SUSTAINABLE DEVELOPMENT GOALS

Innovating with Purpose

A summary of expert perspectives from the VMware–GlobeScan SDG Leadership Forum on Goal 9: Industry, Innovation and Infrastructure

April 2019

Sustainable Development Goals

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

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Foreword from GlobeScan

At GlobeScan, we believe more leadership is needed to inform, inspire, and catalyze collective action to address each one of the 17 Global Sustainable Development Goals (SDGs). Our SDG Leadership Series is a set of online discussions that connects some of the world's leading and influential thinkers together.

VMware and GlobeScan co-hosted an SDG Leadership Forum to address SDG 9: Industry, Innovation, and Infrastructure. Through both an in-person panel discussion and two online forums, our aim was to bring together a wide range of stakeholders to explore how technology innovation can help drive resilient sustainable development. The following pages summarize what we heard from professional stakeholders during the forums – where they feel action is most needed to progress on SDG 9, and how different types of stakeholders can work together to overcome barriers.

The role of technology innovation to help drive the UN's ambitious 2030 Sustainable Development agenda is unarguably important. It is an essential component of sustainable and resilient economic development around the world. But for technology innovation to be applied at the necessary speed and scale, it is essential that innovation is both purposeful and collaborative. The discussion across in-person and online events clearly highlighted this need.

Concerted efforts, multi-stakeholder dialogues, and collective action are necessary for change, and our forums provide a space for stakeholders to learn, inspire fresh thinking, and share best practice examples to turn ideas into action. The perspectives shared with us during these discussions were instructive and demonstrated why leadership and effective collaboration is needed at all levels.

Through listening to, engaging with and responding to a variety of stakeholders, progress can be made to bring us one step closer to a 2030 where we can all live more sustainably while maintaining social and economic dignity.

Chris Coulter
CEO, GlobeScan

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Foreword from VMware

At VMware, we believe it is our shared responsibility to ensure technology is used as a force for good. The 17 Sustainable Development Goals laid out by the United Nations are a grand challenge for all of us and cannot be achieved without technology, innovation, and collaboration. For the GlobeScan Leadership event, we chose to focus on Goal 9, as we believe that infrastructure is critical to creating the foundation needed to meet many of these goals. And at VMware, we believe digital infrastructure is just as vital for today's civilization as the roads are that carry goods, services, and people.

What most people do not know is that throughout VMware's 20-year history, we have pioneered solutions to help build a low-carbon economy. Data centers are responsible for two percent of the world's greenhouse gas emissions—roughly the same as global air travel. Our virtualization technologies make IT infrastructure dramatically more efficient, fundamentally changing how our customers use power. With our 75,000 global partners, our software forms a digital foundation that powers the many businesses transforming the world. But we aspire to do more.

We aim to put back more than we take so we have embarked on a journey where we are building sustainability into all aspects of our business and operations. In addition to driving transformation for our customers, through the VMware Foundation, we are supporting tools and resources that enable global nonprofits to scale. There are 12 million global nonprofits that are already addressing some of the world's most pressing problems, however, they struggle with the needed digital infrastructure that enables them to reach their mission.

According to the World Bank, if the global nonprofit sector were a country, it would have the sixteenth largest economy in the world. Helping nonprofits scale is not only the right thing to do, but also it will have a significant ripple effect that will help us meet the ambitious SDGs.

Meeting any of the SDGs will take an enormous amount of collaboration among governments, NGOs, and nonprofits, and the private sector. Progress requires all of us and I am encouraged by the people that participated in the Globescan Leadership Series. We are all dealing with complex, global challenges each and every day, and here at VMware, we share the conviction that everyone can play a role in advancing progress.

Nicola Acutt
Vice President, Sustainability, VMware

Introduction

With just over ten years to go until the deadline of the UN's ambitious 2030 Agenda for Sustainable Development, there is a clear need to rally around innovation that can accelerate progress on the Sustainable Development Goals (SDGs). As defined by the UN, the 17 SDGs "are the blueprint to achieve a better and more sustainable future for all. They address the global challenges we face, including those related to poverty, inequality, climate, environmental degradation, prosperity, and peace and justice. The Goals interconnect and in order to leave no one behind, it is important that we achieve each Goal and target by 2030."

