



**Prof. Arup Dasgupta**

Managing Editor (Honorary)  
[arup.dasgupta@GISdevelopment.net](mailto:arup.dasgupta@GISdevelopment.net)

# GOING BEYOND DATA ACCESS

*Policy makers address the present but technological progress moves ahead and renders the policy irrelevant. Here's a look at various aspects of geospatial policies and architecture of an enabling framework*



**M**any years ago, when digital data was in its infancy, I had to organise an effort to digitise parts of Survey of India toposheets through a private vendor. In order to remain within the bounds of what we could and could not do with 'official' documents like toposheets, I had to take certain steps. I knew we were allowed to trace certain features from the toposheets to act as the base information for thematic maps derived from satellite data (Landsat 70m multispectral diapositives). I interpreted 'tracing' to be the same

as digitisation as actions were the same if you replaced the pencil with the digitiser puck and printing was akin to taking ammonia prints. The maps had to be taken to the nearby city for digitisation. For this purpose the policy dictated that the carriage and supervision of the work should be entrusted to a Class 1 officer. I found a hapless new Class 1 recruit and entrusted him with the job. As a bonus I arranged an official car for transportation as he was carrying 'official' documents on 'duty'. At the end of the day his task was to check the correctness of the digitisation and then after taking a copy on a floppy disc, he had to erase all data from the vendor's computer, taking care to empty the recycle bin as well. The floppies were then duly numbered and their details entered into a ledger and placed under lock and key. Years down the line the floppies had become unreadable but the rules dictated that they must be destroyed. The preferred mode was to burn the documents – easily done with paper but plastic? This little example illustrates the problem of geospatial policy. Policy makers address the present but technological progress moves ahead and renders the policy irrelevant. My dilemma of 40 odd years ago remains the same today – or possibly worse because the progress, proliferation and democratisation of technology have made things much more complicated. A linear extrapolation of policies is no longer an option. Thinking out of the box is.

In the past, geospatial data was the exclusive preserve of the government. They generated it, used it and occasionally distributed it to others on payment and with enough caveats to deter all but those in dire need and truly brave. The picture changed rapidly with the advent of satellite remote sensing. Suddenly, the forbidden fruits of aerial data were now accessible at a far lower cost and, since the government looked upon these with indulgent eyes as one would an obstreperous child, their dissemination was unhindered. This gave rise to a new breed of geospatial analysts – the value adders and therefore a new industry. The advent of the Internet, GPS and disruptive applications like Google Earth has given rise to community participation in geospatial data gathering and distribution. Meanwhile, governments have realised that the applications of geospatial data go beyond the mandate of national mapping agencies and therefore there is a need for an organised infrastructure. Other non-government users also would like to have access to such an infrastructure and may be even contribute to it. Geospatial policy must therefore, cover all these aspects and all these stakehold-



**"The benefit to national wealth does not lie in the sale price of data. Greater national benefits arrive from creation of multiple businesses and applications that generate productivity"**

**- ABBAS RAJABIFARD  
PRESIDENT GSDI**

ers. It must also address the issue of developing the necessary human resources that can utilise the technology and therefore address a portion of the formal and non-formal education and training scenario.

### **Data acquisition**

Who can acquire data? This question is no longer easy to answer. Satellite remote sensing began as a government sponsored activity in the United States and the erstwhile Soviet Union. At present, the commercial sector is licensed by the government in the US, Canada and Europe and has to conform to strict regulations that respect the UN Principles of Remote Sensing. However, at times of conflict involving these countries with others, national security needs can override such considerations to exercise 'shutter control'. In direct contrast, a company in Israel provides remote sensing systems on an exclusive and secret basis which completely flies in the face of the UN Principles of Remote Sensing. The emergent picture therefore is one of increasing government control either through direct involvement as in India, or through licensing policies as in US, Canada and Europe or through purchase of systems from foreign suppliers as in UAE and Malaysia. When we come to aerial remote sensing, the applicable policies vary from country to country.

