



## Synthesis and Summary Global Solutions Summit

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*[Note: This is a brief synthesis and summary of the main themes discussed at GSS 2023 and the policy recommendations emanating from those discussions. It is not a detailed summary of each presentation.]*

### Introduction

The [Global Solutions Summit \(GSS\)](#), in partnership with the United Nations Department of Economic and Social Affairs (DESA), the [World Federation of Engineering Organizations \(WFEO\)](#) and its Affiliate Member, the [American Society of Civil Engineers \(ASCE\)](#), organized GSS2023 at the margins of the [8<sup>th</sup> Multi-stakeholder Forum on Science, Technology and Innovation for the SDGs](#). GSS2023 was explicitly designed to amplify the discussions at the [Fifth African Science, Technology and Innovation Forum 2023](#) which convened in Niamey, Niger on February 26-27, 2023 and the [STI in Africa Day](#) which convened at the UN on May 2.

GSS 2023 was the third Global Solutions Summit hosted by the UN in conjunction with the annual STI Forum. Although the overarching theme of each Summit was the same -- Scaling Technology Deployment for Achieving the SDGs in Emerging Markets -- each Summit focused on a different facet of the technology deployment challenge. [GSS 2018](#) showcased innovative business models for deploying development solutions from the laboratory to the last mile, especially in the context of fragile states. [GSS 2019](#) discussed practical, action-oriented proposals for harnessing research **and deployment** so that the 4 billion people currently inhabiting the bottom rungs of the income pyramid can enhance their quality of life while simultaneously boosting their income, thereby transforming the lives of people who need their lives transformed.

All three Summits were designed around case studies presented by thoughtful doers -- women and men who are actively working on deploying affordable, cutting edge, effective development solutions. These thoughtful doers explained what they did, how they did it, what went right and what went wrong, where gaps or broken circuits exist in the research/innovation/deployment ecosystem, and what needs to be done to create a more effective deployment ecosystem that can support the design, development, and deployment of development solutions on the scale required to put the global community on a trajectory to achieving the SDGs by 2030 or shortly afterwards.

### GSS 2023

The guiding theme of GSS 2023 is that scientific discoveries, by themselves, will not help countries achieve the SDGs unless countries in Africa and other emerging regions strengthen their capacity to translate results in the lab into tangible results on the ground. This is easier said than done. The late Dr. Vanu Bose, CEO and Founder of [Vanu](#), noted several years ago, "It takes more creativity and innovation

to market a new invention than it did to invent it in the first place." Echoing that sentiment, African Development Bank President Akinwumi Adesina remarked, "Technologies to achieve Africa's green revolution exist. For the most part, they are all just sitting on the shelves." GSS 2023 asked "why are these game changing technologies sitting on the shelves and how can Africa leverage the Diaspora, youth, engineering know-how, the private sector, and the African Continental Free Trade Area (AfCFTA) to transfer these technologies from the shelves of research laboratories to farmers in the field, factories in the cities, processing plants that add value to basic commodities, and urban and rural consumers still lacking reliable and affordable access to water, power, sanitation, health care, and other basic services."

Meeting this challenge would put Africa -- as well as developing countries in other regions -- on the threshold of a new era of sustainable, inclusive growth as the following examples suggest:

- **Smart Cities.** Africa is projected to have [24 million more people living in cities each year between now and 2045](#). This is the equivalent of building approximately three New York Cities every year for the next 20+ years. Providing potable water, power, sanitation, health care, transportation, and food to the current underserved urban populations as well as to the hundreds of millions of new residents that will populate these new urban settlements can be an opportunity for innovation, growth, jobs, and wealth creation.
- **Smart Agriculture.** Feeding this rapidly growing urban population is also a potential opportunity for employment creation and national development. The solution will entail linking rural, peri-urban, and urban communities in an urban food ecosystem encompassing (i) sustainable urban intensification; (ii) post-harvest storage and processing; (iii) transportation; and (iv) distribution to end customers. None of this will be possible on a scale commensurate with the size of the urban food challenge without harnessing a wide range of frontier technologies including connectivity (ICT, IoT, mobile money, fintech financial services); controlled environmental agriculture including vertical farming and horticulture; block chain; high quality enhanced seed; enhanced genetics including cloud biology; nanotechnology and advanced materials; and 3D printing of cells, food, machinery and structures.
- **Smart Factories.** Smart factories which combine AI, machine learning, Open-Source software, robotics, 3D printing, cloud computing, and big data analytics are becoming a more prominent feature of the global manufacturing landscape. At present, most smart factories are located primarily – but not exclusively -- in wealthier countries. We know two facts about these trends – they are most likely inexorable and dumb suppliers will have a dwindling role in smart supply chains. Africa needs to position itself to capture some of the jobs and economic growth spawned by smart factories and smart value chains.

