Help From The Heavens

When satellite imagery collides with physical data, it has the potential to transform the way we farm, fish, build, drive and even frame policies

PICTURE PERFECT: The geospatial ecosystem generates annual revenues of $3 billion and provides 135,000 jobs in India, says a BCG study (Shutterstock)

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Saji Vishwambaran is a happy man. A seafaring fisherman from Karunagapally in Kollam district, the 35-year-old has, of late, brought in increasingly better catches from his forays off the Kerala coast in his mechanised boat Sea Dream.

In Uttar Pradesh's Mandanpur village, Rajender Kumar managed to keep the menacing swarms of borers away from his paddy farm this kharif season.

What explains their turn of fortune? The answer lies in celestial intervention. But not the kind you would imagine though. The 'celestial' here refers to satellite images. Geospatial technology, which combines geographical imagery from satellites and physical ground data, is increasingly becoming integral to the lives of the common man. A subset, global

positioning system or GPS, is what aids Vishwambaran in his fishing expeditions.

In Kumar's case, tips offered by Iffco Kisan Sanchar (IKSL), a joint venture between Iffco, the world's largest fertiliser cooperative federation, and telecom major Airtel, is what kept the borer away. Using satellite images, IKSL arrived at a solution tailor-made for him. Like Kumar, nearly 1.3 million farmers subscribe to its mobile advisory services on fertiliser use and irrigation. "The selection of appropriate seeds, the quantity of water, fertilisers and their frequency of use and quantity are all linked to weather predictions," says G.C. Shrotriya, national head of value-added services at IKSL. The agency correlates all farming practices with weather information sourced from satellite images generated by the India Meteorology Department (IMD) to provide general as well as specific advisories to farmers in 19 states.

"Our data tells us about fish stocks — location, size, species, etc.," says Shailesh Nayak, secretary at the Department of Earth Sciences. "Similarly, marine geographical data helps us explore deep sea minerals. Geospatial technology aids in tracking changes in the mass of (Antarctic) ice, which you can correlate with (global) warming."

EYE OF THE STORM: Leading players from across the globe are eyeing a share in India's geospatial pie

Geospatial technology has spawned an industry that has immense growth potential. For instance, Google has harnessed it to launch a series of products — free as well as paid. "Services such as Google Maps APIs help the economy grow by bringing in job opportunities and paving the way for innovation," says Lalitesh Katragadda, country head of India products at Google. "To enable further growth, governments, firms, researchers and consumers all need to encourage mapping innovations and investments in India."

How big is the pie? In January, a study by the Boston Consulting Group (BCG), commissioned by Google, said the geospatial ecosystem generates annual revenues of about $3 billion and provides 135,000 jobs in India. "Geospatial services deliver annual efficiency

gains equivalent to $40-45 billion in revenues and $70–75 billion in cost savings," the study noted. It went on to state that geospatial services were part of the daily work-lives of 8-9 million employees, about 2 per cent of the country's workforce.

'G' TALES

Success stories from across the country and platforms show the potential of GIS

1 Kanpur municipality claims its tax revenues increased threefold after it introduced a GISbased system to assess and collect property tax and make its operations transparent. A GISbased property database was set up for the entire municipal area. The local body developed an online, interactive system to calculate and remit property tax by renumbering properties with certain 'unique premise numbers'

2 Reliance Infrastructure has a GISbased system in place in Mumbai to manage outages and spot likely faulty sections well before a visit to the complainant's site. It enables emergency service officials to access important information about any outage and update in real time the connectivity status while they fix the problem

3 The Road Information System (RIS) developed by the National Highways Authority of India for its 5,846km Golden Quadrilateral project uses geospatial tools for highway management. It includes a computercontrolled database that provides insights on, say, traffic status, pavement condition and road inventory. It reduces the time nee ded for managing information and keeping it accurate and uptodate

4 A mix of geospatial systems, with simulation and modelling tools, helps the Indian Railways analyse the longterm financial viability of its investment plans. These tools help authorities construct and test 'what if' scenarios and plan more effectively; they also aid capacity enha ncement based on traffic projections

5 Consumer goods giants such as Marico and HUL use GPSenabled cellphones and tablets to collect realtime data from farmers and field representatives. This helps them track inventory, automate replenishment of stocks with distributors, enhance operational efficiency, monitor sales force and in quick decisionmaking

Source: Ficci, AGI

This technology benefits more than 3 million farmers, estimates Delhi-based think tank National Council of Applied Economic Research (NCAER). The services farmers receive include farming advisory and weather forecasts that are sent to cellphones five days a week. According to NCAER, the economic gain from using such technology runs into over Rs 50,000 crore in agriculture and Rs 34,000 crore in the fisheries sector every year in India.

The uses of geospatial technology are myriad. For instance, "agro-entrepreneurs who buy large tracts of land in far off Africa can use the technology to understand the soil condition, fertility and water availability of the land sitting in India," says Srinivasa Rao Jillellamudi, senior vice-president, RMSI, which offers geospatial technology services. Agro exporters and bodies such as the Sugar Board utilise this technology to understand production trends, he explains. RMSI provides rice and sugar production forecasts based on satellite imagery.