Acquisition of data at ground level presents a very interesting picture. At one extreme, we have the government survey relating to land records and titles. The task is so enormous that help of private industry is essential. At the other extreme, we have a new brand of geographers, neo-geographers, who, armed with GPS, are able to provide geospatial data much faster than any organised effort. In fast changing scenarios like rapidly growing cities or in disaster hit areas, volunteered information has become a vital component of geospatial data. There are no policies regulating or standardising such information. However, there are issues in countries like Egypt which ban the use of GPS by individuals.



**"The key challenge is access to geospatial information which is not just the physical access. Geospatial data generators should pay attention to the marketing of their products"**

**- DEREK CLARKE  
CHIEF DIRECTOR SURVEYS AND MAPPING  
DEPARTMENT OF RURAL DEVELOPMENT AND LAND  
REFORMS, SOUTH AFRICA**

### Data dissemination and access

The bulk of geospatial data collected directly by the government or through government funding is directed at achieving 'public good'. This noble goal is indeed met with weather observation systems and systems for disaster management. However, as we move into higher resolution data and large scale maps, we need to ask some questions. Is geospatial data serving the public good within the policy framework of countries? Can policies relating to the data be framed to ensure public good services? If yes, what constitutes an enabling policy? How can the needs for development be met without compromising security? The picture that emerges is that public good has to be served by the government but in doing so it can and should involve industry to provide a variety of services.

According to Abbas Rajabifard, President GSDI, "a national approach to management of geospatial data is essential. In this regard, strong spatial policy development undertaken in partnership between government, private sector and academia can provide a solid foundation and structure for the development of a spatial information industry based on the use of geospatial data created through the use of taxpayers' money. What has tended to happen with

this policy development, however, is that while they are understood by the spatial sector, there has been an inability of these strategies to pervade wider government and society in general.

Derek Clarke, Chief Director Surveys and Mapping, Department of Rural Development and Land Reforms, South Africa observed that geospatial information is key information in every decision that is made; particularly, in public sector units and in developing countries. However, there are many challenges. The key challenge is access to geospatial information and access is talked about in different ways, not just the physical access. The other aspect of access is the need to have information readily available and people to know where it exists. This implies that geospatial data generators should also pay attention to the marketing of their products.

It may be necessary to restrict access to certain information which is of importance for national security, personal rights and environmental protection. But this should be kept to an absolute minimum and there should be clear rules about this. What is most important is that one part of the community should not be advantaged over another by gaining access to the information while the other is denied the same. In a democratic society, information should be used as a tool to empower rather than suppress citizens. Governments should encourage the use of the fundamental geospatial information which is a key to good and effective planning, monitoring and decision making, particularly in a development context.

Prof George Cho, University of Canberra, Australia adds that in the US there is an open records regime where all federally funded data are there for the public to use for the cost of reproduction and labour costs in responding to the public request for the data. Although lately there has been a change of attitude and most publicly funded data are available through various means. Cho feels that the idea that the policy framework is not doing enough for the public in need is an incorrect one. What one means by 'doing good' is debatable. What is the meaning of 'public in need?' Of course there is the

ideal that all policies for the public good should be more enabling. The mechanism



nisms of how to bring this about again differs from country to country and whether that country has the ability to do so both in political will as well as administrative infrastructure. Put these in place and some of the ideals will become achievable.

KK Singh, CMD Rolta and President of the Association of Geospatial Industries in India is clear about the role industry can play and the conditions needed to get industry to play its part. "In India, we presently have a 'Map Policy' inherited from pre-independence days. The industry has been demanding a change. What we need is an emulation of the thoughts and policies that changed our telecom sector. The sea change in the last decade from the sector being almost nothing to being one of the most evolved and penetrative telecom sectors in the world happened because of right policies. The capital has come from the private sector and the market. All that was done was putting in place a regulator. Common man has benefited from this. It all amounts to framing policies that are conducive to innovation. Innovation can be brought about by entrepreneurs and they will join the process only on an open playing ground. We did have a small change in our National Map Policy. Such small changes will not help. The policy changes have to be sweeping and all pervasive to achieve the best. The role of the government has to be that of the 'regulator'."

