a feature, this may alter the longitudinal and latitudinal measurements (Guptill& Morrison, 2013).
Temporal quality	This describes how accurate the dataset is to the world time and geographical database time (NSA,2022).
Thematic/attribute accuracy	The accuracy of all attributes of a dataset that is tied to an earth position must be accurate along with the values of such an attribute (Guptill& Morrison, 2013).

Table 1: Spatial Data Quality Elements (Source: NSA, 2022)

The importance of adopting standards and their implementation is driven by organisations and institutions to develop, share, integrate and use geospatial data for appropriate and informed decision-making. The implementation of the above mentioned Spatial Data quality elements enable a global sharing of geospatial data that is compatible with the global GIS interface. Standardization also allows for a greater level of transparency and credibility as producers of geospatial data share information pertaining to the structure and or production process of the data. Standardized geospatial data can therefore be utilised on multiple GIS interfaces, either open source and or commercial. Standards are crucial for facilitating vigorous open access and transfer of spatial data between platforms. For example, in a varied network of computers that manages various spatial data types (United Nations, 2015).

Guptill and Morrison (2013) demonstrate standards for geospatial information as a continuum, in achieving increasing levels of interoperability of geospatial information. Standards are important to keep up with ever changing and evolving requirements, technology, and tools. Adopting standards is a rigorous process for institutions, and information communities (multiple organisations disseminating information through joint responsibility and resources) (Fisher & Unruh, 2003) are likely to start at different points in the capability or maturity continuum. The continuum of standardization describes different levels of experience and expertise of the organisation involved. In this regard, some organisations are at the beginning stage, and others are at an advanced stage (United Nations, 2015). The model below "Geospatial levels of standards" illustrates the standardization trajectory.

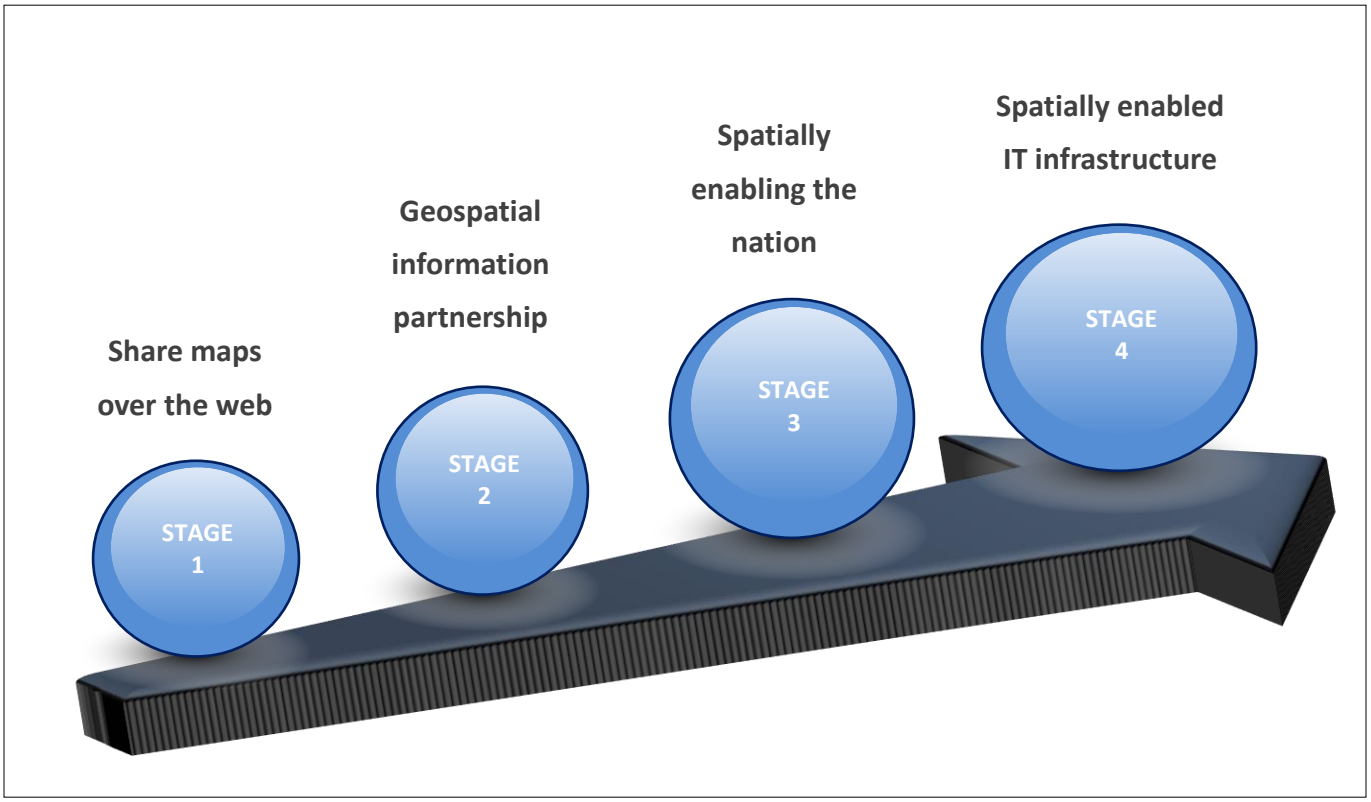

Figure 2: Geospatial Levels of Standards Use (Source: United Nations ,2015)

