An emphatic call for a global data revolution remains a crucial component in the realization of the Sustainable Development Goals.

Insights from M.S. Swaminathan • Martin O’Malley • Sri Sri Ravi Shankar • Keith Clarke • Sir Nigel Shadbolt
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## CONTENT

### COVER STORY

**DIVIDED THEY STAND**

Digital transformation poses a serious threat to the developing and underdeveloped world, as the gap between hyper-digitized and under-connected countries widens.

### VIEWPOINTS

<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
<th>Author(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Data as Crucial as Human Rights</td>
<td>Keith Clarke, Climate Change Advocate</td>
</tr>
<tr>
<td>18</td>
<td>Data Sharing for Good Governance</td>
<td>Martin O’Malley, Former Governor of Maryland</td>
</tr>
<tr>
<td>20</td>
<td>Technology of Spirituality</td>
<td>Sri Sri Ravi Shankar, Spiritual and Humanitarian Leader</td>
</tr>
<tr>
<td>22</td>
<td>Data Fundamental to Draw Conclusions</td>
<td>M.S. Swaminathan, Distinguished Agronomist</td>
</tr>
<tr>
<td>24</td>
<td>Data for Decision-Making</td>
<td>Stefano Toscano &amp; Oliver Cottray, Geneva International Centre for Humanitarian Demining</td>
</tr>
<tr>
<td>36</td>
<td>Dawn of the Data Era</td>
<td>Heather Savory, Co-Chair, UN Global Working Group on Big Data</td>
</tr>
<tr>
<td>38</td>
<td>Credible Data for Rational Decision-Making</td>
<td>Dr Wilber K. Ottichilo, Governor, Vihiga County, Kenya</td>
</tr>
</tbody>
</table>

### USEFUL INSIGHTS

<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>Her Fair Share — Land Rights for Women</td>
</tr>
<tr>
<td>44</td>
<td>Satellites for Conflict Monitoring in Syria</td>
</tr>
<tr>
<td>48</td>
<td>Using Tech for Rohingya Rehabilitation</td>
</tr>
</tbody>
</table>

### CASE STUDY

<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>52</td>
<td>Advanced Laser Scanning for Surveying</td>
</tr>
<tr>
<td>56</td>
<td>Capella Space Poised for Commercial SAR Operations in 2020</td>
</tr>
</tbody>
</table>

### REGULAR FEATURES

<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>05</td>
<td>Editorial</td>
</tr>
<tr>
<td>26</td>
<td>SMEWatch: Latitude40</td>
</tr>
<tr>
<td>43</td>
<td>ProductWatch: WorldDEM™</td>
</tr>
<tr>
<td>54</td>
<td>ProductWatch: Trimble X7 3D Laser Scanner</td>
</tr>
</tbody>
</table>

### EXECUTIVE SPACE

Next Wave of Growth

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The most powerful LabSat yet, the new LabSat 3 WIDEBAND captures and replays more GNSS signals at a much higher resolution than before.

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- SBAS: WAAS, EGNOS, GAGAN, MSAS, SDCM
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Everyone now talks of data as the “new oil.” The comparison is interesting, but fallacious. It is interesting because like oil, data can be monetized and like oil, it is crude and becomes useful only when it is processed, and various products are generated from it. Further, oil and data can be withheld to exercise control. The comparison ends there. Oil is fungible and of one-time use. Data, on the other hand, can be used and reused and can serve multiple purposes at the same time. Given this, how is data monetized?

While monetization sounds attractive, it is the means of monetization that needs to be addressed. Data created at public cost should not be monetized directly by selling. In this respect, both Landsat and Sentinel follow a user-friendly path. Unfortunately, India still believes in making users pay. For data, which is predominantly for public good, the monetization happens through usage in areas such as crop estimation, crop insurance, forest management, environmental assessment, urban and regional planning, and last but not least, disaster management.

However, data generated in the private sector cannot follow this business model, except in rare cases like disaster management. For such data, value addition may be a better model than just data sales. The Radiant Earth model of cooperative data analysis appeared to be a viable model, but the fact that they have changed their strategy to cooperative analytic software development shows that their model did not produce the required results.

If we look at data for public good, we see two distinct streams of applications. One is where the governments and NGOs are involved and the other is where the ‘good’ is defined by enticing apps from private vendors. Consider location as an application. It is of immense use in navigation, location of POIs and in disaster management. But then, there are apps like Pokémon Go that reduce the entire system to a trivial game. Of even greater concern are devices like Amazon Echo, which want to take over your life by thinking ahead using Artificial Intelligence to suggest you which show to attend, whether to have a dinner afterwards, where and at what time to call Uber depending on traffic conditions, etc. Herein lies what we call the Digital Divide.

Traditionally, the digital divide meant the lack of data in developing economies and concomitant ills of social exclusion, marginalization and even false information. While these are very valid concerns, it must be noted that the trivialization of data usage as exemplified by the two examples quoted above are of equal concern. This kind of digital dumbing down has far reaching consequences globally. In an article in IEEE Technology and Society magazine, the author Jeff Robbins questioned, “If Technology is a Parasite Masquerading as a Symbiont — Are We the Host?”

A data revolution must address three points — availability, accessibility and fitness for purpose. Availability is being addressed through many technologies and systems. Accessibility is an issue that has both technological and regulatory dimensions. Fitness of purpose is something that the end user and usage must determine. It is here that the concerns of today — democratic participation by civil society while safeguarding citizen rights and privacy — play a big role. Typically, it is not AI for replacing humans but AI as a helping hand for humankind.

There are many problems that beset the world, and these are not necessarily only in developing countries. Climate Change threatens not only developing countries, but the developed ones as well. It is affecting the ecosystem which in turn is having irreversible effects on flora and fauna. Crops are failing due to unusual episodes of violent weather. Uneven economic development is creating huge gaps between the rich and the poor, and as the poor seek to move out of their poverty, they migrate to other countries and to urban areas living in pitiable conditions because the cities are not smart enough to adjust to migrants.

The solution is not just data, but fit for purpose data and analytics, which may include AI as a tool. The difficulty of identifying what is fit for use data is brought out very effectively in the book Poor Economics by Nobel awardees Abhijit Banerjee and Esther Duflo in the context of poverty alleviation.

In the end, we need to find answer to this question: what data and analytics will positively influence the human condition?
Being a leading mapping and location data services company, how do you foresee transformation in the location sector ten years from now, particularly in a rapidly expanding economy like India?

In the last couple of decades, the way we communicate and live has undergone a drastic change, thanks to the increased penetration of affordable mobile devices combined with Cloud computing, analytics and the rise of smart consumer. The next wave of growth will come from a world that is more connected and advanced. The Internet of Things (IoT) will pave the way for such a world. With 5G gradually expanding in the region, it is only a matter of time before India reaps the benefits of these developments. NASSCOM has predicted that the IoT market in India is expected to reach $15 billion by 2020, accounting for nearly 5% of the global market. Industry estimates also suggest that industrial IoT is expected to surpass the consumer IoT space in 2020, thereby enabling the need to incorporate Location Intelligence into business operations, especially in sectors like healthcare, smart cities, transport and logistics.

From a business standpoint, the government’s supportive stance through programs such as ‘Digital India’, ‘Smart cities’ and ‘Make in India’ have already opened new avenues, whether it is developing smart devices, smart cities, connected homes or connected vehicles. In other words, location will continue to be a driving force behind many of these products. As India looks to create ‘cities of future’, the insights derived from Location Intelligence can be used to analyze and predict traffic routes, weather patterns, redesign infrastructure, create intelligent mobility solutions, develop better waste management programs through fleet management and deliver public welfare and healthcare schemes to citizens at their doorstep.

We will also see India leading the innovations space with a lot of focus in the research and development of emerging technologies. India will lead the innovations with startups and companies creating products and platforms that would cater to a global audience and challenges.

Does HERE have any smart mobility initiatives and interactive traffic management solutions specially tailored for India?

At HERE Technologies, we are primarily business-to-business (B2B) focused and have been providing some of the most advanced digital maps for the automotive industry globally, with 100 million cars getting its maps and content from us since 2010. In India, we have partnered with some of the big automakers such as Maruti Suzuki, Daimler, Land Rover, Ford India, Toyota and Volvo India. For Hyundai Venue, we have collaborated to offer real-time traffic navigation and live local search. We are in the process of identifying partners in India’s two-wheeler segment for navigation maps.
Seamless urban transportation is now a reality

Smart cities require more than smart tech. Mobility ecosystems that serve citizens and keep urban environments flowing require accurate location intelligence.

Build the next generation of mobility solutions with HERE, the world’s most complete location platform.

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As technology evolves, the concerns around privacy and data security are bound to grow. In such a scenario, it is up to the companies and the industry as a whole to come together to set and regulate guidelines when it comes to privacy and security.

On the other hand, we are also focused on building a large and comprehensive set of places of information on maps that can be translated and transliterated, along with minute and point addressing that helps drivers, passengers and customers alike. We also recently partnered with Intellicar India for enhancing our GPS probe data. This partnership will allow us to significantly improve the availability of our data from 500M to approx. 1500M ppm, thus improving our traffic product coverage and quality.

**HERE has an open location platform which it calls ‘neutral data marketplace’. Please tell us about the platform, and is there a demand for a similar platform in South Asian markets?**

The HERE Open Location Platform (OLP) is a collaborative Big Data analytics platform to accelerate the development of innovative location-centric products. The ambition for the OLP is to become the go-to destination for location services, supporting not only autonomous vehicles, but smart cities and intelligent transportation systems too. There is definitely a market for OLP in South Asia. The platform supports other industry segments in addition to automotive, and there is a huge focus in South Asia to digitalize. With the government mandate on tracking and the smart cities initiative, it is our belief that OLP will be highly applicable in the region.

With a Cloud-based, API-driven architecture agnostic to data type and source, the platform offers companies and developers across markets more opportunities than ever before to unlock the power of location in their applications and services through:

- **Ingestion:** Bring your own data from points of interests, streaming sensors, or other geo-tagged data, all while maintaining control of privacy and access.
- **Enrichment:** Leverage rich datasets of real-time information from vehicles, smartphones, wearables, city infrastructure and other IoT devices to add location context to your data and services.
- **Processing:** Access off-the-shelf algorithms (or bring your own) while applying historic, real-time and predictive analytics to your data.
- **Publish:** Promote and share your enriched data and services with ecosystem partners or through your own channels.

The opportunities are endless!

**Do you think there is a need for standardization and a collaborative framework for the mainstreaming and popularization of automotive technology?**

In the Spring of 2018, we announced the OneMap Alliance, an informal interest group of leading mapping and technology companies working to offer a unified worldwide mapping system for automated vehicles.

There are different kinds of maps for automated cars, offered by numerous companies. The alliance will focus on offering mapping that is built to a single map specification — that of HERE HD Live Map. The intention is to make it easier for carmakers to deploy high quality, self-healing mapping for their vehicles, wherever in the world they are sold and used. The companies that are part of the One Map Alliance are IPC, Navinfo and Hyundai MNSoft.
National Remote Sensing Centre
Indian Space Research Organisation
Government of India

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Aerial Acquisition for Specific User Demands & Disaster Management Support

Open Data & Thematic Products Dissemination Through Bhuvan

Development of Techniques for Remote Sensing Applications

Region Specific Solutions through RRSCs

Turnkey solutions for National Projects

Capacity Building in Remote Sensing Applications through Training & Outreach Facility
In an article in *The Wall Street Journal* sometime towards the end of September this year, the writer argued how technological leadership has become an "existential issue" for China, the world’s second largest economy. With the Asian giant facing problems of heavy debt, a rapidly aging population and hostility from the United States, its biggest trading partner, the dynamic information-technology sector is one of the few reasons for it to cheer. China’s optimism about its technological leadership is quite understandable, especially since the country claims to have the world’s largest online population, and digitalization is one of the few factors that can ensure robust economic growth in the near future. But why digitization? Why is technology adoption and data access so important for growth? And what about countries that are still under-connected, or worse, disconnected? Are we witnessing an all new dimension of the global divide — the digital divide?

**Change, the only constant**

The world around us is undergoing a digital transformation at breakneck speed. Today, economic activities are stimulated by billions of online connections among people, businesses, devices, data and processes. The term “digital economy”, which was first coined in a book titled *The Digital Economy: Promise and Peril in the Age of Networked Intelligence* by Don Tapscott in 1995, has data at its core, and flourishes on hyper-connectivity — the ever-rising interconnectedness of people, organizations and machines because of mobile technology, Internet and Inter of Things (IoT).

