



## **Takeaways and Policy Recommendations**

### **Global Solutions Summit 2018**

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#### **I. Introduction and Guiding Philosophy**

The [Global Solutions Summit](#) (GSS 2018) convened at the United Nations Headquarters in New York City on June 4, 2018 with support from the UN Department of Economic and Social Affairs, the UN Conference on Trade and Development, the UN Commission on Science and Technology for Development, and the UN Office of Partnerships. The official theme of GSS 2018 was “From Lab to the Last Mile: Technology Deployment Business Models for the SDGs.”<sup>1</sup>

Why is technology deployment relevant for the SDGs? At a recent [speech](#) to the UN Food and Agricultural Organization in Rome, Dr. Akinwumi Adesina, President of the African Development Bank, answered this question simply, succinctly, and eloquently when he noted, “Technologies to achieve Africa’s green revolution exist. For the most part, they are all just sitting on the shelves.”

Alas, green revolution technologies are not the only ones sitting on the shelves, valued in principle but all-too-often unused in practice. There is no shortage of proven, cost-effective, and affordable development solutions for many of the most pressing development challenges – off-grid, renewable energy, potable water, community health clinics, wi-fi access for remote communities, solar powered irrigation pumps, low-cost housing and sanitation, off-grid food storage, refrigeration, and processing, etc. For example, it is now possible to provide reliable, affordable electric power via community micro-grids or roof top solar systems without constructing a central power plant and expensive transmission and distribution lines. Similarly, it is possible to provide WHO-quality potable water from salt, brackish, or polluted fresh water by deploying an array of small, relatively inexpensive community water purification kiosks, each equipped with technologically-advanced filters. Unlike large-scale power plants and water treatment facilities which take years to build and cost hundreds of millions of dollars, these small-scale, distributed solutions can be deployed in a fraction of the time and at a fraction of the cost. And although most of these technologies were not developed specifically to address the needs of the more than 2 billion

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<sup>1</sup> GSS 2018 was the third in a series beginning with the [Inaugural Summit](#) at the US State Department in April 2014 and a [Second Summit](#) at the Clinton Presidential Library in December 2016.

people at the so-called [bottom of the pyramid](#), they should make it even more affordable and easier, in principle, to hit the SDG targets, especially in the least developed countries (LDCs) where enormous progress is possible simply by deploying proven solutions that are already in widespread use in other countries.

But if that's the case, why aren't we on track to achieve the SDGs? If proven, cost-effective solutions to so many development challenges already exist, shouldn't it be fairly simple and straight-forward to start financing their deployment at scale?

### **Deployment as an Afterthought**

“Build a better mousetrap, and the world will beat a path to your door” argued Ralph Waldo Emerson, the nineteenth century US lecturer, philosopher and essayist. In other words, if scientists and engineers invent a better solution, scaling and deployment will happen automatically, or perhaps with some assistance from online “platforms” to help scientists and engineers who invented relevant technology identify people and communities who need that technology.

Although Emerson was writing in 1882, we are still operating today on the basis of Emerson's optimistic but misguided premise even though experience suggests that technology deployment is not as simple and automatic as Emerson suggests. And if that is the case, we can no longer afford to relegate technology deployment to an afterthought in the SDG dialogue. It is an indispensable piece of the puzzle and requires at least as much attention as the quest for new discoveries. After all, as Dr. Vanu Bose observed 135 years after Emerson, “It takes more creativity and innovation to market a new invention than it did to invent it in the first place.”<sup>2</sup>

Fortunately, in sector after sector – power, water, wi-fi, agriculture and many others -- entrepreneurs have been busy designing and developing successful business models for deploying cost effective development solutions. Their experience suggests that there is no magic bullet or one-size-fits-all solution for tackling the organizational, entrepreneurial, engineering, financial, O&M, supply chain, and business development processes that are pre-requisites for getting these solutions into the hands of tens, if not hundreds, of millions of people in emerging markets. But through their triumphs and setbacks, these pioneers have developed prototypes of successful business models and valuable lessons of experience. Ideally, these will pave the road and accelerate the learning curve for the next generation of deployment entrepreneurs.

### **GSS 2018 Objectives**

With this in mind, GSS 2018 set out to showcase the specific business models and financial mechanisms that NGOs, social enterprises, entrepreneurs and foundations are already using to scale up the deployment of affordable, financially-sustainable development solutions in emerging markets, especially the Least Developed Countries (LDCs). The initial objective was to have these entrepreneurs describe their business models and then discuss the trials and tribulations as well as the technical details of designing, financing, implementing, and scaling-up commercially viable technology deployment programs. In

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<sup>2</sup> Vanu Bose, quoted in MIT Technology Review, <https://www.technologyreview.com/s/609009/the-unfinished-work-of-vanu-bose/>

accordance with this objective, speakers were asked to explain what they did, how they did it, what went right, what went wrong, and what they would do differently with the benefit of 20-20 hindsight.

And yet even though every speaker did what I requested, the results were not what I expected. Rather than framing the discussion in terms of such technical issues as supply chains, financial instruments, partnership arrangements, marketing strategies, and pricing arrangements that straddled the divide between affordability and financial viability, the discussion evolved into a more profound analysis of technology deployment.

This report synthesizes five essential ideas and insights that emerged from that broader deployment discussion and concludes with a series of policy recommendations for the scientific community as well as the UN, World Bank and broader development community. By design, it is not a strictly chronological recitation of who said what and, in a deliberate break from the design of the Summit Agenda itself, it is not organized around specific sectors or technologies – e.g., water, power, wi-fi, agriculture, and finance.

## **II. Five Thematic Conclusions and Observations**

### **A. The Last Mile**

*The theme of the Summit was “From the Lab to the Last Mile.” But what precisely do we mean by “the last mile”? Is it a strictly geographic concept related to distance? Does it refer to grid vs. off-grid solutions? Or does it also contain a socio-economic dimension related to fragility and resilience? How do these distinctions affect strategies for scaling up technology deployment?*

At first blush, the phrase “the last mile” would appear self-evident and not in need of much discussion. But Summit participants rapidly dispelled that misconception. When it was originally coined, “[the last mile](#)” referred to connecting customers to a nearby water, sewage, electric, or telecommunications grid. By definition, it assumed the existence of a grid and deployment was viewed primarily as a series of management, logistical, financial, and engineering tasks. But in developing countries, the last mile concept is more complex and often has more to do with such socio-economic concepts as marginalization and exclusion than distance or proximity to the grid.

