Reframing Smart City in Sub-Saharan Africa

Inclusive engagement approach and co-design tools for a developing economy

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***Abstract*—Sub-Saharan African communities face an urgent need for affordable housing, new working and learning environments, and new technologies to support sustainable development. This paper reframes the Smart City concept in the Sub-Saharan African context and provides insights to the main research questions: 1. How can inclusive engagement process for Smart Community enhanced in an African context? 2. What kinds of information and communication technology (ICT) tools can support such processes? We conducted a focus group study in Keetmanshoop, the Karas region in Southern Namibia. In addition, we interviewed eleven urban planning stakeholders about the urban development situation and participatory urban planning in Namibia. The study confirmed the view according to which participatory model and engagement of people is beneficial approach for the urban development. In terms of transparency and people having a voice in the process, the quality of urban development may be seen improved in terms of "building communities" with feeling of ownership from the community rather just than building houses for those in need.**

Keywords-Citizen-centric; Smart City; co-creation; virtual reality, Africa, developing economies.

I. INTRODUCTION

In Sub-Saharan Africa, there is an urgent need for affordable housing, new working and learning environment and new digital services to support societal and economic development with co-creation [1]. The African population will continue its radical shift from rural to urban areas; in 2010 urban dwellers made up nearly 40 percent of the total population, and the estimation for 2030 is 50% and for 2060 65% [1]. The urban population of Namibia has been increasing from 28% in 1991 to 33% in 2001 and to 42% in 2011. The evolution of the society requires public administrations to tackle many challenges, including civic rights, gender equality, employment, mobility, digitalization, security, environment and many others. One of the main challenges in African governments is to develop more democratic and transparent societies without corruption. The widespread use of new technologies, such as social media and mobile services, has increased the demands for openness and transparency for public decision-making and administrations. There is a need to enhance the communication between citizens and government, and to increase public engagement and to help citizens stay informed about decisions.

Urbanization in Africa tends to differ from the experiences acquired from other parts of the world. In Africa, urbanization is "decoupled from overall structural transformation of the economies". According to a theory, urbanization is a process of transformation where economies evolve from rural agricultural economies towards industry- and service-based economies, and they simultaneously move from low-income to high-income societies [2]. However, in Africa urbanization seems miss this link to development towards industrialization and higher income. Instead, urbanization in Africa frequently refers to "resettlement from the rural hinterlands, to rural market towns". In fact, over 70% of African populations live in towns with less than 100 000 inhabitants, in sparsely populated small towns and along the road networks. There are only a few mega cities in Africa [3].

Our aim in this study is to examine the possibilities of participatory approach in the context of building new affordable housing area in Keetmaanshop, the Karas region in Southern Namibia. Moreover, user needs for local service infrastructure, public and private service development are also studied. In Smart City planning, the open innovation approach and new technologies are increasingly used to support stakeholder communication in urban planning. Advanced virtual reality (VR) models and tools, such as augmented reality (AR) and mixed reality (MR) can be used to visualize future neighborhoods and urban plans. These kinds of tools can significantly improve the understanding of what is being proposed and the potential impacts of different alternatives on landscape and living environment as it is shown earlier in quantitative studies with citizens as well [4]. Moreover, we were interested in to find out how this kinds of tools would support the co-creation process in Africa. To understand the challenges of current housing situation, and dwellers' needs for Smart Community development, we

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conducted five focus groups in Keetmanshoop. In addition, after conducting focus groups, we interviewed eleven urban planning stakeholders about the urban development situation and participatory urban planning in Namibia. The Namibian stakeholders represented different organizations and policy actors: governmental, municipality and companies.

This paper focuses on community-based development possibilities, to enhance socially inclusive bottom-up approach to smart community development. The paper is structured as follows: Section II reframes the concept of Smart City. Section III introduces the participatory approach in African context, Section IV discusses the overall urban planning and housing situation in Namibia. Section V presents the VR and MR tools to support participatory action research. Section VI explicates the case study methods. In Section VII, we present our research findings. In Section VII we draw conclusions and define next steps of the research.

The paper an extended version of our article "Citizen - centric Smart City Planning for Africa: A Qualitative Case Study of Early Stage Co-creation of a Namibian Smart Community" [1].

II. SMART CITY OR SMART COMMUNITY?

In European and in other industrialized countries contexts, there has been an intensive development work, projects and research on the concept of Smart City. The Smart City concept is often approached from a technology-oriented, systemic perspective that provides new technological solutions, big data and innovations to make the living environments smarter through the application of digital technologies [5]. Less attention, however, is given to societal aspects of the Smart City for instance smart governance, smart people, sense of community and social learning [6]. In addition, what seems to be largely missing is empirical insight into how and, which smart city aspects can be applied in different geographical or in decisively different cultural contexts [7]. In addition, less is discussed how to involve citizens and other stakeholders for the development processes with new digital tools for increasing transparency and sustainable, long-term results.