In the last couple of decades, connectivity has grown by leaps and bounds. Global Internet consumption and data generation and sharing has multiplied at an exceptionally fast pace since the early 1990s. According to the United Nations Conference on Trade and Development (UNCTAD’s) *Digital Economy Report 2019*, 100 gigabytes of Internet Protocol traffic per day was witnessed in 1992. It grew to 100 GB per second in 2002 and 46,600GB per second in 2017. By 2025, this traffic is expected to be 150,700 GB per second.

Similarly, the reliance of businesses on data — for both trade and operations — has grown heavily in this period. A recent IMF blog suggests that today, a majority of the world’s largest firms, both in the tech space and otherwise,
To increase the pace of implementation of the SDGs, better use of data and harnessing science & tech with a focus on digital transformation, is required.

GREG SCOTT
Inter-Regional Advisor, GGIM Section, UNSD
In terms of mobile phone ownership, in the less developed countries, there is a clear divide at the rural and urban levels — about 89% of urban households have a mobile phone, as against 63% in rural areas.

In Africa and India, while urban areas have reached the saturation point in terms of SIM subscribers, the mobile uptake in rural areas has plateaued.

In Kenya, for example, despite the country’s advanced DFS ecosystem, the rural poor are about 40% less likely to be active mobile money users when compared to other populations.

Since 2011, the global gender gap in mobile money account ownership has remained unchanged at 9 percentage points.

Mobile access and adoption

In the mid-2000s, the first users of mobiles in emerging markets were educated urban young men with a sound economic background. Over a decade later, even though mobile phone adoption has exploded, the uptake and use continued to be constrained by socio-economic and demographic factors such as income, education, gender etc. “Data, or access to technology is predominantly a male dominated possession in most developing and underdeveloped countries. It’s crucial that women are equipped with technology tools and are made part of the decision-making process,” says Jagdeesh Rao Puppala, Chief Executive, Foundation For Ecological Security.

In the less developed countries, there is a clear divide at the rural and urban levels — about 89% of urban households have a mobile phone, as against 63% in rural ones.

In Africa and India, while urban areas have reached the saturation point in terms of SIM subscribers, the mobile uptake in rural areas has plateaued. And the ones who have adopted late are failing to keep pace with rapid technology advancements. In Kenya, for example, despite the country’s advanced DFS ecosystem, the rural poor are about 40% less likely to be active mobile money users when compared to other populations (2018 Pathways for Prosperity Commission paper on The Mobile Phone Revolution and Digital Inequality).

Then there is the gender gap, which the World Bank’s Global Findex database presents in terms of possessing a mobile money account. Since 2011, the global gender gap in mobile money account ownership has remained unchanged at 9 percentage points. Similarly, GSMA’s 2018 Mobile Gender Gap Report suggests that in low and middle-income countries, the gender gap in mobile Internet access is 2.6 times that in phone ownership.

Still huge digital divides

Half of the world remains offline. In LDCs only 1 in 5 people are online. Gender gap is the widest in the poorest economies.

Geography of the digital economy is highly concentrated in two countries

- United States and China
- Rest of the world
- 75% of all patents related to blockchain technologies
- 50% of global spending on IoT
- >75% of the cloud computing market
- US and China: 90% of the market capitalization value of the world’s 70 largest digital platforms
- 68% US
- 27% China 22% Asia
- 1 in 5 people are online
- Gender gap is the widest in the poorest economies
To maximize value from data, we need to increase access in ways that build trust, conform to legal frameworks and deliver value for the public good.

SIR NIGEL SHADBOLT
Co-Founder and Chairman, Open Data Institute

Missing from maps
Nearly 2.5 billion people around the world are dependent on community land, which is generally held in a collective manner under customary tenure arrangements. Experts estimate 50-65% of the world’s land is community land, though very little is known about the extent to which these lands are recognized. That’s because a major portion of these lands does not find a mention on maps. According to a 2015 study of 64 countries comprising 82% of global land area, only 10% of the world’s land (belonging to communities) was legally recognized (on maps). That is why, LandMark, an online project, is working on mapping all of the world’s indigenous lands to help secure legal rights of communities and alert them about threats such as illegal logging and mining.

Every year, more than one million people across the globe lose their lives to epidemics and calamities like earthquakes, floods, storms, hurricanes and landslides. Though paucity of resources continues to plague disease/disaster-prone areas in less developed and underdeveloped countries, another major problem that hinders relief work in times of crisis is the absence of these areas from maps. Be it 2017 measles outbreak in Conakry, Guinea, or 2016 hurricane in Haiti, no maps means delayed response and uneven allocation of resources. Missing Maps Project, which was set up by a group of humanitarian organizations in 2014, is working on bringing disaster-hit areas and communities on the map.

Let alone Africa and Middle East, places in Europe and America were wrongly mapped, or not mapped at all, until recently. With nearly 80% of data now having a location component, experts argue that maps are important not only for basic development but are also crucial for sound decision-making and analysis. “Around the world, we are facing a range of social, economic and environmental challenges. Data has a fundamental role to play in addressing these challenges. To maximize value from data, we need to increase access in ways that build trust, conform to legal and ethical frameworks and deliver value for the public good,” says Sir Nigel Shadbolt, Co-Founder and Chairman, Open Data Institute.

Online versus offline
Half of the world may have “come online”, but there isn’t much to celebrate, as the status quo still puts billions of people on the wrong side of digitalization. And that is why, technology giants such as Microsoft are going an extra mile to ensure proper Internet access for people in the less developed world. In a blog in September this year, the company said that while the efforts to accelerate Internet access globally, with a focus on developing nations, are not new, it’s clear that the world needs a new approach to this work.

The blog, citing the UN State of Broadband Report, which suggested that broadband adoption has slowed in the world and that the progress is especially elusive in low-income countries and rural areas across the globe, said that even the majority of connected population relies on low speed, basic cellular services and only 14.1% of the global population has an in-home Internet subscription. Through its new international track of the Airband Initiative, Microsoft aims to extend Internet access to 40 million unserved and underserved people around the globe by July 2022.
Experts estimate that 50-65% of the world’s land is community land, though very little is known about the extent to which these lands are recognized (mapped).

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With nearly 80% of data now having a location component, maps are important not only for basic development but are also crucial for sound decision-making and analysis.

In many countries, mobile has become the primary, and sometimes the only means of Internet access, according to GSMA’s Connected Society Report last year. However, the mobile Internet connectivity is not equitable, since just over 40% of the population in low and middle-income countries is connected, as compared to almost 75% of the population in high-income countries. There is also a persistent rural-urban gap in mobile Internet access — rural population in the above-mentioned countries are 40% less likely to use mobile Internet than urban populations. When it comes to gender, women are 23% less likely than men to use mobile Internet. The report suggests that the rural-urban divide and the gender gap are greatest in South Asia and Sub-Saharan Africa.

“We need to be able to leverage the transformative nature of digital technology as a true enabler for all, but it will require Internet access, literacy, availability and most importantly, bandwidth,” says Scott. This is a reality that countries and decision-makers will need to address. However, there are now communications technologies that are emerging from the industry that will assist countries to leap-frog the more traditional approaches. 5G is one such example. But the initial enabling infrastructure for these technologies can still be very costly.

“Ironically, for Africa, another influencing determinant not often considered is access to reliable electricity, without which there simply is no access to computers, ICTs and the Internet, and enjoyment of the subsequent opportunities and benefits,” explains Scott.

**Concentrated data traffic & e-commerce**

Asia Pacific and North America regions are expected to account for about 70% of the total data traffic between 2017 and 2022, whereas Latin America, the Middle East and Africa together will account for just around 10%, suggests the Digital Economy report. Nearly 99% of total global data transmissions run through fibre optic submarine cables and content providers such as Microsoft, Google, Facebook and Amazon own or lease more than half of all undersea bandwidth. Further, most data centers are located in developed countries — out of 4,422 colocation data centers, 1,880 are in developed countries, with the US being home to about 40% of these centers.

Perhaps that is also why the e-commerce numbers have remained unchanged in the past years. The UNCTAD report states that the global value of e-commerce is estimated to have reached $29 trillion in 2017. However, the list of the top 10 countries by total e-commerce sales has not changed since 2016, with the United States being the market leader.

**INTERNET OF THINGS** refers to the array of devices connected to the Internet such as sensors, meters chips and other gadgets that have been assigned an IP address and have the ability to collect and transfer data over a network without manual assistance or intervention. The top seven countries (US, China, Japan, Germany, Korea, France and UK) account for nearly 75% of worldwide spending on IoT, with the first two nations representing 50% of the global spending.

**ARTIFICIAL INTELLIGENCE**, which according to estimates, has the potential to generate additional global economic output of around $13 trillion by 2030, may offer the maximum benefits to China and the United States and the least to Africa and Latin America.

In the case of Blockchain and 3D printing, China and the US are far ahead of the rest of the world. For instance, China currently accounts for nearly 50% of all patent applications for technology families relating to Blockchains, and together with the US, they represent more than 75% of all such patent applications. In 3D printing, the US, followed by China, Japan, Germany and UK, account for an estimated 70% of total global capacity.

In the case of 5G and Robotics technology, a handful of countries are expected to benefit from the advancements. By 2025, the share of 5G in total connections is expected to reach 59% in Korea, as compared to just 8% in Latin America and 3% in Sub-Saharan Africa. The top five markets for Robotics technology, China, Japan, Korea, US and Germany, represented 73% of the total sales volume in 2017.
China, on the other hand, has the largest number of online shoppers (440 million), whereas the United Kingdom has the highest proportion of online shoppers to the population (82% of those aged 15 years and older).

**Collaboration for growth**

If regulations in developing countries can clearly set the rules for digital platforms, argues the UNCTAD report, there might be less need for “ex post enforcement of competition law by authorities”. For instance, the Government of India introduced new e-commerce rules in 2018 to promote competition and prevent restrictive practices by online platforms such as Amazon and Flipkart. Another option for such countries can be joining forces at the regional level within their regional trade and economic frameworks. Such arrangements would boost regional trade and ensure larger markets for local companies. These would also ensure that dominant platforms remain open to local and regional companies under fair terms and conditions, further enhancing the scope for collaboration.

Companies operating in developing or underdeveloped countries can also benefit from the use of global digital platforms, which provide the opportunity to connect with different parts, or even with other countries. This could enhance efficiency and increase access to domestic and international markets. For instance, in many developing countries, Facebook is often used as a means to market domestic services to potential customers. This not only results in new types of trade, but also moves traditional trade online. Further, it is important for developing nations to have their own digital innovation platforms, as the large global platforms may not have plans that align with local market needs. “Global sustainable development is just not possible without data. However, there are a few factors that deserve consideration. It is important to set timelines for development while using data. Also, it is crucial to understand trends presented by data so that the problem on the ground can be properly identified and dealt with,” adds Puppala.

Enormous disparities of opportunity, dignity, wealth and power still prevail as a result of the digital divide. “Billions of people are still excluded from the new world of data and information by circumstance, geographic location, language, poverty, education, income, social groups, gender, age, lack of technology infrastructure, remoteness, or prejudice and discrimination,” says Scott. While the availability of technology, information and knowledge in the developed world provides almost unlimited choices, in the developing world, many are still forced to make one choice — between food and knowledge.

With respect to geographic location, these societal elements can be mapped further geographically when aspects such as rural versus urban and industrialized versus developing countries have an effect. Additionally, the broader overarching national social, political, and economic implications of the digital divide for countries, including lack of opportunity to solve societal problems, needs to be more fully considered. That is when we can think about global development or development for all, let alone sustainable development.

Avneep Dhingra, Associate Editor
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DATA IS AS IMPORTANT AS HUMAN RIGHTS

Supporting the biodiversity and protecting the planet is fundamental to our survival. It is quite clear that we are running out of time, and the time for action was yesterday. By Keith Clarke

We are in an age where the data is prevalent, accessible and comprehensible. And I think comprehensibility is the key — people must be able to understand what the data is. From being ‘useful’, data has now become ‘essential’. This is immensely beneficial for the humankind. Data is the tool that will allow the world to actually de-carbonize the economy and stay within acceptable parameters. It is an enabler for something which is incredibly urgent. The timeframe for action cannot be met by the political world without the sort of technology that big geospatial data and layers of all those levels and penetrations of knowledge give you. As far as issues concerning privacy or abuse of power, those hold true with all technologies and have to be addressed.