Many residents of urban or peri-urban areas, for example, live relatively close to an existing grid. Other communities are located adjacent to power plants or even underneath high voltage transmission lines that bring power to distant communities. But despite their proximity to the grid, residents in both groups of communities have no immediate prospect of being connected to it. From a last mile perspective, they may as well be hundreds of miles from the grid. And finally, many other consumers actually do live tens or hundreds of miles from the nearest grid. In this case, the “last mile” is a figure of speech that refers to a day, perhaps 20 or 30 years in the future, when the grid will reach these consumers.

In many emerging markets and especially in the Least Developed Countries that have made the least progress in achieving the SDGs, connecting the local population to a nearby grid or extending the grid to distant communities is expensive, unaffordable, and most likely unattainable by the 2030 SDG target date. Fortunately, the emergence of proven, cost-effective, small-scale distributed solutions is rendering grid connections both unnecessary and often more expensive than off-grid alternatives. In these cases, the

phrase “the last mile” refers to deploying these off-grid solutions – e.g., roof top solar, community based micro-grids, neighborhood based water purification kiosks, wifi stations, etc. – in communities, farms, businesses, and households that currently are, and likely to remain, off-grid for the foreseeable future.

Jonathan Papoulidis of [World Vision](#) urged the Summit to go beyond these narrow definitions and focus instead on “the global last mile.” This is not a geographic concept related to proximity to the grid. Nor is it a technology/engineering concept related to grid vs off-grid solutions. Instead it refers to the challenge of implementing the SDGs in fragile “contexts.” According to Papoulidis, (citing work by the [OECD](#)) fragility has five dimensions – political, social, economic, environmental, and security. Fragility exists when a community is exposed to stresses or risks that the political, social, economic, environmental and/or security arrangements are not agile and resilient enough to cope with, leading to a downward spiral of chaos, despair and hardship. Contrary to popular belief, security or, more precisely insecurity, is frequently not the predominant source of fragility.<sup>3</sup> Even relatively peaceful communities can be overwhelmed by political, environmental, economic and social stresses that strain their capacity to cope.

How can we achieve the SDGs in these fragile contexts? According to Papoulidis, merely deploying water purification filters, drought tolerant seeds, health clinics, off-grid refrigeration and food processing technology, and other small-scale, distributed solutions is not the most effective way to reach the global last mile, since these deployment interventions, by themselves, do little to promote long-term resilience and reduce fragility. Instead, he argued, deployment programs need to be embedded in a broader three-pronged anti-fragility/resilience-strengthening strategy<sup>4</sup> consisting of:

- **Bonding** to strengthen social ties within the community, promote self-help approaches, share information and assets, pool funds, and provide psycho-social support
- **Bridging** to bring together different communities that don’t have readily apparent shared interests. This will maximize their joint capacities in the face of shocks and stress and mend divisions that can lead to conflict; and
- **Linking** communities and local networks with formal institutions and governments.

Although bonding, bridging and linking may be critically important elements of successful deployment strategies in fragile communities, it turns out that they are often critically important components of successful deployment business models in non-fragile contexts as well. To cite just a few examples, Hilary Haddigan from [Heifer International](#) (agriculture), Patrina Eiffert from the [NRECA International](#) (power), and Lars Willi of [Weconnex](#) (water) are each helping the local communities in which they operate establish local cooperative associations. They refer to their work as building social capital or organizing cooperatives, rather than bonding and bridging but, irrespective of nomenclature, the concepts and underlying approach are broadly synonymous. Similarly, Eiffert, Willi, Granger ([Feed the Future](#)

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<sup>3</sup> For detailed data and information about fragility, see the OECD’s [States of Fragility 2018](#). The key messages and highlights are available [here](#). Two key messages from this report are especially pertinent. The first is that “without action, more than 80% of the world’s poorest will be living in fragile contexts by 2030. This means that development actors across many sectors will need to better grasp the unique challenges of development in fragile contexts if the ambitions of the Sustainable Development Goals are to be met.” The second is that of the 27 countries identified by the OECD as “chronically fragile,” 19 have not experienced a major conflict in over a decade. As Papoulidis notes, “All this to underline the point that fragility is not reducible to conflict.”

<sup>4</sup> Papoulidis provides a more detailed discussion of bonding, bridging and linking in Box 1.2 (Page 47) of [States of Fragility 2018](#).

[Partnering for Innovation](#)), Ferris ([Catholic Relief Services](#)), and Walker ([Mercy Corps](#)) described how their deployment programs linked families and communities to formal markets, thereby boosting household incomes and breaking the scourge of informality, and Beard ([Vanu](#)) and Ahmed ([Aamra Group](#)) explained how their companies provided the communications networks that are so essential for linking in today's globalized world.

Finally, Mark Grobmyer ([Global Solutions Institute](#)) unveiled a Fulbright Scholar linkage initiative which seeks to transform the more than 200,000 Fulbright Scholar Alumni into agents and partners for technology deployment. The Fulbright alumni would not be agents and partners in the strictly commercial sense of the term. Instead, they would use their positions of influence to link technology vendors, NGOs, and financiers to reliable local partners in each Fulbright scholar's home country. In addition, the Fulbright Scholar Initiative, working through a network of US universities, would conduct briefings for the 3,000 or so Foreign Fulbright Scholar Students currently studying each year in the US. These briefings would provide "tool kits" and training on how to serve as linking agents for technology deployment. Fulbright Scholars are not the only potential deployment agents. Other possible linking agents include members of Diaspora organizations with ties abroad as well as in their home country, Peace Corps volunteers, Singularity University alumni, and Ashoka Fellows, to cite just a few of the many possible candidates.

The main takeaways and policy conclusions from this last mile discussion are:

1. Successful business models for technology deployment combine attention to finance, logistics, supply chain management, pricing, partnerships, sales and marketing with such socio-economic issues as building social capital via bonding, bridging and linking.
2. Just as there is not one "correct" business model for all sectors and circumstances, there is not one set of correct tactics for bonding, bridging, and linking. Successful deployment mechanisms generally depend on finding the combination of business model strategies and bonding, bridging, and linking strategies that meet the unique needs of each community. The choice is not between focusing on business models, on the one hand, and bonding, bridging and linking strategies, on the other hand, but on deploying both strategies simultaneously to reinforce each other.
3. Potential linkage/deployment agents – Fulbright Fellows, the Diaspora, etc. – are an underutilized, but valuable, resource for deployment. However, to maximize the value of these linkage and deployment agents, some sort of clearinghouse and light-touch coordinating mechanism may be helpful.

