RESEARCH ARTICLE

INDIAN HUMAN, INSTITUTIONAL AND ORGANISATIONS CAPACITY BUILDING IN GEOINFORMATICS

*Kamal Kumar, M.

Department of Geography and Geoinformatics, Osmania University, TRAC, Hyderabad, India

ABSTRACT

Capacity building is often referred to mean training to advance individual knowledge, in some cases introducing new infrastructure, or quite often exposing staff to better environment through study to improve resource management skills and capabilities. Geoinformatics broadly includes mapping and surveying techniques, remote sensing, photogrammetry, cartography, Global Positioning Systems (GPS) and Geographical Information Systems (GIS). With its unique ability for acquisition, integration and analysis of geographically referenced spatial information, this technology has in recent times been recognized as an effective tool for planning, management and decision making locally and globally. Well articulated policy mechanisms, Government support and the ever increasing domestic demand would go a long way in popularizing geospatial technology in India and bring it into the mainstream an aid for effective governance and developmental planning. The development of geoinformatics over the last two decades and with that the growing awareness of the role of Geospatial data infrastructure (GDI) in civil society imply that professionals of different types are required by organisations involved in the production, dissemination and use of Geospatial information (GI) and with policy development with respect to the roles of the public and private sector in this field. This is a global development, but the different regions and individual countries of the world have to formulate their own ideas and concepts how to deal with this issue, because Geospatial data infrastructure (GDI)'s should be adapted to regional and local context. Advances in space and information technologies have positively impacted on critical capacity globally through availability of geospatial information technology tools. To be fully utilized however, the space and information technologies must be understood by skilled manpower in India to tackle the major challenges in spatial data management. In India, the majority of the professionals and technicians in different organisations involved in geospatial information activities have not been making full use of data and tools to manage and alleviate the consequences in planning and management of natural resources for sustainable development. due to low proficiency in the space technologies. Today there is increasing demands of well-trained staff at all levels, to face the main challenges of spatial data management and urgent situation response. Therefore, it became necessary to provide training and capacity-building in the use of space and information technologies for different levels of professionals involved in spatial data management. This is for the benefit of communities affected by different kinds spatial problems . It will involve exchanges and communication between experts and development partners on one hand, and experts and local communities who must also understand and value the use of space technologies to solve their problems, on the other hand. This paper examines the constraints for manpower development in space- and geo-spatial information technology to tackle numerous situations occurring in India.(flood, drought, windstorm, wild fire, famine, epidemic, etc...). This study also investigated the challenges and successes of geospatial technologies capacity-building programme carried out , designed for technical and managerial staff working on projects. Assessment of the training programme revealed that basic mapping skills could be successfully transferred to the project staff; giving them the capacity to use geospatial technology to better plan, design, implement and evaluate their projects. The role of capacity-building by training institutions like the Indian Institute of Space Science and Technology (IIST), Indian Institute of Remote Sensing (IIRS), National Natural Resources Management System (NNRMS) in improving the situation and facing the main challenges is emphasized and case studies presented.

INTRODUCTION

The geospatial industry is presently witnessing tremendous opportunity within the country as the Union government has initiated reform projects in several infrastructure segments like rural development, power, land and natural resources during the 11th Five Year Plan and mandated the use of geospatial technologies in these projects. Government projects such as Agricultural resources information system (AgRIS), Jawaharlal

Nehru national urban renewable mission (JNNURM) and National land records modernization programme (NLRMP), Restructured accelerated power development and reforms programme (R-APDRP) etc. will boost growth in the sector. Besides, there are various other fields such as, schemes for construction and maintenance of roads, railways and waterways, civil aviation, public utility services, education, health, command area development, flood management programme, flood control, urban renewal, urban water supply, rural water supply, Integrated Watershed Management Programme etc that essentially use geospatial tools and technologies for spatial planning, management and decision.

*Corresponding author: Kamal Kumar, M.
Department of Geography and Geoinformatics, Osmania University, TSRAC, Hyderabad, India.