- Stage 1 illustrates the beginning stage of an organisations' standards use, which may provide access to geospatial information through map images with detailed description e.g.

metadata. As this initiative matures, different organisations collaborate in the sharing, searching, integrating and maintaining a geospatial layer e.g. hydrology through multiple web sources.

- Stage 2 reaches a larger scale with the aim of establishing foundation data (geospatial). Foundation data is a detailed and accurate set of geodata that is required by most users (administration boundaries and transportation)

- Stage 3 illustrates the accessibility of geospatial foundation data for a variety of applications by users nationwide.

- Finally, stage 4 depicts an organisations' ability to resolve emerging needs and be up to date with new technology and leverage on opportunities such as crowd-sourcing (obtaining important information from a large number of people via the internet) (United Nations ,2015).

Increasing levels of interoperability provides decision makers access to knowledge, whereby geospatial information is readily accessible and processed across the web ecosystem. Thus, data pertaining to people, geographical locations and man-made things are linked together in such a way that a phenomenon is better understood (e.g., social environmental and or economics phenomena or disasters) (United Nations, 2015).

6. RECOMMENDATIONS AND CONCLUSION

The challenges created by the rapid increase in urban population and urban growth patterns in Namibia over the recent years creates the need for more informed planning. To enable government to mitigate development challenges caused by urbanization and urban growth, developing countries such as Namibia need to pay more attention to the significance of integrating GIS in spatial planning. This approach requires close collaboration across all government levels and private sectors. Currently, informal settlements are not recognized into the formal city planning and therefore excluded from formal urban planning. Therefore, creates a huge gap in decision making and formulation of policies and programmes that addresses the challenges of informal areas. The lack of information on the status of informal areas in terms services available, needs and challenges experienced in informal settlements makes it difficult to make more informed and

sustainable urban planning. It can be concluded that indeed, spatial data has a significant role to play in spatial planning as it provides a platform that allows participation in planning, consensus creation and mainstreaming communication between all stakeholders such as communities, LA's and private sectors. In many years of urban planning, the functions of GIS such as database management, spatial analysis and mapping have been significantly useful. However, the potential benefits of GIS and its applications need to be realised as little has been done in transforming data into information for making planning decisions, despite several efforts spent on data collection.

This paper therefore recommends that more awareness campaigns should be carried out nationwide, for all the relevant institutions to utilise the National Geographic Portal for planning purposes. Moreover, the need to develop and improve ICT infrastructure that is compatible with GIS software for an effective and timeous functionality. Lastly, there is a need for more research to be done to determine the potential scopes of spatial data use in decision making by local government, more research needed on GIS and spatial planning in Namibia

REFERENCES

Buhaug, H., & Urdala, H. (2013). An urbanization bomb? Population growth and social disorder in cities. *Global Environmental Change*, 1-10.

Claassens, J., Koomen, E., & Rouwendal, J. (2020). Urban density and spatial planning: The unforeseen impacts of Dutch devolution. *PLOS One*, 15(10).

Guptill, S. C., & Morrison, J. L. (Eds.). (2013). *Elements of spatial data quality*. Elsevier.

Imwati, Andrew T. and Okoth George Odhiambo. 2015. "Towards Adaption of Digital Geo-Info Technologies in Urban Planning and Management: The Case of Nairobi City, Kenya." International Journal of Science and Research (IJSR) 4(4):1935–41.

Karen E. Fisher & Kenton T. Unruh. (2003). Information Communities : Characteristics Gleaned from Studies of Three Online Networks. *Asis&t*, 298–305. https://doi.org/https://doi.org/10.1002/meet.1450400137

Koroso, H. N., Lengoiboni, M., & Zevenbergen, J. A. (2021). Urbanization and urban land use efficiency: Evidence from regional and Addis Ababa satellite cities. *Habitat International*, 117, 102437.

Louwsma, M., Konttinen, K., Chigbu, U. E., & Zhovtonog, O. (2020). Generic Tooling for Land Consolidation – The Concept Explained. Amsterdam: Proceedings FIG Working Week 2020.

Namibia Statistics Agency. (2022). *NSDI Data Quality Standard*. Windhoek, Namibia

Namibia Spatial Data Infrastructure - NSDI. (2017). *National Geographic Portal System for the Namibia Spatial Data Infrastructure (NSDI): Quick Manual - Version 1.0*. Namibia Statistics Agency, Department of GIS & NSDI Coordination: Windhoek, Namibia.

