

ISSUE 1 • MARCH 2020

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# ***GIS RESOURCES***

## **GEOSPATIAL TECHNOLOGIES TO PRESERVE HERITAGE MONUMENTS**

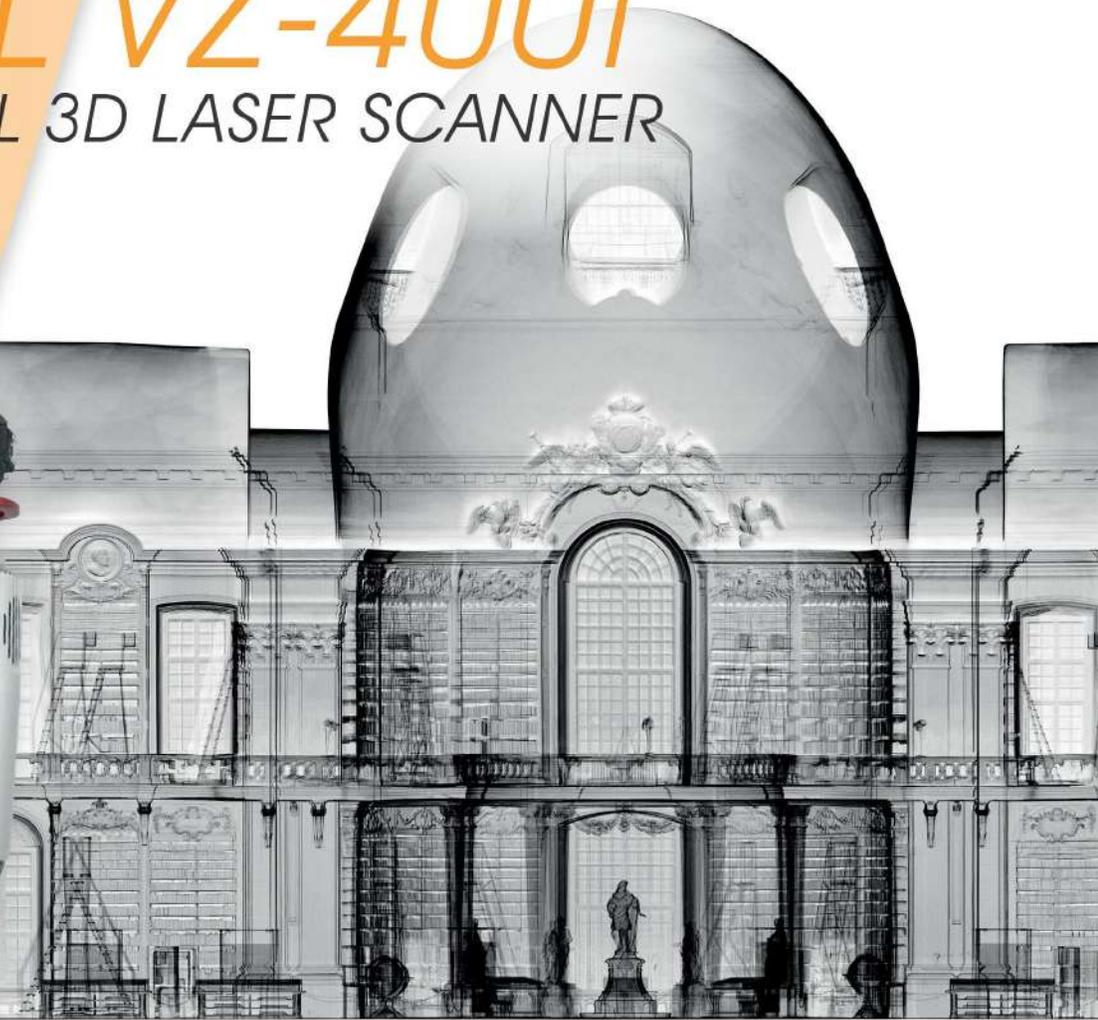
ARCHAEOLOGICAL SURVEYS  
WITH DRONE MAPPING USING  
MULTISPECTRAL IMAGING TO  
DETECT ANCIENT MAN-MADE  
STRUCTURES

HOW MOBILE MAPPING  
EMPOWERS HERITAGE SCANNING  
OF FUNCTIONAL  
INFRASTRUCTURE

ISSUES PLAGUING THE  
INDUSTRY AT THE  
GRASSROOTS LEVEL AND  
NECESSITIES OF THE HOUR

# RIEGL VZ-400i

## TERRESTRIAL 3D LASER SCANNER



a section through detailed scan data of the Austrian National Library

### RIEGL WAVEFORM-LIDAR TECHNOLOGY FOR HIGHLY ACCURATE SCANNING RESULTS IN EXTREMELY SHORT TIME

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# CONTENTS



Image Credit: NPCTT | Mount Rushmore Laser Scanning Complete

**5**  
EDITOR'S NOTE

## INDUSTRY

**6**  
ARCHAEOLOGICAL SURVEYS WITH DRONE MAPPING USING MULTISPECTRAL IMAGING TO DETECT ANCIENT MAN-MADE STRUCTURES

**10**  
HOW MOBILE MAPPING EMPOWERS HERITAGE SCANNING OF FUNCTIONAL INFRASTRUCTURE

**15**  
LIDAR TECHNOLOGY HELPS REVEAL RADIATION HOTSPOTS AT CHERNOBYL

## OUTLOOK

**17**  
SURVEYING AND MAPPING IN INDIA A GROUND REPORT - ISSUES PLAGUING THE INDUSTRY AT THE GRASSROOTS LEVEL AND NECESSITIES OF THE HOUR

## NEWS DIGEST

**24**  
NEWS DIGEST

# executives

## Editor

Ashok Prim  
Director (Retd), Survey of India  
India  
Email: ashokprim@gisresources.com

## Associate Editor

Dr. Venkata Ravibabu Mandla  
Ph.D IIT Roorkee, Australian Endeavour Awardee  
Associate Professor, CGARD, NIRD&PR, Hyderabad, India  
Email: mvravibabu.nird@gov.in

## Advisory Board

Dr. Ch Ramesh Naidu  
Ph.D JNTU - Hyderabad  
Professor, Dept. of Civil Engineering, GVPCE(A), Visakhapatnam, India  
Email: rameshnaidu@gvpce.ac.in

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Ph.D IIT Kharagpur  
Assistant Professor, Dept. of Civil Engineering, BITS-Pilani, Hyderabad, India  
Email: rajitha@hyderabad.bits-pilani.ac.in

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Email: gktripathy@gisresources.com

Dr. T. Ranga Vittal,  
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Email: rangavittal@gmail.com

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Alumni Course 500.73, IIS&M, Survey of India, Hyderabad, India  
Email: kcariappa@gmail.com

Venkat Kondepoti,  
PMP, ITIL, Msc. Geography  
Independent Consultant  
Calgary, AB, Canada  
Email: vkondepoti@gisresources.com

## Regd. Office

GIS Resources  
B-24, Jawahar Vihar, Malik Mau Aima,  
Rae Bareli, Uttar Pradesh, India - 229010  
Phone: +91 790 010 6154, 911 981 1729  
Email: support@gisresources.com  
Website: www.gisresources.com

## Advertising and Marketing Queries

Email: support@gisresources.com

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# editor's note

**T**he Pink City, Jaipur has recently been certified as a World Heritage City by UNESCO. It is a matter of pride not only for the city and its residents but also for the country and the whole world community for the efforts taken to preserve & conserve the cultural heritage of the city for a sustainable future. The citation goes on to say that this is a joint commitment to protect and preserve this heritage for future generations. Several cities in India have been honoured with the World Heritage City certificate.

Any World Heritage City tag comes with its responsibilities. It is important to preserve the architecture of the heritage buildings of the city and its monuments in order to keep them for future generations. Continuous efforts are required to protect the buildings and monuments from decay and destruction due to the vagaries of nature as well as from over enthusiastic tourists or residents who may just want to take a souvenir or two or may etch their names on buildings as amusement.

Besides the Heritage cities there are many precious heritage monuments that that need equal attention to their preservation. In fact, these standalone monuments are more prone to the depredations of nature and man, as being away from the immediate vicinity of any administrative machinery they are more at risk.

Geospatial Technologies are available to not only map the surfaces of the buildings and monuments to capture their architecture, but technologies are now available that also penetrate deeper into the surface of the building to show the materials that were used in their construction. Laser scanning and multispectral scanning techniques along with conventional surveying technologies combined with powerful data processing software will provide three-dimensional data regarding the architecture of the buildings and monuments and their neighbourhood that can be archived for future use. The image of the destruction of the Bamiyan Buddhas in Afghanistan and the temples in the Durbar square in Kathmandu, Nepal must make it necessary to archive the architecture of heritage buildings and monuments in order preserve their architecture for their future reconstruction.

Along with the preservation of the architecture of the heritage buildings and monuments it is equally important to preserve the art, craft, music and other cultural aspects that identifies a city as a heritage city. The ethos of a Heritage City is also due to its highly talented inhabitants who by their art, craft, music, food, ritual, festivals and culture give the city its vibrancy that is appreciated and recognised the world over.

Together they make for a truly heritage city, building or monument.

**Ashok Prim**  
Editor

# ARCHAEOLOGICAL SURVEYS WITH DRONE MAPPING USING MULTISPECTRAL IMAGING TO DETECT ANCIENT MAN-MADE STRUCTURES

An archaeology researcher in the United Kingdom uses drones and professional multispectral sensors to detect buried archaeological features previously seen only after time-consuming geophysical ground surveys.

by MicaSense, Inc.



Features that are invisible or very hard to see with the naked eye or in color pictures show up clearly in the multispectral data.

**A**griculture and archaeology: two disciplines that typically are not thought to go together. But in regions that are rich in archaeological features, the link can be strong.

Soils defines how plants grow and the characteristics of soils are many times affected by man-made features that are buried below the ground. This interaction leads to what are called "cropmarks". Sometimes these effects are noticeable to the naked eye. Many times, the soil variability is subtle and

results only in small changes in the vigor of the plant or the chlorophyll content in the leaves. That small variability (if natural or man-made) can be detected through remote sensing by using multispectral sensors, especially advanced sensors that are able to detect changes in chlorophyll content in leaves.

## How Multispectral Imagery Fits In

For over a year, Henry Webber, a Ph.D. candidate at the University of

## About Author



### MicaSense, Inc.

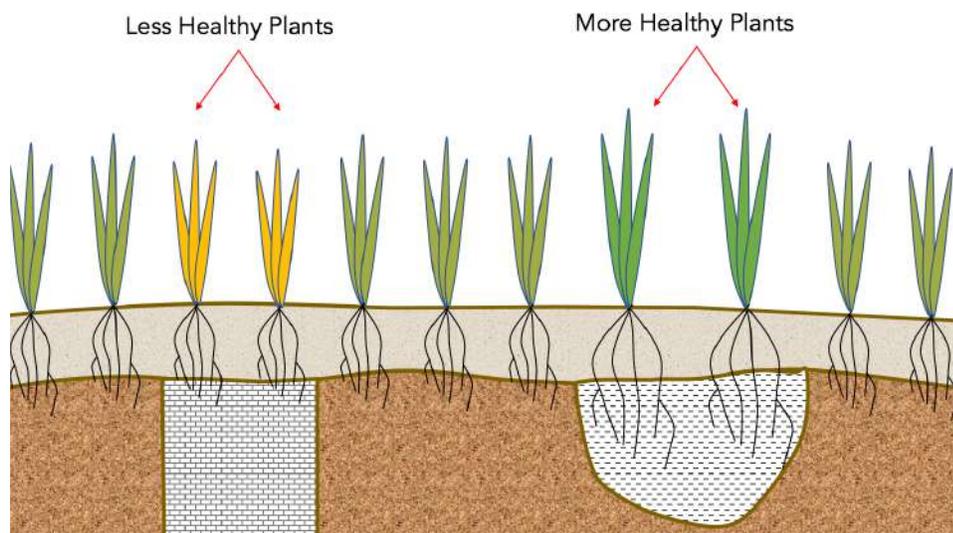
1300 N Northlake Way, Suite 100  
Seattle, WA 98103  
Email - [sales@micasense.com](mailto:sales@micasense.com)

Bristol's Department of Archaeology and Anthropology, gathered data using a drone equipped with a [MicaSense RedEdge](#) multispectral sensor. He flew over agricultural fields that have known archaeological features beneath them and has compared his findings with more conventional tools for surveying such as magnetic gradiometers, which detect changes beneath the surface by measuring the strength and orientation of the magnetic field of the ground below.

