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Contribution by South Africa

to the CSTD 2021-2022 priority theme on "Science, technology and innovation for sustainable urban development in a post-COVID world"

PRIORITY THEME 2: STI for sustainable urban development in a post-COVID world

United Nations Commission on Science and Technology for Development (CSTD)

Dear CSTD Secretariat,

Thank you for the opportunity to participate in the discussions arising from 24th CSTD annual session identifying "STI for sustainable urban development in a post-COVID world" as one of the priority themes for its 25th session (2021-22 period). We are happy to share Department of Science and Innovation of South Africa's perspectives and with reference to the questions posed, providing additional material which may be of interest. Our team are also prepared to engage further on any items which may benefit from elaboration or where opportunities for collaboration and learning may present.

1. *What are the concrete challenges that your country has encountered in transition towards sustainable urban development to make cities productive, inclusive, and liveable?:* South Africa has a growing population profile with persistent and increasing high unemployment rates, particularly amongst the youth (46.3%).[1] The challenge in absorbing people into the productive economy deepens exclusion and inequality, as it translates directly into an inability to access decent, affordable housing and an acceptable quality of life. Demands on state housing programmes are thus increasing, whilst financial resources to meet needs are severely constrained. The housing backlog is estimated to be 2.3 million units, growing at a rate of ~178 000 units per year.[2] About 16% units lack provision of water, sanitation, or electrification. Rising utility costs render services unaffordable especially for the most vulnerable and there are inadequate or unreliable services (water shortages due to drought and climate change, rolling blackouts due to unplanned maintenance of electrification grid etc.).[3] The apartheid spatial legacy remains a dominant feature of urban forms maintaining barriers to access opportunities on racialised lines, contributing to inequality, as exemplified by the poor Gini coefficient and undermining social cohesion.

2. *How has the COVID-19 pandemic so far impacted on sustainable urban development, and what lessons could we draw from the COVID-19 pandemic on sustainable urban development?:* The impact of COVID-19 continues to have a devastating effect on economies across the world including South Africa. South Africa lost a number of senior leaders and practitioners who championed innovation in the human settlements sector due to COVID-19, unrest and violence[4] and experienced major disruptions to planned programmes and to the construction industry at large due to extended travel restrictions, uncertainty and lockdowns. The role of the home has been transformed in the public imagination, with distance learning and working from home normalised. UNDP identifies technology and digitisation as worthy of consideration as a "human right" as it redefined access to work, income and schooling during the lockdown periods

[1] http://www.statssa.gov.za/?p=14415

[2] Msindo, E., 2017. "Housing backlog: Protests and the demand for Housing in South Africa" (presentation, Public Service Accountability Monitor, Pretoria, 2017), 4, https://psam.org.za/wp-content/uploads/2016/11/Housing-backlog.pdf

[3] Gibberd, J., 2019. 1.9 Industry status quo and trends part 3.

[4] Senior officials include Mr William Jiyana of NDHS; Mr Mziwonke Dlabantu of NHBRC; Mr Joe Odhiambo of Agrement SA; Teboho Makhoa of Gauteng Human Settlements and Mpho Mehlape-Zimu, Tshwane MMC for human settlements,

necessitated by COVID-19.[5] COVID-19 has brought the economic inequalities in South Africa into sharp focus. COVID-19 lockdowns resulted in income loss for individuals and firms, with vulnerable populations (low earners, those in informal and precarious employment, etc.) more likely to be adversely affected through temporary and permanent job loss. It is commonly understood that the ability of households to adapt to COVID-19 conditions was deeply affected by socio-economic conditions where the poor lacked facilities to implement sanitation practices as recommended by WHO, were not in a material position to reduce overcrowded living conditions or improve ventilation, could not work from home or access schooling due to lack of ICT connectivity, electrification and equipment and experienced greater hunger and nutritional deficit. Moreover, those living under inhospitable housing conditions like informal dwellings are expected to find the restrictions and circumstances more unbearable, raising the possibility of worsening psychosocial health outcomes, increased incidence of gender-based violence and propensity to engage in civil unrest. Given existing deep socioeconomic inequalities in South Africa, it is anticipated that health outcomes of the poor are more likely to significantly worsen.[6]

3. *What projects/policies has your country implemented to use science, technology, and innovation to make cities productive, inclusive and liveable? What are the main outcomes? What are the main challenges confronted while trying to implement these projects/policies?*
Development Plan (NDP), a long-term plan to reduce poverty and inequality by 2030, which recognises the crucial importance of STI in accelerating South Africa's socio-economic development. To make South Africa a more globally competitive economy, both government and industry need to scale up innovation radically. The NDP acknowledges that advances in technological innovation, the production of new knowledge, research collaboration and the application of knowledge through teaching are vital for a thriving economy.

