

# APOGEO° S P A T I A L

ELEVATING GLOBAL AW



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## *Filling the Gap Left by Google Earth Enterprise Vricon & ArcGIS Earth*

“ ArcGIS Earth is just one piece of a much larger strategy of being the best enterprise GIS solution that there is.”

– Chris Andrews, Esri p. 16

“ Vricon is bringing truly disruptive availability and pricing with the Globe in 3D.”

– Isaac Zaworski, Vricon p. 16

FORMERLY  
**Imaging**  
NOTES

3D textured TIN model of  
San Francisco, California,  
courtesy of Vricon



Skybox Imaging has selected Arianespace to launch a block of high resolution imaging satellites aboard Vega from the Spaceport in 2016. With its solid record of reliability, Vega is the right choice for deploying Earth observation constellations.



@arianespace

**MISSION TO SUCCESS**



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## COVER IMAGE



# San Francisco, California

THIS IMAGE OF SAN FRANCISCO IS PART of the Vricon Globe in 3D. It is built and hosted as a tiled, triangulated irregular network (TIN) mesh (similar to the technology used in modern video games), which allows for extremely small file size and incredibly fast delivery via cloud services. Vricon is currently building the entire globe using commercial satellite imagery. The Globe in 3D will be a fully textured 3D raster layer delivered as a cloud-based service, allowing for an analytical environment based on layered web services where the Globe in 3D is the base that binds everything together.

While the Vricon solution is based on satellite imagery, as other source data becomes available, they can be used to augment the Globe in 3D. This snapshot of San Francisco (from aerial) illustrates the complex, yet lightweight 3D solution.

To learn more about Vricon and other options that will replace Google Earth Enterprise, see page 16. [AO](#)

# APOGEO<sup>°</sup>

## S P A T I A L

Formerly Imaging NOTES

[ Fall 2015 / Vol. 30 / No. 4 ]

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*Apogeo Spatial* communicates the power of geospatial tools and technologies in managing the world's environment and scarce resources, so that the global population has the security of water, food, and energy.

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APOGEO°  
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ELEVATING GLOBAL AWARENESS



# Filling The Gap Left by Google Earth Enterprise

DEAR READERS,

We are seeing so many changes in our midst. "The only thing that is constant is change," as ancient Greek philosopher Hericlitus stated. The demise of Google Maps Engine, Google Earth API, and Google Earth Enterprise (GEE) is one that caught me off guard. And yet, new products that can replace it abound. (I should note that much of Google Earth is moving forward in great shape, such as Google Earth Engine, on which we will report in a future issue.)

A significant change is the retirement of the first two U.S. commercial Earth imaging satellites, IKONOS in March 2015, and QuickBird in December 2014, which marks the end of the beginning of an era that brings to companies and NGOs and government agencies and to anyone who has interest, the powerful, beautiful, useful images of the Earth. Launched Sept. 24, 1999 and Oct. 18, 2001 respectively, both satellites worked well beyond their life expectancy. While France's SPOT satellites (now owned by Airbus) were selling imagery commercially at the time, the launching of these two satellites by U.S. companies enabled an industry whose applications are well beyond what most of us imagined at the time.

Now, we have entered a new era when the convergence of technologies allows these images to truly be useful to businesses, academia, and government on a whole new level. The imagery companies are transitioning from providing "just pixels" to providing "information and solutions" to their customers, and the software companies are following suit. Several companies are providing products that will ultimately replace Google Earth Enterprise, including Esri's ArcGIS Earth, Vricon's Globe in 3D, and others. See page 16.

Vricon is a start-up founded by DigitalGlobe and SAAB, whose combined expertise and capabilities provide an alternative to Google Earth Enterprise. Their first truly disruptive move was to announce Vricon DMS-10 (their digital

surface model at 10 meters) for only \$1.99/km<sup>2</sup>. Disruption can be painful for the marketplace, and yet, change is inevitable...

Hera Systems is a new Earth imaging company that plans to launch the first of its satellites in October 2016. The initial constellation will be comprised of 9 satellites and eventually will expand to 48. In an attempt to be perceived different from other imagery providers, Hera Systems will offer, in a single package, high-resolution Earth imagery, video, and derived information products showing any location on Earth in near-real time, easy access via a simplified user interface and mobile apps, all at an "affordable" price. While we wish all the companies well, it will be interesting to watch the market. We hope that pricing does not get too commoditized.

In our Spring 2015 issue, we shared how building bridges between the satellite communications (SatCom) industry and the satellite Earth observations industry could benefit both. In this issue, we take this a step further. Beginning on page 23, read about the specific example of how the SatCom industry achieved something that has proven to be very tricky for the Earth observations industry: transitioning disaster response providers' free services into paying customers, after the immediate response time-frame has ended. Many companies that offer free services suffer from "donor fatigue" – they cannot continue to donate services free of charge to well-deserving NGOs after disasters without hope of revenue coming in. This article shares how it can be done.

I am also thrilled to share that *Apogeo Spatial* is now demonstrating in action our commitment to long-term sustainability, by joining PrintReleaf. PrintReleaf empowers businesses to certifiably reduce the environmental impact of using paper products by automatically planting trees across a global network of reforestation projects. This program will ensure that as many trees are planted as we use in printing this magazine. See page 6 for more information.

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# Disaster Risk Resilience

## MOVING CLOSER TO BEING PREPARED FOR DISASTERS

ACCORDING TO 2014 FIGURES OF THE WORLD Bank, at least five countries in Central America have suffered natural disasters that have impacted their gross domestic product by 50 percent in the last eight years. It is too early to tell how long it will take for Nepal's economy to recover from the devastating earthquakes that struck the country earlier this year, but the costs of rebuilding are estimated at \$6.7 billion and 700,000 people are expected to be pushed to live below the poverty line.

The call for resilience against natural disasters from communities all over the world is in large part driven by the long-term economic consequences of disasters such as these, which sometimes wipe out decades' worth of progress in already struggling economies.

As the value of space assets in disaster risk management becomes more prominent (to learn more, see "Disaster Risk Management," Spring 2015; "Flood Modeling," Summer 2015), experts are examining how satellite-derived tools can support efforts to build resilience in order to improve the ability of communities to recover from disasters. One useful tool is the United Nations' International Charter on Space and Major Disasters, but it has its limitations. On *Figure 1*, note that only the small area in green was available via satellite imagery for response to Typhoon Haiyan in the Philippines.

In August, the Secure World Foundation hosted "From Response to Resilience: Space and Disaster Risk Management," the second panel on this theme as part of an ongoing effort to promote communication and exchange of best practices across the full spectrum of disaster management activities and the role of space-based assets

in this effort. More information about the event, including speaker biographies and presentations, is available at <http://swfound.org/events/2015/disaster-risk-management-panel/>.



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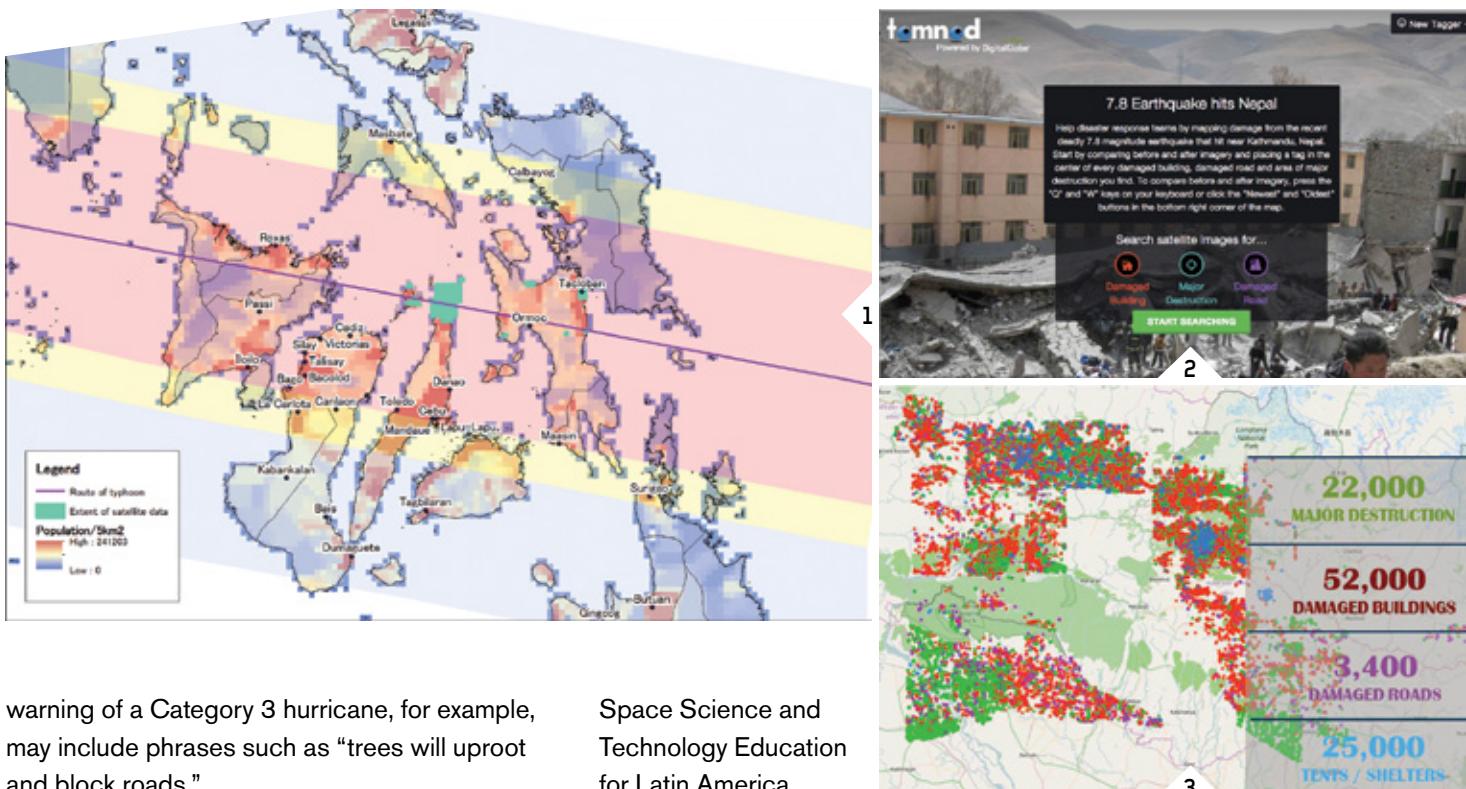