Infrastructure key to development; data key to infrastructure

As we enter the digital age, the future will be all about data. One of the areas where we can use data effectively is building future cities. Increasing population growth would bring with it challenges such as urbanization, transport issues, demand for water and power, among others. The infrastructure sector can’t get the world to global warming of 1.5 degrees Celsius on its own. But by doing nothing, it will only ensure that no one else does either. With the equivalent of six new Europes to be created by 2030, the infrastructure sector is looking at a massive opportunity.

However, we must remember that infrastructure impacts all of the 17 Sustainable Development Goals, which means that the infrastructure sector is fundamental to addressing inequality and poverty in the world.

Layering Big Data with geospatial will allow planning decisions to be shared with the communities. I think you are seeing that aspect of geospatial in many places: Singapore being one; China is looking at it a great deal; work is being done in India and the UK that allows participation in a way that is comprehensible by the general public. In today’s world, the choices that we have to make are quite difficult — between biodiversity, environment, land use, urban redevelopment and employment.

Geospatial data allows you to scale up things, make intelligent choices and run scenarios about what is the most efficient, socially acceptable and socially inclusive way of making those decisions.

Value of data in building a sustainable world

I first realized the value of data — geospatial data in particular — in building a sustainable world when I was the Chief Executive at WS Atkins, the UK’s largest engineering consultant. That was about 20 years ago. I was good at turning businesses around that were in trouble. WS Atkins was in trouble and it was more about making the business viable. I am proud that I managed to turn it around. But I am prouder about how I achieved that. During a conversation with my daughter one day, I realized that sustainability was a bigger issue and I started to look at climate science. As the Chief Executive, you get paid to think about what you think is good for the company. If you do not understand a little bit about science, politics and how media reports it, a little bit about business models that you are looking at related to de-carbonization and a little about economics and human behavior, you end up ignoring the big problem.
It probably took us five years to start the journey. As a global engineering design firm, we decided that reducing carbon in our designs was not just an option, but an inherent part of the job. Over the years, we trained our staff to have meaningful conversations on carbon efficiency with clients. I am proud that Atkins is continuing on that path. Today, carbon-critical designs are part of Atkins’ DNA. The geospatial group at Atkins was an integral part of driving this change. Recently, Dr. Anne Kemp, who has led the company’s BIM strategy and development, received the Order of the British Empire in the Queen’s Birthday Honors list for the role she has played in helping the UK understand how the construction and infrastructure sectors can adopt a digital approach to better design, build, operate and integrate the built environment.

I am not sure whether my daughter got sustainability before I did, but now the whole family has it, and it feels good.

I also realized that data is a useful tool not just for one particular thing or sector, but for a whole range of issues. What I did not understand back then and have figured out recently is that acceleration of merging different datasets would be so fluid and so comprehensible. That changes the game from really useful to something which is wicked cool today. We always knew we had lots of data, but had no knowledge about what to do with it or how to comprehend. Today, the focus has moved from data collection to knowledge collection; and this is a very recent acceleration that we have seen in the geospatial sector too. We will soon be witnessing a highly disruptive world, particularly in the developing parts, where we will have many choices on what to achieve and the way in which it can be achieved. I am surprised about how quickly the technology is advancing. The challenge for the future is to exploit this technology for the good of humankind, but at the same time protect humanity from evils like terrorism. However, the latter is definitely not a reason to move away from this technology, it is a reason to embrace it but adopt it appropriately. That is the opportunity and challenge.

**Climate Change: There is no excuse not to try**

Climate Change has a scientific history of 250 years when people first started to write about it. The acceleration of knowledge around the subject has been extraordinary, but not because Climate Change has been realized as an issue, but simply because of the computing power that is available now. What is clear is that we knew 20 years ago about this issue. We knew it would be unacceptable to the global economy, unacceptable to humankind, unacceptable if you cared about biodiversity. Supporting the biodiversity and protecting the planet is fundamental to our survival. It is quite clear that we are really running out of time. It is not business as usual. It is an emergency and it is disturbing that we did not recognize it when politicians signed the Paris deal. They signed up to a target. We do have many civilized countries in the world understanding that Climate Change is a common responsibility across the globe. And the time for action was yesterday. It is hard to see that we are not going to make it. But that is not an excuse to not try.

**Data disparity: Quality and access**

Inequality issues that the world has are pretty pervasive. We may have fewer poor people as defined by the UN, but they are still far too many. And data poverty is an issue for many communities. Even in the UK, if you are a school-going child who does not have Internet access, you will not be able to do your homework. It is a simple example of being disadvantaged, as compared to someone living in the city with 4G and 5G. In the developing world, people do not have access on how transportation works or how weather is going to be. In some parts of the world, accurate weather reports is a basic thing around which we plan our weekends. However, for farmers who are planning crops, knowing how the weather would be, is very important. And giving them access to data is akin to ensuring human rights. Without access to knowledge, the developing world will continue to be in developing stage. While many countries do not have basic data, in some places, it is the government which hoards all the data. The data should actually be with people. Then it becomes an enabler of choice. The developing world is going to leapfrog into to a place where developed countries like the UK and US are currently if they have proper access to data.

**Keith Clarke is a veteran of the international construction industry. He was the Executive Vice-President of Skanska, CEO of Trafalgar House Construction, Kvaerner Construction and WS Atkins. Clarke is credited with reshaping Atkins to respond to opportunities created by the low carbon economy, and making carbon-critical designs a part of the company’s DNA. An ardent advocate for sustainable development and de-carbonization of the society, he is currently the Chairman of the Forum for the Future, a non-profit working on complex sustainability challenges, and the Chair of Active Building Centre, Swansea University.**
The new political wisdom says that there is no progress without trust, and for that you have to be open and transparent, share data and make it easy for people to understand. **By Martin O’Malley**

I had the honor to serve as an elected executive in the United States for 15 years. I was the Mayor of Baltimore for seven years, followed by the Governor of Maryland for eight years. Since then, I have been doing some writing, teaching and advising technology clients. I was lucky to have been tipped about the power of these tools by a man who invented the COMPSTAT system and methodology of policing in the NYPD. The ability that we now have to model, measure and map our physical and built-in environment is a big gamechanger.

Earlier, the authority was based on an assumption that the leader had a better view of things than the people. But today, because of the Internet, Internet of Things and GIS, citizens know things at the same time as their leaders. Hence, it is important for leaders to be much more open and transparent about the policies they enact and the actions they take, because the authority now is based on their ability to share with one another what’s happening, rather than just telling people what to do and assuming they will be obedient.

**Power of GIS**

While serving on the City of Baltimore Council, with my background as a prosecutor in the criminal courts, I watched as our city became more and more violent. I started looking for answers, and noticed that in New York, violence was dramatically reducing. With the new form of governance comes performance measurement, openness, transparency and a cadence of collaboration. The NYPD was reducing crime every year, and so I began to ask as a Council member why can’t we learn from them? I took delegations to New York on fact finding missions. I had a good sense of what we needed to do and how we could do it, and I sold that to the people of Baltimore who voted for it. In the next 10 years, we put our city on the path of biggest crime reduction in America.

There were people in every department who understood the power of GIS and map. They had never been given the freedom to make it the common platform for the whole enterprise of their department, let alone the whole enterprise of the government. We found that the department of public orders had a terrific base map. They had one of the latest versions of Esri’s GIS product and they were using it primarily for planning water and wastewater system. So, we made that our base map and...
insisted that all silos of departmental information land on that one map.

**Overcoming resistance to change**
The initial resistance was on expected lines, but in our city, the Mayor has a lot of executive power. We were actually able to get up and running very quickly. We appointed a new police commissioner and started running COMPSTAT within 30 days of my swearing-in. CityStat was implemented in all departments in the next few months. We found that a lot of the information was already being collected, but the problem was that nobody could see it holistically. The change didn’t happen in one giant bang; it was incremental and steady. Even if you can make 1% progress every two weeks, I don’t care what the issue is, that is a lot of progress over the course of a year.

When we got the Innovations in Government Award from the Kennedy School for the 311 system, I joked that our big innovation was that we started measuring the output of government instead of just inputs. GIS is the integrator of all of this data and action.

**Creating healthy competition**
In the initial phase, everybody feared coming before the Mayor. Over time, people came to appreciate the fact that only here can a Sanitation Director meet with the Mayor. Over time, people came to appreciate the fact that only here can a Sanitation Director meet with the Mayor. Over time, people came to appreciate the fact that only here can a Sanitation Director meet with the Mayor. Over time, people came to appreciate the fact that only here can a Sanitation Director meet with the Mayor. Over time, people came to appreciate the fact that only here can a Sanitation Director meet with the Mayor. Over time, people came to appreciate the fact that only here can a Sanitation Director meet with the Mayor. Over time, people came to appreciate the fact that only here can a Sanitation Director meet with the Mayor. Over time, people came to appreciate the fact that only here can a Sanitation Director meet with the Mayor.

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**Data privacy concerns**
It is not only important to have the debate, but also to be able to craft the solutions, whether in law or regulation that address those concerns. We used to routinely see the granny photos of somebody robbing a 7/11 and the TV announcer saying, “if you have seen this person or anybody that looks like him, call the police”. But now, the ability to enhance that photo and match it against an array of photos keeps someone from being murdered or robbed on gunpoint. These are powerful law enforcement tools, but they have to be used in accordance with the constitutional rights, and the authority should never be abused. We have to always find that balance.

I think the key is openness and transparency. The Baltimore Mayor and his team recently witnessed a PR disaster, when without telling anyone, they started experimenting with the use of a drone high above the city to do what the police helicopter did. The fact that they did that secretly without telling anybody led to all sorts of suspicion and distrust. Had they said at the outset, look, we spend $15-20 million a year to maintain a helicopter capacity, and for a fraction of that a drone might perform the same function or better keep officers from losing their lives in high speed chases.

**Acting responsibly**
The very openness of the Internet, the ability to connect over vast distances instantaneously, all things that you would think would be democratic were used in my own country to hack our democracy with Russian troll firms posing as citizens in the new public virtual square of Facebook and the Internet. One would hope that citizens become savvier and the consumers of online information become better judges of what’s real and what’s not. But I think, it also means that we have to come up with better ways to authenticate information. The key I think is to be able to authenticate, curate and validate, and to provide context much more instantaneously than responsible authorities are accustomed to doing today.

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**Martin O’Malley** served as the 61st Governor of Maryland from 2007 to 2015. He previously served as the Mayor of Baltimore. After vacating public office, he was appointed to the Johns Hopkins University’s Carey Business School as a visiting professor focusing on government, business and urban issues. As governor, he undertook many welfare initiatives using spatial data. He has also authored a book on the use of technology for good governance titled *Smarter Government: How to Govern for Results in the Information Age*. 
With the advent of the Digital Age, data will be at the core of almost everything. Apart from other utilities, it will be a must for sustainable development. As we use more and more technology in different fields of life and gather data that was not available earlier, new applications of that data will emerge. This has been the trend over the last several years and it will continue in the coming future.

While technology adds comfort to our life, it is the state of one’s being that defines the quality of life. It is worthwhile to pay attention to how one can improve the state of one’s being, and spirituality is the technology for that. By Sri Sri Ravi Shankar
However, too much technology has started to adversely impact people’s health and we now hear of things like ‘digital detox’. Too much information overloads the mind and causes stress. While I am all for using technology, one should also take a break every now and then, and take out time to meditate, so that there can be a right balance of Internet and ‘Inner Net’ in the mind.

**Why spatial data is important**

The growing reliance on data has also brought to the fore the importance of spatial data, which experts argue, is indispensable for building a sustainable world. To counter the looming water crisis in India, The Art of Living has been working tirelessly on reviving rivers and other water resources through its water conservation initiatives. Through these efforts, people at the grassroots, in towns and cities are being made aware of water conservation practices and the importance of the judicious use of natural resources like water.

Even our River Team has been using Remote Sensing data from satellites for planning their work in reviving rivers. As they tell me, they use many thematic maps based on which they derive the optimum River Rejuvenation Action Plan. The team has many hydrogeologists, former ISRO scientists and GIS analysts to work and train the community on the usage and implementation.

Our work so far has seen good results, but there is still lots to be done on the ground; lots of area has to be covered. It is also important to ensure that here is an effective study of the impact of our work so far. We want to involve academic / research institutions to be part of the study and also enable its usage for effective policymaking and needed course corrections across all water distress areas.

