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 'GIS-enabled systems can help governments mitigate losses in natural disasters'

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Pushpendra Johari, senior vice-president, sustainability at RMSI, a global leader in geospatial and engineering solutions, talks about how technology can be leveraged to tackle climate change and respond to disasters better.

Written by [Parthasarathi Biswas](#) | Pune |
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Pushpendra Johari, senior vice-president, sustainability at RMSI.

In an age and era of climate change, what role can Geographic Information Systems (GIS) play to mitigate losses from sudden climate events? Other than agriculture, where else can this system be used to minimise risk and control damage?

GIS can play a significant role in building resilience to combat disaster and climate risk. The increasing frequency and intensity of disasters globally call for the implementation of climate risk reduction strategies to enhance preparedness for effective response and recovery, setting up early warning systems with impact-based forecasting.

GIS is instrumental in assessing climate risk at higher resolutions such as ward level within cities, group of villages. Geospatial data and software can be actively utilised to create climate information systems at regional, national and global levels. In addition to agriculture, GIS can be used in assessing the impact of climate change on hydro meteorological hazards, water resources, forests, and infrastructure.

RMSI has been working for the last 25 years with the world's local and national governments, multilateral agencies and private entities to implement technical consulting and solutions in this space.

Climate change is altering the frequency and severity of hydro-meteorological hazards like flood, drought, cyclone, hailstorm, etc. Overall, the weather phenomenon is becoming more and more erratic.

One specific area where GIS-enabled systems could be applied is in the forecasting of the occurrence and severity of hydro-meteorological hazards. All weather event models need GIS enablement as they try to simulate the weather events in specific geographical areas. RMSI has developed flood, cyclone, avalanche, landslide, and drought forecasting models for several parts of the world.



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An associated area is impact-based forecasting, that is not just forecasting the hazard and its intensity at various locations in an area but also forecasting the potential impacts. These solutions create an inventory of all assets – buildings, population and infrastructure and take hazard maps as inputs. Based on the hazard intensities these solutions generate the damage and loss information on assets. RMSI has been working

with National Disaster Management Authority (NDMA) and IMD to launch India's first impact-based cyclone forecasting system.

The third category is related to GIS-enabled solutions that help respond to disaster events. These are emergency management decision support systems that integrate both the hazard and impact forecasting with a complete IRS, a network of live feeds, on ground devices and a set of mobile apps for capturing information from ground zero. They provide a digital platform for the agencies involved in disaster response to plan and coordinate their respective actions. They also provide administrators important information about the situation on the ground so they could make appropriate decisions. RMSI is putting such a system in place in Jammu and Kashmir and Ladakh.

Your company has trademarked products like India Flood. What kind of investment has gone in to develop such country-specific products? Are you satisfied with the quality of data that are available in India needed to develop such robust models?

India is a country that is most impacted by natural disasters and with these natural disasters, the poor become even poorer. We have spearheaded Make in India – especially creating disaster risk reduction (DRR) solutions for India. We have 25 years of disaster consulting experience in the country and our experts understand the actual local nuances.

We have made scientific models for India for all major natural hazards (earthquakes, cyclones, floods) which can compete with some of the best models in the world. It's a big investment with very little returns but we are proud of the fact that we have taken the lead here. Developing such a model for a large country like India is a multi-year exercise with dozens of modellers, GIS specialists, software developers working on it.

RMSI's India FloodRisk model provides a comprehensive flood risk assessment for the entire country covering more than 19,000 pin codes. RMSI has modelled all the major river basins in India. The model also takes into account man-made floods that happen because of the release of water from reservoirs.

More and more companies and agencies are tapping into our models and it is making a difference. For example, are Chennai floods (2015) and J&K floods; our models had long back predicted that these were flood hotspots. Some of our insurance sector clients followed our advice and significantly saved on their exposure and losses.

Some input data like rainfall is easily available and is of good quality but the same cannot be said about elevation. There is no high resolution (1m) digital elevation data available off the shelf for any agency in India. Most of the modelling is done using the 30m SRTM data that doesn't represent terrain well and has large vertical uncertainty. For our model, RMSI used the DGPS survey data to improve the accuracy of the SRTM data. Also, high-resolution soil data are not available. It is very difficult to get information about dams and their operating procedures. In our model, we relied on the flow and water level data downstream the dams to model their influence on floods.

We feel that even national agencies and local governing bodies should have access to these tools. So the common man is also able to benefit. We launched the Ganges flood risk atlas covering one of the largest river basins in the world. The solution was developed by RMSI and funded by the World Bank. It is available for access in the public domain, providing flood risk loss at each block level across the entire Ganges basin. No such exercise has been tried earlier.

What are the products developed by your company in terms of sustainability? Has India done enough to promote this? Which fields do you think require this the most?

RMSI is bringing the best of GIS technologies to the emergency management community of India. We are developing solutions to promote the adoption of GIS by creating a GIS-based emergency management decision support system (DSS). We are implementing cutting-edge internet of things (IoT) integration technologies with I integrated operational forecasting systems to support early warning.

We are also now integrating machine learning with standard modelling techniques to create hybrid natural catastrophe risk models to support disaster risk reduction.

India is much better than several developing countries in the world. NDMA has developed necessary guidelines but the implementation at the state, district and city level needs more impetus. More thrust needs to be put on impact-based forecasting, early warning, and emergency management decision support systems. Once these are in place then the agencies will be best placed to plan and respond to any disaster events.

Flood forecasts are critical to emergency response programs to limit property damage and avoid loss of lives. The current flood forecasting systems in most parts of India are manual and suffer various limitations including a short lead-time of only a few hours prior to an event. They don't have information about water surface profiles necessary for embankment safety and also do not have any mechanism for flood warning dissemination, public alerts, institutions and communities.

RMSI developed a flood forecasting system using open source-based models. These flood forecasting systems disseminate flood warnings through the web, offering real-time flood forecasting and are based on the global best practices in flood management. Our flood warning systems offer forecasts as early as three days prior to the occurrence of an event, hence, enabling a substantial increase in the lead time for the government for evacuation planning.

Another area that needs to be focused on is mitigation. There is a strong need to understand the risk from natural calamities using natural catastrophe risk modelling and then planning mitigation options to help reduce the risk. Especially for cities like Mumbai, this is critical.

As one of the first movers in the sector, what has been the growth of the sector in India? Do you think we have done enough to leverage GIS for growth and development?

I would say the growth of the sector has been slow, though in the last five years, there is some progress. It is slow when compared to the frequency at which natural calamities are increasing.

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I don't think we have done enough to leverage GIS. How many states have GIS-based platforms in place for natural catastrophe risk assessment, impact-based forecasting, emergency management? The answer is very few. Even where this has been done, the systems are not being utilised to their full potential.