A winter wheat field near the village of Wilsford in the English county of Wiltshire provides an example. The field contains a Neolithic henge (a Stone Age monument that is thought to have been used for rituals and burials) as well as a Roman era farmstead. Henry has mapped archaeological features in this study area as part of his Ph.D. research using a variety of geophysical surveying tools. The magnetic gradiometer surveys have yielded impressive results, revealing in high detail the structure of archaeological features beneath the surface. But the information acquired with multispectral remote sensing has not only largely replicated these surveys but has also shown a previously unknown detail.

Referencing the figure below, the image on the left, obtained with the RedEdge sensor, is a representation of a vegetation index called the Chlorophyll Map. This index uses multiple spectral bands, including the Red Edge and Near-Infrared bands (not visible to the human eye) and is generally correlated to chlorophyll content on leaves. Brighter areas in the map indicate areas where the winter wheat has slightly higher index values (and correspondingly higher levels of chlorophyll). The image on the right comes from the magnetic gradiometer survey and shows an L-shaped structure under the ground.

The multispectral imagery shows that the boundaries of this archaeological



**Figure 1: Archaeological features buried under ground can affect plants that grow above them. Plants that grow on soil above the remains of a foundation for a wall (left) will generally not fare as well as plants that are above the remains of an old ditch that has been filled in (right).**



**Figure 2: Henry Webber holds the drone and the RedEdge multispectral sensor he used in his research. Photo courtesy Henry Webber.**

feature extend to the bottom and to the right, forming what appears to be a rectangular enclosure. This underground feature, not directly visible in the geophysical survey, becomes evident when the effects of changing soil affect the health of the plants above. "This discovery invites a number of exciting questions," says Henry. "Is this enclosure part of the Neolithic henge? Or is it part of the Roman farmstead, making it much larger than originally thought?"

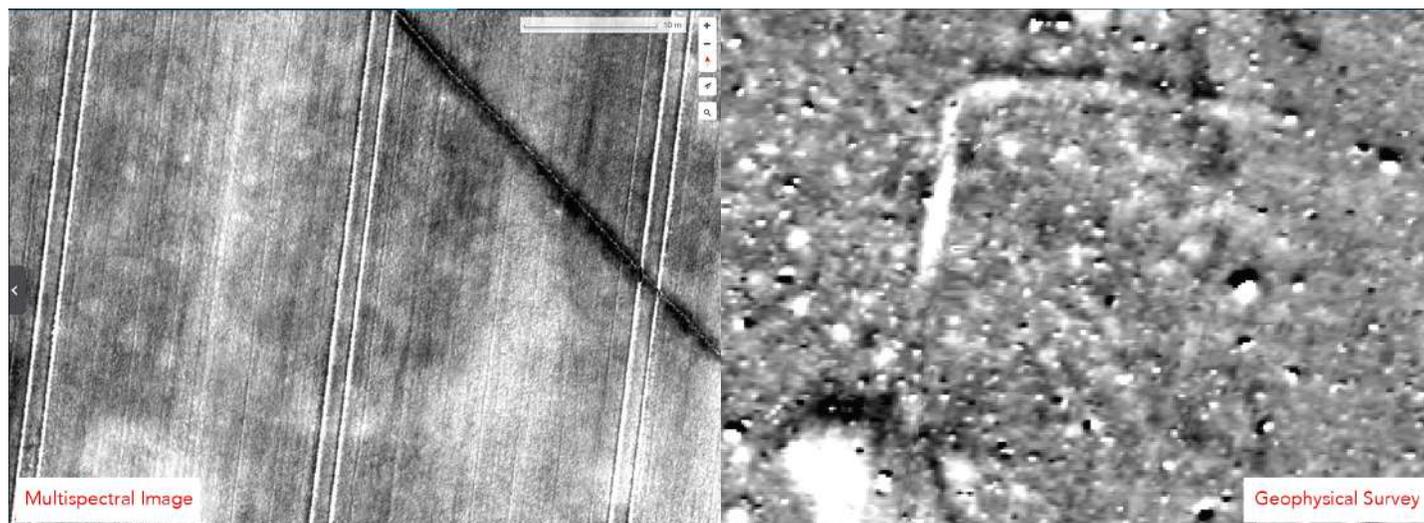
Henry is hoping that future archaeological surveys in this area will help answer these questions.

In the same wheat field, a large Neolithic henge is clearly visible. A number of small circular pits lie buried just below this feature. While inspecting the results from the multispectral data, Henry noticed that two of the three pits were clearly visible in the chlorophyll map output but not in the geophysical

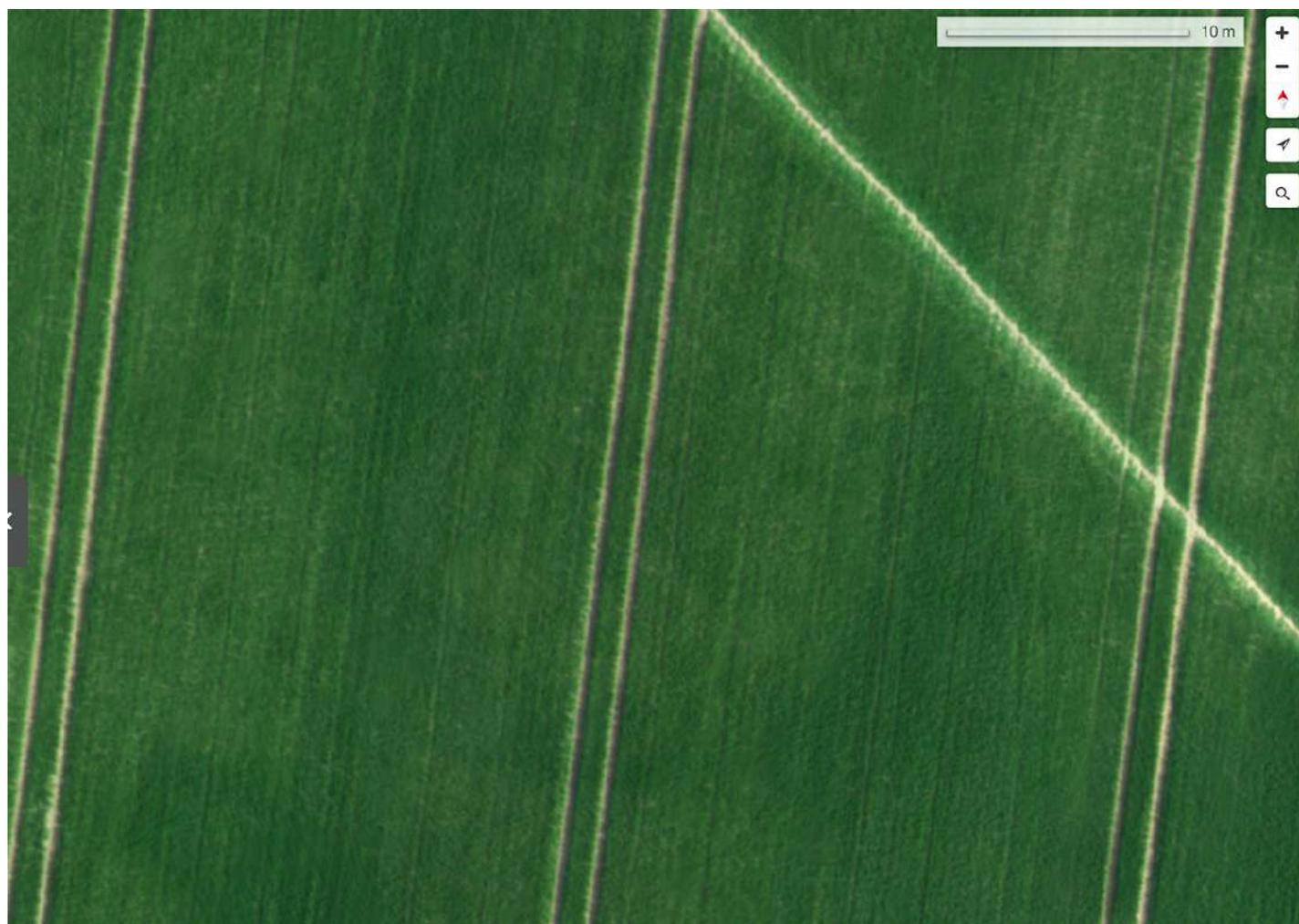
survey. Henry believes these findings can help guide researchers to

understand the circumstances under which magnetic-sensor based surveys

sometimes miss certain archaeological features.



**Figure 3:** A rectangular enclosure buried underground becomes visible when using multispectral data and vegetation indices sensitive to chlorophyll content (left), revealing features that were not directly visible using conventional geophysical survey tools (right).



**Figure 4:** RGB color image of the Wilsford enclosure for reference.

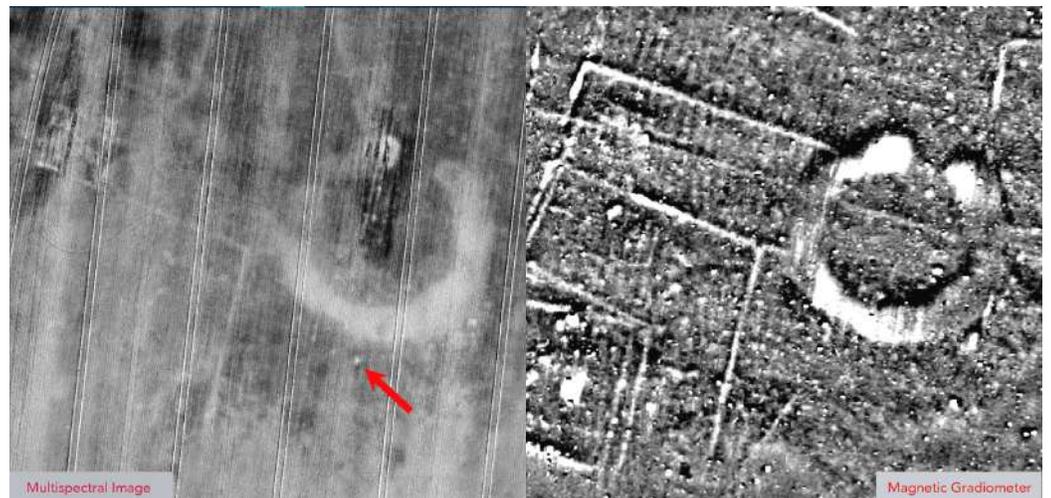
## A Roman Villa Emerges Through A Wheat Crop

Near the village of Kingscote in Gloucestershire, England (about 100 miles east of London) lie the buried remains of a Roman settlement. Dating back to between the 1st and 4th century AD, this archaeological site is comprised of approximately 75 buildings and structures. One of the most intriguing structures in this site is a Roman villa that lies underneath a wheat field.

Henry captured multispectral data over this site and was surprised to see the results. The Figure 7 (left) shows an image acquired with the multispectral camera, featuring the chlorophyll- sensitive vegetation index NDRE. An overlay of the outline of the Roman villa (obtained from archeological surveys and excavation) is shown on the right. For comparison, the standard RGB color image of the same area is shown as well. "It is exciting to see how well the NDRE images match the geological survey results," says Henry. "Features that are invisible or very hard to see with the naked eye or in color pictures show up clearly in the multispectral data".