**Digital divide and data misuse**

Along with innovations and technology advancements, there is a growing disparity in terms of data access. For instance, the developed world has emerging data economies and the developing/underdeveloped parts have populations with absolutely no access to data. The developing countries do not even have the requisite infrastructure that supports creation of the much-needed socio-economic-demographic data.

At the same time, technology has made the entire world a village, where anybody can know anything. This has obviously brought in many changes in the way people communicate and has also given birth to new economies — new kinds of jobs and skillsets have emerged with the emergence of new markets. While data is central to all of this, we have to be careful that it is not misused, as we have seen in many cases in the recent past.

**Climate Change and depleting resources**

Carl Sagan once famously said that “the Earth is the only world known so far to harbor life and there’s nowhere else, at least in the near future”. With mankind facing unprecedented crisis in the form of Climate Change, depleting resources and growing global social and economic disparity, there is a section which believes that we are running out of time.

A spate of natural disasters in the recent times has shown that Climate Change is for real and is affecting all of us. To start with, the most important thing is to sensitize people so that there is a sense of responsibility inculcated in individuals as well as in the society as a whole. This will ensure that the people understand and accept that the environment is not ‘someone else’s problem’. Every nation has a role to play to preserve and rejuvenate their natural resources.

**Reverence for preservation**

Our team has been working to rejuvenate rivers and their ecosystems. They have been working with communities at the grassroots to bring awareness and ensure participation from all stakeholders. There is still lots to do in this direction. The ancient civilizations revered nature and when there is a sense of reverence towards something, you cannot pollute it. This attitude of honoring the nature is what we must bring back through education and awareness.

While technology adds comfort to our life, it is the state of one’s being that defines the quality of life. It is worthwhile to pay attention to how one can improve the state of one’s being, and spirituality is the technology for that.
If you do not have the right kind or the right amount of data from carefully conducted experiments, you cannot achieve the desired results.

By Prof M.S. Swaminathan

In the January of 1964, when everyone was talking about the Green Revolution, I remember what I said at the Science Congress in Varanasi, a prominent district in the northern Indian state of Uttar Pradesh. At the event, I warned farmers that if you overdo something, you will be in difficulty. The key then, and now, is sustainable methods of cultivation that lead to sustainable yields. Inputs are required for output — use of fertilizers, pesticides, water and so on. But overdoing anything can lead to disastrous results. I warned the attendees at the Congress that let us not turn the Green Revolution into a ‘Greed Revolution’. My comments were focused on the principle of sustainability.

From shallow sowing of seeds to water management, over the years, we have worked with farmers across the country in making agriculture more efficient, productive and sustainable. In this decades-long journey, there have been so many heart-touching expe-
riences that it is difficult to recall one particular incident. However, quite recently, I read a news report in a leading Indian English daily about one of the villages where we had worked extensively; the report said that “the seeds that were sown in 1968 for sustainable agriculture have now taken roots”. I was quite pleased to read that and was moved, to say the least.

**Growing significance of data**

Today, data has become fundamental to global sustainable development. If you do not have the right kind or the right amount of data from carefully conducted experiments, you cannot achieve the desired results. In fact, I would say that data is fundamental to drawing any conclusion. For instance, before I tell a farmer to use 80 kg of nitrogen, I must have data to show or prove that 80 kg of nitrogen is economically viable and desirable. Therefore, all recommendations should be based on solid data.

In our field, we have extensively used/relied on data for work-related decisions in the past years. Before we get to recommendations, we have a number of trials and replications at an all-India level. And wherever the results are found to be contradictory or different, we get into analyzing how and why. It is all part of informed decision-making and making the right recommendations.

We are well aware that there is a data divide at all levels. However, this glaring gap can very well be bridged — wherever there’s a will, there’s a way. Back in the 1960s, we introduced the concept of ‘village knowledge canter’. It is a place where we have the entire data available. And mind you, this data is thoroughly analyzed. Farmers discuss among themselves whether to rely on that data based on their understanding and experience. But the data is there to support decisions.

**Public awareness and government intervention**

As far as the global digital inequality is concerned, that too can be tackled, depending on the kind of investments you can make, the kind of efforts you can put in and the number of professionals/experts (in our field, scientists) you can hire. Apart from this, you also need a large number of people taking the message around, generating awareness among the larger masses. Another very important factor is the willingness of the government. If the top authorities in a country are convinced that the investment is worth it, they will make it and things will start to change on the ground.

I will give you an example. In 1964, Lal Bahadur Shastri was the Prime Minister of India. He once came with us to the wheat fields and was instantly convinced that we must accelerate the progress that we had been witnessing in cultivation. He immediately ordered 18,000 tonnes of high-quality seeds. So, government policy has to have such issues on priority. To put it simply, technology and public policy have to come together. Only then will we be able to find sustainable solutions.

**Climate Change threat**

For a long time, the problem of Climate Change was not accepted as a reality. A majority of people were in denial and some of them even called it “scientific imagination”. But that’s not the case today. There is a lot of discussion around Climate Change now, especially in the wake of different kinds of natural calamities being reported from different parts of the world every now and then. We need to save our natural resources and the public needs to be educated on this front. I personally feel that the mass media has a very important role to play in this. Having said that, technology has a key role to play in this process. Technology can not only help us understand the problem, but can also help us in finding solutions, which is most important.

For farmers, market and climate are the two most important factors that literally determine his life conditions. All new technologies are adding value to agriculture and spatial technology is no different. We have used in the past and know how beneficial it is — Vikram Sarabhai (renowned Indian scientist, physicist and astronomer) was alive at that time and he supported the idea.

**Drawing the right balance**

We must now look at practicing climate-secure agriculture. The common man is facing numerous challenges and we need a host of measures, including a sound public policy to overcome these challenges. Though technology is very important, I always keep telling people that ‘don’t worship technology’, worship the outcome that you desire.

Prof Mankombu Sambasivan Swaminathan is a renowned Indian geneticist and administrator, known for his role in the country’s Green Revolution. He has often been called the ‘Father of Green Revolution in India’ for his role in introducing high-yielding varieties of wheat in the country. He is the founder of the M.S. Swaminathan Research Foundation. His stated vision is to rid the world of hunger and poverty. Prof Swaminathan is an advocate of taking India to sustainable development by using environmentally sustainable agriculture and sustainable food security.
As we enter into the digital age, the future will be all about data. Do you feel data will have a significant role to play also in global development?

Stefano Toscano: In today’s world, data and information really are the basis for sound decision-making and optimal action — and there has never been any doubt about that. The real issue has always been accessibility and usability of data. Technological developments of the last few years are, however, opening up exciting opportunities in this respect.

Olivier Cottray: The shift from heavy and complex software tools to role and task-specific applications has helped to put information systems and the information they contain truly in the hands of those who need it and use it. It is the operations and program managers who interact directly with the information in a way that fits within their day-to-day activities and decisions. The increase in data availability must be accompanied by these kind of end-user tools if the potential of data to support development is to be utilized.

Tell us about some of your initiatives where you have used satellite data/GIS/maps. Also, when and how did you realize the value of spatial data for building a sustainable world?

ST: One of the founding objectives of GICHD was to provide the mine action sector with a robust information management system (known as the Information Management System for Mine Action – IMSMA). In mine action, geography is of fundamental importance: we need to know where the explosive hazards lie and to understand their proximity to relevant socio-economic infrastructure to determine where clearance has to happen first. This is why GIS has been at the heart of IMSMA since its inception.

OC: The current version of IMSMA being deployed worldwide is fully built by configuring Esri’s suite of GIS tools. Since these tools are also widely adopted across the humanitarian and development sectors (and employ industry standards in GIS), we are more and more able to reach out to other data platforms such as the Humanitarian Data Exchange (HDX) and leverage that information for planning and prioritization. We are excited about this new phase of mine action, a phase in which data bridges to these other sectors of work.

There is a growing disparity in terms of data access. For instance, the developed world has emerging data economies and the underdeveloped parts have populations with absolutely no access to data. How can we bridge this divide?

ST: GICHD’s mandate is primarily to support national mine action authorities in developing their capacity to manage their mine contamination problem. So, national ownership of tools and processes is at the core of what we do. In terms of information management, we work with our national partners to design and implement appropriate IM systems.

OC: Indeed, we equip them with the tools and skills that they need to run them on their own. Sustainability is the key here; our partnership with Esri allows us to provide the software at affordable rates and the scalability of the tools means that we can adapt the complexity of the system to the size and complexity of the different national programs.
What are your views on open data, especially government data that has been created with the taxpayers’ money?

ST: In principle, publicly created data should remain public. In our line of work, however, there are some exceptions due to security considerations. We should see mine action as tax money going towards the generation of data that allows for the reduction of risk from explosive ordnance, which is a public good in itself.

OC: The challenge here is to find a balance between data protection and data openness. On the one hand, we obviously do not want to lead people to explosives, but on the other hand we need to keep the population abreast of demining efforts in their area and to inform donors on the progress of mine action programs. The ability to provide user-specific dashboards and infographics means that we are increasingly able to deliver the right level of information to the right audience, all stemming from the same data source.

With mankind facing unprecedented crisis in the form of Climate Change, depleting resources and growing global social and economic disparity, are we running out of time?

ST: The climate crisis is a reality that we cannot ignore. There are those who feel that we as humans have run out of time, but that is not the case in my opinion. We must maintain hope, because hope prompts action. GICHD exists precisely because we believe that action — mine action in our case — can make a difference. But that’s possible only if it is well thought through and based on carefully considered evidence. However, what we definitely do not have time for is misinformed action.

OC: Errors in our realm of work can indeed have devastating consequences, therefore a high level of consideration is required, which is only possible when in possession of the right information. When talking about Climate Change, it also comes down to how the public and decision-makers can absorb the vast quantities of information coming from scientists. The key will be to understand how we can distil climate science data into manageable information that provides clear lines of action.

Can you share that one heart touching moment or experience that made you feel very proud of the work you do?

ST: Only a few months ago, I was in Mosul, Iraq, where I saw the effects of war. The city had been under ISIS occupation for over three years, and the effects of war were devastating to see. Most of the city is destroyed to a level beyond imagination, and also heavily contaminated. When you see this with your own eyes, you really realize what we are working for. GIS is helping us greatly in such scenarios. Its impact can however be felt well beyond the areas that we are mapping. We see people going back to their homes, starting to live again — this is what we are ultimately working for.

OC: We believe GIS has an important role to play in preventing conflict from turning violent in the first place and in sustaining peace in a wider sense. GIS is all about managing space in collaborative ways, which in turn help resolve potential conflicts over that space. Thus, GIS makes a tangible contribution to peace.

What would be your message to our readers?

ST: Technology, and especially GIS, is helping us make the world safer in a very concrete way. They are having an impact well beyond the immediate one. GIS is all about managing space in collaborative ways, which in turn help resolve potential conflicts over that space. Thus, GIS makes a tangible contribution to peace.

OC: Providing means to integrate, analyze and visualize the geographic factors that influence peace is key to successful conflict prevention and peace building processes. GIS were designed to do just that: First, GIS allow the integration of different information sources; they ensure that multiple criteria from multiple stakeholders are taken into account when defining optimal solutions for peace. Second, GIS allow us to perform complex analysis of data to provide new information and insight. And third, GIS allow clear visualization of these new insights. If a picture is worth a thousand words, a map is worth a thousand more.

ST: We’ve been calling this GIS for Peace because we very much believe that through the use that Olivier just mentioned, the GIS community at large has a real potential to contribute to peace in this world of ours.
Latitudo40 is an innovative startup founded in Naples in 2017. It was born with the aim of offering a new and simpler approach to the use of geospatial data, especially for companies and customers with limited knowledge of the earth observation domain, but with a huge need to study environmental phenomena, from monitoring infrastructure and cities to the analysis of socio-economic phenomena.

The company, with its fully Cloud-based EarthAlytics platform, has created a value proposition to overcome the barriers currently present in the industry by offering:

- A processing infrastructure already equipped with tools for research and acquisition in the catalogues of images of the main operators (DigitalGlobe, Planet, Copernicus) and the new smallsat constellations.
- A series of ‘building blocks’ for image analysis and information extraction with Machine Learning / Artificial Intelligence algorithms (e.g. building classification or road recognition, cars, containers, etc.).
- An integrated environment through a visual integration tool, which allows integration of geospatial applications directly into the platforms used in the customer’s IT environment.