Smart Cities are frequently linked to big cities and advanced technologies that improve the living conditions and foster economic growth in these highly populated and well-connected urban agglomerations. Slavova and Okwechime [3] emphasize the fact, that African urbanization provides some preconditions, which should be considered when the Smart City approach is used to foster the urban and economic development in Africa. They make a distinction between “hard” and “soft” qualities, or best-practices, as domains that Smart City approach provides for city planners and stakeholders, who may then select a combination that best fits for their city’s needs. Hard domain includes, for example, physical infrastructure like water resources, which can be used more efficiently with more innovative management solutions. Soft domain includes social issues that may be ameliorated, for instance, by provision of housing and social services with integrating such services with ICT. Also fostering of economic development through innovation and entrepreneurship may be considered as a soft approach. Slavova and Okwechime [3] also point out that different strategies are needed for different agglomerations; mega-cities (over 5 million), medium cities (from 5 to 0,5 million) and small cities (less than 0,5 million) and other urban areas (less than 0,3 million). To simplify, soft qualities – social and human oriented development – are likely to be emphasized in small towns and rural environments rather than technology and data driven solutions. Rather than “hard domains”, that are typical to big cities (e.g., physical infrastructure, urban density and congestion) more generic challenges of poor regions (e.g., slums and informal settlements) and especially qualities of “soft domain” (e.g., low quality and segregated social services, unemployment) are key elements to focus on in case of small towns [3]. It should be noticed, that in Namibia small towns, rather than cities are typical urban agglomerations. Even the biggest city, Windhoek, has less than million inhabitants. In our case town Keetmanshoop, there is only 30 000 inhabitants approximately, although it is major urban agglomeration in southern Namibia, and locates close to South Africa, which is Namibia’s main trading partner. Therefore, “soft and human” solutions of Smart City approach are especially important in this case. Keetmanshoop also hosts different social and ethnic groups that have had conflicts in the recent history, which may influence the socio-economic development in the context of urban development also in the future. Having these guidelines in mind, it is safe to conclude, that especially social and human aspects of Smart City approach are relevant for the development of communities in the case area.

Moreover, Ziemba [8] states that the quality and management of information and communication technologies in enterprises as well as information culture have significant impact on development of sustainable information society (SIS), and provides a model to better understand the relation of various dimensions of ICT adoption to impact on sustainability in the SIS context. Therefore, quality, management or culture related to ICT should be considered as context that either hinder or support the anticipated development. In addition, Cocchia [9] explored the concept of Smart City and related concepts in extensive literature study including discussions from 1993 to 2012. It should be noticed, that meaning of the “smart” varies a lot (i.e., intelligent, knowledge, ubiquitous, sustainable, digital, etc.) and universally acknowledged definition was not found in the review. Smart and Digital City are the most common concepts and concept evolves constantly as it spreads geographically and thematically. From the analysis, the weak presences of Sub Saharan African cities and evolving nature of the concept itself suggest that in our specific case the “people” and engagement along with technological dimension, and loose Smart City interpretation may be applied in our case study, Keetmanshoop. These both findings suggest that fairly open concept of *Smart Community* may be seen as a feasible application in the context and for the study at hand.

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Why is the concept of smart communities relevant in the African societal contexts? Smart Cities go hand in hand with smart communities and one is dependent on the other. Smart Cities need also smart citizens – the citizens who live and work in these cities need to participate in adoption and usage of new solutions, at least. Smart Community concept allows socially, economically, technically and environmentally sustainable solution for urban living and advanced digital service-ecosystem for health, wellbeing, and equity of citizens (see Figure 1).

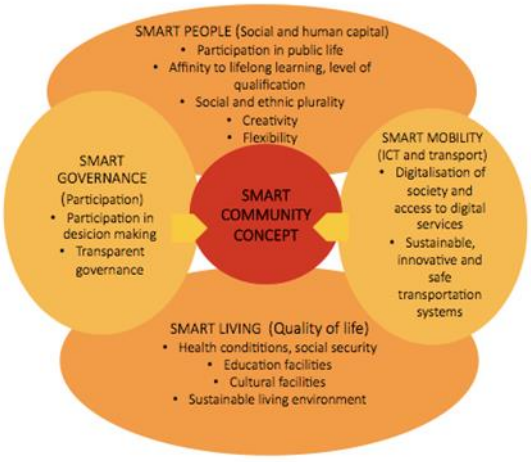

Figure 1. Elements of smart community as modified from [6][7].

In other words, Smart Community resembles Smart City approach that foster broad social, economic and environmental sustainability in urban development. However, Smart Community is application for smaller scale solutions and especially targeted for the less advanced regions, with more emphasis on social and economic sustainability ("smartness in people") than on technology and digital solutions ("smartness in technology"), as is the case in the most Smart City concepts [5][6][7][11]. The Smart Community approach aims to introduce an organized and systematic approach to community development that provides better living conditions for local people. The specific qualities that may be considered as benefits of Smart Community concept include emphasizing local value addition in the construction process, environmental sustainability and cultural and social advantages and long-term sustainability.

Smart management and communication technologies give citizens the opportunity to shape both the culture and the structure of cities. A successful governance of the accelerating urbanization in Africa is a key process in terms of a positive economic and social development of the continent. One of the major systemic challenges based on the observation is that the growth of cities will foster the economic development and growth in the continent, but the low quality of infrastructure and urban planning hinders the positive socioeconomic impacts of the processes. For example, Namibian cities act as nodes through, which development occurs and the rapid urbanization simultaneously poses risks that affect sustainable livelihoods of people [12].