Export promotion councils utilise its forecasts to help members bag advance supply contracts, he informs.

The central government plans to spend Rs 2,900 crore on setting up a National Geographic Information System (NGIS), which will link all its major infrastructure development and social initiatives (see The Rule of the Satellite). Outside the ambit of government programmes lies an even bigger opportunity; one that has resulted in the birth of an increasing number of geospatial companies.

Private Proliferation
Companies engaged in geospatial services run into the hundreds. Among the leading players are Rolta India, Bentley Systems, TomTom, DigitalGlobe, Intergraph, NIIT Navigation and Trimble. That said, it is increasingly difficult to slot a company as a geographical information system (GIS) solutions provider as many more choose to dabble in the technology. For instance, US software major Autodesk, whose 3D design software for architecture, engineering and construction is a key tool for the geospatial industry, cannot be classified as a pureplay GIS company.

Responding to a *BW* query on the pecking order in the GIS business, Bharti Sinha, executive director, Association of Geospatial Industries (AGI), says ranking companies is difficult as the technology has "different components, each of which has different companies, services and business models". Take, for instance, Mumbai-based Rolta. Its technology platform is used for modelling urban environments, transportation corridors, land record management, land use analysis, mapping flood-prone plains, assessing geological hazards, crop monitoring, watershed management, among others. "These solutions have helped us to be successful in large programmes like Jawaharlal Nehru National Urban Renewal Mission and other initiatives under the national e-governance plan. We have also won orders from most of the states and Union territories," claims the company's annual report.

Or, US-based DigitalGlobe, a pioneer in commercial high-resolution earth imagery products and services. It sources information from its own advanced satellite constellation to support a variety of applications within defence and intelligence, mapping and analysis, environmental monitoring, oil and gas exploration, infrastructure management, Internet portals and navigation technology sectors.

In the case of Amsterdam-based TomTom (TOM2), it is its traffic information and navigation technology in automobile in-dash systems, mobile devices and web-based applications that sets it apart.

So attractive is the Indian pie that almost all global majors have set up subsidiaries here with the aim of acquiring a slice of the action in the government as well as private sectors. The increasing interest in geospatial technology has also resulted in the birth of many smaller domestic firms.

However, runaway growth has brought in its wake a spate of problems. "Everyone in the industry, even the firm that hires part-time surveyors to physically plot a location map, considers themselves to be a geospatial firm," an industry veteran points out, tongue in cheek. "There is plenty of free data available on the Internet. Companies may offer solutions based on such data, but it does not guarantee the precision that is needed to take business decisions", he adds. "If technology gets commoditised, it gets used at the grass-roots level,"

counters an industry source.

GIS to provide the core for services like e-Health, e-Legal, e-Files, e-PDS, e-Registry, NREGA, among others. It will assign location tags to all data, plans, programmes, citizen addresses and other entities in urban and rural areas
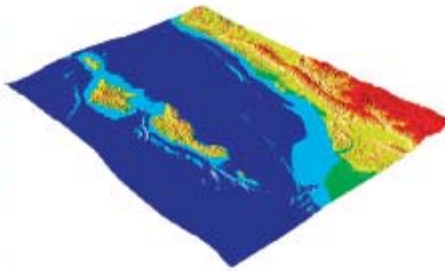
Create 3D models of all major river systems (digital elevation models) to track, forecast, among others, floods. Also integrate and use Isro's National Remote Sensing Centre's flood hazard maps, river configuration and bank erosion studies, geospatial tools for flood mapping and flood damage assessment

Synthesise R&D outputs from earth sciences ministry's farming and weather services, advisory services of remote sensing centres in states and the spatial data infrastructure initiatives of the Department of Space

Prepare GIS maps of the entire country for easy identification and scanning of relevant areas for enhanced postal service delivery. Monitor movement of mail vans for their effective management and route optimisation

Use fertiliser and other agrochemical technology solutions from CSIR, food processing technologies from both CSIR and the Department of Atomic Energy and other satellite-based tools to enhance agriculture services

USE GIS to generate data at the Anganwadi level for preparing a national nutrition database. Map health amenities and disease vulnerability

The rampant use of unlicensed software to analyse information is another major worry. AGI, the industry body that represents the major players, says its primary task is to bring in ethical business practices by developing and designing common minimum standards.

Companies, on their part, feel that though the government uses GIS technology in its infrastructure projects, it does not do so in a holistic manner, i.e., right from the project planning stage. Further, contracts are given without taking into consideration the additional expenses vendors will have to incur if they are to utilise GIS technology.

"Contractors operate on razor-thin margins. So, they cannot innovate. Since the whole tender process is based on L1 (lowest bid), they (contractors) look to cut costs. We need to make GIS an integral part of every tender process. It is scientific, objective, and will help regulators

check on the progress of the work at every level," says Rajan Aiyer, managing director of Trimble Information Technologies India.

