

IAC-13,E7,5,7x16547

PERSPECTIVES FOR A NATIONAL GI POLICY (INCLUDING ASSESSMENT OF EXISTING NATIONAL REMOTE SENSING, MAP AND DATA SHARING POLICIES)

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ABSTRACT

Government of India is taking up the implementation of a National GIS – the core of which is a well-founded Geographic Information (GI) Asset that is seamlessly available for the whole nation, is continuously maintained/updated and would power many a GIS Decision Support applications for governance, enterprises and citizens. Space- and aerial-based Earth Observation (EO) data; survey and satellite-based positioning data; Geographical Information Systems or GIS databases/applications will be mainstay around which such a National GIS would be built.

A Department of Science and Technology (DST) sponsored policy-research project was taken up by National Institute of Advanced Studies (NIAS). As part of the project, the international scenario of EO and GIS and Image Policies has been studied and compared and emerging policies of some nations active in this field across the world have been analysed – which helped trend-definition of the EO and GI Policy scene in the international domain. Similarly, the national eco-system and environment of GI policy has been analysed – especially from the technology, user needs and national security considerations. In specific, a key assessment and analysis of the existing individual policies for satellite remote sensing and EO, in the form of Remote Sensing Data Policy (RSDP), Open Map Policy for topographic maps and the National Data Sharing Policy that spells out sharing principles of information generated using public funds have been detailed. Thirdly, 62 key parameters (14 parameters pertain to EO Imaging; 11 to satellite-based positioning; 9 to advanced surveying; 7 to mapping/cartography; 14 to GIS databases/applications and 7 to eco-system issues) of national importance for GI policy definition have been identified and analysed in GI Policy context for India. Finally, an integrating framework of a National GI Policy has been determined – integrating EO images, satellite-based positioning, advanced surveying, mapping and GIS geodatabases/applications – ultimately outlining national guidelines for GI creation, usage, sharing and also creating a national regime for its protected interests and development.

This is a first of the kind study on GI Policy – comprehensively covering EO imaging, mapping, surveying, GIS and positioning a holistic policy perspective for National GIS. The report (available at Report No: R11-2012. (www.nias.res.in/docs/R11-2012-GI-Policy.pdf) has built a foundation for a national debate on GI Policy. The paper will discuss the report and provide an over-arching perspective of what is the National GI Policy and its next implementation steps.

I. RELEVANCE OF GI POLICY

Geographic Information Systems (GIS) have been making tremendous impact globally for decision support applications in modern times. Geographic Information Systems have emerged as powerful lever for socio economic development because they take advantage of

advances in many technological fields. They are systems of hardware, software, data, applications and policies dealing with spatially referenced and geographically tagged or linked data. Modern GIS technology integrates several technological domains such as surveying and positioning, map making and cartography, imaging and image interpretation,

databases, computing and networking. In view of the convergence that GIS brings in and the impact can create, at scales extending even to national or regional level, the policy and legal aspects relating to GI are assuming paramount importance.

Taking account the heritage built through many programmes in Imaging, Mapping and GIS, India has been planning to establish a National GIS [1] – the successes of which would critically depend upon a good integrated Policy framework. The Department of Science and Technology (DST) under the Government of India (GOI) had sponsored a project on National Institute of Advanced Studies (NIAS) for Policy Research in Geographic Information (GI). NIAS undertook a thorough study through a team of experts, and had organized a “National GI Policy Roundtable” involving experts from government, industries, academia and NGOs. A draft National GI policy document was generated based on discussions and inputs emanating from the meeting. This paper discusses the report and provides an over-arching perspective of what is the National GI Policy and its next implementation steps.

The context and significance of a study on GI policy for India was seen to assume enormous contemporary significance. In order to maintain the course of its growth and inclusive development, India needs a revitalised information regime and very efficient national information systems that will serve as foundation for the governing as well as the governed – bringing continuous assessment of development needs, bridging disparity and gaps, promoting equity, transparency, inclusivity and citizen participation. Geographical Information Systems have emerged as key tools towards such objectives.

There were also other reasons why a National GIS was seen essential. In spite of fairly wide usage of GIS as a technology, the full potential of GIS had not yet been exploited in the country for decision-support by planners, decision-makers, citizens and many others who are stake holders for governance. Although many initiatives have been successful in proving GIS application potentials in a “project mode”, GIS was yet to get a “service orientation” and get assimilated to become a part of the process of governance, planning and nation-building in a significant manner. The main reasons for this limitation were essentially (i) lack of easily available and regularly updated GIS-Ready data for the nation, (ii) lack of comprehensive, easy-to-use GIS Decision Support Systems, and (iii) absence of an integrated and overarching structure to foster high-level of national capability in this field. The solutions to overcome these limitations have to be necessarily

systemic and hence the study on the National GI Policy was focussed on these key issues.