## A Promising Set of First Results, And More to Come

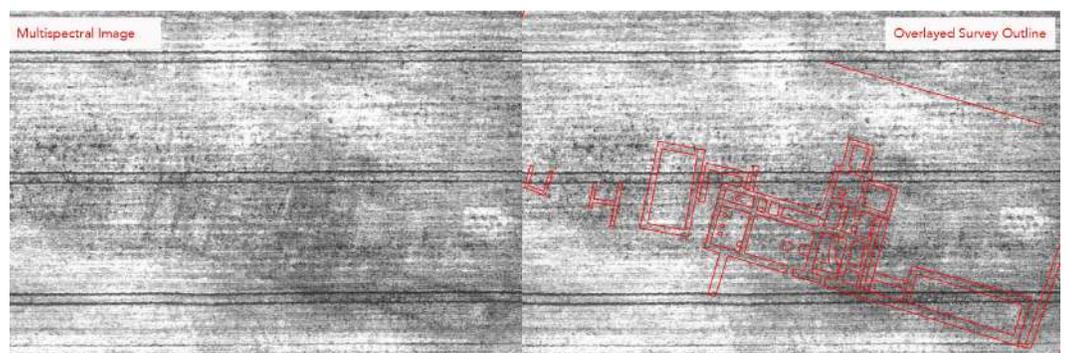
Henry is looking forward to continuing to explore the capabilities of multispectral imaging using advanced sensors as a tool to complement other archeological tools. "It is clear that there is value in this type of imagery, even in areas that have been mapped before," Henry explains. "The ability to see new features and potential anomalies and to compare existing surveys with new ones opens new possibilities for understanding more about the ancient structures that lie beneath our feet."



**Figure 5: Another example of multispectral data complementing geophysical surveys. Here, two circular pits below the henge are visible in the chlorophyll map image (left) but not in the map generated with magnetic gradiometer surveys (right).**



**Figure 6: RGB color image of the buried villa for reference.**



**Figure 7: (left) Shows an image acquired with the multispectral camera, featuring the chlorophyll- sensitive vegetation index NDRE. An overlay of the outline of the Roman villa (obtained from archeological surveys and excavation) is shown on the right.**

# HOW MOBILE MAPPING EMPOWERS HERITAGE SCANNING OF FUNCTIONAL INFRASTRUCTURE

Innovative reality capture technology helps surveyors offer advanced laser scanning and BIM services for heritage scanning.

by Bulent Yusuf



NavVis mapping partners Vermessung Schubert and Levels3D completed projects on subway stations in two European capitals that double as historical landmarks.

3D BIM model of Gumpendorfer Straße Metro Station in Vienna, Austria

Sites of important historical value can represent more than just pretty monuments for tourists to visit and take pictures. They can also play an integral part in the built environment – heritage sites which also serve a functional purpose.

An excellent example of this principle is metropolitan transportation, the subway systems that ferry hundreds of thousands of people around a city each day. Many of the subway stations and tunnels in Europe were first built in the late 19th century, designed by the

leading architects and engineers of their time, and they're still in continuous operation more than a century later.

The beauty of a heritage subway station is that they belong to a different architectural era, proudly representing styles of design and decoration which are very different from the modern day. But their elegance and sophistication aren't impervious to the ravages of time. Changing social and environmental conditions can accelerate decay and damage at these historical sites, so

## About Author



### Bulent Yusuf

Content Marketing Manager  
NavVis GmbH  
Blutenburgstr. 18, 80636 Munich, Germany  
Email - [bulentosman.yusuf@navvis.com](mailto:bulentosman.yusuf@navvis.com)

much so that they require ongoing conservation and restoration.

Using traditional methods, attempts at restoration and conservation at a subway station can be especially challenging. Incomplete documentation or paper floorplans which do not comply with modern standards is just one obstacle. Another problem is access: these subway stations function as the beating heart of the commuter journey. Projects require precise planning to carry out all necessary work without causing delays and disruption.

Modern technology in the form of 3D laser scanning is the solution. Not only can these mapping systems speed up the process, but they can also raise the quality of documentation and, by extension, the quality of restoration by helping create intelligent models for the purposes of building information modeling (BIM). This specific stage of the process is called scan-to-BIM, whereby a high-quality point cloud of the site is generated by a 3D laser scanner and fed into the BIM model.

Point clouds are great for documenting existing conditions, because the data takes the form of billions of points of light generated within a three-dimensional frame. When registering these points with the correct reference, they can provide a detailed, precise, and accurate representation of the as-built condition of a site.

In the sections below, we'll cover two projects completed in this manner at historical subway stations by NavVis Mapping Partners [Vermessung Schubert](#) in Austria and [Level3D](#) in France.

### Case Study: Gumpendorfer Straße Station in Vienna, Austria

Gumpendorfer Straße station in Vienna, Austria, dates back to 1898. Famous for its curved platforms and structure, passengers and even tourists often stop to admire the historic landmark designed by the famed architect, Otto Wagner.

But while historical buildings often become local attractions, archaic floor plans tend to lose their charm over time. In the case of Gumpendorfer Straße station, the original plans were the paper drawings from 1898. There have been many changes in the intervening century, including a major renovation that took place from 2006-07 to increase station accessibility.

Gumpendorfer Straße is the first of 109 public transport stations across Vienna where floor plans are undergoing extensive updates to introduce a BIM workflow. In the summer of 2018, NavVis Mapping Partner Vermessung Schubert, a surveying company based in Austria, was chosen to pitch to station owner Wiener Linien GmbH & Co KG why they should provide the scanning and BIM services.

To give themselves a competitive edge, they showed the prospective client that they can offer them the next generation of technology for the built environment: reality capture. And when they showed them that the end product would include the [NavVis IndoorViewer](#) visualization software, they won the pitch.

### How Reality Capture Software Applies to Heritage Scanning

Since adding the [NavVis Indoor Mobile Mapping System \(IMMS\)](#) to its arsenal of surveying tools, the team at

Vermessung Schubert has been able to scan large indoor spaces much faster. The IMMS makes it much more efficient to update BIM models for existing buildings.

But the real selling point is that captured building data and creating 3D models are no longer just for BIM users. Potential customers – and custodians of historic buildings – are always delighted to find out that they will get browser-based, virtual access to their premises. They can "walk through" the site from their desktop and use this virtual representation to verify measurements remotely.

For surveyors, reality capture software makes it easier to capture more data without additional effort. The NavVis IMMS is on wheels and automatically captures point clouds, dense imagery, and sensor data as the operator pushes the device through indoor environments.

### A Laser Scanning Process That's Fast and Accurate

Of course, there are now multiple reality capture software and hardware solutions on the market. But very few are suitable for being deployed in large indoor environments – that's what sets the NavVis IMMS apart.

A major metropolitan transport hub, for example, is notoriously tricky to capture, with large, open spaces, and long winding tunnels and

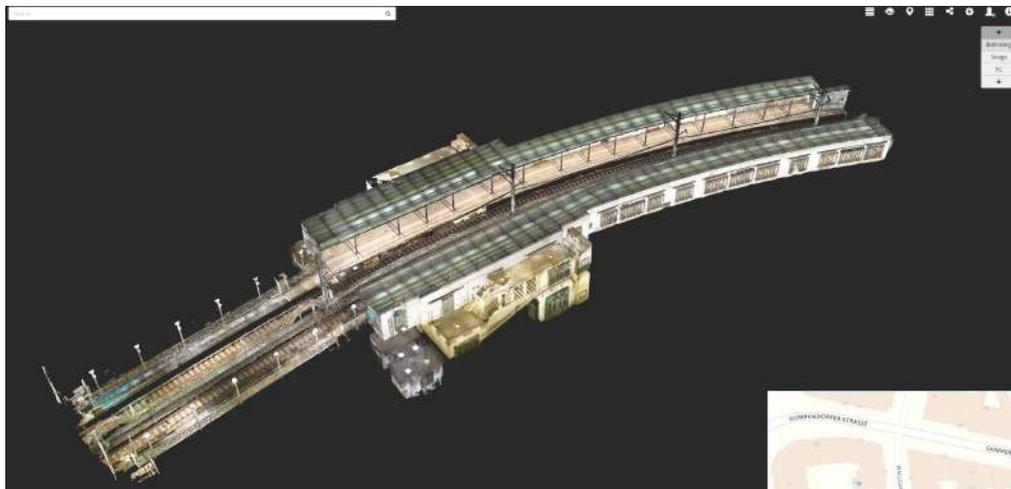


Figure 1: Colored point cloud of the Gumpendorfer Straße Metro Station in Vienna, Austria, captured by NavVis IMMS and displayed in NavVis IndoorViewer.

corridors. And then there's the rush of daily commuters and travelers scurrying to and fro at peak times.

Gumpendorfer Straße Station is a perfect example of this type of complex indoor environment. The team at Vermessung Schubert had to capture open spaces, long platforms, and even the small technical rooms that have kept trains running day after day, week after week, year after year since 1898.

More about the site: Gumpendorfer Straße Station encompasses over 2,000 square meters. Capturing this space with the NavVis IMMS took a little under six hours – half the time it would take using static laser scanners.

At the same time, 46 ground control points (GCPs) were captured by a total station. While this step is not necessary for every situation, GCPs are often used in the surveying industry to increase the accuracy of laser scans. With NavVis technology, these ground control points can accurately position the scan in relation to the real world around it, and to automate dataset alignment.

### Granular BIM Models with Browser-Based Access

NavVis technology made it possible to quickly capture the data needed to bring a historical European structure to BIM. The client especially approved of the approach to minimize disruption to the passengers and being able to turnaround large indoor spaces much faster. But in the end, it was the addition of the NavVis IndoorViewer that won the pitch for Vermessung Schubert.

In short, BIM serves many useful purposes but is limited to those users who have access to advanced reality capture software and the knowledge of how to use it. The NavVis IndoorViewer democratizes building data by offering access to every stakeholder, making it a valuable addition to every surveyor offering.

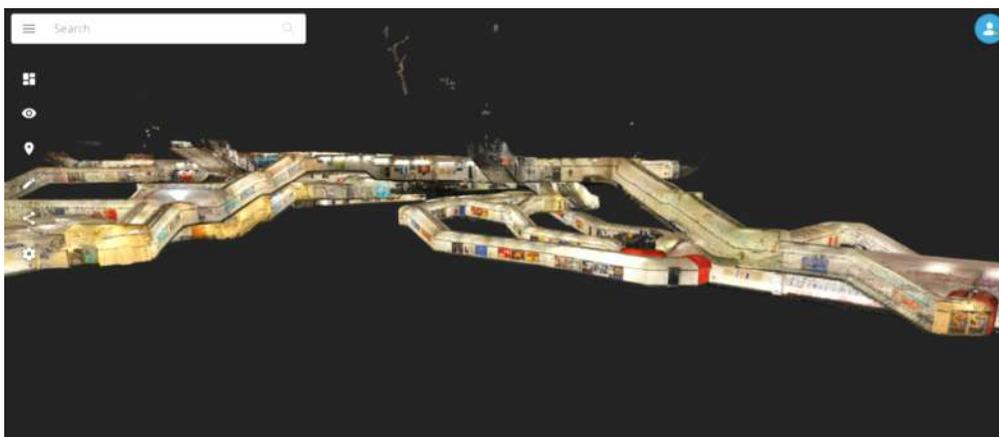


Figure 2: Colored point cloud of the République Métro in Paris, France, captured by the NavVis IMMS and displayed in NavVis IndoorViewer.