As the Indian Government strives towards making a shift from E-governance to G_ governance, the geospatial industry is set to assume a greater and significant role in the Indian economy. Today, GIS technology is being widely used in India by several government as well as private organisations. Several GIS based initiatives are being implemented in the country, such as Natural Resource Information System (NRIS) under National Natural Resources Management System (NNRMS) of Planning Commission, National Spatial Data Infrastructure (NSDI) of the Department of Science and Technology (DST), Bhuvan Image Portal of the Dept. of Space (DOS), Delhi State Spatial Data Infrastructure (DSSDI) of Delhi State, National Urban Information System (NUIS) of Ministry of Urban Development (MUD), recent efforts at modernization of land records under NLRMP, various City_GISs (Mumbai, Bangalore, Kanpur, Kolkata etc.). Author of 'Fundamentals of Geographic Information Systems' Mr. P.L.N. Raju, describes Geoinformatics as "The science and technology dealing with the structure and character of spatial information, its capture, its classification and qualification, its storage, processing, portrayal and dissemination, including the infrastructure necessary to secure optimal use of this information." In simpler terms, it deals with the tools and technology used to acquire, analyse and visualise our planet and its resources from space – like the geographic location of Earth's boundaries, oceans, natural features, man-made structures, etc. This geospatial information (along with geographic information systems) is used to tackle varied problems of geography, geosciences and related branches of engineering. It includes remote sensing of images, mapping, modelling, development of geospatial databases, information systems design, and uses geocomputation and geovisualisation for analysing the geoinformation. The derived results are disseminated in user-friendly formats that are regularly updated. Geoinformatics is an interdisciplinary field with wide-ranging applications in almost all walks of life. It is most useful for government planning like urban and rural planning, land use management, agriculture, forestry, public health, natural resource management, infrastructure development and even the defence sector. For transport, it proves nifty for in-car navigation systems, automatic vehicle location systems, aviation, maritime transport and traffic network planning and management. Meteorology, oceanography, criminology and crime simulation also benefit from geoinformatics. It holds great promise in climate change studies, environmental modelling and analysis, disaster management and preparedness and telecommunications. Business location planning, architecture and archaeological reconstruction are also hugely improved by the use of geoinformatics.

The growing importance of Geoinformatics in India for civil society requires involvement of governments to set policies and to make and stimulate large investments to create and develop spatial data infrastructures. This issue is manifest nowadays and appears high on the agendas of the international geographical information community. We also observe that with time the character of the geographical information community is changing. In the early days of remote sensing and GIS this community consisted of interested experts from other fields and pioneering amateurs who obtained their skills by training and through experience. Nowadays the geographical information community consists increasingly of highly educated professionals. These professionals can be divided in three major groups:

1. Experts in the field of spatial information handling (or specialists in certain aspects of this field),
2. Users of geo-information and
3. Professionals and policy makers, who are aware of the importance of geo-information for Civil Society.

Their education requires programs that are carefully designed, based on the mature paradigms of geo-information science and its related disciplines. The design of the educational programs should also be based on a proper understanding of the contexts in which geo-information is produced and used and of the role that the three different types of professionals play in this field. The courses aim at two types of students, i.e. young students who continue their education and mid-career professionals who want to upgrade their skills and knowledge. The first group are the Undergraduate students wishing to obtain a Postgraduate Diploma or Degree and develop a career in the field of geo-informatics. Most of them will be self sponsored candidates. The second group consists of the mid career professionals who are already working in a professional organization, such as survey organisations, Remote Sensing and GIS companies, engineering consultants, IT companies, universities, NGO's etc.

Objectives of Capacity

Building

The capacity building aims are :
1. Develop institutional capacity for pro poor governance all levels to promote inclusive planning and development.
2. Augment and improve human resource capacity to enhance efficiency in civic administration for planned, inclusive, spatial and socio-economic development.
3. Effective delivery of essential basic civic services and social amenities in india. Effective implementation of projects and reforms with other initiatives launched by the Centre.
4. Enhance, focusing on issues and concerns of the sections of society to include them in the process of mainstream planning and development.
5. Facilitate institutional arrangements and capacity creation to enable the people to participate in the development process as partners.

Strategies for Capacity Building

1. Enhance the existing capacities of different stakeholders such as administrators, engineers, planners, elected representatives and NGOs through trainings, workshops and exposure visits.
2. Augment human resources. This will be done by establishing Technical Cells. The cells will be staffed by professionals from various fields
3. Capacity building programmes would be conducted through National Network of Resource Centres and other training institutes empanelled by the Ministry/ States/ UTs. The training and capacity building with the

purpose to develop adequate knowledge and skills in addition to transfer the same on preparation of detailed project reports ,participation etc.

4. Creation of new institutions to supplement capacity building.

MATERIALS AND METHODS

This study is purely based on secondary data. The data are collected from magazines, dailies, journals, published and unpublished articles, websites, etc.

Capacity

"Capacity is defined as the ability of people, communities, organisations, and societies to perform functions, solve problems and set and achieve targets within an institutional setting or enabling environment. In more concrete terms is the ability of an entity to do the following:

a) Scan and analyse its environment;
b) Identify complex problems, issues, needs and opportunities;
c) Formulate strategic and operational strategies to deal with these problems, issues, needs and to seize opportunities;
d) Design plans and programmes of action;
e) Develop effective communication and information-sharing in society
f) Assemble, effectively and sustainably use resources to implement, monitor and evaluate the plans and use the feedback to learn lessons acquired through the process.