II. INTERNATIONAL SCENARIO IN GI POLICY

Geographic Information (GI) and GIS, which are manifestations of the broader “Information and Knowledge” dimensions of current age that endow tools, resources and pathways for progress, can be the key differentiators for decision support in diverse spheres such as governance, business endeavours and citizen services. However, the integrating and coordination imperatives of GI and GIS across several organisation systems and knowledge disciplines demand innovations in policies and regulatory developments. Global trends in these fields indicate constant learning process and progressive reformations in existing systems to make these tools effective and directed to broader goals of human development.

Landscape of GI policies in different countries across the globe presents a varied picture. In the USA, which is the largest market for GI, the foundations of GI policy rest upon the strong Freedom of Information Law. Well defined organizational mechanisms and structure for coordinated use, sharing and nationwide dissemination of geospatial data exist there. The US policies and legislations in this area underpin the public good investment approach to data, facilitation of widest access to geospatial data/ information and a strong private sector role in establishing technological leadership. A major challenge that continues for the National Spatial Data Infrastructure (NSDI) there is fully achieving the goal of seamlessly coordinating disparate types of geospatial data. [2] In Europe, while the public investments in GI are significant, policies regarding pricing of data vary considerably across the region. There is also focus through European Parliament’s Directive to set up and operate an Infrastructure for Spatial Information in Europe to assist its strategies on environment, security, agriculture, policy monitoring and so on. [3] Another dimension of policy in different countries of the European region is the facilitation of wide access to data held by public sector. In the environment of converging capability for location and for tracking of movements, transactions and communications at individual level, conflicts between social good and economic rationale have become the order of the day and the gaps in law and its implementation in the fields of privacy protection, product or service liabilities, data security etc are actively pursued for resolution. Especially, the EU Data Protection Directive has been shaping global privacy protection by imposing a rigid approach on other trading partner countries [4]. In the case of Japan, one can witness strong policy and legislative measures to

promote the creation and use of GI for developmental needs. NSDI Act (2007) of Japan facilitates national government agencies, local governments, and private sectors to focus the use of geospatial information as vital input to construct a sound and prosperous society.[5] The Brazilian policies reflect the recognition of public good nature of information and providing free and wider access to information that enhances benefits to society. Brazil had taken legislative initiatives for open access to public information [6]. China has also established spatial data Infrastructure called, the Digital China Geospatial Framework (DCGF) which is being organised at National, Provincial, Municipal and County levels. The coordination for data sharing and implementation of standards is achieved through the National Committee for Geospatial Information Coordination, which is an inter ministerial body [7]. Recent times have also seen legal developments in China like the new *Tort Liability Law* that addresses infringements on the right of privacy of citizens.

In addition to the progress on policies in individual nations, several international fora have also been contributing to the policy evolution. Group on Earth Observations (GEO), which is a voluntary partnership of governments and international organisations, aims to provide by 2015 a shared, easily accessible, timely, sustained stream of comprehensive data of documented quality, as well as metadata and information products [8]. It is noteworthy that visions for global approaches, as exemplified by the GSDI movement, had contributed to concepts like citizen participation in GIS.

Foregoing survey is only a sample of trends across the globe. There have been such developments in many more countries. Analysis of GI policies at international level leads us to some important conclusions. Globally, many historical factors contributed to the piecemeal and fragmented developments in GI policies – which at the core level have to deal with the basic issues of *access, economics and security*. Further, driven by diverse goals of policy makers and also the dynamic environment of technology advances in access, transformation, transfer and use of data, the policy landscape has been evolving continuously. This landscape today presents somewhat varying degree of harmony of constituent policy and regulatory elements that include data access, right to information, privacy protection, IPR protection, liability standards, extent of public policy interests, security, pricing and market oriented policies, quality and technical standards and institutional frameworks. While during the last decade thrust was on building spatial data infrastructures and sharing of data available with different agencies, the GI policies are now moving beyond emphasis on the sharing of data and sustaining of the spatial data infrastructures. They are moving

towards systems that can ensure readily usable and current data which different users (in government, business enterprises and citizens) need and towards systems that deliver affordable and timely services. The governments have been recognising the diverse roles of GI (public good, commercial and quality governance) and are investing in infrastructure as well as national capabilities in terms of technology, institutions and human resources. They are innovating overarching policies to realise these.