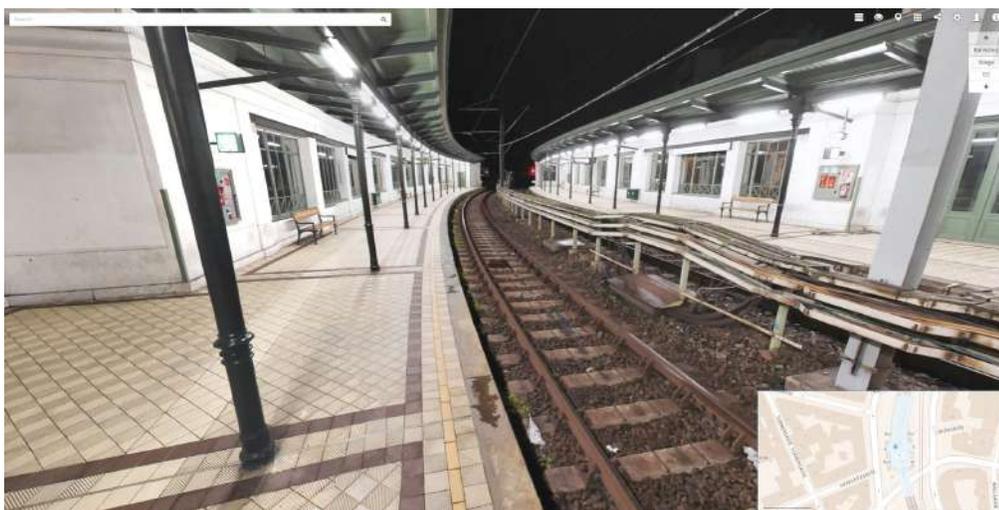


Figure 3: Panoramic image of the Gumpendorfer Straße Metro Station in Vienna, Austria, captured by the NavVis IMMS and displayed in NavVis IndoorViewer.

### Case Study: République Métro in Paris, France

LevelS3D is a French surveying company and NavVis Mapping Partner who took on a unique project with the [Régie Autonome des Transports Parisiens \(RATP\) Group](#), the state-owned operator of public transport in the city of Paris.

RATP had an issue with water seepage in the République Métro in Paris. To address the problem, they contracted LevelS3D in early 2018 to map the entire station so that maintenance teams could identify sources of water seepage from any location using high-definition 360° imagery and assess its status. The project is the first-ever digitization of a major metro station in the bustling capital.

As Dario Gaudart, Project Manager and BIM Expert at Wiener Linien GmbH & Co KG, explains:

*" Having experienced the benefits of designing new construction projects in BIM, we decided to test it in our existing buildings. The NavVis mobile mapping system captured the data needed to create BIM models and provided added value with the browser-based IndoorViewer. With the NavVis IndoorViewer, our building data will no longer be restricted to those team members who know how to use BIM software, which is an excellent starting point for increasing the use cases of digital building technology. "*

In short, the goals of the project were to map the République Métro in Paris in its entirety, create an inventory of 360° panoramic images to help identify and assess water seepages, and provide remote access for barrier-free site inspections.

### The Bigger the Project, The Bigger the Challenge

The République Métro is not just a site of historical value; it's one of the largest and busiest stations on the RATP network, where five separate subway lines converge beneath the Place de la République. The complex character of such a heavily trafficked venue creates a few challenges for indoor scanning.

Firstly, it's a large, complex area. The République Métro has 12,000 square meters spread out across an extensive system of corridors of varying sizes and shapes, connecting the whole station on multiple levels.

Secondly, the team at LevelS3D had a very narrow time frame for capturing the data. Closing the station for the scanning project wasn't an option; the disruption of services and cost for RATP would have been immense.

Thirdly, there was the matter of safety and security, with multiple security and access constraints for managing the stream of people in and out of the station daily.

### Versatile 3D Scanning Equipment for A Complex Environment

LevelS3D was undaunted by the scale of the scanning project, however, because they had a decisive advantage – the NavVis IMMS, capable of fulfilling all the customer requirements regarding data quantity, quality, and time needed.

In preparation for executing the indoor scanning, RATP provided 2D floor plans and guidance so that LevelS3D could cover the whole area in the shortest time possible. The team also conducted a single on-site inspection before commencing work.

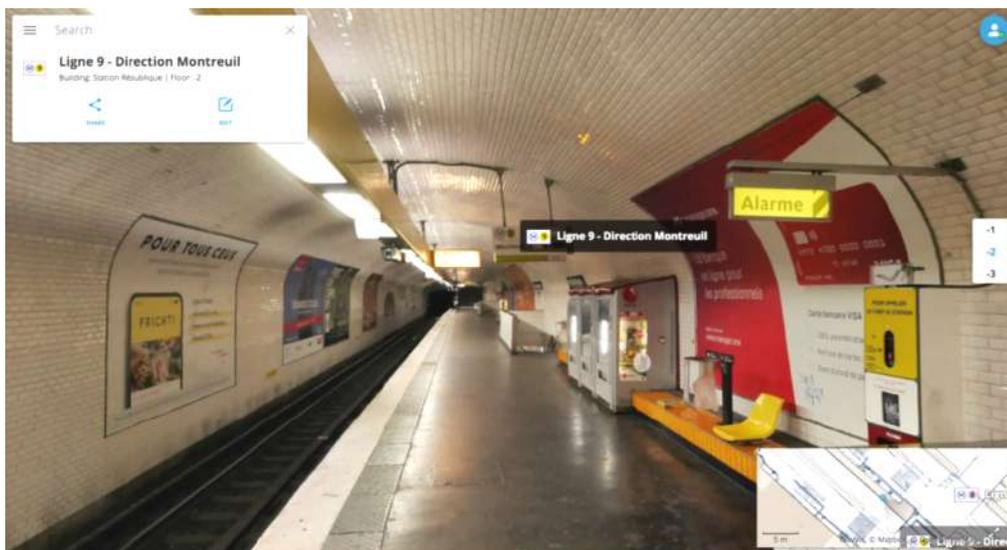


Figure 4: The République Métro in Paris, France captured by the NavVis IMMS and presented as an immersive 360° walkthrough in NavVis IndoorViewer.

### The On-Site Scanning Process with The NavVis IMMS

On the first day, the mobility and versatility of the NavVis IMMS allowed for a smooth scanning process throughout the whole station. Thanks to the ability to adjust the device's height and width, features like uneven ramps and narrow spaces weren't an obstacle to cause any delays.

The scanning process took place over two nights, while the station was closed, between the hours of 1 am and 5 am. That's a tiny window of four hours per night. The allotted time proved to be more than enough, however, since the NavVis IMMS can scan up to 30,000 square meters per day.

How is this possible? Every NavVis IMMS has four laser scanners which gather point cloud data, plus six cameras that simultaneously capture high-resolution images of the surroundings. In effect, LevelS3D was able to quickly and reliably capture all the data from the République Métro without incurring any expensive setbacks.

### Delivering One Project, Enabling Multiple Use Cases

From RATP's perspective, the project upgraded its ongoing maintenance responsibilities at République Métro.

Using the NavVis IndoorViewer, they can assess the condition of the tunnels quickly and more efficiently, and make faster decisions, all while having access to a single source of information on which they can collaborate and share insights.

According to Véronique Harroch, RATP Project Manager: "As a project manager, this tool allows me to have a 3D picture of the station from the beginning of the project. It has the advantage of being searchable anywhere, any time, by all project stakeholders."

Moreover, the project is already enabling other use cases for various departments of the RATP Group, including maintenance activity monitoring and the possibility of BIM modeling for other stations.

According to LevelS3D, the project counts as a significant success for the company. Their value proposition – powered by NavVis technology – secured a cornerstone project with a client operating multiple public transport stations and associated facilities throughout France. And most importantly, it's paved the way towards more large-scale scanning projects on a nationwide basis.

**Wrapping Up**

What these two case studies make abundantly clear is that scan-to-BIM is an incredibly valuable technique to create as-built documentation, which forms the most accurate basis from which to carry out renovation, maintenance, or restoration works of

a heritage site. And once the initial project is complete, this data can be stored and retrieved for future use or fed into subsequent BIM models. As further advancements in mobile mapping technology come to market, the scan-to-BIM workflow will become faster, more accurate, and more

reliable while overcoming the specific and unique challenges posed by a historical site. Not every heritage site is going to be a static monument; preserving their use as functional infrastructure in the present day is a tremendous and perhaps even noble application for 3D laser scanning.

**About**



NavVis was founded in 2013 to bridge the gap between outdoor and indoor digital maps. NavVis has developed 3D scanning hardware, the NavVis Indoor Mobile Mapping System, and 3D visualization software, NavVis IndoorViewer, which serve as the core technologies for seamlessly implementing and operating digital twins. Headquartered in Munich with offices in New York and Shanghai, NavVis currently employs 200 people around the world.



Vermessung Schubert offers surveying, 3D mapping, 3D laser scanning, BIM 3D modelling based on Revit or ARCHICAD, 2D floorplans, 2D intersections, 2D building faces, all together combined as basic input of general planning and facility management tools over the building life cycle.



LevelS3D is a start-up founded in September 2012 by Yannick Folliard, with a focus on 3D digitization applications and augmented reality. LevelS3D is developing a scan3D application for next-generation tablets and smartphones, equipped with a sensor depth (compatible equipment). This application is designed for building stakeholders and more particularly design offices, architects, general contractors and space fitters.

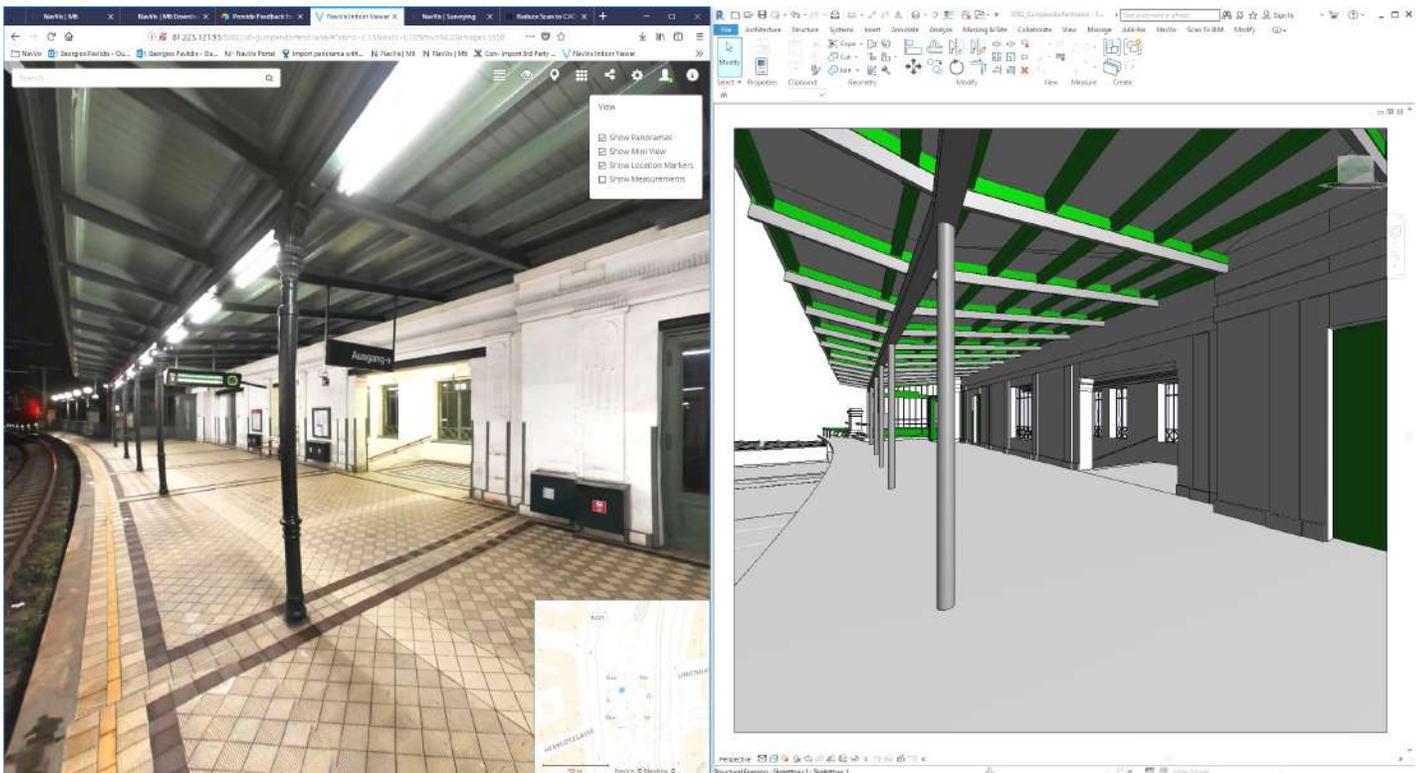


Figure 5: The République Métro in Paris, France captured by the NavVis IMMS and presented as an immersive 360° walkthrough in NavVis IndoorViewer.