Sajid Malik, CEO of Genesys International observes that "Good geospatial data can and has played an important role in nation building. An enabling environment would consist of two important pegs especially in the Indian context. One is appropriate government investment in geospatial data to aid the large urban and rural infrastructure building initiatives. Thankfully, we are seeing the beginnings of that in programmes such as the APDRP, JNNURM and the NLRMP. The second would be to encourage the role of the private sector in map building especially through active and mature participation in schemes such as the above. As far as security goes, I believe the geospatial industry has unfortunately borne the brunt of excessive fears and has consequently been unable to offer the value of this technology in fact other very critical spheres of the economy and services for citizenry. Besides, advancements in technology have created a scenario that a lot of thinking and thus law is archaic in the current context. Law makers need to embrace this advancement. The new face of terror is such that as the saying goes: 'The bad guys already have the data and the



**"The idea that the policy framework is not doing enough for the public in need is an incorrect one. What one means by 'doing good' is debatable"**

**- PROF GEORGE CHO  
UNIVERSITY OF CANBERRA, AUSTRALIA**

good guys don't'. It's time the map policy allows for the good guys to have the data. "

This stress on government-private partnership is echoed by Paolo Colombi, Vice-President International Sales, GeoEye. He opines that policies that stimulate both the adoption and use of geospatial data and information are central to ensuring the viability of this industry. Increased government involvement in this sector – particularly in resource investment – is crucial to ensuring more widespread use of the technology by the public.

Mike McGill, President, Surveil feels that "the data policy spectrum ranges from no distribution allowed to mandates that all data procured by government must be placed in the public domain. These extremes of the spectrum do not serve the tax payer very well. On the one side, "no distribution" is sometimes a requirement for national security reasons and there is a need to respect local risk assessment associated with the proliferation of geospatial data. On the other side of the spectrum, in countries where geospatial data is placed in the public domain, government agencies usually lack the infrastructure to distribute the data in a meaningful and useful way." Mike illustrates an interesting government-private model which can also take care of security concerns. Mike adds that projects, in which he has been personally involved, have proven that "government agencies can cut their data acquisition costs by 50% to 70% and the commercial providers are able to maintain their long term revenue flows by predictably servicing their customers. This proverbial win-win situation in an age when Western governments have to dramatically cut costs is well worth consideration."

### **Data cost**

Derek Clarke raises the issue of cost of data as a deterrent to data access: "If a high price is put on data products, they become inaccessible for many communities to use. Information which is unaffordable (too expensive) will

# Free data or free access?

Therefore, should data be free? The concept of free data is gaining strength in the West. The opening up of data by Ordnance Survey in the UK has stirred up a hornet's nest. Mike McGill feels that free data must be matched with a suitable infrastructure for its use. Paul Colombi understands the push for "free" data, but in a commercial market, data is rarely completely free. For example, GeoEye sells imagery to Google and they post it for free. However, it generates revenue through subscriptions of high-end versions of Google Earth or through advertising associated with its sites. This type of revenue model, while effective for Google, doesn't work for everyone. He adds, "GeoEye-1, our flagship satellite that produces .41-metre resolution imagery with very high geo-location accuracy, was very expensive to build and launch. We have investors and shareholders who, of course, would like to see a return, so I don't think we'll see free imagery in the near future. Over time, as services and solutions become more prevalent and competition increases, you'll see imagery being provided at a reduced cost while the knowledge and value-added products generated by that imagery will be sold or hosted on a subscription basis. We'd hope that countries implement open data handling policies. US commercial imaging companies are currently prohibited from selling directly to customers in India. We hope that policy changes and becomes more in line with policies of most all other nations."

"Data is never free," agrees Mike McGill, "I understand public perception given the availability of Bing Maps, Google Earth, etc. The key is to find a sustainable way for ongoing creation and management of geospatial data while managing regulations regarding distribution. Companies know how to monetise content, but they also know how to distribute it in ways that can take into account local security requirements. I believe that nations and their citizens are well served by a strategic approach to the collection and maintenance of this content that involves significant commercial players that have a vested interest to invest while at the same time address security concerns."

Sajid clarifies that the question is of free access to data as opposed to free data; as nothing really is free unless someone has invested in the same. In the Indian context, a fillip through government spending and a liberalised map environment would ensure that high quality data, regularly updated, would become accessible to the needs of the massive infrastructure our nation is building.