III. CURRENT ECO-SYSTEM OF GI POLICY IN INDIA

India has made tremendous progress over the years in technologies that encompass modern GI systems such as imaging from space, aerial surveys, positioning, precision surveys, information technologies and applications. At present, however, as far as geospatial technologies and applications are concerned, there is a paradox in the national GI eco-system in India – on one side, growing demand for GI and GIS applications in almost all sectors of society; and on the other hand, there are gaps in capabilities and delivery systems – which are expressed by government users, private enterprises and academia in different ways. Another paradox is that while India has been making considerable annual financial investment in GIS – in term of license purchase of GI software and systems from global sources and has been undertaking specific projects and applications and generating experts, they are yet to make COLLECTIVE and big impact at the national scene. Our earlier work pointed to a growing set of policy conflicts arising from advances in GI and Remote Sensing fields and advocated the need for harmonising policies and legal issues through multi lateral consultations [9].

It was also observed in India that fragmented approach to policy making has been one of the critical reasons for the slow pace of development of this field. There are three major impediments to be tackled, namely, (i) non-availability of regularly updated GI content for the nation, (ii) lack of a coordinated, aligned and professional effort in defining and furthering the national goals for GI generation and usage – government agencies have “pulled” in different directions and have not set/defined a NATIONAL GI GOAL towards which all of them worked for and (iii) lack of a holistic NATIONAL GI POLICY – which aims to look ahead and make a road-map for all elements of GI and helping to make GI usage all-pervasive and easily possible.

Five different policies had been in position in India pertaining to different aspects of GI as follows:

- A National Map Policy (2005) defining the scope, distribution and liberalized access of digital Survey of India (SOI) topographic maps to user groups without jeopardizing national security. [10]
- A Civil Aviation Requirement (CAR) which was issued in 2012 detailing procedure for issuance of flight clearances for agencies undertaking aerial photography, geophysical surveys, cloud seeding etc. [11]
- A Remote Sensing Data Policy (RSDP (2001 and 2011) defining the distribution process of satellite images to different category of users.[12]
- The Delhi Geographical Spatial Data Infrastructure (Management, Control, Administration, Security and Safety), Act, 2011 defining the mandatory sharing, accessing and utilisation of Delhi Geo-Spatial Data.
- A National Data sharing and Accessibility Policy-2012 (NDSAP-2012) providing an enabling role and platform for proactive and open access to the data generated through public funds available with various departments / organizations of Government of India. [13]

In the present day perspective, the National Map Policy 2005 needs improvisation in terms of committed schedules for updating maps, providing service level guarantees to users, diversification of mapping concept (beyond topography) and initiating appropriate participative measures for users/industries/citizens. Similarly the Remote Sensing Data Policy -2011, though quite progressive, still lacks a few important requirements of a policy, namely – time-line definitions and service level guarantees to users; committed enhancements for national imaging capabilities with timelines, involving users/industries/citizens as part of transparent and participatory policy defining process and enabling access to data from global commercial satellites in a more rational manner. Considering the technological capability in this field in the country, even positioning into global market in a more prominent way needs to be considered. Turning to aerial surveys, revitalisation of policies relating to aerial survey capability and services is relevant. There is also a need for holistic road-map for growth in this sector. Finally, while noting that the Delhi Geospatial Act, 2011 and National Data Sharing and Accessibility Policy-2012 are progressive steps, they need further consolidation when seen in the context of realising maximum potential of GI for national needs in diverse spheres. Foregoing analysis of current ecosystem indicates the need for envisioning a set of core capabilities related to GI as a policy goal at national level matching with the needs, aspirations and strengths of the country and filling the aforementioned gaps in the current policies. It

is also necessary harmonise these GI policies from various cross cutting considerations like national security, social and legal environments.

IV. TOWARDS DEVELOPING A HOLISTIC GI POLICY

A holistic GI policy in the socio economic and security context of large democratic nation such as India with an inclusive development and growth aspirations needs to consider both technical capability perspectives as well as many cross cutting dimensions in social, legal and security spheres. This approach to policy development involving study of external environment and internal capabilities with engagement of stakeholders was considered an essential means to realise holistic characteristics of the policy instrument.