The Goals are not just for people in the sustainability and development communities, but intended to direct the business community as a whole toward more sustainable and equitable societies. Within the business community, the technology sector has a very important role to play. According to the UN, "technology and innovation are central to the implementation of the 2030 Agenda and the SDGs. When utilized effectively, technology can be mobilized to identify barriers to and provide solutions for sustainable development challenges from the local to global level."

For Goal 9—Industry, Innovation, and Infrastructure—the technology sector is particularly relevant. Not only is today's infrastructure increasingly rooted in digital technology and networks, but innovation is a concept that technology companies embrace and lead. The challenge for the sector remains how to steer innovation toward sustainable development and more resilient, inclusive societies.

VMware, a digital technology company with 20 years of innovation experience, along with GlobeScan, hosted an in-person panel and two online forums (to cater for different time zones) to collaborate with experts and opinion leaders on how to progress Goal 9, which seeks to "Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation," and how this progress can help deliver on the other SDGs.

Joined by more than 150 professionals in sustainability, policy, and technology around the world, the discussion focused on how stakeholders across society can leverage technology innovation to make progress on the ambitious 2030 agenda. The following pages are a summary of the discussion.

Discussion Summary

Participants explored the reasons behind technology innovations, and considered that design for sustainable development may require **an attitudinal shift**. There was a call to move away from design that fits existing systems, and to instead **direct innovation toward *human* needs, particularly those in marginalized regions**. This requires fundamental understanding of challenges in developing countries to inform how technology solutions might be reached. Stakeholders discussed the importance of **local context** in delivering solutions, and that some less developed regions may need **capacity building** to reach the most impact.

One form of capacity building is through education. Participants explored the importance of **education as a form of technology transfer and economic empowerment**. Building STEM skills into education platforms can help empower users around the world, turn students in to entrepreneurs, and inspire the rising generation of innovators.

Education is one way to narrow the digital divide; another is improving physical **access to technology infrastructure**. Participants noted that the concept of infrastructure is evolving: countries around the world now depend on strong networks and internet access as economic drivers. Investments in technology infrastructure are needed around the world, and participants acknowledged that progress in this area will require **close collaboration with governments** and other stakeholders who can help build political will and earn public trust.

As ever, technology solutions in developing countries need to come with a cost-friendly entry point. For many in these regions, new technology is cost-prohibitive and innovators must work toward more **frugal innovation** that relies on deriving solutions from existing technology. The technology sector can help drive adaptable solutions for existing products, and better enable applications for sustainable development in-country.

With limited resources and ability, technology solutions aimed at sustainable development may start small. But when **solutions are applied at scale**, technology innovations can be transformative for economies. Participants highlighted a number of examples of innovation at scale that can be examples for the technology sector, such as electric utilities, internet infrastructure, and public transportation systems. These examples also underscore the **need for collaboration** with governments, local stakeholders, and other key figures in the technology industry. The following is a summary of themes discussed in the sessions.

Collaboration for Sustainable Development Solutions

> *Some of the comments about scale seem to rely on benevolent governments—active and informed citizens in the global north and the global south are a key part of ensuring that scalable innovation has fertile ground (the role of government) and responsible implementation (the role of the private sector).*
>
> – **Neal McCarthy,** Oxfam America

One common theme from participants was that solutions cannot take place in a vacuum: collaboration is needed throughout the process to build trust, inform relevant challenges, and drive collective action. The discussion focused on ways that technology companies can work together with civil society and governments to make progress the SDGs, which may need newer ways of collaborating to effectively understand and act upon local perspectives and needs.