Problems apart, the BCG study says the "sky's the limit" for the growth of the GIS industry. "Some 3.5 to 5 per cent of the annual revenues of IT and telecommunication, utility, hotel and hospitality industries can be ascribed to geospatial services. Location-based technologies and information are responsible for 8 to 10 per cent of cost savings in the transportation, warehousing, information and mining sectors. Nearly 10 per cent of the jobs in the former two industries involve the use of geospatial services," the study points out.

Data providers, location-enabled device manufacturers, application developers, experts and educators are the ones that have come within the scope of the BCG analysis. "GIS can do to field what ERP (enterprise resource planning) and CRM (customer relationship management) did to the management of offices," says Trimble's Aiyer.

"The scope for GIS-based data management in the real estate sector is tremendous," says Soumya Das, director, Rudrabhishek Infosystem (RIPL), a recent offshoot of real estate consultancy Rudrabhishek Enterprises. "As consultants, we have been for long assisting real estate companies in the setting up of large townships. The incorporation of RIPL was simply because of the realisation of this huge market demand." RIPL offers GIS-based solutions right from designing townships to updating the status of a project to maintaining the townships. "We also have a solution that links ERP with GIS or, in other words, a product that transfers the figures and facts of ERP onto a spatial map," says Das.

Time To Hard Sell
GIS works like this. The satellite imagery of the location becomes your basic data. Over this layer, you keep integrating information which is available in other databases (i.e., the government's land records, the database of the telecom department, details of mineral wealth, population data, etc.) to form a multi-layered, even three-dimensional, visual database tailor-made for analysis. While the common perception regarding the utility of GIS is in the form of web applications that are used for maps and directions, these tools have several features that go beyond location-based services, notes a Ficci report released in January. "Geospatial technologies as a tool for decision-making can add immense value to planning and development. They can support governance, enable sustainable development, assist in better management of business process as well as bring location-based information closer to people," the report adds.

Experts believe that geospatial technology, which currently is considered a poor cousin to information technology-enabled services (ITeS), remains underutilised. "You have to evangelise. GIS is pretty much the way IT used to be at the time of Rajiv Gandhi. At that time, it was felt that IT would cut jobs, but that turned out to be a misplaced fear. Similarly, people do not know what GIS is capable of," says Aiyer.

'Today, most official data is not freely available'
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RAJESH C. MATHUR
Vice-chairman, NIIT GIS

'The scope for GIS in realty sector is tremendous'
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Director, Rudrabhishek Infosystem

'Marine data helps us explore minerals'
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SHAILASH NAYAK
Secretary, Earth sciences department

In fact, AGI is on a hard sell drive. In a white paper on the use of geospatial technologies in transport infrastructure, AGI argues that GIS will contribute to saving time, reducing project costs, improving safety and quality as well as protecting the environment during the different phases of infrastructure development. With the government planning an investment of about $1 trillion in the infrastructure sector in the course of the 12th Five-Year Plan, AGI has an economic reason too to argue its case.

"India needs to become world class and GIS is the way. China quadrupled its GDP in a time frame of 10 years only because it used GIS technology in all its infrastructure development projects. In road and highway projects, GIS reduces rework costs, cuts time and improves profitability. Time to completion is 30 per cent less, rework is reduced by 50 per cent and 40 per cent is the reduction in total project costs," explains Aiyer.

Spread It Out
Geospatial technology is not new. Satellite imagery and location-specific information have been in use in the country for a long time, though private industry was not involved. In fact, until 2004-05, the application of geospatial technology was limited to defence. Today, there is rising demand from the GIS industry for information to be made available for civilian applications.

Voicing the demand, Rajesh C. Mathur, vice-chairman of NIIT GIS who heads the Ficci task force on geospatial technology, says that most government data is not freely available in the public domain. "Today, one needs to approach different agencies for different maps or information." Aiyer joins the chorus for easy access. "We have restrictions in the use of (satellite) data. People may be worried about leaks. But positives outweigh the negatives."

But caution continues to guide the government's actions. "GIS is a tool, but we need to ask in whose hands should it be made available," says T. Ramasami, secretary, Department of Science and Technology.

He is quick to add that the technology must benefit citizens. "We have a detailed plan to use 10,000 maps from the Survey of India (along with satellite data) to connect all the geospatial data available across the country under various government agencies," says Ramasami.

Even as the economic benefits of using geospatial technology are beyond doubt, not all see its benefits reaching those who need it the most. "Fish data is also available to the big vessels and trawlers that are faster and more sophisticated than the traditional fishing boats. Also, 80 per cent of seafaring fishermen do not have access to the fishing zone advisories that are prepared by the government," points out T. Peter, president, Kerala Independent Fish Workers Federation.

The signs from the heavens are clear. GIS is the technology of the future. Access is key, and on it hinges India's growth.

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(This story was published in Businessworld Issue Dated 08-04-2013) - See more at: http://www.businessworld.in/en/storypage/-/bw/help-from-the-heavens/r824836.37489/page/2#sthash.5b4QLgTh.dpuf