CAMACHO-LARA

The panelists discussed a number of challenges specific to the question of resilience. The National Oceanic and Atmospheric Administration's (NOAA) Mark Mulholland provided an overview of the agency's role in every step of the resilience cycle – from capturing and processing observations for the development of forecasts and warnings, to supporting recovery efforts. Focusing on the challenge of communicating with the public, Mulholland highlighted NOAA's Weather-Ready Nation initiative aimed at "building community resilience in the face of increasing vulnerability to extreme weather and water events."

This initiative recognizes the importance of both accurate and timely information and of developing effective communication policies before, during, and after extreme events to

improve response. According to Mulholland, one of the lessons learned has been to develop "impact-based" forecasts and warnings to include examples of how citizens may see their lives disrupted following the extreme event. A



warning of a Category 3 hurricane, for example, may include phrases such as “trees will uproot and block roads.”

Among efforts to improve engagement with the general public are those surrounding crowdsourcing, an effort to help address a second challenge towards building resilience: analyzing the vast amounts of data generated to extract actionable information. DigitalGlobe's Luke Barrington described the commercial remote sensing provider's crowdsourcing activities in the aftermath of the Nepal earthquake. In addition to providing before and after images to decision makers working on response and rescue efforts, DigitalGlobe launched a campaign to involve the crowd in damage assessment by publicly releasing imagery through the Tomnod platform and inviting volunteers to identify damaged infrastructure, major destruction, and temporary shelters set up by those displaced by the earthquakes. See *Figures 2-3*. According to Barrington, 61,000 “taggers” participated in the campaign. Efforts such as this help translate pixels into insight, said Barrington, creating information that is verified for reliability before being transferred to the field to support decision making.

In the aftermath of disasters, communities will look to make investments to build capacity in using geospatial information tools in their decision making, a key step to building resilience against future emergencies. Towards this end, organizations such as the Regional Centre for

Space Science and Technology Education for Latin America and the Caribbean (CRECTEALC) help provide technical training to disaster management practitioners. According to CRECTEALC's Sergio Camacho-Lara, many communities that would benefit from the use of space-derived information lack awareness not just of how to use or access this information, but even of its existence.

Fortunately, several institutions around the world are partnering to address these challenges at the regional and national level. Camacho-Lara highlighted lessons learned from three recent capacity-building workshops held in Mexico since 2013 for practitioners in the Latin American and Caribbean region. Camacho-Lara described the series as a “success story,” in part because it has led to steps to the establishment of a working group to promote the exchange of best practices among the larger regional community.

The discussion among panelists and audience members indicated that improving communication, participation, and the exchange of best practices and information is needed not just between data providers and users. The contributions of the different stakeholders in the space and disaster management community can only grow as policy and practice are put in place to build on insights gained through their diverse experiences. ↳

◀ FIGURE 1.  
This map shows in green the very small extent of satellite data available from the UN International Charter on Space and Major Disasters after Typhoon Haiyan in the Philippines. Credit: Asia Development Bank.

◀ FIGURE 2-3.  
DigitalGlobe's crowdsourced platform Tomnod had 61,000 participants after the earthquakes in Nepal. They found 22,000 areas of major destruction, 52,000 damaged buildings, and 3,400 damaged roads.



# Safeguarding Our Life Support System

OVERCOMING THE “IMMUTABLE TRUTH” OF GROWTH BEING NECESSARY FOR A THRIVING ECONOMY

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IN EARLIER COLUMNS, I MADE REFERENCE TO a new definition for sustainable development: a development that meets our needs while safeguarding the Earth's life support system on which we and all future generations depend. Safeguarding our life support system (LSS) seems logical and to be something we all should be eager and able to agree upon.

Andrew Revkin commented in a recent blog on the fact that humans did connect around the recent rare eclipse of the moon but not around our rare Earth,<sup>1</sup> and in another blog he cites Heriberto Cabezas, who said, “We don't have a cultural narrative that says managing our planet in a way that allows us to live on it as long as we can is probably the most important thing.”<sup>2</sup> Why do we not have this “cultural narrative”? Why are we actually degrading the LSS with increasing speed? What is wrong with us?

We are embedded in the LSS, and as outlined earlier, the way we are embedded is determined by our economy.<sup>3</sup> Very recently, we have become the dominating species on the planet that determines the state and trends in the LSS, not just for us, but also for large parts of the biosphere. Thus, we are an integral part of the LSS. This comes with opportunities, responsibilities, and challenges.

I am embarrassed by the poor job we are doing in safeguarding the LSS. What do I mean when I speak of LSS degradation? I tend to consider comprehensive and rapid changes in the LSS as degradation because they create lasting disequilibrium and move us away from the homeostasis that is so beneficial for the biosphere, including humanity.

As illustrated in my last column,<sup>4</sup> particularly during the Holocene, changes in the LSS

were very small and the exceptionally stable epoch provided the “safe operating space” for civilizations to emerge. However, the Post-Holocene that started about 100 to 200 years ago has been a single degrading event. It is difficult to find parallels in Earth's long history for the magnitude of the changes in the Post-Holocene without pointing to periods of large and long-lasting volcanic eruptions or impacts of large asteroids.

I am searching for a telling analogue to what humanity is doing to the LSS. What if we look at Earth as Gaia: a huge organism-like system with physiological processes keeping the system in a dynamic equilibrium, a homeostasis? What would humanity be in this system? Flying in an airplane high above the surface, it appears as if humanity is a malignant skin cancer of Gaia. (See *Figure 1*.) Starting from a few centers, humanity slowly spread over Gaia's surface initially transforming minor parts in an organic way.

The cancer turned malignant with the advent of the North Atlantic culture, and viral when seemingly infinite energy became easily accessible in the form of oil.<sup>5</sup> With this, highly virulent centers soon extended their links all over Gaia's skin and formed metastasis in America, Australia, Africa, and Asia. Today, highly active centers of mutations are all over Gaia, eventually leading to the destruction of

the original skin. Characteristic of a malignant cancer, the metastasis and associated destruction are spreading at an increasing speed. As of today, more than 50% of the ice-free land surface has been transformed, and much of the original surface cover has disappeared: forests, grasslands, swamps have mutated first into cities and then into sprawling urban regions filled with monotonous residential boxes. Highways have replaced animal tracks and human trails; plains have turned into airports that link the malignant virulent centers across the continents and the oceans; agricultural land with extreme abundances for a few species has replaced ecosystems with high biodiversity; invasive species are supporting humanity in the transformation of Gaia's skin to a malfunctioning dying layer; and mine pits and landfills are the bleeding cancerous cracks.

“Earth observations have documented a worrying picture of expanding desertification, degradation in land cover, pollution, coastal inundation, and more extreme weather events. Since we are an integral part of the LSS, social unrest impacts the LSS and so do inequality, poverty, and overpopulation.”

The latest stepping up of the cancerous process is fracking. Modified physiological processes have changed the quality and quantity in the water cycle, altered the chemistry of the atmosphere, reduced the extent and functioning of ecosystems, and fundamentally diminished the richness and diversity of the biosphere. The originally rich forms of Gaia's skin types and the

diversity of organisms in the thin layer inhabited by living organisms increasingly make room for the monotony of a few generic types (deserts, urban areas, industrial wasteland, agricultural wilderness) and an ever lesser number of species, with one species taking over: *Homo sapiens*, or, more correctly, *homo urbanis*.<sup>6</sup>

Today we have 19 cities with more than 20 million inhabitants<sup>7</sup> and more than half of us are living in cities or urban centers. In 2050, more than 2/3 of us will be living in urban regions increasingly further away from rural areas and even moreso from Gaia's healthy skin. Thus, we are close to at least one vision of "Silent Green": Many humans who will never see a natural stream running through a healthy forest; never smell the many scents of spring in an unspoiled countryside, and never breathe the clean and fresh air in a natural environment.