In so far as the ‘capability’ dimensions of policy are concerned, seven basic segments have been identified to reflect needs and gaps of national capability in GI. These were (i) Imaging Capability, (ii) Precise Positioning Capability, (iii) Advanced Surveying Capability, (iv) Mapping Capability, (v) GIS Capability, (vi) GI Knowledge Capability and (vii) GI Policy Capability. All in all, a set of 72 parameters relating to “Capabilities” domain have been analyzed to enable a “holistic” approach to Policy definition. Of these seventy two, 11 parameters dealt with “Imaging” segment, dealing with critical policy issues for leadership in Imaging capability, long-term sustainability, positioning in global environment, service level standards, performance goals and ability to support National GIS content. 8 parameters dealing with “Positioning Capability” were analysed to assess policy needs for shaping Positioning as a service and the strategic approach towards this. Further, 11 parameters that dealt with “Advanced Surveying” had aimed at identifying critical gaps in bringing benefit of aerial survey capability in India and means of bridging these gaps; needs for stream-lining and standardizing ground-surveying activity and its ability to contribute to National GIS. “Mapping capabilities” are explored through 12 parameters had brought out clear gaps in mapping domain and policy issues on availability of up-to-date digital topographic maps and also thematic mapping content in India. 11 parameters represented “GI Content capabilities” that underscored the needs and gaps of DATA/CONTENT for the growth of GI applications and deriving benefits. Lastly, 11 more parameters were defined to explore the needs of GIS application services in the Decision Support Systems and also needs for indigenous capability in GIS software. Foregoing analysis which drew inputs from extensive survey of literature, experience of experts and consultations with diverse stake holders has enabled a

structured approach to policy analysis and a logical basis for synthesizing the complex dimensions of policy.

V. ANALYSING THE CROSS-CUTTING POLICY ISSUES

GI information has national security impacts and it is also extremely essential for national security and defence needs. On the other hand, improperly devised and highly restrictive policies that curb innovation and growth of GI technology in the country can handicap the security/defence system. Most nations have the following concerns from a security point of view, namely, (a) knowledge of who is using GI – mainly to “isolate” any user who intends/plans to use GI against the national interest, (b) the nature of use of the GI– is it benign/permissible OR is there any use against national interest, and (c) can every user of GI be tracked and whether use of GI can be “assessed” in real-time. Technologically, with present-day advances in imaging, internet and computing technologies, it is virtually impossible for a democratic governance system to adopt totally restrictive regime for access to information. Any nation today can set up a global GI server that can serve GI content of any part of the globe to an individual without any difficulty. Hence information denial policy is to be substituted to the maximum possible extent by a policy that positions a front-ranking technological capability that enables sifting of use and adopting online analytics or audit to determine each transaction related to GI information. Such a strategy of elevating technological capability can also counter dominant play in the global environment.

In addition to national security considerations, since GI related activities vitally serve government, enterprises and citizens, a National GI system is to be considered as a basic social infrastructure that helps the nation as a whole. This founding for proper development and usage of GI and establishing the foundation of National GI and its benefits needs to be taken as a national commitment. Any subsequent business model for GI related activity could happen as a sequel to this founding activity – just as it happened other sectors such as telecom, roads, aviation, railways etc. In most of these sectors, the business segment grew only when the founding investments for the infrastructure had already been made by government and provided the “platform” and standardisation for a business model to develop.

There are also several areas of legal field, where existing regulations need to be fine tuned considering specific characteristics of GI technologies and novel ways in which they are used. The nuances and dilemmas

of legal nature arise from several reasons but not limited to the mixed roles of public and private sector and diversity of legal systems and jurisdictions in which processes relating to generation and use of GI occur. Those legal issues include aspects of access and data sharing, Rights to Information, Intellectual Property Rights, Protection of Individual’s Privacy and Liability issues.

A key ingredient of policy for a sustainable and efficiency oriented system is the role fashioned for industry, which many governments recognize and seek industry partnership in national GI development. Such an anchor-tenant role of the government towards industry to begin with could create a healthy, sustainable and competitive industry and justify private sector involvement. Government could consider incentivising industry with limited-period tax rebates/concessions on using indigenous GI technology/data; developing new and indigenous GI technology (instruments, software, data, citizen services etc) and many other methods.

VI. ESSENTIAL ELEMENTS OF DRAFT NATIONAL GI POLICY

Consultations with diverse stakeholders (including experts from government, industry and academia) on the aforementioned analysis of parameters that address “capability” dimensions and “cross cutting” dimensions of policy were instrumental in a consensus building process on different facets of the draft National GI Policy for India. The broad context and purposes of the policy as emphasised in its preamble reflect the national needs for adopting spatial planning, area based development assessment, spatial assessment of disparity and gaps, goal based performance monitoring – all of which would bring focus on scientific and rational developments in various economic and social sectors. It also recognises the criticality of Geographic Information (GI) for furthering inclusive and transparent governance activities and in bringing greater technological benefit to the nation in furtherance to many successful GIS-based activities undertaken hitherto through diverse policy initiatives in the fields of Imaging (from satellites, aerial platforms), Mapping (topographic and thematic), surveying, positioning and GIS (databases and applications) – both in government and private sector. The stated goal of the National GI Policy is to enable the establishment of National GIS and its operationalisation so that (a) benefits of GI will be available as a g-Governance service in the form of customised GIS-Decision Support System (GIS-DSS) applications meeting the needs of governance, citizens and enterprises, (b) real-time availability of seamless and updated GIS for the nation is assured and (c)

leadership in GIS technology and applications is maintained to bring knowledge and competitive edge in the national and international arena.