# LiDAR TECHNOLOGY HELPS REVEAL RADIATION HOTSPOTS AT CHERNOBYL

A team of multidisciplinary researchers have used Routsescene's UAV LiDAR technology to map radioactive hotspots in greater detail than ever before.

by Jason Rogers



Routsescene's 3D mapping solution used to create map of radioactive hotspots in Chernobyl's Red Forest.

It's been over three decades since reactor Number 4 at the Chernobyl Nuclear Power Plant in Ukraine melted down, leading to the world's worst civilian nuclear disaster in history. Now, a team of multidisciplinary researchers have used Routsescene's UAV LiDAR technology to map radioactive hotspots in greater detail than ever before.

Professor Tom Scott, from the School of Physics at the University of Bristol, UK, led a group of researchers from the UK's National Centre for Nuclear Robotics (NCNR) to conduct surveys

on multiple sites of interest within the Exclusion Zone which surrounds the damaged reactor. The surveyed sites included Buriakivka village, a settlement abandoned following contamination from the power plant accident, and the "Red Forest", a natural woodland area located the closest to the reactor, hence the most heavily contaminated.

Working closely with local Ukrainian authorities, the team operated Unmanned Aerial Vehicles (UAVs) to perform a series of radiation mapping surveys. Routsescene's lightweight LidarPod was flown on a

## About Author



### Jason Rogers

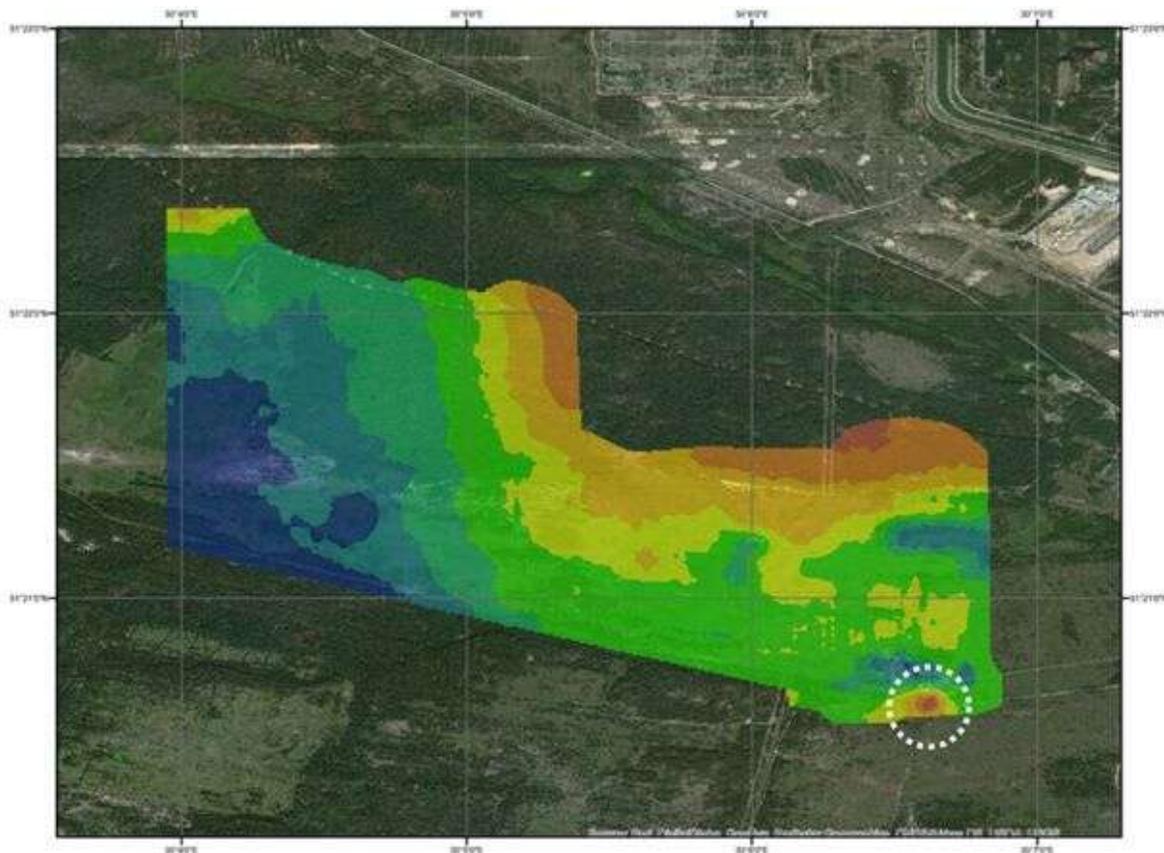
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Routsescene  
Scotland, UK  
Email - [jason@routsescene.com](mailto:jason@routsescene.com)

DJI M600 hexacopter drone over the sites of interest. The point cloud data collected was processing using Routsescene's LidarViewer Pro software to generate a detailed Digital Terrain Model (DTM) and was overlaid with the results from a gamma spectrometer survey, undertaken to measure radiation intensity, to locate the exact sites of the radiation hotspots.

Routsescene's lightweight LiDAR technology was chosen as the team "Required high-resolution terrain and building models as inputs to a hotspot identification algorithm. It was also very useful to capture the 3D shape of some buildings," says Dr. Kieran Wood, Senior Research Associate at the University of Bristol.

"The algorithm converts the aerial radiation intensity recorded by a UAV survey into a ground intensity map. This process is heavily affected by the distance between the airborne radiation sensor and the ground/buildings," explains Kieran, "Hence high accuracy LiDAR based models were essential."

Routsescene's LidarPod includes a carefully selected array of sensors delivering survey-grade high resolution results. Up to 1.4 million data points per second are collected from 32 different lasers angled in a 40-degree field of view. Crucially, the Routsescene solution enabled the researchers to conduct operations and complete real-time QA monitoring at a safe distance from the radioactive sites, keeping them from harm.



**Figure 1: Map of Red Forest showing area of unexpected high radiation levels.**

### Planning The Flight

Over ten days, the researchers deployed fixed-wing drones to fly multiple missions over the sites of interest. They coarsely mapped a grid over an area measuring about 6 square miles. Routsescene's remote-sensing LiDAR technology was then used to create a detailed 3D map of specific areas of interest.

Using the data obtained from the surveys, the researchers were able to create the most detailed map of radiation in the forest to date. The data also revealed radiation anomalies at previously unsuspected locations.

### The Results

While the general widespread radiation contamination in the Red Forest was already known, the results revealed that the radioactivity was unevenly disturbed. Although radiation intensity had reduced in some areas, other areas remain highly contaminated confirming continued danger to anyone accessing those areas.

The researchers detected one unexpected hotspot in the ruins of a facility that was used to separate contaminated waste during clean-up efforts immediately after the accident. Tiny fragments of spent nuclear fuel, found at an old mechanical sorting facility was emitting so much radiation that exposure for just a few hours would dose a person with as much radiation as is usually absorbed over an entire year, Professor Tom Scott told the BBC.

This recent expedition to the Red Forest was the first in a series of surveys that NCNR will conduct in Ukraine over the next year. The new maps will help officials prevent risks to visitors to the area and the full results will be published soon.

For more information about the Routsescene UAV LiDAR system including the LidarViewer Pro software and new Bare Earth tool, please visit [www.routsescene.com](http://www.routsescene.com)

# SURVEYING AND MAPPING IN INDIA A GROUND REPORT - ISSUES PLAGUING THE INDUSTRY AT THE GRASSROOTS LEVEL AND NECESSITIES OF THE HOUR

The previous article shows the gap that existed between what is projected and that what exists on the ground zero. However, this article gives reasons for this gap and presents structurally the fault lines that plague the industry.

by M.D. Karan Cariappa



This article is in continuation to previous article which was based on experience as a Qualified Surveyor on Ground Zero.



## Introduction

In my previous article, I explained in detail the ground realities of what a person seeking to be a professional can expect or hope to expect from the industry. I also brought out some ground truths about the industry that surely would have generated some interest.

Feedback on points that had been highlighted in the article have pushed me to have write a follow-up article. An article that goes a step further from story-telling and quantifies the

issues plaguing the industry not in the form of numbers or finances but, an article that lists down point wise-from my point of view, the problems the industry faces, in the form of what exists and what can be.

Thus, in the following article, I have worked towards presenting structurally the fault lines that plague the industry. As I have said before, identifying and accepting the presence of a problem goes halfway in solving it, I have not delved too deep into providing solutions to

## Submitted By



### M.D. Cariappa

Survey and Engineer & Professional India

Email - [kcariappa@gmail.com](mailto:kcariappa@gmail.com)

these problems. I expect the solution to these issues may be found in the discussions that are subsequently opened-up by the readers. Though many of these have been brought out and discussed earlier, some may be new to many. Many readers may not have thought about certain points before and others may also add their two bits to the listed discussion. Also, I request the readers to not go by the title of the article, "*ISSUES PLAGUING THE INDUSTRY AT THE GRASSROOTS LEVEL AND NECESSITIES OF THE HOUR*", it is rhetorical and doesn't completely encompass the issues being discussed. I have used the words in the title to generally explain the contents of the article, so please bear with me!!!!

To get a better understanding about where we start from, you might also want to get your hands on the previous part in the link below, [SURVEYING AND MAPPING IN INDIA - A GROUND REPORT - THE PAST, THE PRESENT & THE FUTURE](#).

### THE GAP

In the previous article, I had explained the gap that existed between what is projected and that what exists on the ground. As we go ahead, I have listed a few of the reasons for this 'GAP'. To provide a structured understanding for the reader, I have divided this list into three categories, namely, Grassroots, Industry Level and Government or policy level. Many of the points listed below may be connected or related across categories and one may be the base reason for the other existing. But it would be important to address each of these points in their respective categories as well as a whole.

### Grass-root Level

I have chosen to categorize this list of issues under the grass-roots category as it would certainly be an interesting read for youngsters and freshers planning on entering the industry. They may also glean some knowledge on gaining skill-sets in the areas that the industry requires after reading this.

- **Lack of Skill**

Surveying and Mapping is a Line of Work completely based on the Science of the Earth and the Mathematics supporting it. To put it in other words, it can get extremely complicated sometimes and is based on concepts and theories that have been researched over the years. But as these concepts undergo constant tweaking and further development so does the science of Mapping. Thus, apart from being a line where a professional need to have strong foundations or 'fundas', as we say in the local lingo, continuous updating of skills and knowledge is also a necessity.

Currently, most of the personnel involved in the industry are from backgrounds not related to surveying and mapping so most of the skill sets they have developed over some time are, with the time-tested methods of 'trial and error'. Though this has been an important way the industry has survived thus far, as time progresses and the industry in India gets more mature with projects demanding specialized skills becoming the mainstay in the industry, we surely need personnel and professionals with equal capability, qualifications, and knowledge in this line of work.

My next point will shed some light on the reasons for this shortcoming and will help the reader get a better understanding of the educational ecosystem currently in place or the lack of it, in India.

- **Lack of Means for Skill Development**

Directly related to the point I am making above is the huge vacuum that exists in this country, of sufficient training institutes, organizations and skill Development centers that can provide a person with requisite and relevant skills to make a difference in this field of work.

When it comes to providing a student or a professional with the required skill set, it has been found that the presence of an ecosystem has been found wanting. By an ecosystem, I intend to address all the levels of learning and training that are present in this industry, right from the bottom to the top, at managerial levels. Now, it would be wrong to say that, we are the only industry that suffers from such apathy in India, but being a part of this industry, we need to have more open discussions on this topic.