South Africa is signatory to the United Nations 2030 Agenda for Sustainable Development, and in considering its commitments to "substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, adaptation to climate change and resilience to disasters" by 2030, South Africa concluded these outcomes can be achieved only through smart approaches and the use of innovation in the development of human settlements.[7]

The Department of Science and Innovation envisages building a South Africa for the future through hubs of innovation. To enable the creation of innovative cities, neighbourhoods and smart human settlements, the Department established a unit for Science, Technology and Innovation (STI) for Sustainable Human Settlements (SHS). This directorate works in partnership with the national Department of Human Settlements to drive and deliver innovation for the sector. The work of the unit also requires collaboration with a number of public and private sector stakeholders to support the demonstration of alternative and innovative building systems, water provision and purification technologies, alternative energy solutions and information communication technologies in human settlements.

The unit and its partners are also exploring decision-support tools to expedite the creation of a more digitised business environment and processes that will enable the realisation of a digital enterprise by the sector. Transformative, self-sustaining, liveable and carbon-neutral neighbourhoods and cities, and improved service delivery across government can only be achieved if we transform business processes from paper-based processes to digital processes, and when we influence societal and cultural attitudes to become more open to alternative methods in housing. In execution of its work, the unit identified particular challenges in reaching impact at scale and to overcome this drafted a STI for SHS Roadmap.

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[5] https://reliefweb.int/sites/reliefweb.int/files/resources/UNDP%20-%20Socioeconomic%20Impact%20Assessment%20Socioeconomic%20Impact%20Assessment%202020_FINAL.pdf

[6] https://equityhealthj.biomedcentral.com/articles/10.1186/s12939-020-01361-7

[7] STI 4 SHS Roadmap

The Roadmap project identifies a series of activities, partnerships, and initiatives articulated as an ambitious plan of action from 2021 – 2030. To date, the Roadmap has been defined and launched,[8] at the the 2020 Human Settlement Indaba. Participants adopted a declaration on strategic partnerships to transform human settlements for spatial justice and social cohesion. This declaration included, inter alia to "ensure a systematic but progressive approach to Innovative Transformative Technologies through the Science and Innovation Transformative Technologies 10 Year Road Map." Challenges confronted in implementing the Roadmap has seen delays due to COVID-19 to formalise partnerships, and attracting funding.

4. *Can you provide examples of policies/projects/initiatives aimed at strengthening national STI capabilities for sustainable urban development? For example, how does your country build technology and innovative capabilities through investments in R&D and human capital? What institutional and regulatory arrangements are in place to stimulate R & D and innovation, and to effectively address unintended consequences of technological innovation, such as privacy, ethical, gender and other concerns?* The Roadmap Framework sets out six clusters to structure a ten year implementation plan. The first cluster seeks to empower and encourage decision-makers and practitioners to embrace and foster a culture of innovation in their institutions and practices. The second cluster seeks to enhance human settlement planning and governance processes, establish enabling tools, methods and data to support collaboration across organisational boundaries and deepen evidence collection through a digitized enterprise. The third cluster makes use of strategic projects to think, experiment, play, innovate, create, disrupt and transform. By nurturing a technology pipeline, the fourth cluster strengthens relationships between government, the national system of innovation and industry. The fifth cluster seeks to support technology diffusion into the market from inception to end-of-life in order to de-risk, improve operational performance and meet the user's needs and market expectations. The sixth cluster – directed capability - establishes a foundation of research, knowledge development, technical and vocational skills supporting knowledge generation for STI 4 SHS.

   In 2019, the National Department of Human Settlements introduced the Innovation and Transformative Technologies (I&TT) Framework, which notes firstly that technologies are often implemented without following a structured systematic approach and are not aligned to the department priorities. Secondly, proposed technologies are often expensive and not disruptive enough to change the service delivery patterns of the sector. Thirdly, technological innovations proposed for the human settlements sector are taken as an end in itself and not advanced at least annually or every two years. Fourthly, the South African human settlements sector has piecemeal innovations in technology proposed emerging from both local designers and international well-wishers. The result is that the sector has not realized the full potential of the power of innovations in technology in Spatial Transformation and Consolidation in human settlements development.

   The I&TT Framework has the expressed purpose to provide a systematic, transparent and accountable approach to I&TT in the human settlements sector, in order to ensure coordination and alignment of I&TT interventions in human settlements development; ensure collaboration of role players, through integration of systems and/or sector initiatives and demonstrate benefit to poor households in human settlements will benefit via I&TT.

   The I&TT Framework is supported by six enablers. The following section on enablers is extracted verbatim from the I&TT Framework.