The outrageous scale of humanity's action was made clear by Reinhard Goethert, who stated, "The urban population in the developing world will double by 2030. The implications are staggering. One is that we have 20 years to build as much urban housing as was built in the past 6,000."<sup>8</sup> Is there anything else that is focused that much on growth than cancer? More and more of us are living in areas where environmental and social stress is life-threatening. The impacts of the LSS degradation are not homogeneously distributed. Access to clean drinking

water, for example, is still secure in many regions but increasingly a problem in other regions. Earth observations have documented a worrying picture of expanding desertification, degradation in land cover, pollution, coastal inundation, and more extreme weather events. Since we are an integral part of the LSS, social unrest impacts the LSS and so do inequality, poverty, and overpopulation.



1

As a result of the spatial variability in LSS degradation, a lifeboat mentality is developing: more and more people live under circumstances that are life-threatening and their goal is to migrate to the lifeboats. What characterizes the lifeboats? They are areas that likely will continue to provide access to clean water, have bearable temperatures and limited extreme weather events, have social stability and promise economic prosperity. This points to the central and northern part of Europe, the northern part of the U.S. and Canada, and some higher latitude parts of Asia and South America. Having said this, it is very likely that the current migration into Europe is just the beginning of a major relocation of human population on the planet. As is often the case for ships, space in the planetary lifeboats is limited and not all can get in. As a consequence, the LSS in many regions will continue to degrade and push more people to run for the lifeboats.

In his book, "Plan B 4.0 - Mobilizing to Save Civilization",<sup>9</sup> Lester R. Brown rewords an often repeated (but not fully applied) Einstein quote

and writes, "The thinking that brought us into this mess is not likely to get us out." But do we know what in our thinking is flawed and brought us into the mess? Only with this knowledge will we be able to stop the malignant growth process and slowly restore our LSS to a healthy state. This brings us to the most important question of our time: Why did humanity develop into the lethal cancer, killing Gaia?

The core of the problem is – as always – our view of the world and what we consider "immutable truths." At any point in time, human communities have a set of paradigms or "immutable truths" that provide a basis for us being on this planet that we call home and for the way we organize our societies, do business, and justify our actions.

In one of my earlier columns, I mentioned a presentation by James Balog,<sup>10</sup> in which he commented on an immutable truth that postulates that humans are too few and our actions too minor to really impact the environment, the climate, and the planet. He was convinced that this immutable



truth would experience what many others have experienced: they became outdated and humanity moved on and adopted new immutable truths.

He gave three examples of immutable truths that were overcome in the last 150 years: slavery is necessary; child work is acceptable; and women should not vote. Progress towards a more just, a more humane society depended on overcoming these truths. Our ability to address the global unsustainability of a rapidly degrading LSS hinges on realizing the underlying "immutable truths" and making an attempt to overcome these.

This brings us to the question of, what are the immutable truths and paradigms of today that keep us from putting the safeguarding of the LSS first? Going back to the analogue of skin cancer, the paradigm that economy needs growth to thrive emerges as a prime theory. For many, the necessity of growth is an immutable truth, and it blocks us from even thinking about solutions that are not growth-focused. Before I explore this thought more, let us look at a few other

"immutable truths." Some of them have been overcome in the last few decades, and others are still repeated again and again.

### **“IMMUTABLE TRUTHS?”**

#### ***IT1: THE OCEANS ARE INVINCIBLE***

This was a truth widely accepted up to about 1950. A nice example of this is the statement by Thomas Huxley, an Eminent British Biologist, who expressed his belief in the invincible nature of the oceans in 1883. (See *Figure 2*.) However, by now we have evidence that defying the finite nature of the oceans is a consequential mistake.<sup>11</sup> Most recently, an estimate published by the World Wildlife Fund claims that in the last 40 years, humanity reduced the number of fish in the oceans by half.<sup>12</sup> Although this estimate comes with large uncertainties, it is certain that humanity has impacted the oceans not only in terms of number of fish but also in reduced biodiversity, modified ecosystems, and changed chemistry. Acidification is one of the recognized threats of climate change, and even a large-scale change in ocean circulation as a consequence of global warming can no longer be excluded.<sup>13</sup>

#### ***IT2: PROSTITUTION HAS ALWAYS EXISTED, AND WILL ALWAYS EXIST***

We have heard this many times and some men cannot repeat it often enough. Many attempts in different countries to ease the burden on those who suffer (the women and children impacted) have not really reduced prostitution or made it more acceptable. However, Sweden made huge progress by abandoning the immutable truth and redefining prostitution as violence of men against women and children. This led to the logical consequence of legalizing the selling of sex (and thus protect the victims) and criminalizing the buying of sex (and thus marking the Johns as the villains). After some initial delays caused by a lack of enforcement, the new way of looking at prostitution brought it rapidly down to almost zero.<sup>14</sup> Naming things for what they are can facilitate huge progress.

◀ FIGURE 1.  
Seen from an airplane, the rapidly growing sprawling urban areas and open pit mines can be compared to malignant skin cancer. Aerial photo near Newark, New Jersey, courtesy of author.

### **IT3: SEA LEVEL CHANGES VERY SLOWLY AND COASTLINES DON'T MOVE MUCH**

This is a truth derived from 6,000 years of exceptionally stable sea level. Based on the normalcy bias created by such a long experience, many still cannot wrap their minds around the mere possibility that this no longer is true. However, scientists are worried about rapid melting of parts of the ice sheets,<sup>15</sup> and we urgently need to drop this paradigm if we do not want to put civilization at risk along urban coastlines.<sup>16</sup>

### **IT4: ECONOMY NEEDS GROWTH TO THRIVE**

This is an immutable truth created by economists serving those who benefit from growth. Growth is necessary for those who want more than others have. Growth propels inequality. Those who benefit from inequality are the ones who maintain this immutable truth. Andrew Revkin asked whether the wealthy 1 Billion need new goals.<sup>2</sup> I would say, they need to overcome the growth addiction. Unlimited growth is incompatible

with sustainability. This is the single most important issue we need to address. There are many examples of societies that were stable over long periods without unsustainable growth. The cultural narrative we need is how we can overcome the current growth addiction.

### **THOUGHTS FOR THE FUTURE**

Growth that degrades the LSS is not sustainable. Currently we have an economy that is based on the principle of satisfying our needs no matter what, while giving individuals the chance to get super rich. If we declare an economic activity that degrades and endangers the LSS as a crime against humanity, we would have to refocus the economy.

In a blog, Benjamin Neimark stated, "Nature can't pay its own way – so let's take the market

out of conservation".<sup>17</sup> This thinking is flawed. Instead of taking the market out of conservation, we need to bring conservation into the market. This is comparable to the prostitution case, where Sweden found a solution by protecting the victims. Similarly, if we criminalize the selling of products produced by degrading the LSS, we suddenly protect the victim, that is, the LSS and all those who depend on it (including all of us).

Nicholas Kristof used the example of a pharmaceutical company to discuss the problem of an economy in which crime pays.<sup>18</sup> He could have used the oil industry. For example, Exxon spent \$30 Million to discredit the science on the climate change caused by the products Exxon sells.<sup>19</sup> True, not all companies are doing business that is criminal

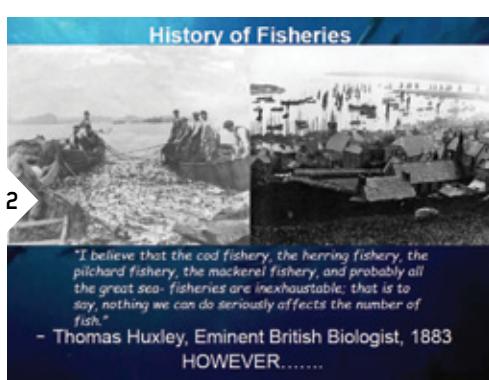
according to existing laws - in fact many of them want to do good for humanity and provide products that do not damage our LSS. But the system does not reward them. Crime pays in the current system.

The United Nations just accepted the proposed 17 Sustainable Development

Goals (SDGs).<sup>16</sup> Unfortunately, the SDGs are focused almost exclusively on those suffering from the unsustainability of our growth-addicted world and do not address the reasons for this suffering thoroughly. In particular, the goal of safeguarding the LSS on which we and future generations depend did not enter into the SDGs in any explicit form. There is no goal for those who are at the top financially that would create a new mindset urgently needed to bring us out of the mess created by the current mindset of more growth.

When will the three spirits that transformed Ebenezer Scrooge from a greedy business man into a valuable member of society start to visit those making in companies for-profit decisions that constitute a crime against humanity, degrade the LSS, harm most and kill many? Or is us waiting for these spirits futile? ↗

► FIGURE 2.  
The once believed "immutable truth" of a basically infinite ocean has proven to be wrong.  
Courtesy of Kent Carpenter.