From the point of view, of a field data collector, I will not be wrong in saying that, there is only one Institute in the whole of the country that truly deals with all aspects of the collection of field data related to Surveying and Mapping, in the true sense. That would be the Indian Institute of Surveying and Mapping in Hyderabad, run and managed by the Survey of India, the National Mapping agency. Having been an alumnus of this institute many would blame me for being partial in my statements, but one look at their courses' structure would certainly interest a non-believer. I also agree that over the years they have fallen behind at updating their course content, but notwithstanding, when it comes to an experience of living out in the field and collecting data, the professional courses at IISM are incomparable. To provide more information on this, I will soon be coming up with an article on the course I attended and the institute.

Apart from this, there exist countless institutes offering qualifications at different levels, all over the country. But after having worked with personnel from these institutes and centers, I believe that the level of training required to handle real-life problems is just not there and this leaves a lot to cover, which is usually done once a person joins a company.

This puts undue stress on private organizations, by making them divert many of their resources to training, which otherwise can easily be used in covering productive profitable work.

- **System for Formalizing Unqualified Surveyors**

Going Back to my previous article where I had explained the entry and existence of unqualified surveyors, I believe that this category of the workforce has made itself indispensable to the industry and if handled well, they would certainly be more of an asset than a burden, as they are currently looked upon.

Today, surveyors holding no formal degree or educational qualifications related to mapping occupy more than 60% of the workforce in the industry. At the lower level, these are much higher. Over the years, this group of professionals has gained immense knowledge about the workings of this line. This knowledge coupled with years of roughing it out on the field has given them deep insight and understanding of the way things work, not only with equipment and documentation but also into the workings of projects, dealing with the bureaucracy as well as the general public. Many would disagree with this point, but if anyone has ever been present during a settlement exercise in a village in rural India or an event that deals with the award of compensation for the Rights of Use for a pipeline, you will certainly agree with me.

To put matters into perspective, I wholeheartedly suggest, the formalizing of their experience in the form of a qualification, so that they may be recognized as 'made men' in this industry. This can also be used as a method to provide them with training in furthering their skills and capabilities. Currently, these surveyors do not enjoy the same status that degree holders and others enjoy, and this

saddens me to a great deal because the efforts and sacrifices made by them have been no less, if not more. The details of such an exercise, of formalizing their experience, can be worked out at a later stage or may be arrived at after discussions between all the stakeholders involved, but what I would want to impress here is that the very fact is that such an exercise is needed and the faster it is done, it would be advantageous to the entire industry.

- **Surveying Being Hidden in the Shadow of Civil Engineering**

To me this point lies close to heart and having completed my Automobile Engineering at my graduate level, I feel I possess enough credentials to back this thought process.

When I finally moved my profession to Surveying and Mapping, the world that opened up to me was completely new and the experience was one that I had not expected at all. Having worked in the construction industry, I had expected, Surveying and Mapping to be an offshoot of Civil Engineering and Oh Boy! Was I wrong?

To the uninitiated, Surveying and Mapping is a world and science onto itself and pairing it with any other field would not do it justice. Many Civil Engineers reading this would disagree with me, but I would not blame them for that. Civil Engineering does use a lot of Surveying, but Mapping is something that is beyond the scope of Civil Engineering to contain. Any disagreeing notions would be completely laid to rest once you have worked on a mapping project and dealt with the complications involved - Civil Engineering does not have the solutions!

Surveying as a science needs to be brought out from the shadow of Civil Engineering and I discuss

this in detail, further in the article.

- **No Clear Picture for A Fresher to Jump into The Line**

Many new entrants in the industry face this dilemma or quandary as to what their first step must be, to enter the industry. Though I will not be discussing or providing the reader with the specifics, I have listed this point to bring to light the lack of awareness as well as a shortage of avenues (courses, degrees, qualifications, training programs, etc.) that exist in the Surveying Industry in India.

If you would look at it, it is quite ironic, that with a national mapping agency that can be easily called the oldest structured organization to have existed in this part of the world, we in this country have very few means of identifying and recognizing paths that can help a youngster in choosing this line as his profession.

This needs to be countered immediately. More on this further in the article.

- **Creating an Ecosystem for Others to Plug in And Out of The Survey World**

Private, foreign players such as Google and Bing have changed the face of mapping around the world. We in India, have also not been impervious to this. Mapping today cuts across lines and fields and is used in many forms (most noticeably GIS) in many applications. Being a qualified member of this industry, I have been approached by many from outside the industry, such as UAV manufactures, coders and application developers, enquiring about the different aspects of mapping and more so, about the inner workings of the systems in place and methods to incorporate them in their line of work.

This has made me believe, that mapping, to the outsider is still a

very difficult maze to navigate and one about which not much information exists on incorporating it with other lines of applications, especially here in India. To counter this, I believe that a system of modules needs to be put in place, in not only collection of data but also in storing and using it, so that professionals across industries can plug-in and take advantage of the resources that Surveying and Mapping provide. In today's world, this is very important and will go a long way in furthering the industry.

- **Up-grading Courses at ITI and Diploma Level**

Many of the major mapping and surveying projects in India, that are already underway and also those that are to begin have a great deal of groundwork embedded in them and this makes the role of field-level data collecting a very important. These projects mainly include Cadastral projects, wherein, interaction is needed with every landholder, in the areas the project is being implemented. From my experience, the best kind of people who can play this role of interacting, collecting and sorting data at the primary level are ITI and Diploma holders, mostly trained in local institutes.

Keeping this fact in mind, it has become very important for us to look at upgrading courses at the ITI and Diploma levels. More of these institutes need to train their students in the use of modern surveying equipment as well as in the use of collecting spatial and non-spatial GIS data using appropriate modern equipment. This would go a long way in ensuring the accuracy and relevancy of data collected.

- **Creating Engineering Line Specifically for Surveying Apart from Civil Engineering with Sub-Branches**

Directly related to the point made about separating the study of surveying from civil engineering is

the need to create a separate line at the undergraduate engineering level that deals specifically with Surveying and Mapping. Such a move will certainly reduce a lot of clutter and will ensure the entry of a younger, better oriented and more aware workforce into the industry.

This will also ensure this line of work to carve a niche for itself among the major fields of technology.

#### **Industry Level**

Coming to the industry Level, I have created this category for explaining those sticking points which exist or are faced by private surveying organizations that are in the business of surveying and mapping. The reader needs to know that almost all works, jobs or contracts in the industry in India are works contracted by the government at the state and central levels. Thus, it's safe to say that the Government is the largest client that exists for the entire mapping industry in India.

This relation between Private Surveying companies and the government on the other side has been a bitter-sweet one. There have existed many problems in this working relationship, but over time both have learned to work together to generate results. In this section, I will be highlighting some points that, when viewed from the Industries side, have been pricking points and have affected the industry drastically. Some of these points are issues that need solving from the Industry's point of view and some from the government's side.

- **Discussions About the Head but Zero Work on The Feet**

After visiting many seminars, forums and meetings held for discussing the future of Mapping in India and propagating the Industry, I have been surprised by the lack of attention given to basic problems that exist at the grass-root level. In many of these

seminars, we have important matters related to subjects such as control network, datums, surveying organizations, etc. discussed, but almost nothing related to training centers, engineering streams, etc.

Though very important, I strongly believe that apart from issues affecting the top, equal importance should also be given to issues that are not that visible in the front. As long as such issues are ignored, I believe that we will never be able to lay a strong foundation for Surveying and Mapping as a distinct and well-established line of technology.

- **Equipment Not Being India Proof or India Compatible**

An important note made during my time spent on the field, most of the equipment coming to India is not designed for India and conditions found here. This needs to change as soon as possible with active and detailed interaction with OEMs of Survey and Mapping Equipment.

We understand, most of the equipment being used in India is sold by western manufacturers. Recently, the use of China-made equipment has seen a surge, but the industry remains dominated by western made equipment, which as per my experience has been hardy, tough and accurate in its use and results. But, during the use of this equipment, I have also come to realize that apart from being 'Water-Proof', 'Fire-Proof' etc, this equipment misses one very important factor in its design and construction and that is 'being India-Proof'.

To understand this one needs to understand that the conditions in India, weather, nature, etc are unique and though there have been some 'pieces' doing well, there have also been many failures due to equipment just not

being able to stand up to the rough conditions present here. I believe that OEMs need to be coerced to look at these conditions and design or re-design their equipment accordingly.

This needs to be done on the equipment side as well as on the data collection procedures. To explain this point in detail, one needs to understand that in India, the majority of the Surveying and Mapping projects are carried out for the government and though different departments may commission or order a project, the general working method remains pretty similar across different wings of the department. The formats and methods of data collection are generally the same if it's a project carried out for National Highways or Irrigation Department.

I believe that lots of time and effort can be saved if these formats and procedures are incorporated within the software of the equipment being used for data collection. In my experience, we spend/waste a lot of valuable time on converting data into formats that suit the client's needs, while this same amount of time can be utilized for production activities.

- **Equipment Being Overly Priced**

Another complaint of business owner, especially owners of small businesses have is that Survey equipment is too highly priced, with taxes and import duties pushing up prices exponentially. It is to be noted here, that there are almost no notable organizations in India producing reliable equipment which performs in the best of form in conditions prevalent here. Due to this, we need to rely on equipment developed abroad and then imported into the country. This makes the prices skyrocket due to taxes and imports levied by the government. A direct consequence of such duties is

that it makes the entry of small business owners into the industry close to impossible, due to the necessity of high amounts of capital needed to spend on equipment. Also hit are educational institutions which find it very expensive to spend on training equipment. Though there is some relief available to educational institutions, this is by no means enough or sufficient in the current state of affairs. To counter this, I believe that, the government can introduce many steps after discussing the same with industry leaders. These may include lower import duties, encouraging the refurbished equipment market, aiding companies to start R&D in India, etc.

- **No Proper Process for Getting Permissions for Carrying Out Fieldwork**

A subsequent issue that, many private organizations face over the concern for security is the absolute haphazard and sometimes the absence of a set method for availing permissions to carry out surveys in areas deemed classified as the government. This has become a major stumbling block in starting projects and automatically adds a month to a month and a half in any project as almost all projects pan-India have a restricted area within the project Aol.

Setting up a proper method for availing permissions and laying down time-based instructions to personnel at different levels of hierarchy can go a long way in solving these problems. Though most of these issues need to be sorted out by the government, the private sector has a major role to play as an advisor.

- **Unnecessary Security Clearances**

One of the gifts bequeathed upon us by the British was this need of secrecy in the name of security

that has become a hurdle for almost all projects being implemented, doing little in the way of actually promoting a secure environment. For private organizations, this has become an obstacle that obstructs the smooth flow of project operation and subsequently fund flow which is the lifeline of the private sector. With layers of red tape and bureaucracy as protection, no government organization or person is held accountable and most projects end up in litigation with owners and managers taking the brunt of the consequences.

Many of these issues can be settled by reviewing and reissuing orders and notifications on data declared classified, in the past. With open-source platforms offering the same data on their platforms, one needs to see the actual advantages such an attitude has and deduce if this advantageous or detrimental to the industry as a whole.

The reader may assume that the point being made is a minor one, but I would like to inform the reader that many projects have been delayed indefinitely or canceled as the issuing authority had not taken into account the non-availability of classified data for use by the contracted organization.

### **Government & Policy Making Level**

Coming to the final category and probably the most important category in terms of effecting the Surveying Industry directly. These are the points and issues that are directly under the control of the government as the largest client of the surveying industry in India and also its largest beneficiary. This in many ways has also made the government the only organization that intentionally or unintentionally may act as a regulating authority within the Surveying world. Though a body of private organizations is necessary for a regulating role,

something that is not influenced by any side and works just towards the betterment of Mapping as a technological industry in the country, such a thing has not been possible thus far, due to the very position the government occupies in this whole industry, currently.

- **Need for A Data Collection and Dissemination Platform to Avoid Surveys of The Same AOI Multiple Times**

It has been seen that due to a lack of coordination and information sharing across different departments within the government, a level of redundancy exists that has led to duplication of works, which otherwise may have been easily avoided.

This has resulted in situations such as repeat surveys of the same area multiple times, data collected during one survey being irrelevant or insufficient for inter-departmental works, etc.