## **B. Scaling Up**

*What do we mean by scaling – Doing more in the same place? Doing the same thing in more places? Is it possible to transition from a stand-alone small-scale pilot project to a larger operation that can help to achieve the SDGs in more than one or two villages? If not, what are the pre-requisites for a successful scaling program?*

One thing we can say without fear of contradiction is that scaling is difficult. Speaking during his presidency about education reforms, President Clinton [noted](#), "Nearly every problem has been solved by

someone, somewhere. The frustration is that we can't seem to replicate (those solutions) anywhere else.” Or as Chris Walker of Mercy Corps and his colleagues at the [Innovation Investment Alliance](#) and Duke University [asked](#), “When there are hundreds, if not thousands, of new mission-driven enterprises emerging around the world, why are there so few examples of social enterprises that scale to achieve systems change?”

At first blush, scaling shouldn't be so difficult. If an NGO is providing potable drinking water or roof-top solar panels to 10 households in a village, it should not be too difficult to provide the same services to 100 households in the same village. But what if the goal is to scale up from 100 households in one village to 500 households in each of 10,000 communities? Reaching 5 million households is an exponentially larger and inherently more daunting exercise. And what if reaching 5 million households per year is a drop in the bucket – woefully inadequate to reach the SDG 6 goal of providing potable water to the 2 billion people who currently do not have reliable access to safe water or the 4 billion people who will lack access by 2030 based on current population trends? Success in terms of SDG 6 will be out of reach unless we find ways to accelerate the current pace of deployment far beyond what is already considered wildly ambitious. The same is true for the SDG 7 goal of energy for all which will require the deployment of tens of thousands of microgrids by 2030. At current rates of deployment, we are not even close to achieving this objective.

So what will it take to mount a successful scaling effort, one that is commensurate with the challenge of achieving the SDGs? The Summit speakers highlighted several important do's and don'ts.

- Scaling should not be treated as an afterthought or an add-on to a small pilot project. It must be a primary objective and integral component of the deployment program from Day 1. All too often, we start by funding a small-scale pilot project in one village and, if it is successful, raising money to expand it to several more villages. This small-scale, piece-meal approach will never be sufficient to achieve the SDGs since entrepreneur with good ideas all too often find themselves unprepared to escape the so-called “[stagnation chasm](#).” Instead, as Jonathan Papoulidis explained, we need to start with a global vision (provide drinking water to at least 100,000,000 people in the next five years), determine what will be required to achieve that objective, develop strategies for mobilizing the required technical, financial, human capital, partnership, political support, and other essential resources, and figure out how to start implementing that strategy. In broad, general terms this can be summarized as (i) developing a scaling-up plan; (ii) establishing the preconditions for success; and (iii) implementing the scaling up process.<sup>5</sup>
- A variety of mechanisms for scaling in one country were featured at the Summit: Randy Welsch explained how [Jibu](#)'s franchise mechanism provides potable water primarily in urban areas of Kenya, Rwanda, Uganda, and, in the near future, Zimbabwe and Tanzania. Jibu's goal is to provide unsubsidized service to the middle 70% (excluding the top 10% and bottom 20%) “of the underserved population within walking distance of the store, who typically drink boiled or untreated water as they cannot afford to regularly purchase safe water” and to find ways to provide subsidized service to the bottom 20% who simply cannot afford potable water. Jibu is now planning to roll out a series of [master franchise agreements](#) so that the franchise mechanism

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<sup>5</sup> For further details see Larry Cooley and Johannes F. Linn, [Taking Innovations to Scale: Methods, Applications and Lessons](#).



can be replicated by entrepreneurs in other countries.<sup>6</sup> [Ignite Power](#) has installed roof-top solar panels in 50,000 Rwandan homes. Now that their model is tested and proven, they plan to provide rooftop power to 500,000 Rwandan homes in the next few years. Via a network of Small Water Enterprises (SWEs), the [Safe Water Network](#) currently provides affordable potable water to approximately 300,000 Ghanaians. With a planning grant from the World Bank, plans are underway to establish a [Ghana Water Enterprise Trust](#) that would be structured to provide financial stewardship for a large portfolio of small water enterprises across Ghana, consolidate funding and leverage the cash flow of the current SWEs to raise capital needed to scale up operations and reach 3 million Ghanaians and many more if there were operating subsidies.

- These programs are laudable. But successfully scaling in one country is only the first step toward achieving the SDGs at the global level. But unfortunately, many social enterprises that scaled successfully in one country simply do not have the financial and managerial capacity to expand their operations even to neighboring countries, not to mention more distant locales and continents. Therefore, scaling at the global level will require, at a minimum, mechanisms to transfer this know-how and lessons of experience from country to country. In the words of [Kevin Star and Greg Coussa](#), “If [successful social enterprises] really want to go to scale, they have to become active facilitators of their own replication. They have to shift from working exclusively as direct doer to taking on at least a partial role as teacher and supporter. They need to package up their model as a systematic, doable intervention (including the systems that make it doable) and ‘sell’ it to those most able to replicate it at scale. They then have to support—often intensively—the successful implementation of the model.”
- Fortunately, many organizations are beginning follow this advice. Jibu, for example, is developing Master Franchise Agreements to facilitate country-to-country knowledge transfer. In addition, Weconnex, whose [Nexus Centers](#) provide an infrastructure hub located in the core of remote communities and [Shared Interest](#) which operates an innovative, financially sustainable mechanism to guarantee loans from local commercial banks in South Africa, are each offering to share their business models with NGOs that want to implement these programs in in countries where Weconnex and Share Interest are currently not operating. Finally, Safe Water Network which operates a rapidly growing system of successful small water enterprises in Ghana and India is developing tools, training materials, and capacity-building programs that will enable other organizations to adapt and adopt the Safe Water Network model.<sup>7</sup> Work is also underway to develop an interoperable set of IT-based operating, reporting and training tools.
- As Chris Walker from Mercy Corps observed, scaling does not require a large organization. But it does require the capacity to partner with the large number of diverse organizations that constitute the so-called “deployment ecosystem.”<sup>8</sup> And this raises the question, “How exactly do you organize an efficient and effective deployment ecosystem so that members can find and partner with other members?”

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<sup>6</sup> A detailed set of Jibu FAQ’s is available [here](#). Case studies of Jibu generated by the University of New Hampshire’s Center for Social Innovation and Enterprise are available [here](#) and [here](#).