Endnotes:

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# The Demise of Google Earth Enterprise

ArcGIS Earth & Vricon & Others Fill the Gap

BY MATTEO LUCCIO / CONTRIBUTOR / PORTLAND, ORE. / [WWW.PALEBLUEDOTLLC.COM](http://WWW.PALEBLUEDOTLLC.COM)

GOOGLE IS ENDING A 10-YEAR RUN OF GOOGLE Earth Enterprise (GEE), which contributed greatly to the market for geospatial “Digital Earth” products for business. Google also has a reputation for ending support for some of its products. On March 20, 2015, it “deprecated” Google Earth Enterprise, meaning that it should be avoided, and announced that it would stop supporting it two years later. The company had previously announced that it would discontinue support for its Google Earth API and for Google Maps Engine. It will support the latter through the end of January 2016.

Google Earth Engine, on the other hand, “is moving forward like gangbusters, with accelerating adoption,” according to Rebecca Moore, Google’s manager for Google Earth Engine and Earth Outreach. Earth Engine is a platform developed to turn pixels into knowledge at global scale, all for societal benefit. Watch for an article in a future issue.

GEE allows organizations to store and process terabytes of imagery, terrain, and vector data on their own servers, and publish maps securely for their users to view using Google Earth desktop or mobile apps, or through their own application using the Google Maps API. Asked repeatedly to discuss the end of GEE, Google declined to comment for this story.

Several options exist to replace Google Maps Engine, including Esri’s ArcGIS Online, Mapbox, CartoDB, iSpatial, Mango Map, GIS Cloud, First Mile Geo, FME Cloud, Nearmap, Ubisense myWorld, CartoLogic, CMaps Analytics, Skyline, and a combination of Google products. Replacing GEE is harder, however, both because of its capabilities and because many of its users are very large organizations, such as federal agencies.

Three possible replacements for GEE to varying degrees are INdicio, by Galdos Systems; ArcGIS

Earth, which Esri plans to launch by the end of the year; and Vricon, a company formed as a partnership of SAAB and DigitalGlobe (DG) that is currently in start-up mode. I discussed the launch of ArcGIS Earth with Chris Andrews, 3D product manager for Esri’s ArcGIS platform, and the start up of Vricon with Isaac Zaworski, the new company’s vice president.

## ARCGIS EARTH

The initial release of ArcGIS Earth will be primarily “a viewing experience,” says Andrews. Users will be able to navigate around a globe and look at different base-maps provided by either ArcGIS Online or their own portal for GIS server, as well as to add a wide variety of KML data and services, shapefiles, Esri feature services, map services, image services, theme services, and other select Esri Web service data. “The idea is to give users a really lightweight experience exploring, visualizing, and then quickly sharing what they are looking at.”

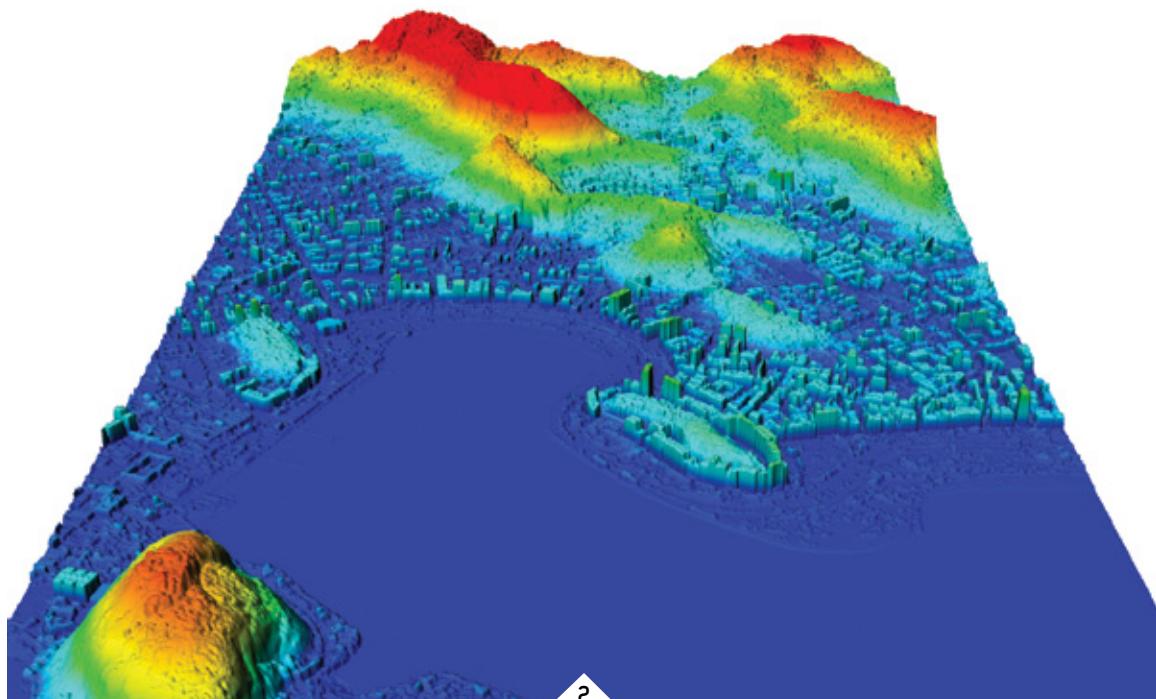
No product platform is ever complete on its first day on the market or ever finished, for that matter. Esri will release a beta of ArcGIS Earth this fall and is “working very hard,” he says, to launch the full product “before the end of the year” as a lightweight, desktop client for interacting with KML, ArcGIS services, and other geospatial data. “We will do some things that will be a lot like Google Earth and other things that will not be.” Jack Dangermond, Esri’s founder and president, picked the name ArcGIS Earth, Andrews explains, because it is intended to be an extension of the ArcGIS platform.

Initially, Esri is focusing on large enterprise customers, such as civilian and military government agencies that are facing a transition off of Google client technology. “If you look at the ArcGIS stack, Server does very well in terms of providing the types of data that



Vricon satellite 3D data over Rio de Janeiro, Brazil

1



2

▲ FIGURE 1.  
Vricon 3D data  
over Rio de  
Janeiro, Brazil

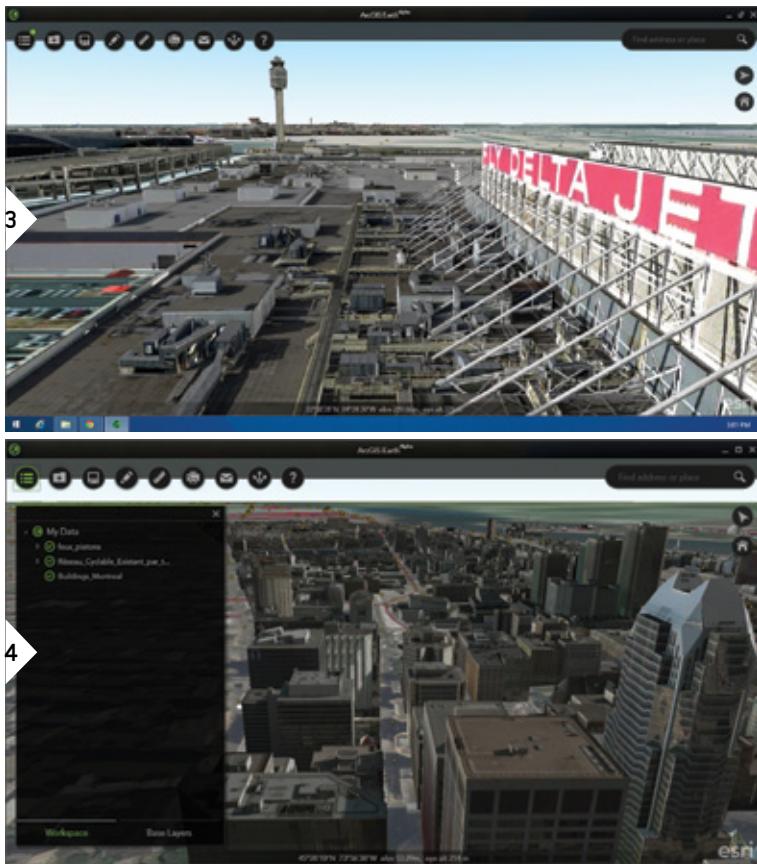
◀ FIGURE 2.  
Vricon Digital  
Surface Model  
(DSM) over Rio de  
Janeiro, Brazil

those customers get out of Google Enterprise software,” Andrews points out. “Portal is the application server that wraps a variety of information products around that data. Then we have Web capability, we have a thick desktop capability, and now, with ArcGIS Earth, we will have a lightweight desktop client and, in the future, a mobile client that can consume the services coming out of Portal for ArcGIS Server. ArcGIS Earth is just one piece of a much bigger strategy of being the best enterprise GIS solution that there is.”

ArcGIS Earth will be available to anyone for free (as Google Earth offered a free version), for example, to look at publicly available data in ArcGIS Online. However, using it to look at private group data in ArcGIS Online or at private data behind a firewall will require an Esri account. To serve out a password-protected service from ArcGIS Online or from inside

a firewall using Portal, ArcGIS Earth should be able to view either one. Many users will probably be behind the firewall, using Portal, but Esri will also make ArcGIS Earth available on its Website.