III. Participatory Approach For smart communities in Africa

Already 1990's Blackie and Tarr [13] recognized the potential of participatory models in Namibian policymaking. Since 1990, key government policies on sustainable development in Namibia have aimed on issues relevant to the Namibian public and policy-makers. It should be noticed, that the most successful of these have been built on strong community-level institutions (e.g., conservancies) or on solid scientific base (e.g., management of fisheries, environmental assessments). The role of strong stakeholder participation in the policy and legislation formulation has been present including co-operation between various ministries. The role of public participation, cooperation among the various sectors within government, and cooperation with other stakeholders, is recognized to be beneficial for the policy outcomes. Democratization (of natural resources) and development of institutions for sustainability have benefitted from this approach. However, the participation and engagement of citizens are still a major challenges in policymaking. Incentives that are more efficient and policy measures to encourage public and inter-sectoral debate, as well as indicators of sustainable development should be sought. More recently, Jere, Kauhonina and Gamundani [14] suggest that Living Lab as advanced mode of stakeholder engagement could ne applied as the Namibian Government aims to improve service delivery to citizens, including the ICT development. The current state of ICTs in the country has still challenges. Living Lab concept has been introduced and Namibian community educated "on how Living Lab methodologies could be leveraged within the ICT sector to improve service delivery in Namibia" in accordance of challenges identified in the National vision 2030. The Living Lab concept should be aligned with the policies and strategic plans.

Hence, citizen participation and social capital are considered as essential elements of Smart Community. Furthermore, in Social scientific research, the term 'community' may refer to both to communities that are location-based, whose social ties rely mainly on geographical proximity (such as neighborhoods) or modern communities that are rather formed around interests and skills (such as professional communities) than around locality [15]. Social scientific research has also recognized the concept of 'imagined communities', understood as socially constructed community, imagined by the people who perceive themselves as a part of that group [16]. In addition, online and virtual communities have gained recently more and more attention. They have been defined as a combination of people, who have a shared purpose, and computer systems, to support and mediate social interaction and facilitate a sense of togetherness [17]. In this context, we are researching mostly local communities – although all kinds of modern communities, including imagined, online and virtual communities have impact on and intersect people's sense of community.

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Citizen participation and social capital are essential elements of Smart Community. In Europe, governments have been launching ICT platforms to facilitate citizen participation for Smart City development. They allow different types of citizen participation, such as voting, rising public awareness and monitoring political processes.

Moreover, co-creation and co-design of urban public services support resilience building and acceptance of public urban services that support sustainability [18]. Co-creation has impact on experienced quality of living environment. Co-design activities affect the experienced quality of a living environment, and diverse fields have recognized the relationship between the citizens' sense of the place, social cohesion and public health outcomes [19][20][21]. With relative few studies looking at smart city and urban planning development in Sub-Saharan Africa from co-creation perspective, we want to develop the participatory approach especially in the context of rural to urban migration in Africa.

IV. Overall Urban Planning and Housing Development in Namibia

According to Angel et al. [22], cities across the world are faced with numerous challenges, which puts a lot of pressure on city resources. Hence, there is a need for cities to address challenges they are facing in a smart, efficient and effective manner. The Smart City concept is increasingly becoming a global phenomenon, with more cities rapidly harnessing the power of information and communications technology (ICT) and other forms of technologies to improve quality of life, service delivery and develop sustainable solutions to help cities overcome challenges they are facing. It is estimated that by 2030 about 60% of the world's population will live in urban areas. The developing world in particular, has seen a huge increase in rural to urban migration.

This is especially evident in many African countries, Namibia being no exception. Based on data from the 2011 Namibia Population and Housing census, the percentage of people living in urban areas increased from 27% in 1991 to 33% in 2001 and to 43% in 2011. This is an indication that Namibia will transit from being a mostly rural society to a mostly urban one within the next two decades, with a third of the country's population projected to be living in the Erongo and Khomas regions. The huge increase in people living in informal settlements in and around towns is the main symptom of this trend. By managing cities intelligently, it is anticipated that cities will efficiently manage scarce city resources. Today's rapid urbanization is clear evidence that urban areas are the focal points of economies, playing a significant role not only in Namibia but world-over.

Furthermore, majority of the people want to live in urban areas because of the opportunities and the quality of life they present. However, urban areas are faced with huge challenges; admittedly, they need to become more creative and innovative in order to remain competitive and to improve the lives of their citizens. To help cities overcome challenges such as global warming, scarce resources, and urbanization [23].

According to Amugong [24] the capital city of Namibia, the population is posed to increase tremendously in the coming years, and posed to reach 1 million inhabitants by 2040. This growing population requires a much deeper understanding of the notion of smart city. Therefore, the city of Windhoek needs to find better ways to manage city resources and although, Windhoek is not at present a smart city, it has the right conditions and well positioned to leap frog to transform into a smart city because of its good network coverage and ICT infrastructure.

Housing is an extremely important goal for sustainable smart city development, but the way in, which houses are constructed influences the achievement of other smart city development goals as well. Despite various public and private sector initiatives, the situation still needs serious attention to reach Vision 2030 goals of providing affordable housing to all, and to do so in a carefully planned and sustainable manner [12].