<sup>7</sup> For more detailed information about Safe Water Network’s operations see [Small Water Enterprises: Providing Safe Drinking Water for Resilient Cities](#) and visit their [Small Water Enterprise Resource Center](#), a curated space that compiles the growing number of publications and resources relevant to the enterprise approach.

<sup>8</sup> Case studies of how six social enterprises scaled their operations to reach at least one million beneficiaries each, is available at [Scaling Pathways](#).

The main takeaways and policy conclusions from this scaling discussion are:

1. Scaling should not be treated as an afterthought. Instead, plans for developing and implementing a scaling plan should be an integral part of the deployment business plan from the outset.
2. Even currently ambitious scaling plans will not put the global community on a trajectory to meet the 2030 SDG goals unless we learn how to support knowledge transfer mechanisms whereby the know-how embedded in successful deployment programs in one location is transferred to organizations and institutions that can implement these programs in additional locations.
3. Knowledge transfer mechanisms should be given a more prominent place in the global SDG dialogue. This should include strategies for scale up knowledge transfer mechanisms so that more organizations are involved in transferring their knowledge and know-how to more countries.
4. Scaling up in one location not to mention scaling up across numerous countries more or less simultaneously will entail developing a much more effective and efficient deployment ecosystem as well as a more effective and efficient knowledge transfer network.

### **C. Building an Efficient and Effective Deployment Ecosystem**

Technology deployment does not happen automatically. Nor does it take place in a vacuum. It requires an effective and efficient deployment ecosystem – one that empowers all the actors in the deployment process to find each other and join forces to get the job done.

Ironically, the emergence of smaller-scale, distributed technologies disrupted the reasonably efficient deployment ecosystem that had been established decades earlier by the World Bank and others. The global development community has still not figured out how to replace that older, but potentially out-of-date, deployment system with something better suited to deal with 21<sup>st</sup> century technologies.

For example, with older technologies, households, factories, and communities had to be connected to a central water treatment plant or central power plant if they wanted reliable access to potable water or electricity. For development finance organizations like the World Bank, a loan to the relevant ministry or state-owned utility company was generally all that was required to provide new power plants and treatment plants and also to extend service to new communities.<sup>9</sup> In many cases, these loans contained a small technical assistance component which trained local engineers and technicians in the ministry or state owned utility to operate and maintain the newest technology. Moreover, with these older technologies, one general contractor, usually a multinational corporation with extensive financial and human resources, would assume overall responsibility for designing the system, procuring the requisite hardware and software from various specialized equipment vendors, constructing the facilities, hiring the necessary subcontractors, and training the local personnel to operate and maintain the finished facility. Technological information and engineering know how flowed relatively unimpeded through this system.

However, these tried and true deployment mechanisms are no longer relevant in a world of smaller-scale distributed technologies – precisely the sort that will have to be deployed at scale if we are to achieve the

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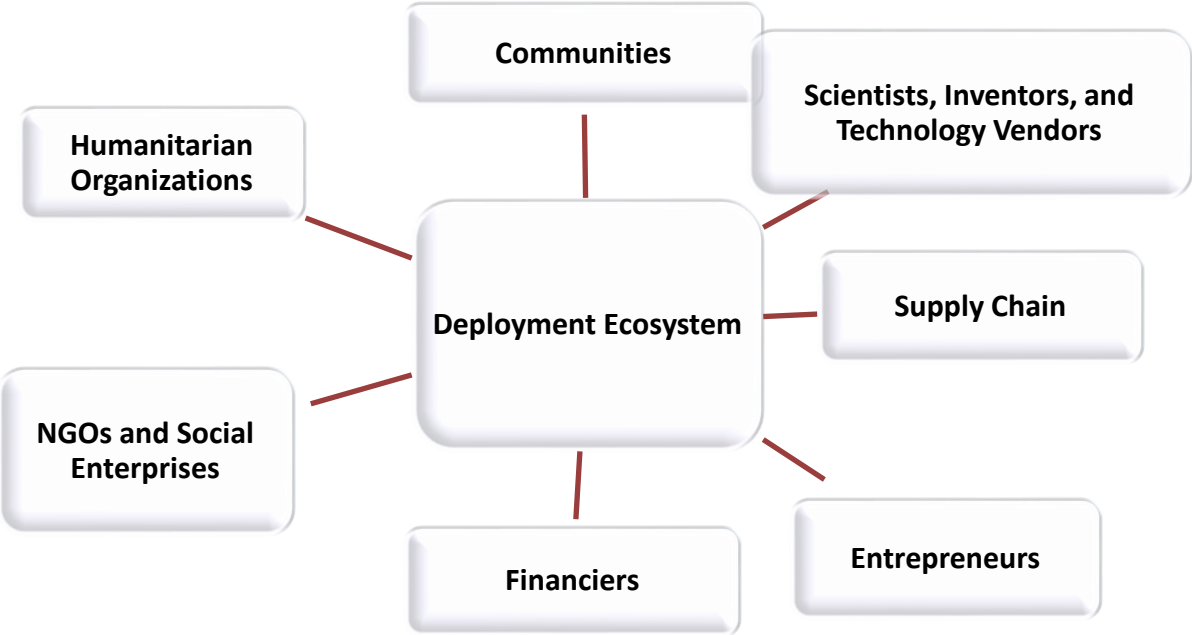
<sup>9</sup> See, for example, Charles Weiss and Nicolas Jequier, Technology, Finance and Development – An Analysis of the World Bank as a Technological Institution, Lexington Books, 1984.



SDGs in emerging markets. In principle, unlike large-scale power plants and water treatment facilities which take years to build and cost hundreds of millions of dollars, these small-scale distributed solutions can be deployed in a fraction of the time and at a fraction of the cost. However, the challenge now becomes figuring out how to finance and deploy these distributed, inexpensive facilities so that they reach tens of millions of people in a relatively short period of time.

This is easier said than done. Although the capital cost of these new technologies may be much lower compared to older technologies, the community empowerment, organizational, financial, capacity building and entrepreneurial challenge of deploying, financing, managing, and maintaining thousands of water purification kiosks or microgrids in thousands of communities is substantially more complex, as Figure 1 illustrates.

**Figure 1: Deployment Ecosystem**



For example:

- **Communities, both fragile and non-fragile** may know in broad general terms what they need, but they don't necessarily know where to find it, how to look for it, how to evaluate competing technological solutions and proposals from NGOs and social enterprises, how to organize local supply chains, arrange financing, handle operation and maintenance,

organize a village enterprise or coop, and negotiate terms and conditions with potential partners who are vastly more experienced and sophisticated.