## STI Roadmaps for the SDGs

Roadmaps help travelers get from their origin to their destination. This is as true for a short road trip as it is for STI Roadmaps for a specific SDG objective. As [Surya Raghu](#) told the Summit, roadmaps are a mechanism for turning “imagination into reality.” To do so, roadmaps must be “dynamic, agile and adaptive”<sup>1</sup> and must specify Goals, Milestones, Gaps & barriers, Action items, and Priorities & timelines.

The essential first step in any roadmap development exercise is specifying the goal or destination. These goals might include such development objectives as:

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<sup>1</sup> Agility and adaptability are important, but difficult to achieve as [Jose Roman Lopez-Portillo](#) explained at GSS 2023. This is because technology changes at a rapid exponential pace while national policies respond at a slower, linear pace.

- Providing power to urban and rural communities that do not currently enjoy affordable, reliable, and renewable energy access.
- Building local manufacturing capacity to participate in smart global and regional value chains.
- Creating smart cities to accommodate the projected urban population increase.
- Establishing Lithium-Ion battery value chains in Africa.
- Generating value added in mining and agriculture.
- Enhancing access to affordable potable water in urban neighborhoods and rural communities
- Enhancing rural livelihoods, promoting soil conservation, fostering gender equality, and empowering women and handicapped persons via regenerative agriculture<sup>2</sup>

The next step is to compile a comprehensive Needs Assessment listing the policy reforms, capacity building requirements, institutional reforms, specific investments, and implementation arrangements required to attain that goal. The Roadmap would then specify how a community, region, or country intends to fill the gaps between what currently exists and the requirements specified in the Needs Assessment.<sup>3</sup>

A Roadmap might address such issues as:

- Funding and institutional mechanisms for promoting mission-oriented research to solve specific problems related to developing and deploying solutions to achieve a specific goal or objective.
- Mobilizing the engineering capacity required to move technologies from the laboratories to farms, factories, and local communities. As [Dr. Marlene Kanga AO](#), President of the World Federation of Engineering Organization (2017-2019), explained in her [opening keynote remarks](#), “Engineering is key to advancing the UN Sustainable Development Goals... We need to build capacity for more engineers, especially women, and provide them with the right skills to advance sustainable development.” This problem is especially acute in Africa, where there are 68 engineering practitioners in SADC compared to 850 and 1160 in the US and UK respectively.
- Promoting wide-ranging community consultation during both the Needs Assessment, technology selection, and implementation phases of the work program. Consultation helps to ensure that the roadmaps are designed with bottom-up community input rather than top-down decrees.
- Mechanisms for involving the Diaspora in technology scouting and deployment. Since the Diaspora generally has one foot in the global economy and one foot in the local community, members of the Diaspora can be effective agents for introducing global technology to the local village. For example, Chakanetsa Mavhunga explained that Africa imports a lot of equipment for developed countries, but there is no means testing to see if a proposed technological solution would be socially, operationally, financially and technically appropriate for a specific village or region. The solution, he argued is to engage members of the Diaspora to scout technology at its source, evaluate competing solutions to see which is most appropriate to solve a specific problem in a specific village and, in collaboration with a wide range of community stakeholders, develop a comprehensive deployment program.

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<sup>2</sup> The [presentation](#) by [Freda Karorame](#) at GSS 2023 is an inspiring example of how hands-on training coupled with modern agro-technology are helping one region in Papua New Guinea achieve these objectives. Videos discussing the Juncao technology are available [here](#) and [here](#).