Republic of Namibia. (2011). *Statistics Act No. 9 of 2011*. Windhoek, Namibia: Government Gazette.

Nordin, B. (2004). *The development of a GIS for an informal settlement.* Nairobi, Kenya: Expert Group Meeting on secure land tenure: 'new legal frameworks and tools

Olamide, Ologunagbe. 2021. "Benefits of GIS in Urban Planning and Development." Retrieved (https://geoinfotech.ng/benefits-of-gis-in-urban-planning-and-development/).

Schüller, J. (1992). GIS applications in environmental planning and assessment. *Computers, Environment and Urban Systems*, 16: 337–53

Sense Partners. (2021). Done right, spatial planning can help improve housing affordability. Sense Partners.

Unearth. (n.d). *Utilizing GIS to Streamline Urban Planning*. Retrieved from https://www.unearthlabs.com/blogs/gis-uses-urban-planning

United Nations. (2015). A Guide to the Role of Standards in Geospatial Information Management (Issue August). http://ggim.un.org/meetings/GGIM-committee/8th-Session/documents/Standards_Guide_2018.pdf

UN-Habitat. (2020). *Population Data Booklet*. https://unhabitat.org/sites/default/files/2020/09/gsm-population-data-booklet-2020_3.pdf

United Nations. (2008). *Spatial Planning Key Instrument for Development and Effective Governance.* Geneva, Switzerland: United Nations.

Van Maarseveen, Martin, Javier Martinez, and Johannes Flacke. 2018. GIS in Sustainable Urban Planning and Management. CRC Press, Taylor & Francis

Yoshida, T. (2020). *Spatial modeling and design of smart communities.* Urban Systems Design.

Yeh, A. G. O. (2005). *"Urban Planning and GIS."* Geographical Information Systems: Principles, Techniques, Management and Applications 404.

BIOGRAPHICAL NOTES

Ms. Ntwala Vanessa Simataa is a Development Planner at the Ministry of Agriculture, Water and Land Reform, and she is also a Research Assistant in the department of Land and Property Sciences, the Faculty of Natural Resources and Spatial Sciences of Namibia University of Science and Technology (NUST). Her research focus is on Land Administration, land management and climate change. She is also a master's Student at the Namibia University of Science and Technology.

Ms. Laina Alexander is a Research Assistant in the Department of Land and Property Sciences within the Faculty of Natural Resources and Spatial Sciences of Namibia University of Science and Technology (NUST). She is also a master's student at NUST. Her research interests are sustainable rural development, land administration and urban planning.

Mr Mario Siukuta is a Research Assistant in the Department of Land and Property Sciences within the Faculty of Engineering and Spatial Sciences at the Namibia University of Science and Technology (NUST). He is also a master's student at NUST. He's research interests are land management, informal settlement upgrading, land-use planning and climate change.

Ms. Penehafo Ricardo is a research assistant in the Department of land and Property Sciences at the Namibia University of Science and Technology (NUST). Her research interest includes land tenure, urban sanitation as well as informal settlements. Currently, she is a registered master's candidate at NUST.

Ms. Menare Royal Mabakeng is a Land Administration Researcher and lecturer in Department Land and Property Sciences at NUST -Namibia. She has worked with civil society for over nine years supporting communities in urban informal settlement upgrading. She holds a Masters in Geo-information science for Earth Observation specialising in Land Administration from University of Twente- Faculty (ITC).

Ms. Jennilee Kohima is a Spatial Planning Lecturer and Deputy Head of Department in the Department of Architecture and Spatial Planning within the Faculty of Natural Resources and

Spatial Sciences of Namibia University of Science and Technology (NUST). Her research focus is on land use management, urban informality, planning policies and practices and planning education. She is also a Doctoral Student at the University of the Free State.

Malcon Mazambani is a Land Administration Lecturer in the Department of Land and Property Sciences within the Faculty of Engineering and Spatial Sciences of Namibia University of Science and Technology (NUST). He has extensive knowledge of Geographical Information Systems (GIS) and Communal Land Administration. He holds a Master of Science in Land Management and Land Tenure from the Technical University of Munich: Germany and a Bachelor of Technology in Land Management (Land Information Systems) from the Polytechnic of Namibia.

Ms. Elvena Hayford is a research assistant in the Department of land and Property Sciences at the Namibia University of Science and Technology (NUST).

CONTACTS (CORRESPONDING AUTHOR)

Namibia University of Science and Technology, 13 Jackson Kaujeua Street | Private Bag 13388 | Windhoek, NAMIBIA | Tel: +264 61 207 2836 | Email: vanessasimataa@gmail.com | Website: https://www.nust.na/