- **Scientists, inventors and technology vendors** may have developed a cost-effective, technologically efficient, and affordable nano-filtration mechanism. But a nano-filter cannot produce and distribute potable water without pumps, hoses, cisterns, a power supply (grid, solar, bicycle, diesel), water quality monitoring equipment, a retail distribution system, a payment collection mechanism, and finance to undertake all of these activities. Who will organize this supply chain and finance these activities in thousands of communities? Those same inventors and vendors may already be selling purification systems to buyers in the US or EU. But they don't necessarily have sales contacts in Africa, Asia, and Central America nor do they have the personnel, financial resources, and inclination to search for potential customers and local partners in thousands of communities across dozens of countries. Even if they did, they would not necessarily know whom to meet in each country or community; how to organize meetings with the key decision makers, how to find reliable local business partners and suppliers, and, more generally, how to do business simultaneously in several foreign countries. This is simply beyond their competence as innovators, scientists, engineers and small business executives.
- **Entrepreneurs** need to incorporate this equipment into a financially viable, scalable enterprise. For example, a technology provider may have a nano-filter that can convert salt water, brackish water or polluted fresh water into WHO-quality potable water. But a filter, by itself, is not sufficient to deliver clean water to a community. Somebody (an entrepreneur) needs to finance and purchase the equipment. The entrepreneur also needs to combine the filter with pumps, hoses, and cisterns. Finally, the entrepreneur has to distribute the water to the community, collect payments, figure out how to operate, maintain, and repair the purification apparatus and provide other essential customer services, and generate revenues sufficient to cover the full range of capital and operating costs. The entrepreneur could be an equipment supplier, a local or international NGO, students, or community members themselves. Irrespective of who handles them, these chores are indispensable pre-requisites for a successful project.
- **Financiers**, including multilateral and bilateral official lenders, institutional investors, foundations, NGOs, private impact investors, the "crowd," the Diaspora, and pension and sovereign wealth funds, among others cannot deploy their capital unless there is a robust pipeline of viable projects. Financial organizations generally do not have the inclination, capacity, or know-how to develop this pipeline. They are financiers; not project developers. Someone else has to handle this project development task and present the projects in a form that financiers can evaluate. In addition, different types of financiers provide different types of capital – commercial loans and equity, grants, guarantees, subsidies to "buy-down" the cost of other forms of capital, family funds and impact investors seeking investments that generate "profit with purpose," etc. Projects will frequently require a blend of capital from different sources with different, but complementary terms and conditions. This, in turn, means that financiers will need to form consortia and alliances with other capital providers and project developers. They must also be able to find each other as well as the entrepreneurs, community leaders,

technology providers and other partners associated with particular projects. And this is only the first step. As the next section will discuss in more detail, at the end of the day, none of this will matter unless there are financial conduits for delivering this capital in the correct form and quantity to thousands of last mile projects.

- **NGOs and social enterprises** may be operating successful water purification pilot programs in one country. They have the sectoral expertise and operational know-how along with a general willingness to help in a much larger universe of communities. But as noted above, they have neither the contacts to replicate their efforts in neighboring countries let alone countries farther afield nor the organizational capacity and personnel to operate similar programs in additional locations.
- **Humanitarian organizations** may be present in numerous countries, but they are not necessarily in the business of owning, operating, managing, maintaining and repairing water enterprises in every community where they are present.
- **Local and national government officials** may be buffeted by competing local vested interests who don't welcome disruptive interlopers. Wrong decisions made with the best of intentions can be costly, both politically and financially. Therefore, these officials need to know whom to say no to and whom to say yes to. They need technical information to support their decisions along with the capacity to ensure that decisions at the highest government levels are implemented in a "whole of government" by lower level agencies and organizations.
- **Bilateral and multilateral development agencies** need to learn how to operate effectively in this newly emerging ecosystem.

In some locales, critical pieces of this deployment ecosystem are missing entirely. In other locales, many of the constituent elements of a vibrant and effective deployment ecosystem already exist, but they are fragmented and disconnected, resulting in an ecosystem characterized by a series of broken circuits. Where the ecosystem is missing entirely, companies like Vanu told the Summit that they had to create the necessary ecosystem from scratch before they could begin the deployment process. This is what prompted the company founder Vanu Bose to note that it is harder to market a new invention than to invent it in the first place. But it is also highly inefficient to have each NGO or social enterprise create its own ecosystem every time it wants to undertake a deployment program. It also substantially increases the cost of deployment, making it difficult if not impossible for many social enterprises scale their operations beyond a few pilot communities.

The net effect of this fractured or non-existent ecosystem is that deployment efforts are less scalable and effective than they would be if potential partners could join forces and establish some greater organizational coherence. Perhaps most damaging of all, the accomplishments of one partner in a particular locale do not become stepping stones to support the efforts of other partners working in that same country or region. For example, if one member of the ecosystem -- an NGO, for example -- is setting up agricultural cooperatives or other income-generating activities in a community, development solutions that were previously unaffordable in that community might become eminently more affordable. This in turn might create opportunities for other partners to set up social enterprises providing pay-as-you-go micro-grids, rooftop solar, or potable water in that same community. But because there is no easy

way for partners to exchange information with each other, these potential synergies are not exploited to the fullest extent possible.

The main takeaways and policy conclusions from this ecosystem discussion are:

1. Social enterprises and NGOs have developed business models for getting their technology and development solutions into the market. But these enterprises and NGOs are not autarkic organizations. They depend on a well-functioning ecosystem of local partners, financiers, suppliers, sales personnel and others to implement that business model.
2. In many locales, but especially in the Least Developed Countries and fragile communities, the existing deployment ecosystem is fragmented, littered with broken circuits that reduce the effectiveness and increase the cost of existing deployment programs.
3. To support the deployment process and enhance the prospects for achieving the 2030 SDG targets, the global development community should develop policies and programs for strengthening the deployment ecosystem.
4. At a minimum, this will entail a two-pronged strategy of (i) developing a platform so that all the disparate elements of the ecosystem, ranging from technology vendors to local supply chain candidates to financiers to potential local entrepreneurs to Fulbright scholars and other Diaspora representatives -- can find each other and join forces more easily; and (ii) building the capacity of local organizations, institutions and individuals to participate more actively and fully in the deployment process.

#### **D. Bringing Finance to the Last Mile -- Building a Better Financial Plumbing System**

At a July 2015 meeting in Addis Ababa, Ethiopia, [the UN encouraged](#) “long-term institutional investors, such as pension funds and sovereign wealth funds, which manage large pools of capital, to allocate a greater percentage to infrastructure, particularly in developing countries.” In the wake of the pronouncement, the World Bank, IMF and other multi-lateral development banks outlined plans for increasing public and private investment flows for sustainable development from [“billions to trillions”](#) of dollars.