Those customers who will have to make the transition already have many challenges, Andrews points out. They have very well established workflows and processes. Often, they are already Esri customers. “So, we are not necessarily talking about winning over a customer. We are talking about helping our customers stay happy and operational.” Today, typically, they have a workflow for having their “globes” produced – sometimes by Google, sometimes by Esri, sometimes by another integrator partner – and for hosting them on a server and serving them out to many users across their organizations. Higher-end GIS users will continue to use desktop and now ArcGIS Pro in those scenarios.



▲ FIGURE 3.  
3D view of a portion of Hartsfield-Jackson Atlanta International Airport, based on data from Pictometry, courtesy of Esri

▲ FIGURE 4.  
3D view of downtown Montreal, Quebec, Canada, courtesy of Esri

► FIGURE 5-6.  
USGS earthquake data, courtesy of Esri

ArcGIS Earth is rebuilding on top of Esri's platform a piece of the workflow that they can no longer perform on Google technology. Andrews acknowledges, however, that on day one Esri's new platform will not be able to satisfy these organizations' every requirement, such as time-based information. "We have a development road map and we have to be sure that we are delivering a quality product," he adds.

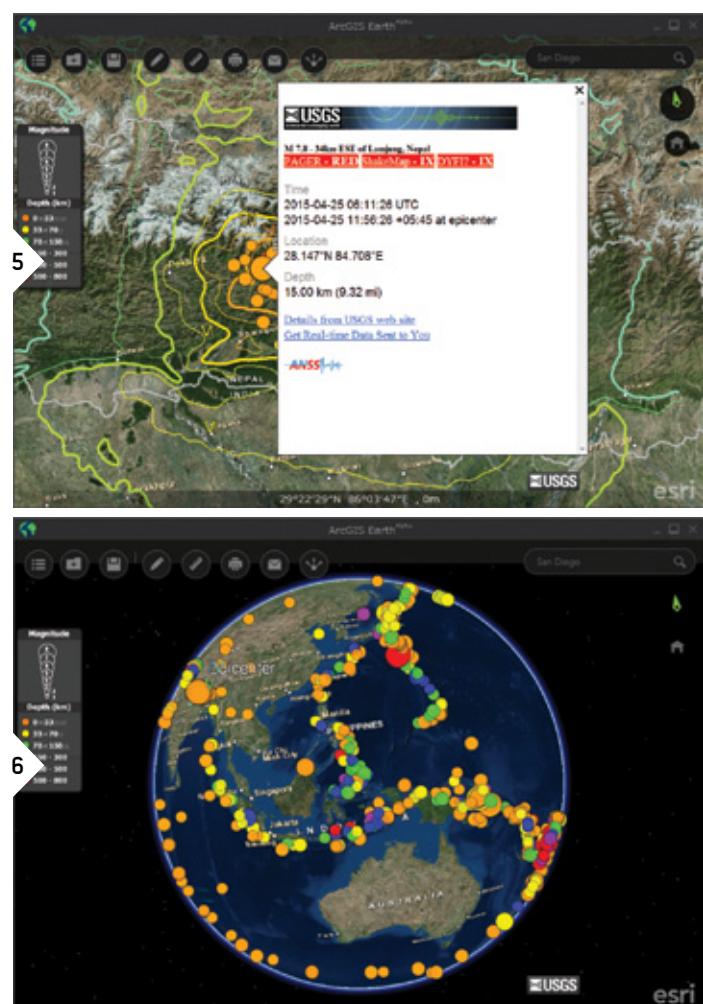
Organizations that will have to transition off of Google Earth Enterprise have alternatives to ArcGIS Earth. However, none of them are "as robust as Esri's overall platform picture," according to Andrews. "If you get down on the granular level of feature-by-feature, then there is always somebody with a better feature in one area or another, but if you are looking for an enterprise GIS platform that can deliver 2D and 3D, I don't see anything that truly is an alternative right now."

## VRICON

Vricon was created in May 2015 as an independent company, as a joint venture between Saab AB, which contributed IP it developed over 25 years and considerable financial investment, and DigitalGlobe, which contributed a "library card" to its entire collection, present and future.

Vricon's core product is a fully textured, 3D surface mesh model at 50-cm resolution and an absolute accuracy of 3m SE90 or less, called Globe in 3D. "We are going to build the entire face of the planet and it will be consistent, which is something that has really never been feasible before today," Zaworski says. "Our vision is to build the highest resolution, most accurate 3D map or representation of the face of the Earth that we possibly can." It starts with building the data but, in the longer-term, his company wants to push the community to think of all spatial data in 3D and then 4D. Starting in early 2016, the company plans to build two million square kilometers of 3D data a month, just using DG's data.

Vricon, Zaworski explains, will offer products and services in three categories: data products, primarily 3D, in conventional formats and unconventional formats; software products to use and exploit those data products, as well as other data products; and a services package that can enable users to perform advanced analysis off of the best data available, making it accessible to customers who may not have been able to afford



**“ArcGIS Earth is just one piece of a much bigger strategy of being the best enterprise GIS solution that there is.”**

to buy high quality lidar data. Additionally, it also builds several derivative products for use in conventional geo-spatial datasets, such as a 2m DSM in standard geoTIFF format. Their production process also yields a vector layer that describes all of the water in any given scene or location and remotely sensed control points for GPS-denied areas around the world.

Building on decades of research and development, SAAB built a capability to do fully automated, multi-view stereo 3D reconstruction. Automation, Zaworski explains, is the key to Vricon's large scale plans. It is building a very large data center in Reston, Virginia, which will do all of the processing. A very small production staff will make sure that the data quality is consistent, but will not edit the finished product.

Traditional stereo correlates two raster images taken from slightly different angles and compares them at a pixel- or feature-level in order to calculate the third dimension. This generally requires collecting the data in a structured stereo way. Today, it is possible to contract satellite or airborne providers to collect stereo pairs. However, that type of collection tends to be time-consuming and expensive. Furthermore, because most of the pixels collected that way are from near nadir, they do not incorporate the oblique information that enables accurate modeling of the sides of buildings and windows, under bridges, etc.

Multi-view is an evolution on that old stereo concept, Zaworski explains. “It takes a whole bunch of images that happen to be overlapping, collected from a whole bunch of different angles in an unstructured way, and uses image processing and computer vision techniques to correlate them, compare them, and extract the parallax information statistically. This greatly cuts costs because it does not require expensive, structured stereo collects and allows Vricon to make full use of DG's archive. It also allows us to build models that do include really good representations of the sides of buildings and all that complex geometric structure that you might miss in a traditional stereo product.”

The algorithms that Vricon uses are sensor-agnostic. Therefore, DG is not the only source it can use to build

3D data. “One of the biggest reasons we started out as a joint venture with DG is that they have 65 or 70 petabytes worth of data in their archives today and it is growing with more than one million square kilometers of new collection on a daily basis.” Additionally, Zaworski points out, DG's data is very accurate, which is essential for Vricon because it does not use any ground control. Rather, it relies exclusively on the images' original metadata, extracting the geometry very precisely, and doing bundle adjustments across many images. However, if needed, it can use images from other sources, such as Airbus, Planet Labs, or Google's Skybox.

Vricon will port to the cloud all of the finished products from the Reston facility – high accuracy, fully textured, 3D data – and host them live in a Web service. “So, not only do we provide a capability to post data on an enterprise scale and make it available to customers with a user experience that is simple and responsive, kind of like the way that Google Earth revolutionized the way that we think about very large raster datasets, but we are actually bringing the data too and the ability to operate on them,” says Zaworski. It will allow users to layer on other raster and vector data in the form of other OGC services, such as Web Map Tile Service (WMPS), KML shapefiles, WFTS, and WFS services.

Google Earth Enterprise provided users in closed environments the server-side ability to fuse datasets into a “globe” or a run-time environment that they were



▲ FIGURE 7-8.  
3D data in Vricon  
Explorer of  
Washington, DC,  
USA

▼ FIGURE 9.  
Damascus, Syria  
satellite image,  
courtesy of  
Vricon



**“Vricon just announced a new product, Vricon DSM-10, which is a 10-meter digital surface model at the disruptive price of \$1.99/km<sup>2</sup>. ”**

then able to serve out as a Web service. Vricon's model is similar, except that it does not require the user to actually spin a brand new globe or a run-time environment for each update. "Our 'globe' exists in database space," says Zaworski. "For all intents and purposes, it is an efficiently correlated spatial database that supports the

ability to do dynamic updates as well as providing the full, multi-layered support that you would be interested in from a Google Earth-type capability."

The visual starts off with a background of low-resolution global elevation profile as well as a 15-meter blue marble texture. In a demonstration, Zaworski zooms down into a 50-cm resolution, full color 3D surface mesh of the Washington, D.C. area that is streamed down from Amazon services, displayed on his computer, and dynamically paged in and out. It is very responsive.

"This is being rendered on my machine, in the exact

## Q&A

### Z Matters: Building the Globe in 3D

MYRNA JAMES YOO, PUBLISHER, APOGEO SPATIAL  
AND CRAIG BROWER, VP, VRICON



Myrna James Yoo



Craig Brower

#### Q What does Vricon offer?

A Vricon is building the highest-resolution, most accurate 3D model of the entire world. The Globe in 3D is a georeferenced photo-realistic 3D geospatial dataset that is hosted live in the cloud and made accessible to customers as a streaming Web service. Vricon's technology offers warfighters, analysts and decision makers the ability to work in a truly 3D environment and develop new insights and make better decisions faster.