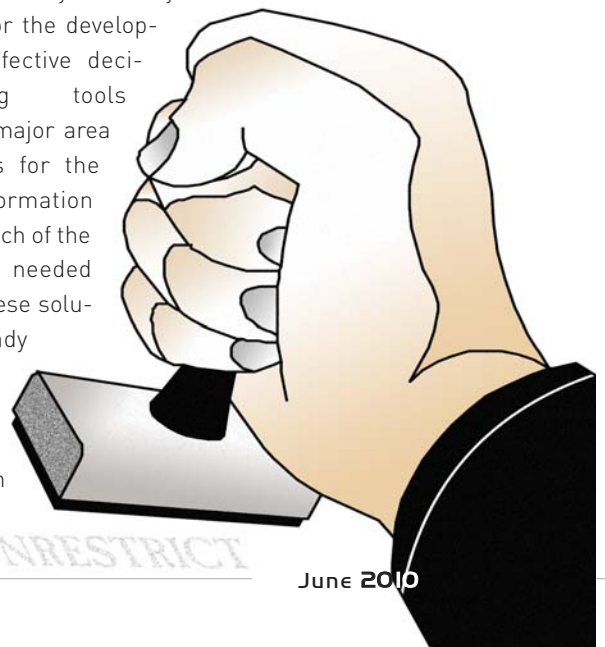
not be accessible and therefore not used by the less privileged." Abbas Rajabifard agrees. "If the cost is as low as possible, more people get engaged in using it creatively. Therefore, the idea of providing information free or at low cost is now articulated in many countries - the contribution to the economy at large is considered far in excess of

the retail price of the information. Moreover, the value of information in spatial systems is now being identified so that its significance as a major institutional asset is more fully recognised. The benefit to national wealth therefore does not lie in the sale price of data. Greater national benefits arrive from creation of multiple businesses and applications that generate productivity and hence improve taxation receipts and employment."

## Value addition

Geospatial data supports multiple applications affecting every sphere of life. The cost of data can thus be distributed over multiple applications reducing the cost per application. Further, data can have value added to it to turn it into a new product for further use. However, national policies relating to data usage and value addition, barring a few exceptions, are still very protectionist. As a result terabytes of data, collected at great cost to the exchequer - and therefore, the taxpayer, stagnate in government archives. This represents a huge waste of resources and is akin to the tons of food grain procured by the government and left to rot due to improper storage and inefficient distribution systems. The protectionist attitude extends to use by other government departments as well and results in data duplication. The time is ripe to fine tune geospatial policies to allow both public and private sector to use the data and build more applications and in turn to contribute to the economic development of a nation.

Agreeing to this proposition Abbas says, "The development of geospatial policies that help in the ability to generate solutions to cross-jurisdictional issues has become a national priority for many countries for the development of effective decision-making tools which is a major area of business for the spatial information industry. Much of the technology needed to create these solutions already exists; however, it also depends on





**"What we need is an emulation of the thoughts and policies that changed our telecom sector. The sea change in the last decade happened because of right policies"**

**- KK SINGH  
CMD ROLTA AND PRESIDENT OF THE ASSOCIATION OF  
GEOSPATIAL INDUSTRIES IN INDIA**

an institutional and cultural willingness to share outside of one's immediate work group. This creates the need for jurisdictional governance and inter-agency collaborative arrangements to bring together both information and users to facilitate the realisation of spatially enabled society."

Sajid opines that the likes of Google, Microsoft and Nokia will create the enabling platform to create increasingly more consumer driven apps which will penetrate the day to day lives of the individual. This consciousness will start permeating also at the enterprise level as more and more people become exposed to the power of the technology. For example, in a place like India in three to five years there may be ten to twenty million people using mobile devices to navigate. This map consciousness will force the rate of adoption in all other sectors of society as users will want the power of geospatial data to help them.