Whether it is estimating the value of a property in a city, verifying the stability of a power line tower or identifying leaks in a water pipe, EarthAlytics helps simplify development, streamline processes and focus attention on the value of the customer and the success of a project.

“Several customers have believed in our business and technological model, which is based on a service fee that is easy to understand and includes all the elements of the service, with the ability to start a monitoring project in less than two months,” says Gaetano Volpe, CEO and Co-Founder of Latitudo40.

“Our first projects were centered around infrastructure monitoring, with focus on power grids for tower stability analysis, conductor breakage detection and risk monitoring, and on water networks to analyze the risk of pipeline leakage with an absolutely innovative approach,” says Mauro Manente, Chief Technology Officer and Co-Founder of the startup. Manente adds that they have a “clear vision of their development roadmap that is driven by the needs of some of the customers”.

“This will be implemented over the next year, taking advantage of the ESA-BIC acceleration program in Rome and the Urban WorkLab acceleration path in LVenture. The next project is the implementation of a vertical solution to offer new tools for monitoring insurance and reinsurance contracts, in partnership with a leading European insurance company,” adds Manente.

The startup’s next target is to expand its team, which already has 10 specialists in various areas of the value chain, and its expansion into the international market, thanks to agreements with a number of business partners, especially in the field of GIS integration. These partners are appreciating the concept of an integrated platform open to self-service, with a visual development tool. This is unique in the market and allows you to overcome the limitations of all other solutions.

For more information, log on to www.latitudo40.com; info@latitudo40.com

**Latitudo40 provides its customers a processing infrastructure equipped with efficient tools, a series of ‘building blocks’ for image analysis and information extraction, and an integrated environment through a visual integration tool**

**Courtesy:** Latitudo40
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Now RTK and optical solutions are available simultaneously and can verify each other’s solutions. They also can cover each other, when one is not available.

RTK has six engines. We treat the J-Mate solution as the seventh engine of the system.

The system is self-sufficient for all jobs. No need to pay RTN service providers for RTK base stations and no need to pay communication service providers. The communications are done via integrated and included Bluetooth, UHF, and Wi-Fi embedded in the system.

Another major advantage is that because your own RTK base station is not far from your rover, RTK solutions will be provided much faster and more reliably.

**We added the “Aim” option for stake-out.** In this mode J-Mate points to the selected stake point and you follow the laser to reach the intended point. This is in addition to the robotic mode which J-Mate follows your Zebra pole.

At TRIUMPH-LS = 2.13 kg (4.40 lb), TRIUMPH-3 = 1.26 Kg (2.20 lb), and J-Mate = 2.17 kg (4.41 lb), The total package of 5.6 kg (11.02 lb), weighs less than one conventional optical total station alone.

J-Mate does have complete geodetically encoded scanning (3 points per second) and robotic features too.
Take Backsight with a Single Shot

To calibrate the J-Mate, take few seconds of RTK at the Backsight point, and click “Backsight” button. There is no need to locate Occupation Point and the Backsight point, because Occupation point is the RTK Base station and one point is enough to determine the azimuth to calibrate the J-Mate angular encoders.
Backsight with Auto SunSeek

Click a button and after a few seconds Backsight will be calibrated with the Sun AUTOMATICALLY. Don’t forget the Sun filter.

See details at www.javad.com
Light Weight, Low Cost

Costs ½, Weighs ½ and works much better than conventional total stations and RTK systems.

Complete RTK Base & Rover.
Complete optical system.
Complete controller and software.
Free updates.
Robotic & Scanner...
...all under $40K

And it all fits in a small carrying bag.
Smart assignment of satellite signals to different engines.

This vigorous, automated approach to verifying the fixed ambiguities determined by TRIUMPH-LS gives the user confidence in his results and saves considerable time compared to the methods required to obtain minimal confidence in the fixed ambiguity solutions of other RTK rovers and data collectors on the market today. The methods required by other systems are not nearly so automated, often requiring the user to manually reset the single engine of his rover, storing another point representing the original point and then manually comparing the two by inverse, all to achieve a single check on the accuracy of the fixed ambiguities. Acquiring more confidence requires manually storing and manually evaluating more points. Conversely, J-Field automatically performs this test, resetting the multiple engines, multiple times (as defined by user), provides an instant graphic display of the test results, and produces one single point upon completion.
J-Field, the Embedded Controller

J-Field is the embedded application program of TRIUMPH-LS. It has the following unique features for each point surveyed:

- Six parallel RTK engines to maximize solution availability.
- Automatic Engines Resets, verification and validation strategy.
- Several graphical and numerical confidence reports and documentation.
- Voice-to-text conversion for hands free operation and documentation.
- Lift & Tilt and automatic shots for hands free operation.
- Visual Stakeout (Virtual Reality).
- “DPOS it” or “Reverse Shift it” features. The most advanced RTK verification.
- Photogrammetry and angle measurements with embedded cameras.
- Automatic or manual photo documentation.
- Automatic screen shots documentation.
- Audio files for documentation.
- Automatic tilt correction.
- Scanner feature.
- Find objects by their shape, by laser or optical.
- Comprehensive HTML and PDF reports.
- Comprehensive codes, tags and drawing tools.
- Status of all GNSS signals and their quality.
- Over 3,000 Coordinate Systems.
- Automatic and free software update via Internet.
The new TRIUMPH-3 receiver inherits the best features of our famous TRIUMPH-1M.

Based on our new third generation TRIUMPH chip enclosed in a rugged magnesium alloy housing.

The TRIUMPH-3 receiver can operate as a portable base station for Real-time Kinematic (RTK) applications or as a receiver for post-processing, and as a scientific station collecting information for individual studies, such as ionosphere monitoring and the like.

It includes options for all of the software and hardware features required to perform a wide variety of tasks.

• UHF/Spread Spectrum Radio
• 4G/LTE module
• Wi-Fi 5 GHz and 2.4 GHz (802.11 a, b, g, n, d, e, i)
• Dual-mode Bluetooth and Bluetooth LE
• Full-duplex 10BASE-T/100Base-TX Ethernet port
• High Speed USB 2.0 Host (480 Mbps)
• High Speed USB 2.0 Device (480 Mbps)
• High Capacity microSD Card (microSDHC) up to 128GB Class 10;
• “Lift & Tilt”
• J-Mobile interface

Ideal as a base station
RIEGL offers a broad line of LiDAR scanners for integration to unmanned aircraft. Choose the scanner exactly right for your application and benefit from the proven RIEGL LiDAR technology: a sophisticated design, Multiple-Time-Around signal processing, multi-target capability, highly accurate and informative scan data, a wide field of view, customized configurations, and user-friendly integration options.

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**RIEGL VUX-1 UAV**
- Versatile & powerful sensor for wide area UAV surveying
- Up to 550 kHz Laser PRR
- Range up to 1050 m @ \( \rho \geq 80\% \)
- 330° field of view
- Accuracy 10 mm, precision 5 mm
- Up to 15 target returns
- 3.5 kg / 7.7 lbs

**RIEGL miniVUX-1 UAV/2 UAV**
- Miniaturized LiDAR sensors for integration to various small UAVs
- 360° field of view
- Accuracy 15 mm, precision 10 mm
- Up to 5 target returns
- Extremely lightweight 1.55 kg / 3.4 lbs

**RIEGL miniVUX-1 DL**
- “Downward-Looking” tailored design for corridor mapping
- 100 kHz Laser PRR
- Range up to 260 m @ \( \rho \geq 80\% \)
- 46° field of view
- Accuracy 15 mm, precision 10 mm
- Up to 5 target returns
- 2.4 kg / 5.3 lbs

**RIEGL LASER SCANNERS FOR MEDIUM-SIZED UNMANNED AIRCRAFT**

**RIEGL VUX-240**
- For high point density corridor mapping
- Up to 1800 kHz Laser PRR
- Range up to 2150 m @ \( \rho \geq 80\% \)
- 76° field of view
- Accuracy 20 mm, precision 15 mm
- Up to 15 target returns
- 4.1 kg / 9 lbs

**RIEGL VQ-840-G**
- Topo-bathymetric scanner for coastline surveying
- Up to 200 kHz Laser PRR
- Water penetration \( \geq 2 \) Secchi depth
- 40° field of view
- Optional high-resolution digital camera or infrared laser rangefinder
- 12 kg / 26.5 lbs
THE DAWN OF THE DATA ERA

Today, powerful data sources are readily available, with scalable cloud compute and storage resources, tools, techniques and skills, which empower us to generate more insight. By Heather Savory

Data has an essential role to play in sustainable development, as citizens, businesses and governments become more actively interested in how our actions impact the planet — locally, regionally and internationally. Global issues such as Climate Change, natural capital, agriculture, poverty and levels of trade between nations are increasingly at the top of public and political agendas. Also, many businesses are starting to look at the overall impact of their actions, seeking to operate more sustainably and to invest in a more impactful way. A new era is dawning. This era is marked by the data revolution.

Powerful data sources are readily available, together with scalable cloud compute and storage resources, tools, techniques and skills, which empower us to generate more and more insight. The barriers to entry into the data space — in terms of the cost and availability of these data and technologies — are lower than ever.

Today, many people recognize the opportunities the ‘Data Era’ presents for sustainable development. Data for good projects and programs are underway across many countries and sectors, with different organizations, including governments, charities and NGOs, starting to work more innovatively with data.

To understand the world better, we need independent measures of the planet (environment, climate) and the societies people live in (how they live and the economies supporting these societies). These measures need to be trustworthy — data should be used ethically, individual privacy should be respected, methods of calculation should be open and results should be published for all.

We inhabit a physical world and so need to know where things are happening. Geography tells us this. Geo-referencing is a fundamental component of any useful data infrastructure, allowing us to know how the different factors we are interested in combine at any given physical location. Geospatial data can provide us with high-frequency, high-resolution insight into many things; it is probably the most powerful source of data we have.

Understanding Earth’s extremities

I recently attended an evening on ‘Sustainability and the Climate Change Emergency’ hosted by Valtech UK at the Royal Geographical Society. The speakers for the evening included Paul Rose, recipient of the

Heather Savory is Co-Chair of the UN Global Working Group on Big Data. Prior to this, she was Deputy National Statistician and Director General, Data Capability at the Office for National Statistics. Heather has previously worked at 3Dlabs as Vice-President of Engineering and Operations and she worked with the UK Government, spending two years in HM Treasury and three in the Department of Business, Innovation and Skills at the Better Regulation Executive (BRE).
Society’s 2018 Founder’s Medal for scientific expeditions and enhancing public understanding. Paul has been leading expeditions for over 30 years, collaborating with the world’s top field scientists to unlock the secrets of some of the Earth’s most extreme areas. He spoke about his work and we saw pictures of the tented research stations set up on vast ice plains in Antarctica and of the team diving beneath ice flows in sub-zero seas. One of the major projects, the Antarctic Seabed Carbon Capture Change Project, involves trying to measure how much carbon is held per unit area of the seabed per year, and how this varies in time and space. What is interesting about this work from a data perspective is that it brings together the most disparate data sources you can possibly imagine. Directly sampled physical data is collected by diving in frozen seas to find (and later replace in the exact same locations) small shellfish. This local, physical data is combined with satellite data for analysis.

Local biodiversity
At the event, the National Biodiversity Network spoke about the data they collect on the flora and fauna of the United Kingdom and their innovative NBN Atlas which combines multiple sources of information about UK species and habitats, providing the ability to interrogate, combine and analyze data at a single location. The NBN Atlas lets you type your location into a map and shows you the species around you. In my case, 1984 separate species were reported within 1km of my home despite my London location. Again, physical data combining with geospatial data to deliver useful insight.

These are just two small examples of why we need geospatial data as data for good. It needs to be trusted data; we need to know its provenance and we need it to be as open as possible. Geospatial data is needed, in its own right, also to be combined with other data sources such as administrative data, business data and survey data to answer the questions which, ethically, we should be asking about the world. The challenge is not so much about ‘can we do this?’ It is more about should we do this and how to build,

In the data for good space, the onus is on us to welcome questions on building the public trust in ethical use of data for their benefit

Public interest in data
As public interest in the use of data grows, anyone working in the sustainable development sector, or in other sectors, should expect to be challenged more and more strongly in the future about how they are using data. Where that data comes from, how it is being analyzed and what they have discovered from the data? Also, how to prove what they have discovered from the data, what they have done with that information?