This problem may be easily remedied in today's world if departments agree to cooperate and share data seamlessly across jurisdictions. Probably, the government is still not in a place to share data publicly, but we in the industry look forward to the day, this becomes a reality. The effects it will have on data collection and analysis will be far-reaching and almost impossible to fathom.

- **Need for The Govt. Regulation Body Institution of Surveyors to Be More Robust**

Currently, nobody exists that may be truly called the final regulation body for the Surveying and the Mapping Industry in India. On the government side, we do have the Institute of Surveyors, but very little is known about this organization and from personal experience, it's very difficult for a person from the private world to get a membership and achieve certification from this body.

The need for a regulating authority that decides on qualifications, standards, and benchmarks is extremely important and of tantamount importance to the development of Mapping in India.

- **Need for A Private Surveying Association That Champions the Cause of Private Surveying Companies and Surveying Professionals (Including Violence on Sites)**

As a continuation of the above-mentioned point, I believe it is extremely important that a body exists that looks into various workplace-related problems that are endemic to this line. E.g. the violence inflicted upon surveyors in cadastral related surveys is a cause of concern and the scale at which it is perpetrated is alarming. There exist many such issues that need to be tackled proactively. The solution to these may exist through different mechanisms, but the point I am trying to raise here is that a body is extremely necessary for at least identifying and starting a discussion on such issues.

- **Need for Survey Qualified Personnel on The Government Side Handling Projects**

Another important point that needs to be addressed, especially from the side of the government is the appointment of qualified and experienced personnel as client representatives on the client's side for GIS and mapping projects. As projects are getting more and more specialized, with aspects of a single project covering many other facets and not just map production, it has become very important to have personnel who know about the line and can clear deliveries as per schedules.

- **Government Pushing Policy to Make Projects Successful**

Now taking it a notch higher, we come to a very subtle initiative that the government needs to take to ensure completion of

Survey and Mapping projects, the record of which in my experience has been abysmally poor so far.

The reason for so many Mapping projects to fail in this country is not just the above-mentioned points. Also contributing to this high failure rate is completely absent government policy that needs to be in place to ensure complete adherence to practices and processes that are being put in place. This may be from the protection of control points to digitization of rural cadastral maps to appointment of officials for resolution of cadastral disputes. It should be noted that, in many situations, tweaking of government policy is more than sufficient than physically policing. Such an action will also prevent inaction on the part of officials, which in my opinion is the biggest threat that looms over any project.

- **The Need for Training Projects and Modules Project-Wise to Implement as well as Maintain the Subsequent Steps of Updation**

In India, it has become cliché to commission projects without thinking about having appropriately trained man-power for executing it and then subsequently maintaining and updating the data from a mapping project that is generated.

This usually ends up in creating a huge dataset that is neither relevant nor accurate and once commissioned has no processes in place to maintain.

This attitude needs an immediate change in all respects. The very inception of mapping and GIS projects needs to be planned for the ease of maintaining them, once commissioned. Training modules for persons involved in executing projects and then updating them need to be put in place, especially for major projects which have a high impact

on socio-economic conditions such as mapping projects. One might argue that this is not a role that the government needs to play, but in the absence of relevant training centers, I feel that its steps such as these that will ensure the successful execution of projects.

• **Talk of Surveying on a Much Larger Scale (Ministry of Geospatial Affairs)**

This is a topic that is close to my heart and one that I feel hasn't been discussed enough. During my visit to many forums, Seminars, etc. I noticed very often that the conversation around the expansion of Surveying and Mapping in India, was limited to talk around Survey of India and NRSC mostly and sometimes around revenue departments of various state governments. Stalwarts of the industry often discussed on expanding the role of Surveying and Mapping in the form of collection and propagation of GIS data using modern methods. All this conversation seen and heard in seminars and meetings usually ended at no definite structure or vision that the participants would like to see this line of work materialize into.

To me, this, in today's world is a very narrow way of looking at the advantages that mapping can present to us in the way of providing fair and efficient governance to 1/6th of the world's population. To explain my stand a little more clearly, I will have to take the reader back in time, a period that I have also written about in my first article. In the

late 1700s, the British had defeated Tipu Sultan in Mysore, thus finding stable footholds in all three Presidencies in the continent. They were quick to realize the vastness of the subcontinent and soon was born the Survey of India in its earliest forms. Even at this early stage it was organized as one organization to operate within and out of the boundaries of the three Presidencies of Madras, Bombay and Bengal. The Surveys conducted by it were of immense importance and the maps and data collected by The Survey of India became the first tools for the British for administrating this huge expanse of land.

So, I would not be wrong at saying that the British were the first at understanding and appreciating the role of GIS for governance in India. Though India was a colony and the Brits the Governors, a rule of Law applied, and many decisions taken at that time were done so after careful analysis of data and information collected during mapping and from knowledge gathered from the maps subsequently created. Just to underline the importance attached to Survey of India, I would want to state that, it was one of the few organizations that lasted almost the entirety of the British Rule in India. Also, the importance attached to it was so great that it remained as a part of the Military and was never brought under civil administration during this period. In the absence of satellite imagery and other modern methods of data collection, Survey of India was the

sole means of gathering GIS data for the government of the time.

The story after independence is completely different and probably would need another article to elucidate. Putting this aside, I have brought up this example to show how effective Geospatial Data can be in administration and governance when handled by a small group of people to use over a large populations and area. With the increase in use of GIS in Civil Administration I believe much more can be achieved than what is being done today. In order to do this, we as a community need to start advocating for responsibilities at a much higher level and larger stage than what is being asked for today.

In my opinion, to influence issues right where they generate at the ground and at the place where solutions to them are found in the top echelons of the government, it would be perfectly in place to have an organization at the ministerial level that deals solely with geospatial affairs. Right from data collection, which may include ground data collection to satellite imagery to its analysis and propagation in the form of Maps or GIS data in a digital medium. This organization can be all that we are missing today in the world of mapping in India and can be the one point of contact that propagates valuable means of governance that bring together affective means of administration backed by the best use of GIS data. So, can a Ministry of Geospatial Affairs be a reality in this lifetime?




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### Hexagon strengthens HxGN Content Program with Acquisition of COWI's Mapping Business

Hexagon AB, a global leader in sensor, software and autonomous solutions, has announced the signing of an agreement to acquire COWI's aerial mapping business. COWI is a leading international consulting group within engineering, economics and environmental sciences with a mapping business that serves as Europe's largest provider of airborne surveying and spatial data processing and key partner of the HxGN Content Program.

### Hexagon Strengthens its Smart Mine Solutions Portfolio with the Acquisition of Blast Movement Technology (BMT)

Hexagon AB has announced the acquisition of BMT, a pioneer in blast movement monitoring and analysis for open pit mines. BMT's technologies complement Hexagon's drill and blast solutions with accurate ore location information, enabling customers to extract greater profit from every blast. The ability to accurately track blast movement is a huge benefit for mines striving to be smarter and more sustainable. It's a highly variable process that can cost mines millions of dollars in lost revenue per year from ore loss - where valuable ore is sent to the waste pile, and dilution - where waste is sent to the mill.

### Bentley Systems Announces the Acquisition of GroupBC, UK Leader in Cloud Services for Construction Information Management

Bentley Systems, Incorporated, a leading global provider of comprehensive software and digital twins services for advancing the design, construction, and operations of infrastructure, has announced the acquisition of GroupBC, a leading UK SaaS software innovator. For over twenty years, GroupBC's and Bentley's software solutions have been deployed for complementary purposes to improve project and asset information management. The transaction results from GroupBC's expansion agenda, and Bentley's investment appetite, for international growth opportunities stemming from the UK's national initiatives.

### Trimble Joins Geotab Marketplace to Accelerate Expansion of Video Safety Technology with Focus on Light- and Medium-Duty Vehicle Market

Trimble has announced that its Video Intelligence™ solution is now part of the Geotab Marketplace—a portfolio of mobile apps, software add-ins and hardware add-ons—to enable the expansion of video safety technology in new markets. Trimble's Video Intelligence solution includes a two-channel DVR and forward-facing camera, with the option to add secondary cameras. Creating a unified customer experience for its users, Video Intelligence integrates directly with Geotab's MyGeotab fleet management software.

### Seequent Wins 2020 Esri Partner Award

Seequent has received a 2020 Esri Partner Award, 'Analytics to Insights', for its industry-first tool Target for ArcGIS Pro which enhances the integration of mining and exploration data. The recently released Target for ArcGIS Pro which enables the seamless integration of subsurface drilling and borehole data into ArcGIS Pro, creates world-leading end to end solution that allows geoscientists to find what's hidden faster. Alex Miller, president, Esri Canada, says Seequent was recognised with the 'Analytics to Insights' award for "integrating mineral data from around the globe."

### HERE Technologies Appoints Fred Hessabi as Senior Vice President and General Manager for the EMEAR Region

HERE Technologies, has announced the appointment of Fred Hessabi as Senior Vice President (SVP) and General Manager of Europe, the Middle East, Africa and Russia. In his role, Hessabi will be responsible for driving regional revenue growth and diversifying the HERE customer portfolio. Hessabi replaces Stefan Hansen, who left HERE in December 2019 to take a position at NTT Data. Hessabi will identify opportunities for customers, partners and developers, across industries, to leverage the power of location intelligence to solve their business problems. Hessabi replaces Stefan Hansen, who left HERE in December 2019 to take a position at NTT Data.

### AMAP selects HERE as Global Provider of Map and Traffic Data

AMAP, China's leading mapping, navigation and location-based services provider has selected HERE Technologies as their main provider of global map content and traffic information outside of China within its app, AMAP in April 2020. A super app, AMAP allows users to book taxi or car rides within the app from multiple ride-hailing companies, search for suitable carpooling options, find available bicycles nearby to rent and offers content on nearby tourist attractions.

### NovAtel® Delivers First Shipment of Signal Generators to Modernize the FAA's WAAS Navigation Service

Hexagon | NovAtel announced that shipments of next-generation Ground Uplink Station (GUS) Signal Generators have commenced in fulfillment of the contract with the United States Federal Aviation Administration (FAA) to support the FAA's safety of life Wide Area Augmentation System (WAAS) navigation service. Developed by the FAA for civil aviation, WAAS is a safety-critical navigation aid that provides integrity monitoring and differential corrections for all phases of flight. The next-generation NovAtel GUS Signal Generator replaces the legacy product which has operated successfully for over 15 years and ensures continued operation for years to come.

### RIEGL Won The MAPPS Member Choice Award

It was announced that RIEGL won the Member Choice Award for the RIEGL VUX-240 lightweight UAV laser scanner in the Technology Innovation category at the 2020 MAPPS Winter Conference. The MAPPS awards competition recognizes the professionalism, value, integrity and achievement that member firms have demonstrated in their projects and technology developments over the previous year. The RIEGL VUX-240 is a lightweight airborne laser scanner, especially designed for use on UAS/UAV/RPAS and small manned airplanes and helicopters. With its wide field of view of 75 degrees and an extremely fast data acquisition rate, the instrument is perfectly suited for high point density corridor mapping applications.

### **ISRO Successfully Launches RISAT-2BR1 – A Radar Imaging Earth Observation Satellite**

ISRO – India's Polar Satellite Launch Vehicle, in its fiftieth flight (PSLV-C48), has launched RISAT-2BR1 along with nine commercial satellites. RISAT-2BR1 is a radar imaging earth observation satellite weighing about 628 kg. The satellite will provide services in the field of Agriculture, Forestry and Disaster Management. The mission life of RISAT-2BR1 is 5 years. The nine customer satellites of Israel, Italy, Japan and USA were precisely injected into their designated orbits. These satellites were launched under a commercial arrangement with NewSpace India Limited (NSIL), the commercial arm of Indian Space Research Organisation (ISRO).

### **Aspectum Adds Arc Visualization to Its Features**

Aspectum, a cloud platform for map-based visualization and analytics, releases a new arc visualization display as part of its growing array of features. The main purpose is to show data connections such as geographical origin and destination of movements. This is relevant for various purposes such as tracking of goods, in particular, as they are being delivered across the globe. Not only physical objects but even digital services and information can be tracked via IP addresses.