> *Fortunately, there are extraordinary people around the world who have devoted their lives to working with these communities who have some of the problems that are represented in the goals. Corporations have collaborated with these organizations for a long time but the relationships are very asymmetrical. The companies have all the money and so the companies tend to like to have all the control and I think to really make progress, we need to move to a form of collaboration that is genuinely more balanced and that brings to the fore the knowledge, the exposure to the real users and the real problems that these organizations who are often non-profits have.*
>
> **– Debra Dunn,** Stanford University d.school

Opinions on What Companies Can Do

> *The role of technology companies is to provide the insights and technology expertise—but also bring ecosystem of partners and problem solving to the table.*
>
> **– Suzanne Fallender,** Intel

> *Businesses can lead in making technology inclusive—both by conscious design choices and by smart business choices.*
>
> – **Soumitra Dutta,** Cornell University

Across the different themes emerging from the discussion, there are clear points of action for technology companies, and companies in other sectors, to help drive progress on the SDGs and Goal 9 in particular.

- Engage with local actors on the ground in countries to understand the local context and needs for technology innovation;
- Refine technology for good and rally around common purpose for the industry, to steer innovation toward human needs through development;
- Convene governments around new tech that can enable development
  - Leverage resilient city technology as an entry point for governments
  - Government-led efforts to drive local innovation and engage people on the ground
- Invest in early stages of IT development for recognized problems;
- Lead in pushing the industry toward environmental impact assessments and drive improved standards.

> *You think about the inspiration that the Apollo missions had for inspiring a whole generation of people to use technology for good. How do we recapture that vision, that mission, that scale with today's culture, the ecosystem in Silicon Valley and beyond?*
>
> **– Victoria Lee,** World Economic Forum

Opinions on What Governments Can Do

> *Many governments are enabling environments for tech sector to solve development problems.*
>
> **– Shalini Singh,** VMware

Governments have a crucial role to play, with a number of key actions emerging across the themes of the discussion.

- Incentivize innovation and design for sustainable development
  - Link taxation to outcomes in economy and technology
  - Incentives on energy saving infrastructure, vehicles, etc.
  - Pricing on carbon, waste
- Rally and build political will
  - Embrace new technology and learn from markets with successes
  - Ensure that regulation is an incentive, rather than a roadblock to innovation
  - Build institutional capacity

> *Innovation happens when the opportunities are soon, salient, and certain. Government action can create these qualities.*
>
> **– Andrew Hargadon,** University of California, Davis

A Paradigm Shift Is Needed

> *A new paradigm of business partnerships and product development is required, which educates the invention ecosystem, methodically identifies opportunities at the intersection of business and the SDGs and leverages *existing* inventions and supply chains to eke out financially sustainable models.*
>
> **– Noha El-Ghobashy,** Institute for Transformative Technologies

To make progress on sustainable development, stakeholders agreed that technology solutions must be designed with *people* in mind, particularly those who are traditionally underserved in emerging markets. Participants highlighted that this may require an attitudinal shift in the way technology companies innovate: rather than designing products that fit into existing systems, technology solutions will need to be designed with all social groups in mind, but especially marginalized communities. These groups are often most in need of the benefits technology can bring, but they remain out of sight for the scientific community.

> *We just have to work with the poorest and marginalized people to make sure that they will be part of the solutions. We need to design, test, and implement technology with them, to make them able to achieve their empowerment.*
>
> **– Simone Sala,** Sustainable development practitioner

This highlights a gap between the technical and scientific communities and those working to advance sustainable development in the NGO/multilateral space. Beyond just an attitudinal shift, participants agreed that the new, human-centric approach to innovation must also include active collaboration with partners on the ground such as entrepreneurs, government officials, and grant-making organizations, who are most knowledgeable about how innovation can spur impact where most needed.

> *The challenge here is about local relevance: the shift that we need to make as a global society, about how we solve problems and the context within which we are solving them and making sure that our innovations are built on that understanding.*
>
> **– Nicola Acutt,** VMware

Many participants rightly alluded to the urgency of action that is needed to drive this innovation, but it was also stressed that innovations and their application need to be purposeful and resilient.

> *Speed is a really double-edged sword. [The] people who spread something good . . . actually take the time to develop something excellent that works. Our motto [should be] to spread excellence.*
>
> **– Bob Sutton,** Stanford University

Of course, any attempt to refocus technology innovation on the specific needs of those who need it most, would be lost without a re-doubling of efforts to increase access. One challenge to inclusive technology is the lack of technology infrastructure or access; participants cited this as an ongoing barrier to inclusive societies and strong economies. Today's digital divide has wider implications than ever, with impacts projected to accelerate in coming years along with technology advances.