In the data for good space, the onus is on us to welcome these questions and be open in our answers to them to build public trust in the ethical use of data for public benefit. Data for good needs to pay more attention to the wider questions around data usage. Open data and open information should be the norm unless the data identifies individuals, in which case it must be properly protected. We must be able to prove who is accessing which data for what purpose.

Those who cannot prove that their use of data is ethical, properly governed and fully operationally controlled will, in time, lose their license to operate, across all sectors.

The public questioning has started. As I write this column, the United States House Committee on Financial Services is grilling Mark Zuckerberg. They have asked directly why “he and Facebook should be trusted after years of privacy scandals related to data breaches and the Cambridge Analytica affair”. All of us who work with data should take this seriously. This is not just about a successful and wealthy entrepreneur, or about Facebook and other big corporations. These and other questions will be publicly levelled at us too in the future. The more important the questions we are asking and the insights we are generating, the more we need to be above criticism; we need strong ethics, active governance and robust working practices.

The work I am doing with the United Nations Global Working Group (GWG) on Big Data for Official Statistics is bringing such principles and practices together. Under the auspices of the United Nations, we have developed the UN Global Platform (UNGP), an ecosystem which facilitates international collaboration in the ethical use of data for public benefit. The UNGP brings together National Statistics Offices, UN development programs, data scientists, academics, data providers and technology suppliers with an operational model which implements strong ethics, active governance and robust working practices, and delivers benefits to all parties. We should not be competing in the data for good space and the UNGP facilitates collaborative co-working across multidisciplinary international teams. Since the work is for public benefit, results will be shared openly. So, when one team has developed a robust method to measure an indicator using satellite data, the method and the data source is there for use by a neighboring country. The UNGP also has learning materials and virtual communication channels to deliver cross time-zone support for skill development and capacity building, which are especially important for small and developing nations, many of whom face significant challenges to measure and deliver the SDGs.

But the key benefits of the UN Global Platform are not the data sources, technology, services, tools and content; they are the ecosystem and operating model which reduce the barriers to entry to advanced data analysis for all parties whilst maintaining strong ethics, active governance and robust working practices. These aspects, underpinned by openness and collaboration, will deliver solid outcomes for data for good.
For communities to effectively participate in the planning process, the first thing is to ensure that they have access to the right information and data.

By Dr. Wilber K. Ottichilo

Since 2013, the Kenyan government has adopted a system of governance in which there are 47 County Governments, along with the National Government. For a long time, the National Government could not devolve power to the grassroots. Most of the planning was done at the national level without the involvement of the local communities, and therefore, the implementation of most plans did not succeed due to lack of ownership and monitoring.

For the last 50 years, there have been so many plans on paper, but most of them have not been properly implemented. Consequently, most of the rural areas in Kenya remain underdeveloped to date. Therefore, the introduction of devolved system of governance aims to directly involve the local communities in planning and decision-making in their development agenda.

Dr. Wilber K. Ottichilo is the Governor of Vihiga county in Kenya. He holds a PhD degree in Natural Resources Mapping and Assessment, apart from a MSc degree in Biology of Conservation and Ecology and a Postgraduate Diploma in Natural Resources Planning and Management. Before joining politics, Dr. Ottichilo worked as the Director General for Regional Centre for Mapping of Resources for Development (RCMRD) for Eastern and Southern Africa, which is an affiliate of UN Economic Commission for Africa. He joined politics in 2007 and was elected as a Member of Parliament in 2008.

Rational decision-making requires credible and up to date data. Article 35 of our Constitution allows access and use of public data and information by any person on request to the relevant government office or institution.

Therefore, for communities at the county level to effectively participate in the planning process, the first thing is to ensure that they have access to the right information and data. The use of spatial data and information is very important as 80% of the data that we require is spatial or positional. That is why GIS is a crucial tool for planning and decision-making at the local or community level.

I was a Member of Parliament for Emuhaya constituency (2008 to 2017) prior to becoming the Governor for Vihiga county.

RATIONAL DECISION-MAKING REQUIRES CREDIBLE DATA
in 2017. During my tenure as a Member of Parliament, I established a GIS laboratory at the constituency office where local resource maps and socio-economic data was generated and used for planning and decision-making by the local communities. The use of GIS simplified maps and graphics, and enabled the local communities to directly participate in the development, planning and decision-making of their respective areas. Further, using GIS modeling capabilities, we were able to undertake GAP analysis to determine the appropriate locations of schools, health facilities and general infrastructure. This eliminated the general subjective decision-making, which is normally driven by selfish individual or political needs or motives.

**Empowering different communities at county level**

As a Governor, I resolved to undertake equitable and rational development in the county through the use of data and information. The first thing I did was to call for meetings in the different communities and to request the people to unite and focus on development.

Using GIS generated maps and socio-economic data, communities at ward level identified their prioritized development projects and programs for five years (2018-2022). With the use of GIS generated maps and graphics, we guided them in making rational decisions on the choice of priority projects and programs without resorting to political or personal consideration. We further empowered the communities to monitor the implementation of the projects and programs and report any malpractices and challenges using a dedicated toll-free number. This was achieved through formation of project implementation committees.

To facilitate the coordination and implementation of projects and programs, the county has established a fully-fledged GIS laboratory. We have further established County Development Information System (CDIS), where each sector has established its own information system. For example, County Health Information System, County Agricultural Information System, etc. Each sector has its own staff who manage and continually update its information system. The GIS staff ensure the integration and management of the entire CDIS.

**The power of GIS in election mapping**

Apart from using GIS in community empowerment, planning and decision-making, I used it very effectively in election campaign and mapping. First, we used the GIS in mapping all biophysical resources and development initiatives in the county. We further conducted opinion surveys to understand what development needs people wanted in their respective areas as well as the challenges they were experiencing. This information was needed to prepare my campaign manifesto.

The GIS generated maps were used in planning campaign strategy in terms of transport logistics and areas of focus based on population and voting patterns. We mapped all polling stations plus their previous voting patterns as regards to our political competitors. This information guided our decisions on our areas of focus. For instance, we focused on areas that were less visited by our competitors and where they were not popular. Further, we never held the conventional rallies, but instead we had household meetings where we built a personal rapport with attendees. In a nutshell, my campaign for the gubernatorial seat was knowledge based and as a result I was able to use very limited financial resources to win the election.

**The role of GIS in governance**

Good and consistent governance practices require credible and updated data and information. The easiest way to understand and use data and information is through the display of the same in map and graphic forms, and in an integrated manner. GIS is the only tool that can be used to effectively display and integrate data and information on maps and graphics. Further, it allows the analysis of the same data for applications other than those originally intended. It is therefore my belief that GIS should be part and parcel of all governance initiatives — from grassroots to the national level — to enhance transparency and accountability in leadership.

With the establishment of a well-managed GIS, I believe that the current challenge of corruption in our governance systems can be minimized, if not eliminated. I am happy that when I was the Member of Parliament, I was instrumental in the incorporation of the use of GIS in planning and decision-making in our county government’s legal and policy frameworks. It is therefore mandatory that all county governments create and maintain a GIS database for integrated planning. However, since the introduction of county governments six years ago, the implementation of GIS as a planning tool is yet to be achieved due to many challenges, mainly due to lack of capacity and realization of the power of technology.

Being a GIS professional, I have decided to promote its use in my county so that it serves as a model for the rest of the counties. In this regard, I have established an operational GIS laboratory in my county with the support of Esri, Airbus, FAO and LocateIT Ltd. Our GIS laboratory has in a short time become so popular that a number of counties are visiting us for benchmarking and with the help of FAO, they have embarked on establishment of their own GIS laboratories. Our county has been recognized nationally as a champion for GIS and has been appointed to spearhead the use of geospatial technologies in open governance partnerships (OGP) at the global level.

**Taking GIS to grassroots**

My goal as a Governor is to demonstrate how GIS can be used as a planning tool at the grassroots level. For many years, GIS technology has remained in the realm of technical experts who only promote its applications in national and international conferences and workshops with little evidence in practical application in resolving real socio-economic development challenges.

To date, there are very few practical examples on how geospatial technologies are being used to solve day-to-day socio-economic challenges and problems. It is therefore my conviction that I can effectively use my unique position to demonstrate and institutionalize the power of GIS in our development and governance initiatives. After all, GIS is about your geography or it is the science about location or ‘where’.
Her Fair Share

Bhorva, a remote Indian village, is testimony to the fact that access to land rights for women not only empowers the community, but also leads to increased income, better crop yield and an overall sustainable society. By Anusuya Datta

The intensity on her face is the first thing that strikes you about Ratniben Bhabor. The 60-year-old is a resident of Bhorva village in Dahod district, 190 km from Ahmedabad in the western Indian state of Gujarat.

Ratniben's alert eyes belie her age, as the crow's feet in the corners of her mouth, worry lines on her forehead, salt-and-pepper thinning hair, sudden but loud expressions give away the paradox. The paradox of a lone, frail woman in a non-descript village fighting to own the land that belonged to her late husband. One detects the tempering that Ratniben has gone through to become an example for many to emulate.

“After my husband’s death, I applied for varsai (land registry) at the Swabhoomi Kendra. Thereafter, government officials came to my house for my signature as well as that of my extended family members,” she says.

All hell broke loose. “My brothers-in-law were furious. The nephews challenged me as to why I had done varsai without informing them. I fought back: ‘Why should I ask you? This is my husband’s property; I don’t need anyone’s permission.’

What followed was a regular script. Ratniben was accused of colluding with ‘outsiders’. Abuses and threats began with a regularity that even surprised her. “I did not know they had so much venom; and just because I wanted what was rightfully mine!”

Matters came to a head when a nephew physically assaulted her. What followed, however, was not regular — particularly for a remote village. “I dialed 181 for the police.”

Justifying her bold steps, the 60-year-old says, “I had heard of people with varsai benefiting from government schemes. Earlier, we used to migrate to cities for work. But after varsai, I work on my own land. Otherwise, I would have become homeless; my in-laws would not have allowed me to live here.”

The steel and fire in Ratniben is the story of the fight for women’s land rights across India.

Where it all began

Bhorva is home to about 8,000 people, majority of whom belong to Scheduled Tribes. As per the 2011 Census, female population of Bhorva is nearly 50%, of which only about 14% are literate. Low literacy and intricacies of the law make things doubly difficult for the women here, even in routine work such as collating evidences of land ownership or obtaining husbands’ death certificates.

Nandaben’s life story is similar to Ratniben’s. Only older. Age has calmed her, but you can still detect the steel in the soft-spoken woman.
About 42% of the agricultural workers in India are women. The India Human Development Survey estimates less than 2% have land to their names. Feudal socio-economic makeup has denied property rights to women for long.

“My husband passed away in 2002. A few years after that I applied for varsai,” she says. The script of taunts, intimidation and insult was the same, with vehement opposition from the in-laws. That did not stop Nandaben from going ahead and even paying INR 500 — a significant amount for her then — for the registration.

While counting the benefits of having the land in her name, including the borewell and Kisan Credit, she insists other women too should ignore family pressure and follow her example. “Without access to land, we wouldn’t even have a place to live after our husbands are gone.”

About 42% of the agricultural workers in India are women. The India Human Development Survey estimates less than 2% have land to their names. Feudal socio-economic makeup has denied property rights to women for long across the country, further exacerbating the vicious cycle of vulnerability, deprivation and oppression. This is in stark contrast to the amendment to the Hindu Succession Act in 2005.

What complicates matters further in areas such as Bhorva is that tribals are usually apprehensive of outside interference. Further, bureaucratic lethargy ensures that policies are not executed effectively even as some laws are ambiguous and open to interpretation at the grassroots. For one, it is difficult to get a woman’s name included in land-ownership documents when her husband is alive.

This is a typical problem that Kantaben Baria faced. When

**What does the law say**

*The Hindu Succession (Amendments) Bill was passed on August 29, 2005, which guarantees Hindu women in India rights over agricultural land and joint property in the Hindu Undivided Family (HUF). The Bill grants women joint heirship in HUF; they have equal rights even in their grandfathers’ properties, which was denied to them earlier.*
Women are a significant part of the global agricultural labor force, but are a minority when it comes to landholding.

There is a direct correlation between women’s land rights and increase in crop yields and more sustainable farming practices.

Access to land for women also creates more economic opportunities for them, including access to capital, credit and market.