According to Derek Clarke, the private sector companies are important players in the economy and the government earns tax money from them. They are also job providers. The private sector companies should then be able to exploit the data in the interests of the economy. It can be argued that this benefit should be restricted to companies registered in the country only and exclude foreign companies. While there is merit in this, it will be difficult in the global digital arena to prevent foreign companies from accessing data. Colombi asserts that private sector can be an extremely powerful engine for applications development and, by extension, economic development in various market segments. Policies that stimulate government investment in geospatial technologies can only have a positive effect on the economy. As KK Singh of Rolta has mentioned, "... we will have a multitude of entrepreneurs jumping into the field and striving to develop and deliver what millions of Indian users want. The usual blame game on who is responsible for the present scenario will cease when a billion people think innovatively. With the excellent education system our country has in place, we

have had no dearth of bright minds that have done exceedingly well globally in all fields of science and technology. If we are to benefit from our own 'human resource', we have to put in place proper policies and we have to do it now. Opportunities will be lost as time goes by and as the global economic trends change."

### **Coordination and infrastructure**

The activities of data acquisition, storage, dissemination, processing and value addition requires coordination among stakeholders and the creation of an efficient infrastructure for data and information management. All nations have committed to some form of national spatial data infrastructures. However, the progress has been slow even with the early adopters like the US. In fact, it is the late adopters like Qatar and Singapore, who do not have the excess baggage of legacy systems, which have moved ahead rapidly. Opinions vary on the best kind of coordination framework that should be adopted in a country or region to facilitate better data sharing. What is the right prescription for data sharing?

According to Sajid, "India has a unique opportunity for three reasons to create a good data sharing environment: It has began now several nationwide initiatives for large scale data build-ups, it has several good geospatial companies who have had a huge track record in working with several governments and countries around the world. Their experience and capability can and should be tapped and their involvement as repositories and catalysts for data sharing encourages and lastly advancements in technology could perhaps allow for a leap frog mentality when you are not dealing with several legacy related issues. I would be all for a PPP model wherein a special purpose vehicle would ensure data sharing amongst various users driven by commercial interest."

Mike McGill states that SDI is a great concept for distribution of data across governments and to GIS professionals. This works because the audience of users is manage-



**"The geospatial industry has unfortunately borne the brunt of excessive fears and has consequently been unable to offer the value of this technology"**

**- SAJID MALIK  
CEO, GENESYS INTERNATIONAL**



**"Policies that stimulate both the adoption and use of geospatial data and information are central to ensuring the viability of this industry"**

**- PAOLO COLOMBI  
VICE-PRESIDENT INTERNATIONAL SALES, GEOEYE**

able but the SDI concept breaks down when the audience is not clearly defined and contained. Governments are not positioned to serve the general public at large and are therefore well served by handing this function over to their commercial partners. This is in line with what Sajid mentions about SPVs. Mike further adds that instead of governments spending time on content procurement, they should form a small working group that brings federal (including defence & intelligence), state and key commercial providers to the table to work out a self sustaining mechanism for the creation and distribution of content. Such arrangements should operate in five year increments in order to support a focus on content creation and management.

Derek: "There needs to be a common vision among all the stakeholders that supports the common good of sharing the information. Agreements must be put in place which clearly state the responsibilities of each data custodian. The model to be used should promote the 'togetherness' of the collective information, based on a single logical model but with the data itself being physically distributed at the respective data custodians – they are often the greater user of their own data, so don't take the data away from them."

"There must be strong protocols in place for keeping up-to-date the metadata of all available information. There must be a data discovery facility, with all available geospatial information, which again must be kept up-to-date. There must also be strong data fusion/integration facilities that will provide for seamless access to all relevant information. This, again, requires adherence to standards."

KK Singh: "A people-friendly national geospatial policy will definitely go a long way towards bettering the lives of the citizens. This is achievable by facilitating a coordinated exchange of geospatial information on natural resources, environment, land ownership, land use, transport, communication, demography, business and eco-

nomic indicators amongst various stakeholders within the country. The Indian Geospatial Industries Association is trying hard to get a totally 'open geospatial policy' in place and we are very optimistic about it."

Abbas: "The national policy on spatial data must include a framework of a national spatial data infrastructure (NSDI) that permits horizontal and vertical sharing of information among levels and agencies of government, and with the public and businesses. SDIs as enabling platforms are being developed by many countries to improve discovery, access, sharing and integration of spatial data and services but, there are still many issues and challenges which need to be overcome in order to have a fully functioning platform."