> *We need to ensure that technology is something that can be used by all, young and old, rich and poor.*
>
> **– Tiffany B,** Northern Kentucky University

SDG 5: Women's Empowerment through Development-focused Innovation

The huge opportunity that comes with digital literacy and connectivity was undisputed by participants. Across social strata, wider access to technology offers individuals the ability to participate in commerce, and ultimately have greater control over their livelihoods. Particularly for women, the ability to conduct business remotely can have empowering outcomes in many developing countries where cultural norms may keep them physically separate from commerce centers.

By granting access to the economy, technology has the potential to empower women across different societies. In developing economies, it can provide women greater ability to manage family income and expenses, and have greater autonomy as a whole. Women can also access tools that enable entrepreneurship outside of a traditional family role, narrowing the gender gap that exists across education systems.

In turn, women entrepreneurs are among the best placed to address local needs and challenges, including innovations that make their lives safer and more secure. Empowered as entrepreneurs, women can hold influential positions in their communities and further inspire rising generations of girls as innovators for more sustainable and equitable societies.

> *Innovative technologies are also allowing women to access new markets, work flexibly and remotely, receive training and provide mentoring, and improve financial autonomy.*
>
> – **Nazila Vali,** United Nations Development Programme (UNDP)

> *One of the key things that I've seen is how empowering women with technology helps drive confidence and provides them with more tools and influence to improve their local communities.*
>
> – **Suzanne Fallender,** Intel

The digital divide exists not just in terms of access to physical technology infrastructure, but also in terms of digital literacy and the ability to contribute to societies where technology is a strong economic driver. Stakeholders discussed different perceptions of the digital divide around the world, and noted that understanding distinctions will be key for organizations seeking to address inequality through innovation and inclusive technology.

> *1bn people don't have any form of ID. 1bn don't have access to mobile network. 1bn don't have access to financial services. The digital divide is not between developed and developing countries, but between the last billion and the rest.*
>
> – **Anit Mukherjee,** Center for Global Development

> *Digital divide is perceived differently in many countries ... solutions differ according to the needs, to make sure we address the right challenges.*
>
> – **Holy Ranaivozanany,** Huawei

SDG 4: Technology Skills and Education as Path to Inclusive Innovation

One element of the digital divide is a gap in skills. Improvements to technology access or infrastructure will not be as impactful if intended users are unaware of their potential. This applies to product usability, but also the ability to work with technology tools for wider impact.

> *Education is the key driver and enabler for sustainable change. We need more STEM skills, more sustainability skills, and provide equal access to quality education. Technology in turn can be a key enabler to ensure this access to education, even in remote areas.*
>
> – **Yvette Sweringa,** CSR Europe

Throughout the dialogue, participants discussed the enabling impacts of technology and education on each other. Technology can deliver education to remote communities, and STEM education can give local entrepreneurs the tools they need to innovate.

The importance of technology skills training and education was a consistent theme: users need training to effectively realize the sustainable and economic benefits technology can bring. Ultimately, technology education helps build local capacity for economic success through knowledge transfer. Participants agreed that education programs designed for sustainable development should include technology and STEM as fundamental skills. Similarly, engineers and developers should be trained to consider sustainability outcomes and impacts associated with every product or innovation.

The Need to Understand Local Context

> *You can never solve a problem or create a solution without understanding what is on the ground, who is involved and affected, and how they react.*
>
> **– James Rosenstein,** JSR International Consulting

In addition to lack of technology skills being a barrier, participants also discussed economic barriers and the ability to access innovative products and services financially. For technology to have real impact in sustainable development, stakeholders agreed that solutions must be designed with users in mind and help break down economic barriers through cost-effective entry points.

Whether individuals or organizations, acquiring new technology is out of reach for many and solutions must be reached more frugally. This means working with existing technology and re-innovating solutions that respond to local challenges, again highlighting the importance of collaborating with entrepreneurs in-country.