In our case study town, Keetmanshoop, which is acknowledged as the administrative capital of southern Namibia, there is significant interest from private and public investors. Investment opportunities range from real estate, retail, solar energy, to logistics and hospitality. Some of the most significant projects on the horizon include the University of Namibia Campus, with 420 upmarket residential plots and a 10 000 square meter retail center.

One essential element that frames all the building projects in Namibia is the growing price level and challenges in access to credit. One method to analyze the demand is the evaluation of purchasing power of potential house buyers and prices of the houses available. Recently Namibian national mass-housing program that aims to provide low-cost housing for the most needy (without access to credit), has encountered many challenges. The cost of houses has remained too high due to insufficient precisely pricing mechanisms and estimations, as well as many challenges in construction processes. Also, housing prices have soared in Namibia during the last decade, making it increasingly challenging for many to buy a house [25]. Recently housing prices have grown less aggressively, due to strict credit conditions and partly a growing number of consumers, which are cautious. The most recent median price (in 2016) in major towns was 850 000 N$. Nonetheless, high median prices do not indicate that most transactions take place at that level. However, median price is more likely to describe the typical house price than the average (of all transactions), when the price distribution is biased, as is the case in Namibian housing market.

Median price in Southern Namibian town Keetmanshoop was close to 700 000 N$ in 2016, but most transactions were likely to happen with clearly lower than median prices. In general, the South and Karas region have lower amount of transactions compared to North and much less movement in property prices [26]. However, within Karas region in Keetmashoop, median house prices have grown even more than in Namibia during the last years, although the price level remains lower (Table I).

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TABLE I. ANNUAL MEDIAN HOUSE PRICES (N$) IN NAMIBIA.

Location	Year and House Price			
	2009	***2011***	***2013***	***2015***
Windhoek	381, 000	480, 000	640,000	868,000
Keetmanshoop	271, 500	407, 000	421,000	698,750

One the one hand, rising interest rates, credit conditions and consumer caution are likely reasons to lower the growth of property prices. On the other hand, structural reasons hindering the housing provision, investors and speculative actions in housing market area likely to keep demand and price level high. According to IMF [25] in June 2016 the house price overvaluation at national level was on average around 16 %. This was slightly less than in the 2015, possibly due to both to the recent slowdown in price growth and to revisions to the historical values of the housing index [25]. Some estimations even suggest that overvaluation is causing a "bubble" and return to "real price level" will take place soon.

Access to credit is essential in financing the purchase of a house. To receive a full house loan, a rough estimation is, that household's annual gross earnings should be more than one third of the house price. For example national median price of 850 000 N$ requires monthly gross earnings of 25 000 NAD from the household to afford a bond to buy a house. This equals with monthly income level of 12 500 NAD per person in two-earner households. However, the median monthly income level *among the employed* in Namibia was 6 800 NAD in 2014. Moreover, it should be noticed that many households in Namibia have only one earner. According to 2011 report of First National Bank [26] only 5,7 % of population has income level *higher than 10 500 N$/month*. Estimated housing backlog, instead, is mostly concentrated on population with less than 4600 NAD monthly income. Therefore, the demand in higher income groups is more limited because there are less consumers, whereas in lower income group the demand is hindered especially by access to credit. According to Statistic Namibia (2015), less than 15% (about 4500 people*) of employed* people in Karas region work for industries, where median wages are more than 10 000 N$ a month, most of them in mining and quarrying (6,8 %) or education (3,7 %). In sum, challenges in housing provision are structural part of the society and economy in Namibia. In the next sections, we will discuss the possibilities of Smart City and Smart Community development in African societies to bring about changes and more transparency into urban planning and housing projects.

V. VIRTUAL AND MIXED REALITY TOOLS TO SUPPORT PARTICIPATORY ACTION RESEARCH

As a basic methodological approach, we deployed *participatory action research* (PAR). PAR contrasts with many research methods, which indicate disinterested researchers, reproducibility of findings and observation of human behavior in the hope of eventually emerging meaningful change without researchers' intervention. Instead, PAR emphasizes participation and action and intends to make sense of the world through collective efforts to change it. Research is conducted *with* people instead of "on" or "for" people, in a collaborative manner that suits especially when the object of the study is how to promote co-creation process [26].

According to Greenwood and Levin: *"Action research is social research carried out by a team that encompasses a professional action researcher and the members of an organization, community, or network ("stakeholders") who are seeking to improve participants´ situation. Action research promotes broad participation in the research process and supports action leading to a more just, sustainable, or satisfying situation for the stakeholders"* [27]. The problem is defined and examined together by the researcher and other stakeholders involved. Importantly, action research democratises the relationship between the researcher and the rest of the members involved in the research process. According to approach all people accumulate, organize, and use complex knowledge continuously in everyday life. Characteristic to action research is that it has usually been a more practical way of doing research: the research is conducted in the field than in laboratory settings and it is often practiced more due to practical rather than theoretical reasons [28]. PAR approach may be enhanced by using VR or MR methods.