The Globe in 3D is a commercial, full-color, 50-cm-resolution 3D dataset with an absolute accuracy of 3m SE90 (Spherical error 90%) anywhere in the world.

This dataset is streamed to users as a lightweight Web service, accessible in real time for efficient visualization and exploitation via cloud storage. Additionally, Vricon's Globe in 3D product suite offers traditional geospatial data products including DSMs, point clouds, and true orthos. All products offered from the Globe in 3D product line are built using the same automated image processing technology, without the use of any ground control points.

#### Q Why does Z matter?

A Z matters because the real world is 3D!

Vricon has been called a paradigm shift by our clients in the defense and intelligence space, applying Vricon for GPS-denied navigation, precision targeting, mission planning/rehearsal and general situational awareness. Think about getting in and out of a remote hostile location. With Vricon, operators can become familiar with

the terrain and situation and make better informed decisions.

In industries where we are striving for more precise answers to questions that are increasingly more complex and numerous, traditional 2D geospatial correlation eventually becomes a limiting factor; 3D correlation is a logical next step. By including the Z dimension (in addition to the x and y axes) in analyses, true precise geospatial context can be achieved for all datasets, and the next generation of data analytics can be enabled.

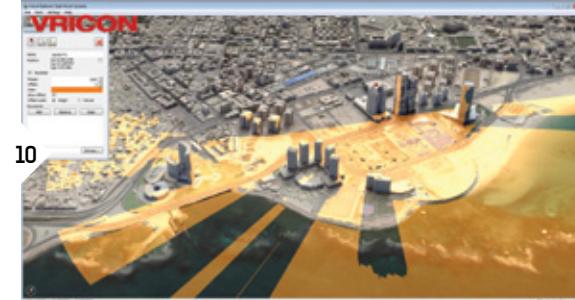
#### Q What's different about Vricon?

A Vricon implements automated 3D image processing algorithms inside a state-of-the-art high-performance computing system with direct access to the world's largest global imagery archive. This creates an unparalleled geospatial production capability – and enables the production of The Globe in 3D at an extremely rapid rate and significantly reduced cost.

Currently, access to 3D data for most mainstream geospatial analysts is limited. Lidar sensors, SAR sensors, and existing stereo extraction techniques for generating 3D data are too expensive

same tiled fashion that you would think about from a Google Earth," he points out. "Every single pixel is fully projected to, in this case, WGS84 global coordinate system" (the World Geodetic System 1984, which is used by the Global Positioning System). A dynamic measurement tool, operating on the client side, calculates distances and areas in real time. Other tools allow the user to extract the coordinates of any point and perform viewshed and line-of-sight analyses.

Vricon also offers its Explorer software. Similar to Google Earth Pro, it is a very lightweight and easy-to-use data visualization environment with some ability to do exploitation and analysis.



◀ FIGURE 10.  
Vricon Explorer  
viewshed analy-  
sis of Tripoli,  
Libya

## CONCLUSION

As tens of thousands of users, including some very large organizations, are assessing their options following the end of Google Earth Enterprise, Esri's launch of ArcGIS Earth and Vricon's ramp-up appear to be two promising alternatives. Others will be covered in future issues. ↗

and time-consuming. Additionally, specialized exploitation tools are required to make the data useful.

Vricon provides a scalable and affordable 3D environment that is available to geospatial organizations as a consumable Web service. Users will be able to stream, visualize, utilize, and exploit The Globe in 3D on any desktop or mobile device. Vricon also offers locally stored solutions for applications without network access. This provides a true 3D situational awareness capability, replacing current 2.5D situational awareness applications.

**Q** *How fast can I get a piece of the Globe?*

**A** The Globe in 3D is under construction at Vricon today. Nearly instant access is available to our fast growing, off-the-shelf archive of cloud-hosted 3D data, which includes more than 100 locations around the globe. On top of our current archive, we are steadily ramping up production capacity to a full operational capability of 2,000,000 square kilometers per month by mid-2016. At this rate, we will be able to produce areas of key importance to our customers in the first 18

months. For comparison, the entire area of the two countries of Iraq and Afghanistan is roughly 1,100,000 square kilometers.

**Q** *What types of imagery can Vricon use?*

**A** Vricon employs sensor-agnostic algorithms that can process imagery from satellites, and aerial and unmanned platforms. Vricon's unique access to DigitalGlobe's extensive archive of commercial satellite imagery – which, today, exceeds 5 billion square kilometers – provides an extensive foundation on which to build The Globe in 3D.

**Q** *How "real time" is the data that you will be offering, in terms of imagery?*

**A** The limit to the real-time aspect of our 3D data is based on the availability of source data. As more source data becomes available (e.g. small satellites), our production speed can be leveraged to create a more real-time 3D modeling solution.

**Q** *How did Vricon get started?*

**A** Vricon is a new independent commercial company created in May 2015: a joint venture between

Saab AB and DigitalGlobe, Inc., Vricon (McLean, Va.), combines Saab's unique 3D image processing capability with DigitalGlobe's data archive. This exceptional mixture of technology and data enables Vricon to produce highly accurate photorealistic 3D models.

**Q** *What does the future hold for Vricon?*

**A** We think of ourselves as a startup company, with our primary focus on scaling up our production capacity to build The Globe in 3D. The next step is to enable solutions and services to solve new problems on a global scale. We will continue to incorporate new datasets and phenomenologies into our production process to augment our view of the real world in both space and time. Vricon just announced a new product, Vricon DSM-10, which is a 10-meter digital surface model at the disruptive price of \$1.99/km<sup>2</sup>.

Vricon envisions a future when Z is not overlooked – a future when all users in the global business and government geospatial communities will have access to high-quality, recent 3D data and services, on demand.

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# Disaster Response STRATEGY for SatCom Companies

APOGEO<sup>°</sup>  
SPATIALEXECUTIVE INTERVIEW WITH STEVE BIRNBAUM  
HUMANITARIAN & DISASTER RESPONSE CONSULTANT IN ICT  
(INFORMATION & COMMUNICATIONS TECHNOLOGY)

► FIGURE 1.  
Ebola response,  
courtesy of  
Gisli Olafsson,  
NetHope

Some disasters disappear from headlines before they ever have a chance to be noticed. Others can survive at least one 24-hour news cycle. It is easy to recall the coverage of the Haiti earthquake or Typhoon Haiyan, but Cyclone Pam's damage to Vanuatu was not as noticed.

The more visible a disaster has been in the media, the easier it can be for humanitarian response organizations and their partners to obtain donated resources to support the response. However, there is a limit to any organization's ability to help with in-kind or cash donations. The point at which that limit is reached is typically referred to as "donor fatigue."

The global commercial satellite communications and Earth observations industries are not immune to this challenge. Addressing this challenge was one of the objectives that Steve Birnbaum set out to address in the aftermath of the Haiti earthquake in 2010.

From that time until earlier this year, Mr. Birnbaum led this effort in collaboration with the Global VSAT Forum (GVF). Steve continues to lead it, now an independent initiative with the support and participation of leading satellite operators, equipment manufacturers and service providers from around the world. Some of the participating companies include Intelsat, SES, ABS, Globecom and Ultisat.

During the response to the earthquake in Haiti, many of the hundreds of NGOs that deployed asked numerous satellite communications (SatCom) companies individually for assistance to Haiti. Not wanting to deny resources that can be of help, the companies readily donated millions of dollars of equipment, service and even personnel who were flown to Haiti to support the installation and operation of the equipment.

Rather than stove-piping resources, this approach took a wide view of the needs of the response community. Humanitarian response organizations are often located near to each other, or even within the same compounds. In the past, each one may have sought out the donation of a VSAT terminal, for example. That is no longer the case.

With the coordination in place, all requests can be collected in one place. The organizers then look at the “big picture,” and work with the vast array of resources that our members offer to find a solution that best solves the “big picture” needs. In most cases, that comes at a significantly lower cost than a multitude of individual solutions. It also does not delay the response, and can often speed it up. Since Steve has worked closely with the humanitarian community for many

years as a partner and within the Emergency Telecommunications Cluster (ECT), they have the benefit of experience and familiarity with what all parties can offer to find the most suitable solutions.

There is a hidden benefit to this. By reducing the complexity or the scale of the resources needed from the SatCom industry, the cost to that same community is also reduced. That means that companies are better able to support multiple responses over time. Something that is not needed for a particular response can be kept ready for the

next one. They have demonstrated the benefits of this approach in the response to the Japanese earthquake, Typhoon Haiyan in the Philippines, the Ebola crisis in West Africa, Cyclone Pam in Vanuatu, and the recent earthquake in Nepal.

## TYPHOON HAIYAN

Typhoon Haiyan began to impact the Philippines on November 6, 2013. As the initial damage assessments started to come out of the country, the humanitarian response community recognized that this would require a significant response effort. The Emergency Telecommunications Cluster began to seek available resources. Also apparent early on was that many of the organizations would be located close to each other.