> *Many sustainable innovations are built by reconfiguring established technologies rather than imposing new ones. We need to recognize novel configurations of established technologies are our best path forward.*
>
> **– Andrew Hargadon,** University of California, Davis

For the technology sector, there is an opportunity to engage local entrepreneurs on innovating with existing technology. Companies can work with partners on the ground to cultivate entrepreneurship in developing markets, and help identify ways existing technology can drive new solutions.

> *Innovation often comes from people with a unique perspective putting together two or more existing technologies or techniques in a different or unique way. You make this process more inclusive by educating more people on available tools and techniques. Again it comes back to education being an enabler.*
>
> **– Joe Baguley,** VMware

A Need for Local Capacity

> *Capacity building is crucial—we can support local talent to help spur innovation locally but hard to replicate the model sometimes even in the same country.*
>
> – **Holy Ranaivozanany,** Huawei

In developing economies, implementation of technology solutions requires key capacities on the ground. Participants discussed the importance of local capacity with respect to three crucial areas:

- ***Entrepreneurs to ideate local solutions:*** Support and engage local entrepreneurs who understand challenges on the ground and can be activated to drive innovation;
- ***In-country IT training and education platforms:*** Facilitate tech knowledge transfer and ensure that intended users are equipped to realize benefits;
- ***Strong energy, network, and internet infrastructure:*** Work with governments to encourage investments in infrastructure that is resilient and delivers innovation long-term.

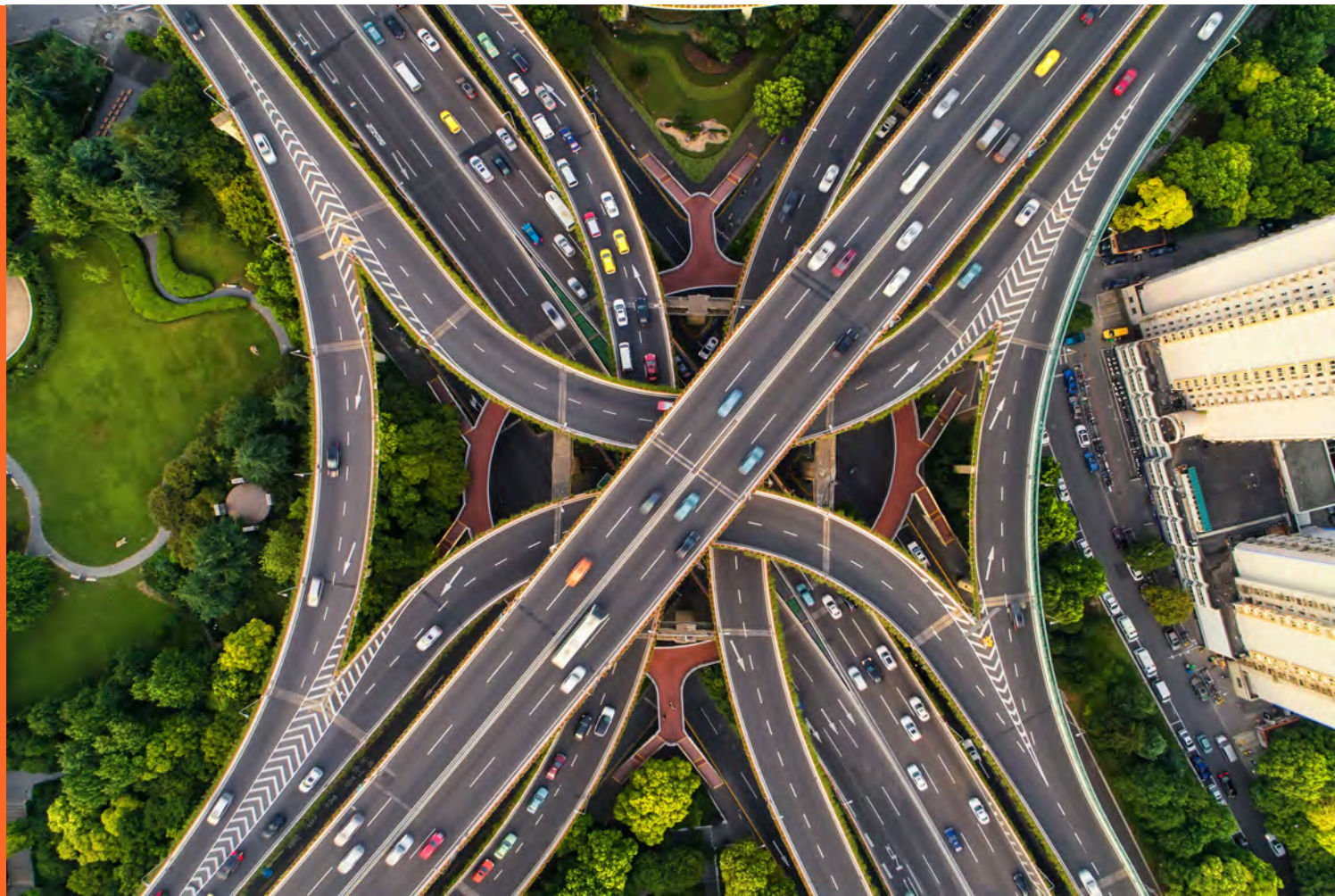
The first two elements are arguably areas where the technology companies have already been taking action, in particular with partnerships. However, participants considered that these are often skewed to people already in developed markets, and may be only accessible to those with increased levels of access.