"Spatial information and technologies are key tools in this transformation because we define our relationships by place. The 'spatial enablement' that these tools create can reshape our lives. In facilitating this and to improve access, sharing and integration of spatial data and services, SDIs have emerged as enabling platform. Therefore in order to be successful in data sharing, the process should be at an early stage of development because its benefits are unappreciated by decision makers, and the engineering of an SDI requires patience and dedication of visionary people within a nation. Spatial professionals need to educate their acquaintances about the benefits of an NSDI."

### **Standards and interoperability**

NSDI will bring together heterogeneous systems. And to make them work together we need standards to ensure interoperability. Earlier, the thinking was that one could standardise on a particular product or vendor. These are short term solutions. In the long run, standardisation at a more generic level will make scalability and diversification more future proof. Standardisation as a matter of policy will enable reduction of duplication of data, give more flexibility in terms of choosing hardware and software and enable more people to use and contribute to the system.



**"Government agencies can cut their data acquisition costs by 50% to 70% and the commercial providers are able to maintain their long term revenue flows by predictably servicing their customers"**

**- MIKE MCGILL  
PRESIDENT, SURVEIL**

Abbas Rajabifard cautions that “There are many technical and non-technical obstacles in the integration of multi-sourced spatial data and this is one of the major problems in sharing and using spatial data among organisations. From a technical perspective, spatial data may differ semantically, syntactically and structurally. Institutional, social, policy and legal issues also hinder data integration. In order to effectively overcome these issues, a holistic framework is required to manage and address the issues that include standards and interoperability issues. The development of an SDI aims to achieve this holistic framework, and development through implementation at all levels of government within a country can help to create the effective policy framework required for implementation. Standards and interoperability are not appropriately included in a formal legal framework because they change, over time. Instead the framework should refer to ‘best available’ standards and set up a process for identifying these from time to time as needed.”

Derek Clarke adds that “enabling policy will be requirements to openly share the information, to adhere to accepted standards and data discovery facilities. The user should be able to access and use the information without having to know where the data is physically stored.”

Sajid opines that “both these terms are individually milestones for the geospatial industry which needs to be crossed in order to truly unlock the hidden potential of geospatial data sets. In the absence of standards, geospatial data requirement many a times calls for creation of data from scratch. At smaller scales of 1:50,000, Survey of India base map is widely accepted as a standard map. This is a typical situation where a ‘product’ has set the ‘standard’, but for the larger interest of the industry we need to work on broadly accepted standard, including the acceptance of government departments, PSUs, municipal bodies and the private industry; which eventually would lead to geospatial data products adhering to these standards. The onus of interoperability rests more with the private industry, but suitable policy can act as catalyst towards an interoperable environment.”

“Bringing standards and interoperability into the policy framework is a critical step which can happen with the intervention from government department or ministry, along with dialogue with the stakeholders of this industry, so that appropriate document for the standards and interoperability is incorporated in the policy framework, which

## Human Capital

The most important of all resources are the human resources needed to effectively organise and utilise geospatial data and applications. Geospatial policy must also address the creation and maintenance of such resources. Prof George Cho feels that “most developing countries are groping around to come to grips with geospatial data both in their collection and in its use. The ideal would be to have some kind of development aid from developed countries to assist in the skilling and training of competent staff. Also it would help in making the activity more sustainable so that when the technical experts leave, there is both the knowledge and physical infrastructure remaining that will permit the development of the country with the use of good geospatial infrastructure. At an early stage, there will always be the question of security concerns. Again this depends on the country and jurisdiction – some are sensitive to security concerns.” This concern is voiced in a different way by Abbas when he says that for a policy to be enabling, there is a need for it to build capacity not only at a technical level, but also at a wider governmental and societal level. Derek Clarke voices similar concern by asking, “Another aspect of access is can people who get information use it? What is the use of accessing terabytes of data and they don’t have faintest idea of what to do with it?” He goes on to say that this requires basic map literacy. Without such a capacity, people will not access data because they do not know what to do with it. Certainly, we have technologies today that make it easy for them to use information but they need to be taught.

even if it does not have the consensus of all it takes care of the interest of the large section of stakeholders of the geospatial industry.”