It creates gender balance, including greater decision-making power and leadership opportunities for women.

It also has a direct correlation with better nutrition and improved education for their children including for the girl child.

The ‘must’ is an imperative the Bhorva womenfolk are reaping the fruits of. Empowerment has taken a defiant form here. Kantaben’s sister-in-law, once among those opposed to her actions, now wants to have the land belonging to her late husband in her name. The encouraging results have also nurtured self-help groups, well-meaning government officials and social workers to join forces and push for the cause.

Enabled, empowered
The likes of Shardaben, Manguben and Saritaben, and many more here, have similar stories — of suffering, steely determination and success — to narrate. All of them are hinterland heroines in their own rights who have turned their lives around in a society where patriarchy runs deep. The Bhorva women today are equal participants in village-level decision making, be it community development, civic amenities or cultivation.

“We undertake farming with complete authority now, with an ownership we never knew earlier. We cultivate our fields just as we nurture our children,” says Ratniben.

The women are also in a better position to take decisions and experiment with organic farming, crop rotation and other means to better productivity. A noteworthy result is the 15% rise in agri incomes in the village. Buoyed by the wins in their humble lives, some of the womenfolk are taking up the fight for their less-fortunate sisters. They have joined the Swabhoomi Kendras, an initiative to guide women on land ownership and provide information on crop patterns, prices and financing.

Manguben is one such individual. “Most of us live in joint families. Therefore, even if a man wants his wife to be the co-owner of his land, others in the family are likely to oppose it,” she explains. Lack of awareness about women’s rights is a problem faced not just by the ‘other’ women marrying into a family but also the daughters in the household. It is as if the women belong neither to their fathers’ families nor their husbands’. “This is the mindset we are trying to change,” points out Leelaben, a paralegal worker who has worked over the years for women’s land rights. “They say since a daughter gets married and goes away, of what use is land in her name? A lot of women are scared to come out and demand land rights because they don’t want to go against their families.”

Women who have land in their names are more assertive and aware of their rights. Their name on the land papers, she asserts, also acts as a deterrent to domestic violence as women have the means to fight back and even seek legal recourse.

The battle is far from over
Although majority land is still owned by either men or undivided families, enactment of laws assuring women’s rights to agricultural land have begun to move the needle of disparity in Bhorva. Shilpa Vasavada of Working Group for Women & Land Ownership claims about 80% of the cases pertaining to women’s land rights here have been mitigated successfully.

This does not mean the naysayers have vanished. The taunts, strife and intimidations have not stopped. “My nieces still fight with me as to why my name appears on property documents. Village women still tell me only an idiot would do this (go against her family for land),” says Ratniben.

“The major challenge is the mindset — be it men or women in the village, or the policy implementers,” asserts Vasavada. A crying need for a monitoring mechanism and general segregated data is also being felt, which only the government can fulfill, she adds.

Notwithstanding the challenges, the first rays of a new dawn is upon Bhorva. The tide is turning. The mindset is changing. And not just among women. Ter Singh Baria — husband of Kantaben — is an indication. “I have been ill for a long time and if some-thing happens to me where would my wife go? I helped her have her name on the land papers. Now, she has security, government benefits and legal rights. She can continue to live with dignity, even after me.”

Anusuya Datta, Executive Editor
anusuya@geospatialmedia.net
Airbus Defence and Space in association with German Space Agency (DLR) has generated a highly accurate Digital Elevation Model (DEM) (Hydrologically corrected DEM) having an accuracy of:

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Airbus Defence and Space refines the DEM according to customer requirements and makes three WorldDEM products available: WorldDEM™CORE, WorldDEM™HYDRO and WorldDEM DTM (Bare Earth Model).
Syria, or the Syrian Arab Republic, has witnessed unspeakable devastation in the last decade. Its refugee crisis, next only to World War II, has left over five million people displaced. In the absence of monitoring organizations on the ground, satellite imagery has played a significant role in assessing the extent of damage caused by a long-standing conflict. By Aditya Chaturvedi

The first casualty when war comes is truth. Hiram W. Johnson, a Republican Senator from California may have said this way back in 1917. But a century later, it holds true like never before. Monitoring the extent of devastation in a conflict zone is never easy — there are few or no independent agencies/journalists on the ground when the entire region is marred by heavy firing and bombing. In addition to aiding propagandas, the monitoring agencies’ inability to ascertain the damage in a conflict often results in unchanneled reconstruction efforts, sometimes leading to war-torn cities turning into permanent ghost settlements.

In the case of Syria, which has been witness to one of the deadliest conflicts in recent times that has led to the biggest refugee crisis since World War II (with over five million people displaced), satellite imagery was the only way to see through the propaganda and get accurate statistics and data.

What happened in Syria
The conflict in Syria has been raging since 2011. From a civil war, it has turned into a multidimensional conflict, involving multiple nations both directly and indirectly. What began as a series of peaceful protests by civilians in the southern city of Darra — in the wake of the Arab Spring that had engulfed the entire Middle East — against the decades-old Baathist regime in Syria, soon turned into an armed uprising converting the country into an epicenter of insurgency and terrorism.

In this background, satellites from the space have been aiding non-profit organizations, local governments and international developmental organizations in gathering authentic information, identifying risk zones, verify-
ing the extent of damage and formulating an outline for post-conflict reconstruction.

Infrastructure

Syrian capital Damascus is often referred to as the oldest continuously inhabited city in the world. Amidst the conflict, normalcy could be seen in the western part of the city that was controlled by the government. On the other hand, almost all buildings in the militant-occupied eastern suburbs like Ghouta were completely flattened. Juxtaposition of satellite imagery by Google Earth and by Airbus/McKenzie Intelligence Services shows this striking contrast.

Another map prepared by UNOSAT shows satellite-detected damage in the suburbs of Kafr Batna and Irbin, and in the eastern parts of Damascus.

DigitalGlobe (now a Maxar company) satellite imagery shows that the devastation when the entire district of Masaa Al Arbaeen in Hama, the site of the doomed uprising and the bloody massacre of 1982, was razed to the ground in 2012. It is estimated that over 3,000 buildings were destroyed.

Aleppo, the largest industrial manufacturing center of the country and its most populous city, suffered heavy damage to infrastructure as a result of relentless bombing by Syrian and Russian forces. Satellite imagery by DigitalGlobe/UNITAR-UNOSAT shows the destruction of houses in the Karm ad-Da’a district of Aleppo and schools and nearby houses in the Jabal Badro area.

In November 2012, Dar al-Shifa Hospital, one of the biggest medical facilities in Syria, was reduced to rubble after a massive airstrike.

In the eastern city of Deir ez-Zor, images show the destruction of the suspended pedestrian bridge across the Euphrates River that was the link to the
Monitoring agencies’ inability to ascertain the damage in a conflict often results in unchanneled reconstruction efforts, sometimes leading to war-torn cities turning into permanent ghost settlements.
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DigitalGlobe imagery show the devastated Citadel of Aleppo on May 26, 2013

Visualization by scientists from Wuhan University, China and #WithSyria shows most of Syria in darkness

which contains 40% of the country’s oil reserves and Hasakah region. ISIS used scorched earth tactics in Deir ez-Zor and burnt most of the oil wells. This led to a severe hike in groundwater pollution and contamination of potable water. In Rmeilan, north east Syria, oil waste polluted agrarian land.

With the help of Flash Environment Assessment Tool (FEAT), Copernicus Sentinel Hub identified the potential environmental risks associated with pollutants in the areas affected by the conflict.

Agriculture
According to a report by the FAO (Food and Agriculture organization), food production in Syria has plunged to a record low and more than 50% of the population is unable to meet its daily dietary needs. Al-Hassakah, Ar-Raqqa, Rural Damascus, Deir-ez-Zor, Dara’a and Idleb are the regions where agriculture has been most severely affected.

Deimos Imaging started a project for monitoring farms and arable land in Syria and neighboring war-torn Iraq with Earth Observation satellites Deimos-1 and Deimos-2. Both these satellites constantly monitor the fields, collect data and provide imagery that is useful for calculating vegetation indices. The datasets are compatible with the Landsat series.

While the crisis in Syria does not seem to be ending anytime soon, what has ended is the need for risk-taking reporters and overzealous monitoring organizations to be present on the ground to ascertain the magnitude of damage caused by the bloody conflict. 📃

Aditya Chaturvedi, Assistant Editor, aditya@geospatialmedia.net
Way back in 1969, when Mick Jagger wrote this opening song for the Rolling Stones album *Let it Bleed*, he had his eyes on the Vietnam war. He couldn’t have known that his lyrics would go on to depict the lives of the Rohingyas — the homeless, stateless people in the neighboring Myanmar — half a century later.

UNHCR was racing against time to build a settlement camp for refugees in Bangladesh when the Rohingya crisis blew up. The team had to settle 600,000 people in six months in a flood-prone, unstable area. That’s where Autodesk’s site planning software came in handy. By Mahashreveta Choudhary

W

ay back in 1969, when Mick Jagger wrote this opening song for the Rolling Stones album *Let it Bleed*, he had his eyes on the Vietnam war. He couldn’t have known that his lyrics would go on to depict the lives of the Rohingyas — the homeless, stateless people in the neighboring Myanmar — half a century later.
Imagine building a city for 600,000 people in less than six months! That was a Level 3 crisis for UNHCR, and this meant we had to put all possible efforts to respond to the need of Rohingya refugees as soon as possible. The work was tremendous, and the time was very less,

Phoebe Goodwin, UNHCR’s Lead Site Architect, narrates in a video.

Race against time

The site allotted for the settlement camps was not flat and faced extreme flood conditions in the monsoons. The UNHCR team approached the government for approval to modify the landscape. They brought in machinery for heavy earthwork and eventually built a bigger track of flat land for safe shelters.

But first, the UNHCR team needed to understand risk areas. For example, where the flooding happens, what is the natural drainage flow, which are the settlement aspects that can be shifted to a higher ground, where they can lay roads, what kind of diversions for flood water they can create. These were very basic, but critical issues before the team.

Goodwin highlights other challenges that she had in front of her: “Rohingyas are Muslims, and it was important to understand their cultural preferences. Also, due to the sudden influx, people had initially built their shelters wherever they found space. So, we also had the issue of relocation. The risk of overcrowding was another issue.”

The UNHCR team didn’t even have the time to prepare a proper proposal for the project. Also, often in refugee settlement context, operations are dynamic and fluid, and changes are made as per the situation on the ground. So, no advanced site planning you produce becomes a concrete blueprint.

The team needed some technology that could help it generate plans rapidly and dynamically.

Collaboration

Enter Autodesk. “UNHCR approached us articulating the need for a dynamic software that could serve their needs. We suggested Civil 3D software,” Priya Bali-jepalli, Sustainability Success Manager at Autodesk, tells Geospatial World.

UNHCR is part of the Autodesk Tech Impact Program, which aims to provide social impact software for non-profits and welfare organizations using design solutions for creating climate-resilient communities. The engagement entails not just the software license but also understanding the specific project, plans and priorities, and
What is Civil 3D
Civil 3D is an engineering software application used by civil engineers and other professionals to plan, design, and manage civil engineering projects. These projects fall under the three main categories of land development, water, and transportation and can include construction area development, road engineering, river development, port construction, canals, dams, embankments, and many others. Civil 3D allows to create three-dimensional (3D) models of land, water, or transportation features while maintaining dynamic relationships to source data such as grading objects, breaklines, contours, and corridors. As an industry-leading Building Information Modelling (BIM) solution, Civil 3D is well known in the civil engineering community and is widely used on a variety of infrastructure projects both large and small. Using Civil 3D, engineers can create an existing ground surface. Its accurate and dynamic drafting tools make it the tool of choice for engineers and designers using third-party and spreadsheet-based hydraulic and hydrologic modelling solutions.

How it helped
The training program was a huge help for the team — now they could visualize the requirements at the site and how to finish the work in the given deadline. For instance, once they completed the watershed analysis of the settlement, they were able to figure out the natural water drainage in the site, the high flood plain areas and how the water will flow during the monsoon season. Overlaying this data on the existing settlement site also helped them see which part of the settlement area was under high risk and which could submerge, the area prone to landslides etc.

“Civil 3D is great because on top of actual site planning, we were able to take couture maps, use the tools to generate analysis, be it watershed or flooding, and also combine it with 3D modelling in Infraworks to improve on site planning and site selection,” says Goodwin. “Without Civil 3D, I don’t think this project would have met its deadline. The degree of professionalism it adds along with accuracy and speed of implementation and execution was incredible.”