Recently VR and MR tools have been created to visualize urban plans. In principle, these tools can be used to increase transparency and inclusive engagement in city planning [4]. Traditionally, urban planning processes are regulated by the public legal service sector. However, legal requirements typically base on a top-down distribution of information, even if the perception among different stakeholders of, for example, the characteristics of urban attractiveness and livability may vary significantly. To make cities more inclusive, planning processes should be developed towards exchanging of ideas, in which dwellers can participate. Such processes could use computer-aided design, including VR and MR modelling to visualize the plans and different options. Moreover, inclusive engagement supports resilience building and acceptability of plans in the long run [18].

Currently, in Africa, urban planning proposals are communicated to stakeholders and the public to a varying extent and by different means. Often only, a limited amount of stakeholders is well informed and new technologies, such as virtual models, are not widely used. However, statistic images and technical reports may be inadequate if a meaningful participation, and convincing common vision is desired [27].

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MR models and applications have been increasingly piloted in various urban planning and renewal projects [28]. VR and MR technologies can provide users ubiquitous experience: need for information any time anywhere with their smart mobile devices. In addition to visualizing future city environments with VR and MR models, mobile applications for instance, have been recently piloted for developing two-way communication between city governance and citizens. The piloted applications allow citizens and city officials to discuss local urban planning development issues [29].

A prototype of a MR application supporting a range of devices for a collaborative multimodal interaction was developed by Wagner et al. [28] to enable a group of participants to create a vision of urban projects. The stakeholders and users involved in the urban planning project had various backgrounds ranging from local urban planning specialists to other stakeholders such as members of local commerce. According to the study, MR visualizations proved useful in enriching the available representations and enhancing stakeholders' understanding of urban situations. 3D visualizations, videos and sounds helped to express and co-construct their ideas.

Smartphones with augmented reality system for urban planning have been piloted with citizens in many countries. The (AR) prototype system was experienced as a useful tool for visualising proposed architectural designs [30]. These above described MR and AR technology tools have been applied in various parts of the world like in Europe and in New Zealand [4] [28] [30]. Consequently, we were interested in to finding out how these kinds of tools would support the inclusive engagement and co-design process in Africa.

One possible way to communicate smart community planning in the future is by using a virtual reality solution that was developed in order to visualize the planned residential area in Keetmanshoop in Southern Namibia. The system was developed by engineering firm A-insinöörit using virtual models of houses and the whole housing area by architecture firm Aihio Architects (Figure 2 and Figure 3).

Figure 2. Virtual reality models from the future housing area planned in Keetmanshoop, Namibia.

Figure 3. A Virtual reality system with devices for demonstrating virtual reality solutions.

The aim of the virtual reality model is to visualize the future residential area and to enhance the co-creation process with different stakeholders. The end-users of this kind of virtual reality model can be professionals such as architect firms and interior designers who want to communicate their plans for their clients or decision makers. In the long run, the virtual models can be also used by cities and communities to engage citizens in the planning processes and getting feedback for the plans. The virtual model (Fig. 2 and Fig. 3) were used in discussions with decisions makers in the town council and with other stakeholders such as local city planners. The virtual model was also presented as part of some of the focus groups, as it helped these groups to figure out the residential area and aimed to facilitate feedback and ideas related to the different solutions such as house technology and building materials. It also aids in visualizing and choosing different material for houses and overall planning of the area.

In practice, the system uses devices for demonstrating VR solutions such as AR and MR head mounted glasses (HMD) and their peripherals to produce a fully immersive simulation of the area. Furthermore, to create virtual worlds from a real world environment, special capturing devices are needed, for instance drones equipped with camera. Fully immersive simulations are able to provide very realistic user experiences by delivering a wide field of view and high resolutions. However, one of main challenge of adopting technologies in the African context, which are quite mature tested and capable in the EU, is the slowness of the internet connection. The average download speeds in Finland, Denmark and the Netherlands are among the highest in the world (over 25 Mbps). In Namibia it is 7,5 -10 Mbps, which is higher than the average in African and Sub-Saharan African countries in general, but still low compared to the more digitalized areas of the world.

VI. Case Study Methods

The face-to-face focus groups and interviews were selected as a method for data collection as a conversational style is likely to produce rich information on concepts such as Smart Community, which may need clarification. Accordingly focus groups are used to gather in-depth information about social processes and they give researchers

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opportunity to participate and observe group interaction and discussion [31]. Moreover, the standard response rate for surveys tend to be rather low in Sub-Saharan Africa, around 36% [31]. We conducted a focus group study in Keetmanshoop in February, 2017. The potential participants of the focus groups were located through cooperating organizations, i.e., the Municipality of Keetmanshoop and the University of Namibia, Keetmanshoop Campus. The focus groups were specified from different social groups including: young people, families, mobile professionals, social and health workers and traditional community leaders.

The aim of the focus groups was to discuss and share ideas about living, planning of the housing area and environment in Namibia and Keetmanshoop with potential future dwellers and different stakeholders involved in the process. The groups were selected to provide insights for the new area under development from the point of view of various social and professional groups.

After conducting the focus groups, from August to October 2017, we interviewed eleven Namibian stakeholders. Only one out of eleven stakeholders chose to e-mail their response.

A. *Dwellers' focus groups*

Five focus groups were conducted with the following group configuration in Keetmanshoop:

- Potential dwellers who are listed by the Keetmanshoop municipality and First Capital Housing Fund (8 persons)
- UNAM final year students (8 persons)
- UNAM faculty/Staff members (3 persons)
- Social and community development workers (4 persons)
- Community leaders representing different parishes (4 persons)

The selection of the focus groups was based on the intention to start the first construction project in a given location.