Tacloban was a major base of operations. Steve began to put together a solution with participating



▲ FIGURE 2-3.  
Typhoon Haiyan,  
in Tacloban,  
Philippines,  
courtesy of  
DigitalGlobe.  
Before image:  
Feb. 23, 2012  
After image:  
Nov. 10, 2013

The companies that provided this assistance were proud to do so, but the high cost of this support in some cases exhausted the budgets these companies had at their disposal to help. When floods impacted Pakistan several months later, many of the same organizations that had rushed to help in Haiti had exhausted their available resources and could not help again so soon.

Steve worked with the SatCom industry to address this challenge in a number of ways.

First, as was recently described in this publication in the Spring 2015 issue, GVF acted to provide coordination across the SatCom industry, and between them and the humanitarian response community. This allowed for a dramatic increase in the efficiency and effectiveness of the communications assistance provided to the international response community.

companies. SES, one of the two largest global satellite operators, had available capacity. Speedcast, a large service provider, offered to provide the connectivity service using its iDirect equipment. AsiaSat, the operator of the teleport where that equipment was located, re-pointed the antenna and provided the teleport services. iDirect ensured that Speedcast had the resources they needed.

Within a mere 36 hours, a new VSAT (very small aperture terminal) service had been put together that would be offered exclusively to the humanitarian response community. It was on a very powerful satellite that enabled use of small antennas, which reduced the logistics challenge of moving them to and within the country. Making this service available using a single solution meant that resources were used efficiently. It also meant that organizations could move VSAT terminals around, knowing that they were all going to be compatible. It also meant that many other companies that had stepped forward to offer services could be asked to keep those in reserve for the next time.

But that wasn't enough. The response to Typhoon Haiyan would last a long time, and there is no way that these companies could offer the donated service for free indefinitely. They could certainly do so for the initial emergency response period, but what then?

There was a perception among some in the SatCom industry that the global humanitarian community asked for donations and was almost never willing to pay for service. Company leaders, who have a fiduciary duty to shareholders, sometimes expressed the sentiment that it would be easier to donate services during an emergency if there were a possibility that they might see revenue at some point in the future. That is not to say that they wanted to make a donation with any strings attached, but simply that it can be easier to justify why money was spent on a donated service if at some point in the future the recipient organization would purchase a product or service. In practical terms, it meant that support for the donated resources might come from marketing budgets rather than only corporate social responsibility (CSR) funding.

The three companies that were providing the service after Haiyan were asked for how long they could provide it at no cost to the humanitarian community. The answer was three months. That represented a donation of well over \$250,000 in in-kind services. Knowing from the outset that it would be available for



4

▲ FIGURES 4.  
Nepal Response,  
courtesy of  
Steve Birnbaum

three months also benefited the humanitarian community, as it set appropriate expectations. There would be no last-minute surprises.

But more importantly, the three companies also agreed that it could be made available beyond the three months on a commercial basis, and nominated one of the three to be the commercial interface with the humanitarian community. This had never been attempted before on this scale.

As the response progressed, some ETC members began to plan ahead. NetHope, a member-based NGO that focuses on ICT (information and communications technology) solutions, negotiated terms for continuity on a commercial basis directly with the companies involved. There was no obligation to do so, of course. There was no requirement to continue paying for service as a stipulation for the donation. That would never be acceptable for ethical reasons.

Rather, it created the opportunity for NetHope and others to continue to use the service if it met their needs. By the end of the three months, most NGOs will have successfully led fundraising campaigns. They will often then have the means they may not have had in the early aftermath of a disaster to allocate funding for communications services, and they will not be under the pressure of the early response.

Typhoon Haiyan marked the first time such a coordinated SatCom response effort was transitioned to commercial service during a disaster response.

## EBOLA IN WEST AFRICA

In 2014, the world watched with deep apprehension as Ebola took many lives in West Africa and caused panic around the world. UN agencies and NGOs launched their response efforts. A SatCom company extended an offer to donate equipment and service to NetHope for a period of six months. Over the next several months, the terminals were deployed to many locations throughout the three affected countries of Sierra Leone, Guinea and Liberia.

**“Typhoon Haiyan marked the first time such a coordinated SatCom response effort was transitioned to commercial service during a disaster response.”**

As the months progressed, NetHope had ample time to identify an authorized dealer of the service in Africa, and to develop a relationship with them. As the six month deadline approached, many of the sites that had been operating on the donated service were transitioned to commercial service. Other sites, which no longer needed connectivity, were decommissioned. This provided the humanitarian community with continuity, and a smooth transition. They could make decisions based on available budget, and without the pressure of an emergency situation.

## CHARTING THE FUTURE

It is important to note that at no time were the companies guaranteed any revenue until a commercial agreement was signed. Since Mr. Birnbaum was operating within the Emergency Telecommunications Cluster, he was able to work with both the humanitarian community and satellite companies to ensure that the services and the subsequent transition was a transparent process that adhered to humanitarian ethics and principles.

These two responses demonstrate that a transition to commercial service is indeed possible, providing that the process is transparent from the start. There can be no strings attached to a donation, but humanitarian response organizations understand that a donation cannot be indefinite. They are willing to work with the private sector to find a solution that meets everyone's needs.

The ability to prove that a transition commercial service is possible can now be used by companies to

justify future in-kind or cash donations in support of humanitarian response. This has created a better partnership, with a better understanding of the needs and limitations of everyone involved.

With increased collaboration across the industry, guided by neutral parties, it is possible to create new models for private sector support of humanitarian response. These new models are more sustainable, and treat both the private sector companies and NGOs as equal partners in developing solutions to save lives.

Looking ahead, Steve plans to build on past successes. He is working on improving the predictability of responses by developing solutions in advance for high-risk regions, which is consistent with the United Nations and others, whose efforts are now focused more on disaster readiness than response. There is a global cadre of GVF-certified VSAT installers. While they have been called upon in the past to aid response organizations, Mr. Birnbaum's hope is that they can be further developed as a resource through additional training specific to disaster response.

We have seen the industry advance significantly from the type of ad-hoc response to Haiti in 2010 to the types of coordinated responses we have seen in 2015. It has been said for years that communication saves lives, but with the advent of social media use of geospatial intelligence resources in the field, that has never been truer. It is therefore important that the global satellite communications industry always works to improve the means of ensuring the rapid delivery of effective and sustainable communications solutions following a disaster. ▲

► FIGURES 5.  
Nepal Response,  
image courtesy of  
Steve Birnbaum,  
on left, with UN  
aid worker





**SAVE THE DATE!**

# GEOGRAPHY 2050

EXPLORING OUR FUTURE IN AN URBANIZED WORLD



In 2014, we mounted an "Expedition to the Future", and a topic that prominently recurred through much of the dialog was "urbanization" since an ever increasing proportion of the world's population will dwell in urban areas by 2050, and the world's population will swell by billions. The geographies of our urban habitats are poised to change radically by 2050, and the implications of this for local, regional, and global decision makers are significant and paramount to our well-being. The spatial-temporal processes and patterns that will reshape our urban habitats are many and interrelated, and will manifest differently in different places over time. In short, there is no single "urban habitat," and it is imperative that we, as a global society, understand the variety and interconnectedness of the world's cities, as they are likely to evolve by 2050.

The AGS Fall Symposium brings together leaders in business, government, science, and education that might not otherwise have the opportunity to interact, and provides opportunities for discussion, debate, and collaboration to further the understanding of the future of our cities.

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► FIGURE 1.  
The problem is  
that a standards  
document is  
a complicated  
document.

# OGC

## Simplifies Standards Documents

Increasing the Adoption Rate of Standards

BY SCOTT SIMMONS / EXECUTIVE DIRECTOR / STANDARDS PROGRAM  
OPEN GEOSPATIAL CONSORTIUM / [WWW.OPENGEOGRAPHIC.ORG](http://WWW.OPENGEOGRAPHIC.ORG)

*The problem with standards is that a standards document is difficult to read and convert into a product. A standards document must be clear, internally-consistent, and testable... but there is no requirement that it be friendly. The Open Geospatial Consortium (OGC) has evolved the format by which its standards are published to facilitate coordination with other standards bodies and to ensure that implementations against those standards are compliant. We acknowledge that this format is not particularly friendly to software engineers and developers. See **Figure 1**.*

We publish standards to meet market needs and the only real measure of success of these standards is how frequently or broadly they are adopted. Recognizing the importance of adoption, we have initiated an effort to develop “implementer-friendly” standard documentation. This work is driven not just by the need to increase adoption, but also by feedback from our user community and members, including through our Ideas4OGC process [[http://external.opengeospatial.org/twiki\\_public/Ideas4OGC/WebHome](http://external.opengeospatial.org/twiki_public/Ideas4OGC/WebHome)].

Rapid prototyping of OGC Web Services software should not require that a developer understand the nuances of geodetic concepts; rather the developer should simply code against requirements. The development management and quality assurance process can include the requisite experience to ensure that the software is correctly addressing the geospatial concepts.