Mike: “They are very important within the community of geospatial professionals and much has and is being done to establish these standards. Such standards are indirectly important to the public at large because they theoretically make the aggregation of data simpler and therefore cheaper; the lower the cost the broader and greater the availability. At the end of the day, this serves well for all stakeholders. A small working group could be well positioned to address such policy as a component of their content creation and management strategy.”

### Legal liabilities

As we move away from a single data generator and supplier situation to multiple data suppliers and an international milieu, the issues of liabilities become more complex. Further, with geospatial technologies becoming more people-friendly and services becoming tailored to individual needs, the issues now include privacy and protection of individual rights. Geospatial technologies are

Rolta

Page 2

ca Ad

28-29

*"Geospatial data supports multiple applications affecting every sphere of life. The cost of data can thus be distributed over multiple applications reducing the cost per application. However, national policies relating to data usage and value addition, barring a few exceptions, are still very protectionist."*

going mainstream in areas like civil aviation, insurance and environmental legislation. There is a need for these activities to be framed within a specialised legal framework to protect privacy, liability and the intellectual property rights of data owners. What kind of legal framework is conducive to development?

Prof George Cho feels that there can be no single legal framework that can attempt to protect privacy, liability and IPR of data owners. It depends on the regime and jurisdiction. There can be no framework that is conducive for development because when there are financial and trade implications, obviously most would be protectionist in attitude.

Abbas: "The complexity of current access arrangements to spatial information will continue to restrict innovation and unless more flexible arrangements can be implemented. In addition, spatial data and its uses need protection from those who argue that privacy and other broad values demand its sequestration away from the public and professional stakeholders. Without a clear legal framework to ensure open access, use of geospatial data will be determined by forces antithetical to spatial policy. A formal framework should be expressly created because an informal, and potentially ill-informed, framework will be applied regardless. Issues of licensing and the use of the Creative Commons are part of the solution to issues of sharing data.

In addition to this, the issue of free data, accessed through an SDI for example, requires a whole range of policies and institutions that have to be put in place in order for security concerns to be mitigated. For example, policies must be determined on privacy, intellectual property and copyright. Another dimension to opening up

geospatial data and access to it is to what extent the access environment or infrastructure supports intelligent decision-making."

Sajid: "It will be incumbent for policy to first allow clearly private sector participation which will be followed by laws which will protect their IP rights. The Ministry of Science and Technology plays a very crucial role in this."

Mike: "We know from experience that the more a company can protect its intellectual property, the better it can serve any particular market. With that said, this is a difficult and complex issue. In short, individual governments should promote the development of intellectual property rights and provide the legal framework that promotes efficient prosecution in cases where intellectual property rights are violated."

Derek: "Regrettably there are those few who are irresponsible or have criminal minds and so it is necessary to have a legal framework to protect the exploitation of rights. There is also the need to protect the interests of the public by ensuring that geospatial information being used will not cause damage to life or property at any stage. As part of the legal framework, there should be the requirement for professional responsibility and liability by those collecting and providing information. The rights of individuals must be protected to uphold their dignity."

## Conclusion

Any discussion on geospatial policy somehow regresses into a discussion on data access. While policies on data access are of paramount importance, it can be seen from the discussion by the experts that there are many dimensions to geospatial policy which range from acquisition to usage and capacity building. At each step, we need enabling policies to be able to maximise the benefits from the technology. There is a welcome convergence in the thinking of geospatial professionals in government, academia and industry. We would welcome a similar convergence between the geospatial professionals and the policy makers.

## Acknowledgements

GIS Development would like to thank **Abbas Rajabifard**, President GSDI; **Derek Clarke**, Chief Director Surveys and Mapping, Department of Rural Development and Land Reforms, South Africa; **Mike McGill**, President, Surveil; **George Cho**, University of Canberra, Australia; **KK Singh**, CMD Roita and President of the Association of Geospatial Industries in India; **Sajid Malik**, CEO, Genesys International and **Paolo Colombi**, Vice-President International Sales, GeoEye for their inputs. The report "The Land Remote Sensing Laws and Policies of National Governments: A Global Survey" by The National Center for Remote Sensing, Air, and Space Law for NOAA was also a very good reference source. ■