### **Overwatch Imaging TK-9 Earthwatch Airborne Sensor Selected for New South Wales Rural Fire Service Intelligence Aircraft**

Overwatch Imaging, a leader in automated airborne imaging systems for piloted and unmanned aircraft, has been selected by Coulson Aviation(USA) Inc to provide the imaging technology package for two Citation V (Model 560) Special Mission platforms in support of the New South Wales Rural Fire Service (RFS) in Australia. Coulson will install the TK-9 Earthwatch multispectral imaging systems in the Citations, which will serve as lead planes in support of a Coulson-provided Boeing 737 Fireliner and other bushfire information needs of the RFS.

### **TCarta Developing Commercial ICESat-2 Bathymetric Product with National Science Foundation Grant**

TCarta Marine, a global provider of marine geospatial products, is commercializing a new technique to derive highly accurate shallow-water bathymetry measurements from NASA's ICESat-2 satellite data. The new methodology is being developed by TCarta with funding from the National Science Foundation (NSF). TCarta pioneered the application of high-resolution optical satellite imagery for seafloor depth measurement in 2014 with commercialization of a proprietary technique. TCarta is developing a software tool incorporating AI algorithms to automatically extract bathymetric measurements from ICESat-2 data sets. This tool will soon be available for beta testing.

### **SimActive Announces New Drone Training Program for Mapping**

SimActive announces a new training program for drone mapping. The program's goal is to provide educational material and resources on how to effectively process drone imagery, to both neophytes and experts. The new offering includes educational documents, tutorial videos and monthly webinars as well as tailored training sessions, which can be provided both online or on-site. All aspects of data processing are covered, such as the generation of DSMs, DTMs, point clouds, orthomosaics and 3D models.

### **LiDAR Technology Helps Reveal Radiation Hotspots at Chernobyl**

A team of multidisciplinary researchers have used Routescene's UAV LiDAR technology to map radioactive hotspots in greater detail than ever before. Professor Tom Scott, from the School of Physics at the University of Bristol, UK, led a group of researchers from the UK's National Centre for Nuclear Robotics (NCR) to conduct surveys on multiple sites of interest within the Exclusion Zone which surrounds the damaged reactor. The surveyed sites included Buriakivka village, a settlement abandoned following contamination from the power plant accident, and the "Red Forest", a natural woodland area located the closest to the reactor, hence the most heavily contaminated.

### **Virtual Surveyor Streamlines Volumetric Calculations for Stormwater Retention Ponds, Basins & Quarries**

Virtual Surveyor has released Version 7.1 of its popular drone surveying software, introducing functionality to efficiently calculate volumetrics in quarries, mine pits, retention ponds, and other basins that fill with water. This new functionality complements advanced cut-and-fill mapping capabilities unveiled in late 2019.

### **Aspectum Releases A Smart Map of Besiktas Shipyard for Better Maritime Business Management**

Aspectum, a cloud service for location data analytics, presents its latest interactive map of Besiktas Shipyard. This map serves as an example of shipyard management. Just in a few clicks, users can view detailed 3D visualization and gain valuable insights about the shipyards' workload and current infrastructure.

### **APEI First to Purchase Leica CityMapper-2**

Hexagon's Geosystems division has announced that Aero Photo Europe Investigation (APEI), has become the first customer to purchase the Leica CityMapper-2 oblique imaging and LiDAR hybrid airborne sensor. With the CityMapper-2, APEI expands its business to the rapidly growing smart city market.

### **HERE Introduces HD GNSS, A Precise Global Positioning Solution for the Mass-market**

HERE Technologies, a location data and technology platform, has announced the introduction of High Definition Global Navigation Satellite System (HD GNSS) positioning, a cloud-based solution that enables mass market devices to achieve sub-meter accuracy across the globe. Devices and vehicles for the mass market are becoming equipped with dual frequency GNSS receivers which together with the HD GNSS service enables high precision positioning. This capability was cost and geographically prohibitive less than two years ago. Now, HERE HD GNSS accelerates chipset, hardware and software makers ability to offer a step change in what can be delivered to consumers in new product capabilities, features and user experiences.

## PRODUCT LAUNCH

December 15, 2019 - March 15, 2020

**Esri Releases ArcGIS Analytics for IoT**

Esri has released ArcGIS Analytics for IoT. Part of ArcGIS Online, Analytics for IoT allows users to visualize, analyze, store, and act on massive velocities and volumes of IoT sensor data. This new Esri capability will help organizations take advantage of the insights made possible by the IoT with up-to-the-second data and improved situational awareness.

**Hexagon Unveils Luciad 2020**

Hexagon's Geospatial division has launched Luciad 2020, a significant update to its platform for building advanced location intelligence and real-time, situational awareness applications. Luciad 2020 delivers even faster and more powerful 3D visualization and analysis capabilities. It also extends the portfolio with LuciadCPillar, an API for C++ and C# developers to incorporate advanced geospatial visualization and analysis into their applications.

**SimActive Further Accelerates Processing with New Version 8.4**

SimActive Inc. announces the release of Correlator3D™ version 8.4 with significant accelerations. The new version leads to speeds that are multiple times faster compared to previous releases. Correlator3D™ 8.4 allows a dynamic allocation of hardware resources, reducing potential bottlenecks from PC components. For example, solid state drives (SSD) are used more efficiently by the software, as well as additional CPU cores and extra RAM.

**Trimble Introduces Tekla 2020 Structural BIM Software Solutions**

Trimble has introduced the latest versions of its Tekla software solutions for advanced Building Information Modeling (BIM), structural engineering and steel fabrication management— Tekla Structures 2020, Tekla Structural Designer 2020, Tekla Tedds 2020 and Tekla PowerFab 2020. Tekla software is at the heart of design and construction workflows building on the free flow of information, constructible models and improved collaboration. Tekla Structures supports the Constructible Process to transform the entire design, build and operate lifecycle.

**Hexagon Introduces HxDR**

HxDR creates accurate digital representations of the real world through the seamless fusion of reality capture data from airborne, ground and mobile sensors. Users can then leverage the complete, accurate and precise real-world replicas to visualize and share their 3D design projects and models within real-world context.

**Trimble Clarity: Free Point Cloud Viewer**

Trimble Clarity is a browser-based viewer for point cloud and 3D model data. It can be used to share projects and progress updates to team or clients, and allows them to interact with the data without having to have a 3rd party software installed on their computer. One can import point cloud data (.las, .laz, .e57) and 3D models (.skp, .obj) associated with the project. Then a link can be generated (public or private) to share this project.

## GEO EVENTS

**May 7-9, 2020****GISTAM 2020**

Heraklion, Crete-Greece  
<http://www.gistam.org/>

**May 12-15, 2020****INSPIRE 2020**

Dubrovnik, Croatia  
<https://inspire.ec.europa.eu/conference2020>

**May 20-21, 2020****GEO Business**

London, UK  
<https://www.geobusinessshow.com/>

**June 3-5, 2020****AEC Next Technology Expo + SPAR 3D**

Chicago, IL, USA  
<https://www.aecnext.com/colocation/>

**June 14-20, 2020****XXIV ISRPRS Congress**

Nice, France  
<http://www.isprs2020-nice.com/>

**June 22-24, 2020****Geolignite 2020**

Ottawa, Ontario, Canada  
<https://2020.geolignite.ca/>

**July 13-17, 2020****Esri User Conference**

San Diego, California, USA  
<https://bit.ly/2Wfrp5W>

**September 15-17, 2020****Commercial UAV Expo Americas**

Las Vegas, NV, USA  
<https://www.expouav.com/>

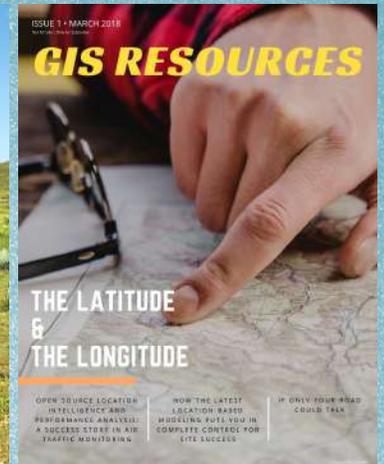
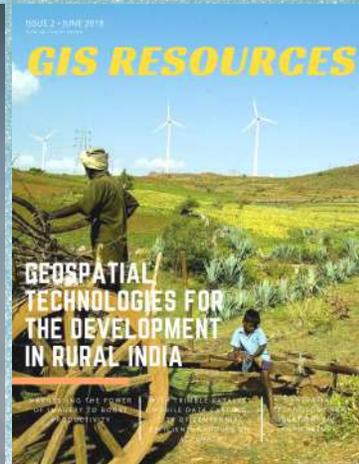
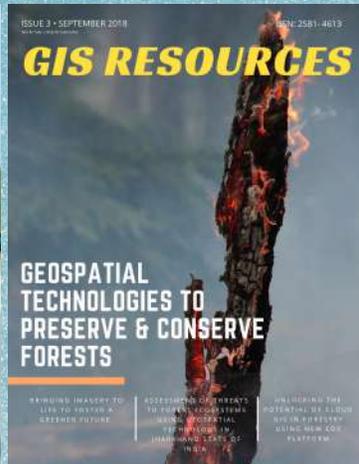
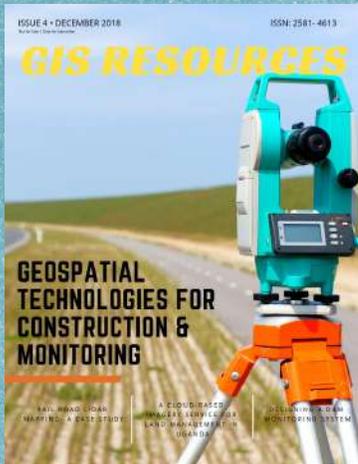
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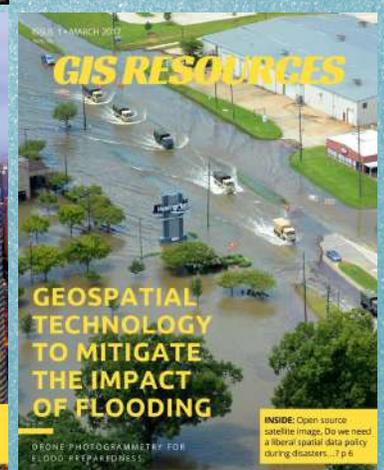
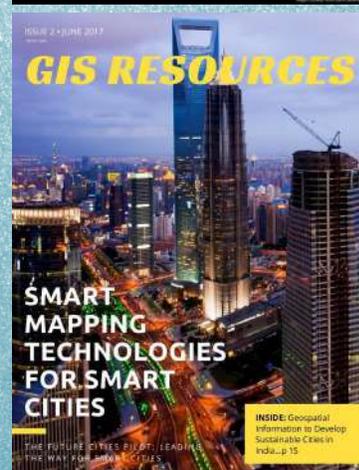
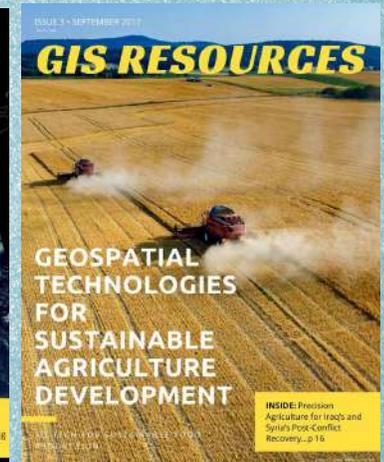
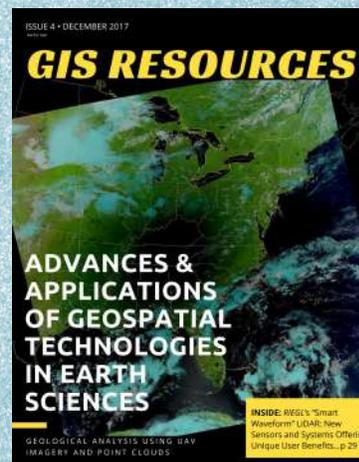
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