<sup>3</sup> See Pages 4-5 of this [report](#) for an example of how one project in India is employing roadmap methodologies to foster landscape restoration and agro-forestry practices that can potentially improve agricultural yields, add value to the local agriculture and food processing sectors, and improve the livelihoods of rural communities in the Indian State of Chhattisgarh.

- Building institutional capacity, perhaps housed in local university engineering faculties, to evaluate competing technologies on a range of criteria including whether they are affordable, scalable, and financially and operationally sustainable.<sup>4</sup>
- The role of complementary technologies. One piece of technology by itself – a nanofilter for water purification, a machine for food processing, a PV cell for solar power, etc. – will rarely be sufficient to solve a particular development challenge or achieve a specific SDG. Successful implementation will almost always require complementary technologies, institutions, and processes. For example, food processing initiatives like the [UN Technology Bank’s](#) Post-Harvest Loss Management project in the Gambia, which was discussed by [Taferre Tesfachew](#) and [Federica Falomi](#), will generally require potable water, power, packaging materials, finance, marketing arrangements for the finished product, workforce training, and enterprise capacity building, as well as specific food processing technology. Effective roadmaps will need to identify mechanisms for scouting, evaluating, sourcing, and deploying these essential complementary technologies.
- The role of the national government and various civil society organizations. Should the government take charge of creating the roadmaps and implementing the recommendations prescribed in the roadmap or should business organizations, universities, foundations, and other civil society organizations play the lead role in both the design and implementation of the roadmaps? Within the government what is the appropriate division of labor between the Ministry of Science and Research vs. such other line ministries as Education, Infrastructure, etc. One possible model would be the [Ten Member Group’s](#) proposal for creating a [Network of Banks of Ideas](#) and Funds for Innovation, led by autonomous Ethical Councils and supported by a collective of experts within a global digital platform under the auspices of the UN System.<sup>5</sup>
- Using and deploying innovative technologies generally requires specialized skills spanning the gamut from scientists in research labs to engineers to specialized technicians and craftsmen. A skills shortage anywhere along the chain can bring progress to a halt. An effective roadmap will need to specify who will organize and finance essential workforce skill development programs and enterprise capacity building programs that can spawn further local innovations.
- How the community intends to employ hackathons, start-up weekends, government procurement programs, and competitions<sup>6</sup> to mobilize students at local universities and youth to develop innovative businesses around deploying technology to solve problems in rural villages and urban neighborhoods. And how the community intends to learn from and perhaps duplicate, with

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<sup>4</sup> One possible model (not discussed at GSS 2023) for technology scouting, enterprise capacity building, and skill development is the Manufacturing USA Initiative discussed briefly [here](#) on Pages 5-7.

<sup>5</sup> The objective is to create a global innovation ecosystem within the TFM’s STI4SDG roadmaps that is coherent, self-adapting, self-financing, scalable, collaborative and widely informative (Mexico is a pilot country). The proposed Network would seek to reverse the growing innovation divide between disadvantaged communities (mainly in the Global South) and the few nations and corporations that dominate the field. It does so by addressing the concerns of most innovators that their ideas will be disregarded, taken without due consent or compensation, or exploited by third parties (among others) and focusing on specific problems, integrating local and indigenous solutions, accessing necessary funding for SDG-relevant projects, and offering seed capital in exchange for participating in any resulting companies’ profits or shares.

<sup>6</sup> One example of a competition designed around the SDGs is the IEEE [Empower a Billion Lives](#) (EBL) program – “a global competition aimed at fostering innovation to develop solutions to electricity access. Solutions are expected to be scalable, regionally relevant, holistic, and leverage 21st-century technologies with exponentially declining prices.” EBL employs a bottom-up process for identifying issues and solutions that generate economic and social impact in their communities, using energy access and other enabling technologies. This process also creates local pools of entrepreneurs and technicians who can keep solving problems.

appropriate modifications, a solution that some other community or country already deployed successfully.<sup>7</sup>

- Who will finance these programs and what financing and risk sharing mechanisms will they employ?
- How does the community plan to use such innovative business models as cooperatives, franchises, social enterprises, and for-profit businesses, among others to scale deployment from a few pilot families or communities to thousands of families and how could the UN help to scale these models from one community to thousands of communities in dozens of countries. In the case of cooperatives, for example, [Mutale Chilangwa](#) explained that Heifer International’s objective is to “assist 10 million households to grow out of poverty.” Organizing and promoting [agricultural cooperatives](#) is one of Heifer’s their main tools for helping farmers in Africa and elsewhere generate living incomes, promote local economic development, empower women, promote environmental sustainability, ensure food security and nutrition, acquire relevant technology, and sell value added products in local, regional, and international markets.