[8] CSIR Roadmap Launch (antfarm.co.za)

A.1.1 *Enabler 1: ICT*

"Human Settlements developments will use the ICT. This means among others, the internet, gadgets and applications to generate the inclusive, integrated and functional neighbourhoods, with prosperous property markets. ICT will empower people starting with the Informal Settlements Programme through internet based public participation, hence, strengthening the relationship between people, people and government as well as people and businesses in the human settlements sector. This will be evident in the way people connect with the human settlements sector administration through gadgets and applications, holding the human settlements administration accountable.

A.1.2 *Enabler 2: IBT*

Human settlements developments will use the following methods, processes, materials, and norms and standards for IBT in order to achieve ***adequate affordable housing****.*

- *DHS – Red book for design*
- *NHBRC – IBT guidelines*
- *SANS 10400 The application of the National Building Regulations:*
  - *Part X: Environmental sustainability*
  - *Part XA: Energy usage in buildings.*
  - *Part T: Fire protection*
- *SANS 10313 (2010) Protection against lightning and,*
- *Agrément SA approved list of building materials.*

IBT guidelines have been developed by the NHBRC for the Human Settlements sector. All projects that intend to use IBTs must comply with the NHBRC IBT approval process.

A.1.3 *Enabler 3: BIM*

The creation of liveable neighbourhoods, functional property markets and adequate housing will use digitized technologies, creating passive design enabled by BIM through various software such as 3D printing, 3D images of the building and the spaces between.
All human settlements development plans will be done in two dimensional (2D), three dimensional (3D) and printed in 3D.
This enables scenario planning and design in the human settlements sector. In addition, the sector will pre diagnose shortfalls in the construction value chain, life in the shelter, and the space between buildings.

A.1.4 *Enabler 4: AI*

Human Settlements in the creation of liveable neighbourhoods and adequate housing, will use Artificial Intelligence (AI) such as robots/ robotics for the analysis of existing conditions of the population, construction, and drones used for monitoring the construction processes.

A.1.5 *Enabler 5: Big Data*

Big Data among others will analyse the following;

- *Areas of* ***urgent housing need*** *where there is an established high demand and low supply of housing opportunities;*
- *Areas requiring* ***upgrading and/or redevelopment*** *for purposes of delivering housing choices including subsidized housing;*
- *Areas requiring* ***improved access to infrastructure, amenities and services; and***
- *Areas that* ***supports the integration of different housing typologies, land uses and economic development.***

A.1.6 *Enabler 6: R&D*

Research on innovation and transformative building technologies will keep the sector a braised with cutting edge discoveries ahead to the present information revolution."

5. *Could you share case studies of regional and international cooperation that have helped your country in strengthening STI capacities? Can you provide success stories in this regard?*

   The EcoSUN Green Village, located in the Eastern Cape province, Sarah Baardtman district Kenton-on-Sea, Ekhuphumleni township -under the Local Ndlambe Municipality - is a case study that involved the collaboration of international cooperation.

   The EcoSUN Green Village, is a collaborative pilot project between Department of Science and Innovation (DSI - Funders), Ndlambe Local Municipality (NLM - Beneficiaries), Nelson Mandela University (NMU – Conducting research on post construction/training/ Develop Local Economic Development plan), Eastern Cape Department of Human Settlement (ECDOHS – provision of 10 houses) and the German Ministry of Education and Research (BMBF - Funders and donors of innovative technology and architectural/urban designs).

   The objective of the project is to implement innovative technologies to address challenges faced by the human settlement sector, such as water and energy resource scarcity as well as unemployment. The innovative technologies include the application of water recycling (grey water technology), water filtration, renewable energy (solar technology), innovative building materials and sustainable water drainage.

   The 1 hectare village includes, 10 houses, Multi-purpose Centre, landscaping for recreational activities, vegetable garden and waste management facility. The intention is to make a village that operates independent of the municipal services, a village that supports the community and generates jobs.

   The EcoSun Green Village to date has created employment for 22 youth from the area, in the construction of the Multi-purpose Centre and has attracted donors eager to support local economic development. In addition, the German Ministry of Education and Research and the Nelson Mandela University have collaborated in the development of empowering and training the local youth on the operation and maintenance of the innovative and 'green' technology. Further collaborations are to be forged with in the upcoming construction of Sustainable Urban Drainage System and landscaping for the village.

   This pilot project has proven that innovative building materials and technology can be implemented with a limited time and accepted by communities, even under challenging conditions brought about by COVID-19.

6. *Could you suggest the contact person(s) of the nodal agency responsible for projects/policies or international collaboration related to the theme? We might contact them for further inputs.*
   Please reach out to Tshepang Mosiea TMosiea@dsi.gov.za or Lorato Motsatsi LMotsatsi@csir.co.za and Selby Modiba at Selby.Modiba@dst.gov.za tel:+2712 843 6393, +2782 306 5114. for further information.