The policy envisages the implementation of National GIS through establishment of Indian National GIS Organisation (INGO) which will have responsibility for the development and growth of the GI sector so that a systematic and coordinated development is ensured amongst government, private, academia and others. National GIS will facilitate access to its assets and services on “non-discriminatory” and “need to access” basis, establish Technical standards and Protocols and also facilitate, in collaboration with the national mapping agency – Survey of India, the development and free availability of National Spatial Foundation Dataset, which enables any user to build GI and participate in National GIS. The policy envisages further developments of National GIS through a participative forum of users and providers on annual basis.

In consonance with a holistic approach that it represents, the draft policy also provides an overarching framework for different segments related to GI as well as other cross cutting areas. For satellite imaging segment, the key provisions deal with governing roles of Remote Sensing Data Policy for which the Department of Space (DOS) is the responsible agency; encouraging and positioning a regime for private ownership and operations of Indian registered RS satellites; revitalizing the model for global marketing/distribution of data from government owned space assets; service level guarantees to users; access to global sources of imaging data and positioning a long term strategy. The key provisions in respect of Positioning segment deal with implementation of Positioning-As-A-Service concept, and, ensuring accessibility of Positioning data to citizens of India on “non-discriminatory” basis subject to multi-level registration. As regards Survey segment, the policy proposes to upgrade urban survey data to ultra-large scales from aerial platforms, with periodic updating to enable effective planning, infrastructure development and management of cities. The policy also emphasises the development of industrial capability, simplification of procedures and improved access to registered users, and development of Standards for Ground Survey data collection and Quality assessments. In respect of Topographic mapping, the policy reiterates the role of Survey of India and governance of distribution of topographic maps as per the National Topographic Map Access Policy. It also elaborates the provisions of National Thematic mapping Policy which mandates INGO to licence mapping for National GIS. This policy would also require thematic mapping activity in the nation to be based on National Spatial Framework

(NSF) dataset as a base and adoption of National GIS Mapping Standards. An important feature of the National GIS Policy is that it serves as a platform for growth of GIS applications and services and in this direction it promotes and encourages national/state planning/fund allocation/monitoring/reviews to be based on use of National GIS DSS applications. It also allows hosting of GIS applications conforming to be National GIS application Standards by both public and private sector providers as well as academia. It would incentivise development of indigenous technology base and support capacity building initiatives.

The draft policy also lays considerable stress on the development of a healthy eco system that integrates security provisions which are friendly to benign users and sensitive responses to social and legal issues.

VII. CONCLUSIONS

The study and development of National GI Policy undertaken by the National Institute of Advanced Studies in India demonstrates a unique and rational approach which integrates scientific exploration of all core issues and engagement of stakeholders in the development of the necessary policy instrument. The study itself was carried out through a step by step process of issue identification, policy analysis, policy instrument development and consultation, and the report [14] was delivered to the Department of Science and Technology of the Government of India for undertaking further steps of coordination, decision, implementation and evaluation. Policy it also attempted to benefit from the historical global experience with the role of GI in economic development and social transformations. The perspectives of policy brought out by the study, although depicted in the national context of India, are highly relevant to different regions of the globe since they strike at the roots of fundamental issues that characterise the structures in which generation and applications of GI are being pursued. The experience of the study is useful, for example, to harmonise and integrate the fragmented policy making approaches in the context of convergence that GI technology and applications represent and to further develop a holistic policy which allows realising the maximum potential of GI technologies. It is also useful in reviewing and revitalising the outdated policies of control of access and ensuring security.

ACKNOWLEDGEMENTS

This paper has been prepared from the NIAS report - Perspectives of a National GI Policy (Including a draft Policy) - Mukund Rao and KR Sridhara Murthi. A report of National Institute of Advanced Studies,

Bangalore. Report No: R11-2012. (www.nias.res.in/docs/R11-2012-GI-Policy.pdf). The authors are thankful to Department of Science and Technology, India for the project grant for the GI Policy research study.

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