The third, in particular, requires building capacity and relationships with governments. Without reliable energy and internet infrastructure, technology remains out of reach for many in developing countries. There is a need to invest in infrastructure as part of Goal 9, and for the technology sector, this means driving resilient networks and energy systems.

> *In 2018 [infrastructure] is not just longer roads, water, energy, etc.—it now means access to high-quality IT/connectivity too.*
>
> – **JP Leous,** World Resources Institute

Investing in infrastructure is a pillar of Goal 9, but this depends on political will. Progress will require that technology companies work closely with country governments, to build political will to embrace the need for investment in technology infrastructure and innovation, earn trust and buy-in from important stakeholders, and create an environment that enables inclusive and innovative solutions.

> *Governments must understand technology first. Then need to regulate smartly, making sure they do not hinder innovation. And today it is becoming more and more important for the tech giants to act ethically if they do not want to lose the trust of people and hence market share.*
>
> **– Rositsa Zaimova,** Dalberg Data Insights



Unlock Political Will through Technology Infrastructure

Participants agreed that the first step in creating scalable technology innovations is to understand and account for local capacity: innovation will be fruitless if the proper infrastructure, resources, and people are not in place to make it successful and workable at scale.

> *Successful digital transformation will depend on whether the emerging digital society in developing countries has the necessary capacity to do so.*
>
> – **Anit Mukherjee,** Center for Global Development

Participants pointed out that local NGOs, companies, and other stakeholders can be valuable partners in helping to build political will and earn local trust in developing countries. Governments are one of the most important stakeholders to engage: their policy making can either enable or inhibit the way technology is applied to development.

> *There's also a digital divide between the innovators and the policy makers that needs to be bridged, so the latter can make informed decisions that pave the way for innovation. … Without this understanding, governments won't be able to act responsibly to effectively use innovation.*
>
> – **Tim Retford,** VMware

SDG 11: Building Resilience through Tech Deployment

> *Monitoring solutions are key. So cities can measure and track progress against SDGs and identify gaps.*
>
> **– Daniel Schmid,** SAP

Developing countries have much to gain from technology solutions, especially as they can contribute to resilient, more stable communities and cities by shedding light on resource use and overcrowding.

One entry point for influencing government action is demonstrating the benefits technology investments can contribute to resilient cities, stable economies, and more efficient resource use. Stakeholders noted that many developing economies are stretched by growing populations that wear on outdated infrastructure. Such challenges as food and water scarcity can be helped by technology solutions enabling smarter infrastructure including artificial intelligence and Internet of Things.

> *I see resilient technology infrastructure as the one enabling us to better absorb shock, learn from them, and improve over time.*
>
> **– Simone Sala,** International Adviser on the Application of Digital Technologies for Sustainable Development

More advanced systems can track resource use throughout communities and even help stretched economies better manage resources. Participants discussed Blockchain technology as having major potential for this, but acknowledged that many such solutions come with a high energy cost. Working to develop technology that is itself sustainable—and does not exacerbate existing challenges—is a significant challenge in innovating for sustainable development.