This is all fine from a broad macro perspective. But as a practical matter, how will we get these financial resources to individual "last mile" communities and households who need finance in much smaller increments than billions or trillions of dollars. In other words, how do you scale up financial mobilization from billions to trillions and then build a financial plumbing system with conduits that can deploy these funds in the thousand or million dollar increments needed to finance tangible projects on the ground?

Although these financial engineering issues were not the main focus of GSS 2018, two important messages emerged from the general discussion.

First, NGOs like Shared Interest and companies like Credit Ease in China, along with many others are developing conduits to bring commercial finance to last mile customers who, in the opinion of many commercial lenders, could not meet the creditworthiness and collateral requirements for obtaining a standard commercial bank loan. [Shared Interest](#), which operates in Southern Africa, guarantees local

commercial bank loans to last mile consumers, producers, and enterprises. Shared Interest's initial guarantees were rather extensive, covering as much as 75% of the commercial banks' loans. But as the banks saw that repayment rates from these last mile customers equaled or exceeded those of their regular customers, some began to lend with less comprehensive guarantees and some dispensed with guarantees altogether. In the process, Shared Interest has achieved significant leverage. Its \$29 million in guarantees has resulted in commercial bank loans totaling \$122 million to economically marginalized borrowers. In addition, as word of the program spread, more banks participated in the program, helping more last mile communities gain access to commercial finance. Perhaps most impressive, though, is Shared Interest's financial record. Shared Interest operates as a stand-alone, financially viable not-for-profit financial entity. It charges fees for its guarantees and maintains a guarantee loss reserve fund, which have been more than sufficient to cover calls on guarantees and some of the technical assistance costs. The securities Shared Interest purchases with the money it borrows from investors back the organization's guarantees and allow Shared Interest to make every scheduled interest payment to its investors.

Unlike Shared Interest which is working within the commercial banking system, [Credit Ease](#) is bypassing the commercial banking system altogether and lending directly to last mile rural customers. These customers do not have formal credit scores or histories, but they do have money transfer and bill paying histories embedded in their cell phone records. Credit Ease uses this information to generate an equivalent credit score, which seems to be as reliable as more traditional "standard" credit scores. Similarly, Laura Koch from Ignite Power and Syed Farhad Ahmed from Aamra explained how regular, timely payments via the cell phone banking system not only allow their customers to obtain roof top solar power and wifi services but how they also enable their customers to generate a cellphone-based credit score. This, in turn, enables them to borrow from a new class of fintech lenders such as Credit Ease as well as directly from technology vendors and solutions providers like Ignite Power.<sup>10</sup>

Second, in designing new financial conduits for last mile deployment programs, it is important to answer a simple question: Who is the borrower for each specific project. At first glance, the answer would appear fairly obvious. If a household needs a rooftop solar installation or a franchisee wants to start a potable water enterprise, the most likely borrower at first glance would seem to be the household or franchisee, as the case may be. Therefore, building financial conduits to channel resources to the household or franchisee would appear to be the most obvious way to finance technology deployment for the SDGs. However, real life situations are not always this straight forward.

In some cases, for example, channeling finance to entities domiciled in the US or EU may be the best arrangement for delivering power and potable water to last mile consumers in accordance with SDG 6 and SDG 7. To cite just a few examples:

- In the Jibu franchise model, the local franchisee is required only to make a small down payment to Jibu. In exchange for the down payment, Jibu provides the franchisee with equipment, training, marketing, and other business services. Jibu, in other words, finances the franchisee who repays Jibu over time with an agreed share of sales revenues. An equity injection from Jibu's owners financed Jibu's initial operations. In the near future, Jibu expects to finance further

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<sup>10</sup> For an excellent discussion on how fintech is revolutionizing lending in emerging markets to customers without formal credit scores see [here](#).

rounds of expansion with a combination of revenues from (i) existing franchisees; (ii) a series of Master Franchise Agreements whereby local investors become franchisors in new markets, using their own funds to provide the upfront capital to franchisees in the countries in which they operate while Jibu provides the know-how, expertise, and lessons of experience; and (iii) the proceeds from a [\\$7 million Series B financing round](#). Jibu will use the proceeds from the Series B financing “to accelerate its launch of 1,000 drinking water franchises in at least a dozen new countries by 2022.”

- Ignite Power pays up front for the entire cost of purchasing and installing roof solar panels on household rooftops. In effect, the household receives a microfinance loan from Ignite with the solar panel acting as collateral. Affordable monthly payments of \$4 to \$5 per month from each family to Ignite pay for the home solar panels. After two years, the family owns the solar panels and makes no further payments to Ignite. To reach new customers in rural areas where the grids or mini-grids do not reach and to expand into new markets outside Rwanda, Ignite will need to raise capital from external investors.
- The Safe Water Network owns and operates a network of small water enterprises (SWEs) in Ghana and India. They deliver potable water to last mile consumers who pay only for the water they consume. Since these last mile consumers don’t own or operate the water purification assets, they do not need finance from either Safe Water Network or other financial intermediaries. However, Safe Water Network needed capital to get started and will require additional capital to expand their existing network. Safe Water Network’s initial capital came primarily from charitable grants. However, as the existing network of SWEs becomes profitable, Safe Water Network is designing models for blended finance, such as the [Ghana Water Enterprise Trust](#), that would raise expansion capital by securitizing the profits generated by the initial SWEs.

In each of these cases, serving last mile consumers entails delivering finance to non-last mile entities. In other cases, especially in the agriculture sector where the ultimate beneficiaries are smallholder farmers, it would seem logical to assume that finance should be channeled directly to these last mile farmers. But in many situations, the best option may be to channel finance to last mile input suppliers or last mile service providers, rather than directly to the smallholder farmer. Examples include funding coops acting as intermediaries between the small holder farmer, on the one hand, and urban markets on the other hand or funding social enterprises which, for example, purchase milk from smallholder farmers, chill it in portable solar-powered chillers, and sell it at a premium price in urban markets. This is only a small sample of the real-life opportunities for helping smallholder farmers by financing intermediaries that service these farmers.

The main takeaways and policy conclusions from this discussion of financial conduits are:

1. From a macro-financial perspective, implementing the SDGs will require increasing public and private investment for sustainable development from “billions to trillions.” But that is only the first step in the process. The next, equally important step is developing the financial conduits for delivering this finance in smaller increments of thousands and millions of dollars to finance specific projects and programs.