## WHAT WILL THIS NEW DOCUMENTATION LOOK LIKE?

In short, an implementer-friendly standard will:

- ﴿ be an alternative view of a standard;
- ﴿ be light in text;
- ﴿ reference background information from the normative (official) standard, yet not include that information;
- ﴿ include sample code;
- ﴿ provide links to sample data;
- ﴿ highlight reference implementations in the open source community; and
- ﴿ be published in an easy-to-use format such as HTML and/or in GitHub.

All OGC standards must adhere to a number of quite strict requirements to ensure that these standards can be implemented. Each includes a number of specified requirements and an Abstract Test Suite in an annex. The implementer-friendly view will make these requirements the most prominent part of the document. The requirements will be presented in an order and grouped according to the sequence in which they should be implemented. Each requirement will be accompanied by sample code, pseudo code, and/or implementation advice. Our goal as a standards body is to ensure that the tremendous work contributed by our Standards Program membership is distilled to more of a how-to guide than a detailed reference manual. See **Figure 2**.

Critical to this alternative view is keeping text to the minimum required to describe the methods necessary to implement the standard. Of course, some context is needed, but deep technical background or discussion of use cases is not critical as primary content for a developer. Such information is best provided through a reference back to the normative text.

Sample code and data will ideally be created or identified as part of the standard development process. For example, both the OGC GeoPackage Standard and the SensorThings candidate standard were developed simultaneously with participants creating test implementations of functionality as it was defined in the draft standard. Some Standards Working Group participants can choose to release pieces of their code as samples. OGC staff will assist in curation of such samples, but we do not plan to validate that each piece of code is correct – we assume that the community will self-vet the content.

The implementer-friendly view needs to be

## Getting a Map Image

The GetMap request queries the server with a set of parameters describing the map image. The values of the parameters are taken from the Capabilities document (see above). This [GetMap](#) request will create the image shown below:

The link has been truncated for readability. Use the link above to get the map image.

```
http://metaspacial.net/cgi-bin/ogc-wms.xml?
VERSION=1.3.0&
REQUEST=GetMap&
SERVICE=WMS&
LAYERS=DTM,Overview,Raster_250K,Topography,nationalparks,Infrastructure,Places&
STYLES=,&,
CRS=EPSG:27700&
BBOX=424735.97883597884,96026.98412698413,467064.02116402116,127773.01587301587&
WIDTH=400&
HEIGHT=300&
FORMAT=image/png&
BGCOLOR=0xffffffff&
TRANSPARENT=TRUE&
EXCEPTIONS=XML
```



◀ FIGURE 2.  
This is an example of how an implementer-friendly view might be formatted.

published in a format familiar to and useful for developers. HTML is an obvious candidate and certainly the simplest to manage, but we are also considering GitHub or other collaboration environments as mechanisms to host the documentation in a publicly-accessible repository. Regardless of the publishing environment(s), it is incumbent upon OGC to ensure that the content is synchronized across each.

## HOW WILL OGC MAKE THIS HAPPEN?

The concept and goal of the implementer-friendly standard effort has been discussed in various OGC member forums and subjected to strategic review by our Board of Directors. We have broad support and commitment by the people who actually do the work to create standards.

Initially, prototype implementer-friendly views will be published to a publicly-accessible OGC wiki page [[http://external.opengeospatial.org/twiki\\_public/Main/StandardTemplates](http://external.opengeospatial.org/twiki_public/Main/StandardTemplates)]. OGC staff and invited experts are working on the prototypes using guidance received to date from our membership and Board.

We will request that our members and the public

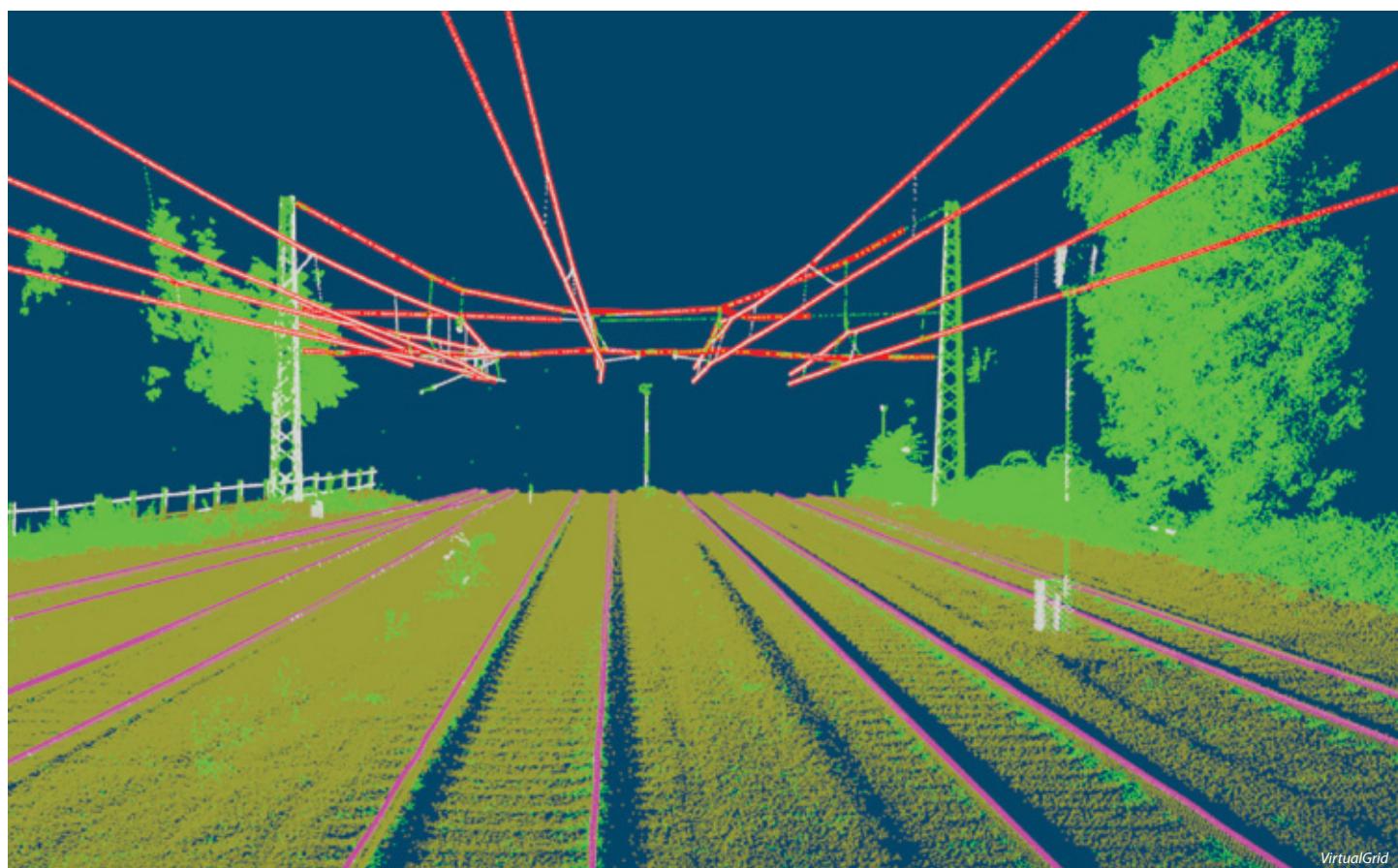
comment on the views. To be clear: the OGC always relies upon public comment and requires that the input from the public be considered before any OGC document is allowed to be approved in our process. Once the OGC members and public weigh in on the proposed content, adjustments will likely be made to the prototypes and formal guidance will be created to explain how the implementer-friendly standards will be published. The OGC membership will vote on this guidance document.

We envision the implementer-friendly standards to be living documents with OGC member and public contribution of sample code, data, and implementation advice. The initial publication of each will likely be somewhat thin on this extra information, but we will encourage the growth of informal documentation that supplements the official content.

Mechanically, all of the requirements and background information in the implementer-friendly view will be pulled directly from the published normative OGC standard. Each OGC standard is created, approved, and published to a specific normative version. Our end users expect that such normative versions are strictly controlled. Fortunately, OGC standards are now published in HTML and the implementer-friendly (and potential other) views of those standards will be directly linked from the original HTML content to ensure that the view does not deviate from the normative content.

## HOW CAN YOU HELP?

As mentioned above, the OGC welcomes public comment and participation in our activities. If you are implementing OGC standards, take a look at our new view for select standards and let us know if those views make implementation easier. Suggest improvements to the view. Submit sample code, sample data, or advice (even if informal) that can be included as extra information in the implementer-friendly version of a standard. ↗



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is a technical conference and exhibition showcasing the latest airborne, terrestrial, and underwater LiDAR as well as emerging remote-sensing and data collection tools and technologies.

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- Airborne, Terrestrial & Bathymetric LiDAR
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- Corridor and Utilities Mapping
- Data Classification, GIS, Data Modeling/Management
- Emerging Technologies
- Geiger Mode, Single Photon, FLASH LiDAR
- Integration & Data Fusion
- Mobile Mapping
- UAVs/UAS

### APPLICATIONS INCLUDE:

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- Civil Infrastructure
- Land and Natural Resource Management
- Urban Modeling
- Coastal Zone Mapping
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