> *Ironically, blockchain technologies are extremely compute intensive ... The open source Concord project is aiming to dramatically reduce the performance and capacity requirements of maintaining distributed ledgers/blockchains at scale. Simply making new technologies perform more efficiently can be an unheralded but important sustainability goal.*
>
> **– Chris Wolf,** VMware

Participants agreed that effective technology deployment will rely on working with local telecoms, utilities, and governments to identify the most urgent challenges, which can range from resource scarcity to disaster response to public safety.

Scaling Innovation for Sustainable Development

Stakeholders emphasized the importance of innovation that can be taken to scale, and some pointed out examples of where city infrastructure can provide lessons for the technology industry. Public transportation, telephone lines, and internet access are all examples where transformative innovation has scaled to achieve wider impact on communities around the world.

> *Some amazing innovative thinking is happening in these hubs [Nairobi, Lagos, Dakar, Bangalore, Dhaka, Jakarta, Asthana], and their outputs are not getting to scale in the markets in which they would have most impact.*
>
> **– Neal McCarthy,** Oxfam America

Solutions that start small are sometimes the most impactful when applied at scale. Some organizations today are embarking on frameworks to govern innovation for sustainability, and these are providing useful starting points for innovators in sustainable development. Some examples include Digital India, Corporate Digital Responsibility, and the Principles for Digital Development.

> *Digital India movement is around enabling the world's largest set of non-internet connected users to benefit from digitalisation. Direct benefit transfer schemes to the bottom of the pyramid and our social security system are part of the digital India movement.*
>
> **– Alok Medikepura Anil,** Next Big Innovation Labs

Participants agreed that, while models are not always adaptable across markets, these frameworks can help steer policies that favor digital innovation for sustainability. Not only do they help define responsible technology innovation and deployment, they offer proof points about the benefits of investing in infrastructure for sustainable societies.

> *We have seen many innovations through the use of technology. From improved access and quality of education to more efficient healthcare systems, management of supply chains etc. However, it is essential that innovation and technology is developed and deployed responsibly. We therefore started to work on the topic of Corporate Digital Responsibility.*
>
> **– Yvette Sweringa,** CSR Europe

Some participants also noted that different sustainability standards seem in competition with each other, and that differing criteria that can be confusing for government stakeholders as well as industry players. Stakeholders felt that a common framework defining the concept of "technology for good," specifically oriented around the SDGs, was needed in order to establish common benchmarks toward achieving them.

> *We need an ecosystem in place (governments, telecoms operators, academia, NGO, communities, social entrepreneurs) ready to "guide" us in what is needed and how we can all contribute.*
>
> **– Holy Ranalvozanany,** Huawei

Discussion Summary Conclusion

The discussion in both the in-person and online events highlighted the potential of technological innovation to help accelerate progress on both Goal 9 and across the SDGs. It also highlighted the challenges facing governments, civil society, and those in the technology sector to innovate for the specific challenges faced by different communities around the world, at the speed and scale needed to help achieve the ambition of the 2030 Sustainable Development Goals.

As Debra Dunn of the Stanford University d.school stated: "To get to a world of peace and shared prosperity, we need to deal with all of these issues [identified in the SDGs]. The good news is technology is absolutely required. There is no way we are going to achieve solutions to all of these problems in the timeframe we are talking about without extensive technology innovation and application."

List of Expert Guest Contributors

- Joe Baguley, Vice President and Chief Technology Officer, EMEA, VMware
- Soumitra Dutta, Professor of Management at the SC Johnson College of Business, Cornell University
- Noha El-Ghobashy, VP, Strategic Issues, Institute for Transformative Technologies
- Suzanne Fallender, Director, Corporate Responsibility, Intel Corporation
- Andrew Hargadon, Professor Technology Management, University of California
- Chris Kutarna, Fellow Oxford Martin School, University of Oxford
- JP Leous, Head of Corporate Relations, World Resources Institute
- Neal McCarthy, Senior Manager, ICT4D Program, Oxfam America
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