## What is Progress?

The global community is woefully behind schedule in meeting many of the 2030 SDG targets. However, with diligent implementation, detailed roadmaps addressing many if not all the items discussed above could help close the gap between the pace of results on the ground and the pace needed to achieve the 2030 targets. But how can we be certain that we are deploying solutions that are closing the gap in a long term, sustainable manner rather than inadvertently increasing it?

Citing evidence from the road transport and energy access sectors respectively, [Paul Chinowsky](#) and [Deepak Divan](#) argued that many countries are striving to meet short term SDG indicators at the expense of long-term sustainability. STI roadmaps should examine these tradeoffs – between climate change and efforts to expand the road network and between technological change and the effort to expand energy access -- thereby helping countries make informed decisions between short-term illusory progress and long-term sustainable progress. We are expanding the road network. We are expanding the grid. We appear to be closing in on the relevant SDG indicator. But what appears to be progress may actually be setting us up for long-term failure and disappointment.

SDG Indicator 9.1.1 for example focuses on the “proportion of the rural population who live within 2 km of an all-season road.” In his [presentation](#), Chinowsky noted that only 27% of Africa’s 2 million kilometers of roads are paved (19% in sub-Saharan Africa). Expanding the paved road network is an obvious priority. But if a country’s road building program (and roadmap for road building) ignores the impacts of climate change on the durability of the road network, the nation will ultimately have to divert an increasing proportion of its road building expenditures simply to repairing the damage from climate change. In the end, the country will find itself spending more merely to stand still or watching previous indicators erode. The solution, therefore, is to include climate change and climate resilience into SDG roadmaps from the outset.

In his presentation, [Divan](#) reported that more than 700 million people live with no electricity, and 3 billion live with extreme energy poverty – they earn less than \$1.90/day but pay the most per kwh. After 30 years and billions of dollars of investment, only 15 million people living off-grid have Tier 2 access, defined as 200 Wh/day. Under these circumstances, expanding the power grid would appear to be an obvious way to

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<sup>7</sup> Recommendations for answering these questions are available in the concluding section of the [GSS 2019 Synthesis and Policy Report](#).

achieve SDG 7’s objective of “ensur[ing] access to affordable, reliable, sustainable, and modern energy for all.” Divan, however, asserted that focusing on grid expansion is the wrong way to proceed. It is neither financially sustainable, operationally feasible, nor technologically necessary. Instead, developing countries have an opportunity to leapfrog over 20<sup>th</sup> century grids by installing 21<sup>st</sup> century state of the art energy access solutions. These would be based on bottom-up, scalable electricity ecosystems that use standardized smart interoperable devices for plug-and-play operation, democratize energy access, and empower local communities.

All this is possible, Divan asserts, “because the most important technologies are following steep and sustained learning curves, with rapidly declining prices. This includes digitalization, PV solar, batteries and EVs – all pivotal in tomorrow’s energy infrastructure. For instance, PV and battery prices have dropped by 90-95% in a short span of 20 years, are now well below parity compared with coal, gas, and diesel, and will continue to decrease over the next 20+ years. Most roadmaps do not address these fundamental issues -- but need to. But by outlining a strategy that expands on the use of these technologies and specifying solutions that are modular, interoperable, and scalable, roadmaps can point the way to a bottom-up build of an energy system that is smart, built where it is needed, and affordable for both governments and consumers.”

## **Conclusion**

The global community is not on track to achieve the SDG 2030 targets. Well-crafted STI roadmaps can help to accelerate the rate of progress. R&D is one component of a roadmap. But as the speakers at GSS 2023 emphasized, effective roadmaps must address a wide range of concerns, stakeholders, and issues, many of which are distantly related to the realm of science and scientists but essential if we are going to achieve the global community’s 2030 objectives.