2. NGOs and social enterprises are developing innovative conduits via the banking system as well as the newly emerging fintech system to deliver finance directly to last mile consumers and producers.
3. However, in many other cases, finance will have to be channeled not to the last mile consumer but to the social enterprise providing services to these last mile consumers.
4. Understanding precisely who needs finance, in what form and in what amounts, will be critical for achieving the SDGs. This issue goes above and beyond calculating the aggregate funding needs for each SDG.

#### **E. Generating Income to Deliver the SDGs**

In many cases, last mile consumers and communities do not have access to potable water or off-grid power primarily because they cannot afford it. Low-cost, distributed technology and innovative business models can make service provision less expensive, thereby mitigating some of the affordability impediments. But by themselves, these initiatives are often insufficient to bridge the gap identified by Heifer and others between “current poverty level incomes and a living income” needed to afford basic services. A second option, therefore, is to couple technology deployment initiatives with explicit programs to generate more income for households and communities by enhancing their access to more remunerative formal markets. These income-generating/market access programs are not distractions or minor add-ons to existing deployment programs; they are integral components of the deployment business model from the outset. As Shaun Ferris of Catholic Relief Services observed at the Summit, “Technology deployment is not merely about asset delivery.... It’s about creating opportunity for smallholders to talk with their dollars.”

Weconnex, for example, set out initially to provide potable water and off-grid electric services to poor communities in Madagascar and Nepal. But via a process of trial and error, along with a string of initial setbacks, they concluded that their deployment efforts would never succeed unless they found a way to boost the income of the communities and households where they were working. To tackle this problem they [helped these communities organize farming and fishing marketing coops](#). The primary purpose of these coops was to establish stronger links between the communities and formal markets so that their fish and produce would fetch much higher prices. Along the way, Weconnex transformed itself from a technology vendor into a farm produce and fish marketing company that also happens to sell technology for water purification and off-grid power generation.

Weconnex’s transformation was an unexpected departure from the company’s initial business plan. But establishing marketing coops to facilitate technology deployment has a long history in the US and elsewhere. Since 1962, [NRECA International](#), an affiliate of the US National Rural Electric Cooperative Association, has established electric coops in 43 countries and brought energy access to over 160 million people. Dr. Patrina Eiffert described one pillar of these programs -- [the Productive use of Electricity Program Initiatives \(PEPI\)](#)<sup>11</sup> -- which combines energy access with specific programs to help farmers

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<sup>11</sup> For an in-depth description of NRECA International’s cooperative development program, see [Cooperative Development Guide: Establishing Cooperatives for Rural Electrification](#) which consists of 20 self-contained modules covering the organizational, legal, technical, and financial aspects of rural electrification project design and implementation and electric cooperative development.

increase production, reduce spoilage losses via refrigeration, improve processing and storage capability, increase efficiency, add value to crops before sale, and grow market share through agriculture value chains.

Similarly, Heifer International is helping smallholder farmers in developing countries build social capital, organize agricultural coops to market crops and purchase inputs and, along the way, increase their access to electricity, potable water and a host of other SDG services.<sup>12</sup> As Hilary Haddigan of Heifer explained, the success of those coop programs rests on a simple proposition, namely that “technology deployment is not about technology; it’s about people.” More specifically, it is about helping communities generate social capital -- what Papoulidis described as bonding, bridging and linking -- for market-led development. By banding together, these Heifer coops form “one stop shops” linking farmers to formal markets, processors, financiers, and input suppliers. They also generate impressive increases in income – from \$1.09 per day to \$4.60 per day between 2009 and 2015 in the case of Malawi. Similarly, Heifer’s East Africa Dairy Development Program, financed by a grant from the Gates Foundation, helped 179,000 East African dairy farmers boost annual milk sales by \$131 million. With this additional income, farmers can afford to purchase potable water, power, education, health care, and other essential services.

The main takeaways and policy conclusions from this discussion are:

1. Technology deployment and income generation are closely-related components of a self-reinforcing feedback loop or virtuous circle whereby the provision of power, potable water, and agricultural inputs helps boost community and household incomes and increased incomes give families and communities the financial capacity to purchase power, potable water, and agricultural inputs.
2. Technology deployment for the SDGs cannot be approached solely in terms of technology availability, scientific discoveries, and inventions. As Hilary Haddigan of Heifer explained, successful deployment often entails policies grounded in “values based holistic community development.” This consists of building social capital by organizing groups, transforming and empowering these groups to take charge of their own fate, building capacity in the group, and generating a sense of community, common purpose and shared future within the group.
3. However, as Shaun Ferris of Catholic Relief Services also observed, these social capital/community building activities are time consuming and expensive. Success requires strong committed leadership; flexible management; a strategic vision for management; and systems for tracking progress. Even with these systems in place, the time frame required to achieve results on the ground often exceeds the patience of many NGOs not to mention the private sector. As a result, these critically important processes are frequently ignored or given short shrift in the STI for the SDGs discussion. In addition, cost estimates for achieving individual SDGs are probably too low since they focus primarily on the cost of purchasing and installing hardware and fail to account for the time consuming, expensive and **indispensable** social capital development/community building components of the deployment process.

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<sup>12</sup> See [here](#) and [here](#) for more details about Heifer International’s approach to community development, social capital, income generation, and cooperatives.

### **III. Policy Conclusions**

At first glance, technology deployment seems rather simple, so simple in fact, that it is often relegated to an afterthought in the discussion of science, technology and innovation. After all, cost-effective, proven, small-scale technologies to address many of the most pressing development challenges to achieve the SDGs already exist. Hundreds of millions, if not billions, of people, need this technology. What is so difficult about getting this technology to the people who need it? Why can't we just do it?