To secure the engagement of real potential dwellers to the process, one group was formed of people who met the both of criteria: firstly, they had availability of funding due to clientele of national agency (The First Capital) that offers affordable house loans for public sector workers. Secondly, they had their name on the municipal waiting list based on the plots available for the construction. These criteria made people potential buyers of the planned houses, instead of random sample. The persons were sent a letter to invite them to the focus group and they were also called with the help of a Keetmanshoop community leader.

Usually focus groups involve around five to eight participants, as suggested in literature [32]. We conducted five separate focus groups with people with similar type of life stages, styles and occupations so that the chosen topics cuts clearly across these stages and so that we could get a deeper overview of the subject from chosen perspective.

The group consisted of officers, accountants and human resource practitioners from different government sectors. To allow various insights of the needs of the future dwellers, both genders and parents with different family characteristics, from age group from 27 to 52, were recruited for the potential dwellers' focus groups. To find out about young people's insights about future living in Keetmanshoop, UNAM final year business students were chosen for the focus group. The selections were made with the help of a local professor so that suitable students were recruited within the time frame. Most of the students were from different locations in Namibia and were soon to make decisions about their future plans after graduation from the university: where to live and how to pick a career.

Figure 4. Five focus groups were conducted in Keetmanshop in Namibia.

To study how mobile, educated professionals see their future living needs UNAM faculty members were chosen also with the help of University of Namibia professor. This three persons were males in their early thirties and were working at the University of Namibia while still permanently living somewhere else. In addition, two special focus groups were conducted to find out about the social situations, living conditions and challenges in the living communities. These focus groups consisted of social and community development workers and community leaders representing different parishes. The social and community workers had the best knowledge about the current social challenges in the area. On top of that, the community leaders are known to have a lot of influence act as opinion leaders in their communities. The participants for these focus groups were recruited with the support of Keetmanshoop municipality.

The focus groups were conducted in the locations that were familiar to attendees and were easy to reach. The future dwellers focus group was conducted in a guesthouse in the commercial centre of Keetmanshoop. The university students and faculty participated in the focus groups in the university's lecture rooms. The social and health workers' and community leaders' focus groups were organized in the Keetmanshoop town hall. However, due to early phase of the project (planning rather than building), these engagement activities are related to concept of the

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SmartCom especially (e.g., idea, services) rather than actual housing solutions (e.g., size, style) only. The focus group study was discussing the following topics:

- Living and finance- how the dwellers perceive housing prices in Keetmanshoop and Namibia, and how does it impact on participant's future location?
- Housing styles and alternatives - new solutions and materials in housing
- Social and cultural sustainability of the neighborhood – safety, diversity and community building issues

Tree persons were conducting the focus groups, i.e. two researchers from Finnish research organizations VTT Technology Centre of Finland and University of Tampere, and a research assistant from University of Namibia in Windhoek. Two of the facilitators; a Finnish and a Namibian, were guiding the conversation and asking questions, while one was making observations and notes. This made possible also to localize and explain the questions more in detail, if needed. All the focus groups were recorded. Qualitative content analysis was conducted to the focus group material.

B. *Stakeholders' interviews*

The interviewed eleven stakeholders represented different organizations and policy actors: governmental, municipality and companies. The interviewees were selected to represent different organizations, both private sector and government. They were all experienced professionals in their field, except one recent graduate. They did not participate to the focus groups described earlier in this article. The interviewees were selected with the support of co-operating organizations; University of Namibia, City of Windhoek and Keetmanshoop Municipality. The Smart Community project aims and focus groups results were presented briefly for the interviewees, especially considering participatory approach to urban planning. The interviews lasted about one to one and half hours. The interviews provided additional information regarding various questions that had risen during the focus groups and explored the current practices and challenges of urban planning and housing situation in Namibia. In addition, it was discussed how they see the role of new virtual mixed reality tools and inclusive engagement in the urban planning and smart city development. All the interviews were recorded and transcript. A qualitative content analysis was done to the interview data. The transcripts were then coded and categorized according to themes, and the themes were picked up as major insights and findings from the material.

VII. RESEARCH FINDINGS

A. *Dwellers' focus groups*

In the dwellers' focus groups, especially young people highlighted the need for development of wiFi network, as well as the need for affordable housing and feasible services. Young people wished more flexibility to the housing and living concepts; house may be smaller and cheaper at first, and as prosperity and family grows, it may be extended by building new rooms to the house. At the moment housing markets are not very dynamic, and houses are seldom sold by the individuals, but mostly by investors or contractors who have new housing projects.

In the families focus group, it was interpreted as a positive way to create areas mixed with more various income levels to make housing markets more dynamic. People are ready to accept also less typical solutions, also partly because for the many the situation or circumstances is that "you have to take what you got", due to growing price level and low availability of houses. One suggestion was that the government and relevant authorities should offer more affordable options and venture cheaper building materials as most Namibians cannot afford the housing prices at the moment. However, some people also expect more expensive and unique solutions than standard houses; more spacious, two-storey houses and using quality materials for walls, doors etc.