The process was done by amalgamation training into making the team comfortable in its use. “We roped our internal technical team and internal channel partner Microdesk to add momentum to the work by engaging with them on technical training,” says Balijepalli.

Senior Microdesk consultants travelled to Geneva to work with the UNHCR team, training them to use Autodesk software in design and construction of these elements. A total of 50 site planners of UNHCR were trained on AutoCAD Civil 3D in just a week.
of GIS data with the site data. As per Balijepalli, the interesting part of having GIS data is that one can have natural topography in solution. “When you use this data as baseline data and run an analysis, it helps to understand the actual scenario of the place.”

In the Rohingya site planning, this amalgamation helped to understand where rain falls and how it flows, where does it get collected. This particular information was the base of the entire planning. This data can be overlaid with already existing camp-sites and it helps site planners to know that certain aspect of community settlement. “In certain areas, you will get to see that settlements are in low line area and you get to know that at this particular place the water can get collected, which means that place is prone to get submerged,” adds Balijepalli.

To further complicate the problem, the settlement area is close to Cox Bazar, a place right next to a natural reserve and home of one of the most endangered species of Asian elephants. Every year migratory path of elephant cuts through the settlement site. Goodwin’s team overcame this problem also by overlaying a CAD file of elephant movement on the top of the site plan to identify the high-risk areas so that the problem could be dealt with.

Tech for good
The number of Rohingya refugees staying at the settlement has grown rapidly in the past couple of years. While the Bangladeshi government continues to insist that the nearly 1 million refugees stuffed into various camps are just temporary, there are few signs that they will leave anytime soon. Preparing land for new homes, growing their own crops and enrolling their children in religious schools, the Rohingyas seem to be clearly looking at a longer stay. According to media reports, there are even playgrounds popping up in some places, with solid metal slides and swing sets.

Further, along the edge of the largest camp, hundreds of men and women with shovels and wicker baskets are tirelessly working on turning a barren hill into a parking lot-sized plateau. The land will eventually hold new and stronger shelters that will lessen the burden of the existing overcrowded camps.

Goodwin, who was in Bangladesh for over six months when the crisis was at its peak, says, “A shelter is a tangible, physical core component of protection. And a shelter just doesn’t come out of thin air.”

“I am an architect and I advise on site planning and shelter design. I like being an architect because I know there is a social element associated with it either through humanitarian or development work. To see the laughter and joy on people’s faces is incredibly rewarding,” she adds.

The settlement of the Rohingya community is one of its kind which used tech for good. There are more than 65 million refugees across the globe who are in dire need of settlement. And, here technology can help in mass settlement in lesser time period.

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Physical infrastructure systems play a vital role in any country's development. A strong transportation network — including roads, ports and highways — facilitates and spurs economic growth by providing improved connectivity and boosting a nation's productivity and efficiency. For businesses involved in building these systems, there is a certain sense of responsibility and pride in the work they undertake, as it contributes to a larger purpose that is beyond the self. One such company that exemplifies this is Theotech Projects Services, a leading land surveying company based in Haryana, India.

Established in 1995 by Pravin Kumar Sinha and Trilochan Mohanta, the company specializes in engineering surveys of public infrastructure. “We started out with a clear vision, which was to offer the best service in the market for what we considered to be a challenging but fulfilling field. Through our involvement in various projects across the country, we hope to bring about a better tomorrow for our future generations,” says Pravin Kumar.

Quality control
Over the last two decades, Theotech’s team of dedicated professionals has worked with both public and private entities on a diverse range of projects. Typically, these involved terrestrial, topographical and route alignment surveys of railways, highways, mining sites, gas pipelines, canals and airports. Projects would last between a month to half a year and survey deliverables would depend on each client’s desired outcome and budget. Often, Theotech would be responsible for maintaining quality control and setting objective parameters for construction teams to adhere to. “In the initial years, our engineers used to rely on conventional methods such as theodolites. We knew, however, that technology adoption was critical for us to stay ahead of the pack, so we very quickly moved on to using differential GPS, total stations and mobile LiDAR technology,” explains Kumar. “We still felt we needed a solution that could obtain data much more quickly, yet still provide high levels of accuracy,” he adds.

Developing new capabilities
A progressive and innovative company, Theotech is on a constant lookout to better itself, and had begun looking into expanding its offerings about five years ago. The team decided then that it would venture into construction management and assist clients in generating detailed project reports (DPR) — essentially pre-project studies to assess the feasibility of investment. This led the team on a hunt for an all-rounded measurement solution that would enable them to take on more projects of this nature.

The Theotech team first came across laser scanning technology from FARO in late 2017 during their research. The FARO® Focus® Laser Scanner is an ultra-portable device that captures accurate measurements of complex and easily. Capable per second at provides a quick detail-rich, that effortlessly reports on the SCENE software.
“The FARO Focus® 330 was a godsend because it addressed all the pain points we were facing. With the DGPS and total stations, we did not have digital data that we could immediately manipulate, and the workflow was not as efficient. It was also challenging for the team to deliver quality results in a timely manner. All that changed when we harnessed the full capabilities of the Focus® 330,” says Kumar.

Of special mention is a recent project that Theotech undertook with the National Highway Authority of India (NHAI) in Maharashtra. Using the Focus® 330, the team has scanned over 270km of highways between Aurangabad and Paithan, Shendra and Verul, as well as Ahmednagar and Kashti. Concurrently, the company is also assisting the NHAI with surveys on the Lucknow-Kanpur Expressway in Uttar Pradesh and Gujarat.

Comparing the results the team gathered in this project with previous ones, there have been marked improvements in several aspects. “We are very impressed by the high level of precision and detail and also how little time and effort is required to obtain the scans. I would say this is 300% better than conventional methods and the data quality is four times better than what we get with mobile LiDAR surveying. Ever since the switch, our customers have been extremely pleased with the data quality and our timely delivery,” the Theotech founder adds.

Looking ahead
Even as the company enjoys success with its new-found laser scanning solution, its spirit of excellence is evident in how it looks forward to better itself and deliver the best service to its clients. “Perhaps we will survey the moon someday soon,” exclaims Kumar.

Courtesy: FARO® Technologies, Inc.
Can you be part of a high-stakes construction project without the right scanning expertise? The answer is a yes, if you are planning to use Trimble’s new X7 3D laser scanner. According to the company, its new laser scanning solution assists professionals with no survey workflow background in easily getting precise and highly quality results in a time-bound manner.

Detailed information

“The idea is to capture every single layer of 3D information for informed decision-making. Some of the big advantages of X7 are that it is very simple to use and saves both time and energy, while ensuring quick data collection and processing,” emphasizes John Whitehead, Director of Sales and Distribution, Asia-Pacific for Trimble’s Geospatial vertical.

“The Trimble Perspective software integrated within the X7 provides unmatched functionalities. The X7 features simple and streamlined workflows. It is able to offer unique capabilities, including automatic calibration through the Trimble X-Drive, self-levelling and automatic registration through Trimble Registration Assist,” says Amit Saxena, Regional Sales Manager-Geospatial, SAARC Region at Trimble. Built on the three principles of “simple, smart and professional”, the Trimble X7 is compact and is easy to carry anywhere in the field.

Opening new avenues

Since the scanner pretty much functions like a useful, everyday tool which does not require scanning expertise to operate, the X7 opens the avenues for more construction, surveying, industrial and forensics professionals to capture and deliver high-quality data. It also includes high performance cameras to create panoramic images that can be integrated within projects. “This allows for the export of a fully registered, photo-colorized point cloud before even returning to the office. This way, scans and images can be captured, fully registered, refined, controlled and exported to a variety of established data format,” adds Saxena.

For surveyors, the X7 is a powerful tool that carries an IP55 rating for water and dust protection. It is also significantly lighter than previous models, weighing a total of 5.8kg. Just before its launch, a promotional video by Trimble showed it being able to be transported in a manageable, soft-sided backpack rather than a bulkier hard case. It also comes with a two-year warranty as an assurance for its ruggedness.

“For surveyors and geospatial professionals, the X7 3D laser scanner provides fast and balanced performance in both indoor and outdoor environments and can be used in numerous surveys,” explains Whitehead.
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At the beginning of 2019, Capella Space received the GeoBuiz award for the "most promising startup." A year after launching its first satellite, Denali, Capella Space is now poised to start operational services in 2020. The Capella Space constellation of 36 satellites will be placed in 12 orbital planes.
to provide hourly revisit observations. All satellite operations, from scheduling to product delivery, will be autonomous, and the constellation schedule constantly updated to support on-demand acquisition requests. In addition, each satellite will be operated under orbit control conditions that meet the needs of good quality interferometric SAR data, with an interferometric repeat time as short as 4 hours.

On December 3, 2018, Capella Space successfully launched a pathfinder satellite, Denali, whose goal was to validate, and then improve, autonomous satellite operations. Today, Denali operates autonomously, with human intervention occurring only for iterating, deploying and testing new features. This level of autonomous operation is key to operating a large constellation.

Capella recently entered into an agreement with the leading global mobile satellite communications provider, Inmarsat, and leading one-stop digital, wireless and broadband communications technology products innovator, Addvalue. The partnership gives Capella a significant market lead as the only Synthetic Aperture Radar (SAR) provider with real-time tasking capability and positions Capella as the only SAR operator capable of real-time responsiveness. This constant contact with the fleet via Inmarsat’s network of communications satellites will reduce the time it takes to order and deliver Very High Resolution (VHR) Earth imagery from hours to minutes.

With the next Capella satellite, Sequoia, the new real-time tasking and responsiveness capabilities will be demonstrated. Capella will launch Sequoia in the first quarter of 2020, and evaluation and pilot projects with partners are being scheduled for the second and third quarters of 2020. Sequoia will be deployed into a polar sun-synchronous orbit by a PSLV launcher from India. The miniaturized SAR sensor that will fly on Sequoia is a significant upgrade from the radar tested on Denali, and it has been successfully tested on an aircraft (see image).

These airborne campaigns have validated the success of our design innovations and demonstrated the high quality of the Capella SAR sensor. The collected VHR SAR data (0.5 m resolution and better), corrected to on-orbit conditions, have an excellent image interpretability rating, with evaluations using the Radar National Imagery Interpretability Rating Scale (RNIIRS). RNIIRS provides a systematic approach for measuring the quality of imagery, the performance of image capture devices, and the effects of image processing algorithms. Unlike in electro-optical imagery, the driver for the rating level in SAR is not primarily spatial resolution, but rather a complex mix of spatial resolution, normalized radar cross section (NRCS), and level of multi-looking. The Capella SAR system will be capable of providing high spatial resolution with unprecedented radiometric resolution.

In preparation for new applications that can be enabled by an hourly revisit capability, Capella has collected a SAR data stack over a highly-dynamic area at hourly intervals. Patterns of life and associated dynamics can be traced through change analytics, and then visualized and quantified with this novel technique. The data stack is based on airborne data collects adjusted to the future Capella SAR satellite capabilities.

Capella has begun inviting select SAR users to explore the benefits of hourly monitoring with the VHR SAR data stack. In exchange for feedback and information sharing, members of this user community will have free access to explore different applications to solve some of our world’s greatest problems—from natural disaster response and city planning to illegal fishing. Along with the user community, a partnership with SpaceNet, a non-profit focused on geospatial applications for Artificial Intelligence, will broaden the adoption of SAR. Capella will officially launch the user community program in January 2020, and academics, public, and private organizations are encouraged to join once it is announced.

In addition to the upcoming launch of the Sequoia satellite, Capella has initiated the Whitney program through which the Capella SAR constellation will be expanded by 6 additional satellites in 2020. As Capella advances to the start of commercial operations in 2020, the company will reveal how it is modernizing the process of ordering and delivering satellite imagery. A sophisticated web application will enable customers to instantly log and verify satellite tasking requests, that will then be forwarded through the network to the next available satellite. The satellite will maneuver to complete the task and return the image and data to the ground station network within minutes of it being captured.

With the advancement of Capella’s innovations in satellite technology, VHR SAR imagery, and on-demand, real-time earth observation data, 2020 will be a momentous year for Capella, its customers, and the commercial space industry. We invite you to stay informed and learn more at www.capellaspace.com.

Joerg Herrmann, Senior Vice President, Special Projects, Capella Space
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