Unfortunately, technology deployment is not that simple. The path to scaling up deployment to achieve the SDGs by 2030 is strewn with obstacles. As the speakers at GSS 2018 noted, reducing or eliminating these impediments will entail:

- Developing a much more effective and efficient deployment ecosystem attuned to the challenges of deploying distributed, affordable development solutions in tens of thousands of communities with hundreds of millions of people in dozens of countries by 2030.
- Developing platforms so that the diverse participants in this newly emerging ecosystem -- ranging from technology vendors to local supply chain candidates to financiers to potential local entrepreneurs to Fulbright scholars and other Diaspora representatives -- can find each other more easily, join forces, and exploit each member's comparative advantage.
- Developing a knowledge transfer and communications network so that lessons of experience, both good and bad, regarding deployment programs in one community or country can be transferred to NGOs, entrepreneurs, the private sector, and decision-makers embarking on deployment programs in other countries.
- Building technical capacity and social capital so that local organizations, institutions and individuals, including the private sector, can organize themselves to participate more actively and fully in the deployment process taking in their communities.
- Building the capacity of developing country governments, universities, scientific institutions, the private sector, and civil society more generally to evaluate competing technologies and participate on a more informed basis in decisions about technologies, business models, and legal frameworks for deployment.
- Increasing public and private investment for sustainable development from "billions to trillions" and then developing the financial conduits for delivering this finance in the much smaller increments of thousands and millions of dollars that will be needed to finance specific deployment projects and programs.
- Helping communities and households boost their income so that they can afford the new technologies on offer.
- Putting more emphasis on and devoting more resources to the social capital/community building dimensions of technology deployment.

What does all this imply for the role of science and scientists and also for the role of international organizations like the UN and other development agencies?

#### **A. Role of Science and Scientists in the Deployment Process**

Scientists play an indispensable role in technology deployment. None of the low-cost distributed solutions featured at the Summit would exist were it not for the discoveries of numerous scientists and the work of engineers and inventors who convert these discoveries into useable development solutions. But a new scientific discovery or innovation is only the first step along the long run to mobilizing science for the SDGs. A scientific achievement will only generate large results if it is deployed at scale and this requires work along a wide range of fronts, almost none of which require scientific expertise. These include developing financial conduits and business models, filling in the missing pieces of the deployment ecosystem, developing better communications channels so that different components of that ecosystem can find and communicate with each other more easily, developing knowledge transfer mechanisms for transferring proven deployment programs from one community or country to another, developing bonding, bridging and linkage mechanisms to facilitate deployment in fragile and non-fragile communities, and supporting a wide range of local capacity building initiatives.

Scientists are singularly ill-suited to undertake these tasks. They are unlikely to leave their labs – nor is it desirable from the standpoint of society at large that they do so – to devote their time and attention to these non-scientific tasks. As Steve Blank [observed](#), “It’s rare that the smartest technical innovator is the most successful entrepreneur. Being a domain expert in a technology field rarely makes you competent in commerce [or technology deployment].”

Two policy conclusions flow from this discussion:

1. The process of transferring scientific insights from the lab to the last mile should be thought of as a supply chain with scientists occupying the most up-stream position, engineers and inventors in the next spot, and deployment participants, including the private sector, filling out the remainder of the deployment supply chain.
2. Discussions regarding the role of science, technology and innovation for the SDGs (STI4SDGs) should start by celebrating the achievements of scientists, without which no progress would be possible, as well as acknowledging the limitations of science in getting those achievements to the last mile. Therefore, official discussions at the UN and elsewhere about STI4SDGs should focus not only on the achievements of science, but also on the necessity of passing the baton from scientists to those diverse groups of non-scientists who are best-suited to undertake the essential deployment processes.

## **B. Role of the UN and Development Agencies in the Deployment Processes**

1. The non-science components of technology deployment issues should figure more prominently in the work of the UN Technology Facilitation Mechanism, STI Forum, Commission on Science and Technology for development, Ten Member Advisory Group, and Inter-Agency Task Team. To cite just one example, the UN’s [2030 Agenda for Sustainable Development](#), adopted at the United Nations Sustainable Development Summit in September 2015, called for the development of an “[online platform as a gateway for information on existing STI initiatives, mechanisms and programs](#).” This UN-sponsored online platform could be an excellent venue, not just for advertising the supply of and demand for development solutions, but for helping to organize the deployment ecosystem in each country or region.

2. Technology Roadmaps currently under development within the [UN](#) and [World Bank](#), as well as the Science, Technology and Innovation Policy Reviews conducted by UNCTAD, UNESCO, and the newly-operational UN Technology Bank for the Least Developed Countries should discuss the technology deployment dimensions of science, technology and innovation for the SDGs. A good place to start is by asking: (i) what specific capacity does a country currently have to facilitate deployment in a particular sector – e.g., water, power, health care, etc.; (ii) what specific organizational, institutional, and human capacity does it need to address each of the specific deployment tasks and issues enumerated above; (iii) what specific, detailed steps will be required to create the requisite capacity within each country or group of countries; (iv) who is best suited to undertake each of these tasks and what type of light-touch coordination would be required to provide the necessary coherence? Should the government be in the driver’s seat, taking primary responsibility for implementing each task, or should it develop and then rigorously implement deployment-friendly rules, regulations, and procedures that empower others -- NGOs, development agencies, the Diaspora, the private sector, local entrepreneurs and students, foundations, private financiers, local universities, etc. -- to drive the deployment program?
3. Several high priority deployment tasks – for example, knowledge transfer mechanisms, platforms for connecting local and international participants in the deployment ecosystem, capacity building – fall into the realm of global public goods. They may be essential for achieving the SDGs, but the private sector is unlikely to finance these activities on the scale and with the scope required to achieve global objectives. These tasks, therefore, are tailor made for such international organizations as the UN, bilateral aid agencies, foundations, and multilateral development banks. However, someone will have to take the lead in ensuring that these activities are properly designed, adequately financed, and effectively implemented. This will most likely require a collaborative effort, with one organization taking responsibility for leading the work in a particular realm. In addition, these organizations will have to determine if they have the technical capacity to undertake these tasks “in-house” or whether it would be preferable to empower others to do the work and, if so, how they can empower without smothering the bottom-up deployment initiatives highlighted at GSS 2018.
4. The World Bank and other multilateral and bilateral development agencies have an abundant supply of capital. Their challenge going forward will be to develop innovative catalytic financing mechanisms that finance and empower social enterprises, NGOs, foundations, and others to undertake deployment programs on the scale that will be required to meet the UN’s 2030 sustainable development objectives. This will likely require new financial conduits and lending/guarantee programs. It will also require respecting each organization’s fiduciary responsibilities, guarding against reputational risk, adhering to social safeguards, and guarding against corruption while at the same time not smothering these deployment/scaling initiatives with procurement and other regulations designed for an era of large scale infrastructure projects. These are all daunting tasks, but essential if we are to hit the 2030 development targets.

The 2018 Global Solutions Summit did not dwell on these issues. But the Summit also revealed that a large number of bottom-up initiatives are beginning to tackle these next generation policy questions. Shining a spotlight on these initiatives and gathering the wisdom inherent in them will be the focus of the next Summit.