The families also expected more transparency about the housing situation. At the moment families do not know, and cannot check, what is their position in the municipality's waiting list for a new apartment or a house. It may also be unclear, how one proceeds on the list, and why someone receives an invitation to see the house and some others do not. Support for local companies and constructors is seen as a good thing, but not at the expense of the quality: quality of houses is not always good and cracks to walls may come fast. Regarding sustainable energy solutions, for example solar panels are already now widely used for energy, so sustainable (solar) energy sources are not distinctive factor as such, but rather usual solution.

The mobile professionals' focus groups emphasized the wide availability of different affordable services and quality housing. The mobile professionals, even though they had a job at the city, they were not planning to stay permanently at this stage. They stressed the need for livable service structure, including a wide range of public and private services. For instance, libraries, schools, commercial services, movie theatres, day care with qualified people and good quality premises were seen as important. Many basic services, like car maintenance, are still missing or too expensive in the rural areas, which is keeping professionals living in two locations simultaneously.

The social workers and community leaders also pointed out the need for healthier and safe recreational area choices like playgrounds, parks, gymn, library, and sports clubs for kids and young people to keep youngsters out of bars.

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B. Stakeholders' interviews

In the stakeholders' interviews, many commented on the critical need for the process of development to be fast, efficient, and perceived public involvement efforts to date as impartial. It is important to engage the community because ultimately, they would have to use the spaces created. The stakeholder interviewees identified that the major social as well as urban and rural development trends during the last five years in Namibia is rural-to-urban migration and low and high urban sprawl. This is where you find suburb areas and individuals moving out into the outskirts of the city. The challenge they face as town and regional planners is that urban sprawl is very difficult to manage whether it is in informal or in formal settlements.

Ten out of eleven stakeholders were positive for co-creation with dwellers and stated that engaging the public instead of imposing development plans allows the public to feel a sense of ownership. "Engaging the public in urban development process is a very important step that one should not dare to overlook", one stakeholder reasoned.

Only one stakeholder was against citizen engagement and suspected that listening citizens only delay developmental processes and cause chaos at this stage because of the slow and bureaucratic urban planning process. Six out of eleven stakeholders have had some experience of stakeholder engagement in some form. A feedback channel that allows the government officials and the laypersons to have a conversations and discussion in a neutral and unbiased space should be created. Such discussions to find a common ground can be difficult between educated government officials and beneficiaries with less education. Accordingly, conversation could be led and mediated by a third party who is educated and can communicate with the government officials but who also has a relationship with the community and understands their needs. Academic institutions are generally well placed to play these roles.

According to the stakeholders, housing culture is underdeveloped in Namibia. In terms of housing, the citizens are not given much of a choice. Likewise, the idea of what housing means should also be challenged because a house should not just be a place where one sleeps in but should also be able to improve one's quality of life, both socially and economically. At the urban development plan challenges are related to that, people cannot afford to buy houses, so they tend to squat in informal settlements. This puts stress on development plans because the area occupied by these high influx of people is not serviced or properly managed: people are not provided even basic services (i.e., land, water and electricity) in such areas. However, there are some improvements that are obvious and evident: the central government has introduced an initiative to provide housing to these people. In fact, clinics have been mobilized to reach the informal settlements. Moreover, expansion of facilities have been created to accommodate the influx of people.

According to the stakeholders, the benefit of the co-design is the fact, that the inhabitants gain a space that they can take ownership of and feel comfortable in. Lack of engagement with the communities involved, poses the risk of creating a project that is not relevant and sufficient to the inhabitants, which would ultimately be a waste of resources. The challenges is that there are many people in the community with different needs and desires and compromises will have to be made to find a solution that is acceptable to everyone.

The new co-design tools should support engagement with dwellers throughout the process to ensure that they are on board with the project and understand what the end goal or product is. VR and MR tools could help to give a good visual representation of the project. They should be used if and when they add value to the project - not in places where only a limited number of people understand their purpose.

There are various ways to engage the public, but by creating platforms that the public feels most comfortable in is a best way to activate and motivate people to participate in urban development plans. This kind of feedback channels will only exist if the people understand what is being said to them. It is important how to communicate with the people so that they understand that the message is to engage them. In African contexts, all the local languages need to be used when disseminating information to the people and the information also must be presented in a way that even the illiterate understand what is being communicated. The usage of indigenous languages allows to reach people that are deep in areas that are usually overseen. Understanding their needs is also another way to activate and motivate the community to participate in urban development plans.

According to the stakeholders, in many community development programs like in Harambe Prosperity Plan, the timeline is unrealistic and ineffective. Social and welfare related projects generally take a long time to see results because of their trial and error nature; because they have not been done and proven to work already, they will have to be observed, revised and adjusted over time to improve processes and outcomes. However, collaborations are not properly managed and there is not enough collaboration amongst expertise, officials and the public to help solve some the major issues identified. Moreover, there is a lack of proper and transparent communication amongst the main actors in trying to solve these issues and problems identified.

Overall, the housing culture is very much dependent on finances and affordability and the options generally fall in one of the following categories: a detached house on a single erf, a house in a gated community on the outskirt of the city, an apartment or flat in a housing "complex", a rented backyard flat or a room and a corrugated tin structure. Buying property is seen as the best and safest option. There is no culture of long term property rental as it is seen to have less security than that of buying property. The majority of people are merely looking for a place they can afford and end up compromising on preferences such as location and facilities if they are able to find a place they can afford to buy. Generally speaking, according to the stakeholders, the current instrument for funding housing in the country is functional. There are many options people can use to purchase their homes. Government employees or civil servants have housing subsidies. A new plan has been

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introduced to use civil servants pension fund to purchase a house, home loans from financial institutions have lower housing rates and so on. The problem is that people cannot afford what is available in the market. To sum it up, funding is available, but there are no affordable houses.

Among other things, shortage of land is affecting the availability of housing. According to the stakeholder interviews, the capacity of professionals in the government or line ministry to provide or make the land readily available for the people is a slow process, which leads to shortage of land. The current procedure is lengthily. It brings frustration to the people in need of the service and delays development in the country. To sum it up, the development and building projects may face many challenges starting from the decision-making about the land, to transparency of the communication processes, getting quality raw materials and qualified professionals to work for the building sites.

VIII. CONCLUSIONS AND FUTURE WORK

To conclude, the major social trend in terms of rural and urban in Africa is the expansion of towns. The population is moving to areas where they can get better infrastructure, better sanitation, better education and job opportunities. The towns that experience such influx of people cannot meet the demands of these people.

The participatory urban planning processes and Smart City development are sensitive for different cultural and global contexts. The advanced virtual reality technologies may work well in the countries and areas with high WiFi speed, but these kind of technology-driven solutions may be less usable in rural regions with occasionally very slow internet access. Consequently, there is also a need for lightweight mobile solutions, which could function more securely in rural areas to involve more citizens in the co-creation process. In addition, to outreach more citizens in urban planning processes, the usage of indigenous languages is needed to cover people that are deep in areas that are usually overseen.

In this particular project, to enhance citizen-driven planning processes, more transparency and information sharing is need. Citizens in general were expecting more transparency to the urban planning and housing projects. In particular, simple online tools that would inform citizens about their position on the municipality's waiting list for new apartment or house and would notify about the progress of the building project, would improve the communication between government and citizens clearly.

Different citizen groups such as young people, families and mobile professionals have diverse needs for Smart Community development. Typical standard house solution is not serving all groups; also unique solutions are requested and especially mobile professionals were emphasizing availability of a wide variety of both public and private services. However, the most highlighted issue in the all groups was the need for affordable houses. At the moment housing markets are not very dynamic and cannot provide apartments for all.

It was obvious that various groups, especially young and educated, had different views about urban living and quality of life, compared to e.g. older age cohorts. Although it is not possible to make far reaching conclusions about the appropriate housing solutions for Namibia based on this data only, we may draw some methodological interpretations based on these findings. As still pictures and other traditional means to visualize the different solutions have rather limited capacity to make new and possibly unfamiliar solutions understandable for the stakeholders, more advanced tools might serve this purpose. Therefore, VR and AR tools, when appropriately applied, could potentially provide value-added to the processes, where stakeholders and local people may provide fairly distinct interpretations and views concerning the desirable housing solutions. This, obviously, could then provide an more advanced platform to create common understanding and shared views at the early phase of the planning process in order to nurture more purposeful discussion about solutions and alternatives for both, individual housing and wider neighbourhoods as well. As it seems that desired housing solutions may acquire increasingly diverse forms among the local people, new methods to communicate and visualize these alternatives among the communities, not only between planners and communities, may add value to the local planning and development process.

The study confirmed the view according, which participatory model and engagement of people is beneficial approach for the urban development. In terms of transparency and people having a voice in the process the quality of urban development may be seen improved in terms of "building communities" with feeling of ownership rather just than building houses for those in need. It should be noticed that "soft" qualities related to trust and mutual respect are the basis for the application of more concrete institutions and policies. Therefore, it might be relevant to further seek the possibilities to develop engagement in the given context, although it evidently requires more systemic approaches, as failure in housing provision may emerge from various societal and economic reasons, regardless of quality of specific development project and even more so of specific process of engagement. While discussion of systemic approach to Smart City may be left outside of this paper, it may be highlighted that carefully designed engagement process with new tools should be planned to play part in that wider design. One element that could support this systemic development, would obviously be a more functional ICT infrastructure and related skills, as discussed in the paper. However, as the wide systemic changes may take a very long time, the lesson learnt from the study at hand is that micro-level interaction and engagement practices may foster the "people dimension" of the Smart Community at very local level and therefore, improve the quality of life from this part. It is then rather a "part of the solution than part of the problem", although many questions and challenges remain. In addition to new methods to modernize urban planning and increase collaboration, a lot of political will is needed to solve the

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identified challenges related to urban planning and availability of affordable housing.

Our qualitative study is limited to one rural, but developing community in Namibia and as such, the results cannot be generalized to all African or Sub-Saharan countries and communities, as the socio-economic and political situations might be very different. In the next stages of the research, we are going to focus on developing frugal innovations, i.e., locally designed and co-created digital solutions for engaging citizens in planning or developing in their living environments and service-ecosystem in Namibia. Moreover, other important questions to research further are, how local people can be engaged to participate in planning most effectively, what kind of feedback channels do people need and how should be the communication and the interaction in between the governance and citizens in urban planning be developed.

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