Study Area: India

India

Capacity development

"Capacity development is [therefore] essentially a process of enhancing the human, institutional, and organizational abilities to perform core functions, solve problems and seize opportunities, organize communication and information sharing, define and achieve objectives in a sustainable manner. The implication of this broad definition is that one may need to distinguish between capacity development for organizations, for institutions and for state building to the extent that these different levels may require different approaches involving different actors. It is important to realize that capacity development is not an end in itself; it is a means to achieve objectives and goals set by society at its respective levels (groups, communities, sectors or whole societies)."

Capacity for what?

Current ICT tools provide a very dynamic infrastructure for managing, accessing, and using all kinds of information, including the ability of IT infrastructure to handle location-specific data in open, standard ways. Geospatial data has now become the raw resource for creating location-specific information, and the collection and use of geospatial data is no longer the exclusive preserve of GI specialists. 'Map' data more easily/freely available; map-enabled applications (location services) have become commonplace; and GPS and navigation tools almost taken for granted. "Looking around, the evidence of change is striking" (Sonnen, 2005).

Capacity for Whom?

The collection, processing, management, analysis, usage, and distribution of geospatial information involve several actors operating at various levels. (GIM)Geographical information management must therefore be addressed through the development of (SDI)Spatial data infrastructure which, by definition, requires buy-in from a diverse group of stakeholders.

Capacity Development Process
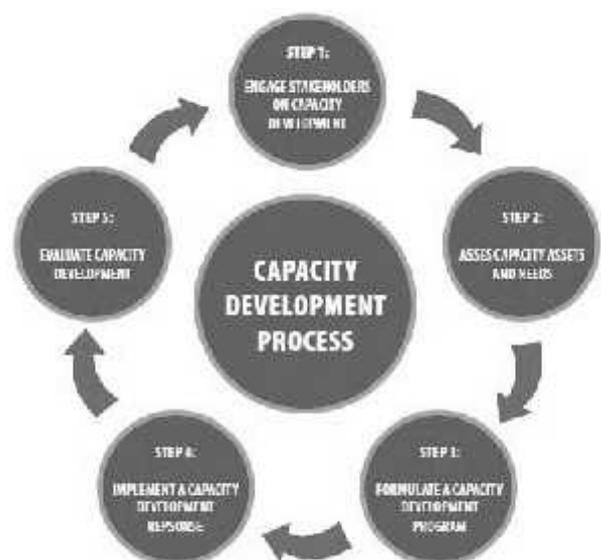
These stakeholders include (GIM) Geographical information management experts/technicians, users of geoinformation, and policy-makers/decision-makers in public agencies, private corporations and civil society organizations (Molenaar 2002). Capacity development must shift its focus from training of technical specialists, to engaging with the full spectrum of the stakeholder network.

Technical Capacities and Functional Capacities

Technical capacities refer to subject matter knowledge, such as geodesy, surveying, remote sensing, GIS etc.; these are 'skills' required to provide necessary information, techniques and approaches for problem analysis, and identifying and implementing solutions.

Functional capacities, on the other hand, may be considered as the essential catalytic and management skills that allow for planning, implementing and monitoring and evaluating initiatives for growth. The latter is at the heart of transformation and drives the process. Existing institutions were strengthened and new institutions were created for the purpose of training and providing geospatial information services; In india policy frameworks to support the development, exchange, and application of geospatial data were put in place; Institutional arrangements to facilitate the production and exchange of harmonized geospatial datasets were put in place; An active, network or community of geospatial information practitioners emerged;

National GIS Policy

1. National GIS would comply with current national policies – even as there is a recognition that the GIS related policies must constantly and regularly be reviewed and updated frequently (especially as Earth observation and GIS technology is changing rapidly; it would be even appropriate to have a standing National GIS Policy Review Committee that annually reviews and considers changes, as required).
2. There are already existing policies for Remote Sensing data (RSDP), topographic maps of SOI (Open Series Map Policy) and efforts are also ongoing to define and position a Data Sharing Policy. It is envisaged that National GIS Policy would specifically address the GIS aspects – even as RSDP continues to define policy for availability of Remote Sensing images and Open Series Maps continues to define how topographic map data of SOI would be made available. It may be also that ministries/departments would define their own "policies or guidelines" for their datasets and these would be continued. But National GIS Policy must clearly define how a GIS content is assimilated, made available, updated and maintained for the country. It is envisaged that in defining the National GIS Policy,Indian National GIS Organization(INGO) could bring an "integrating" and "over-arching" framework with Remote Sensing data Policy and Open Series Map Policy and other policies – thus bringing a "virtual" integration into a single GIS Policy.
3. The GIS Policy must basically address for the growth of National GIS in India for a broader usage of geo-spatial

technologies and conducive to manifest benefits from GIS in a wider manner (even as the Remote Sensing Data Policy and National Map Policy are being reviewed separately).
4. It is essential to have a National GIS Policy on the following principles:
4.1. One harmonized Policy framework for all GIS content and its use - be it maps, survey data, satellite/aerial Images and so on & should define how activities of GIS data usage and applications can be undertaken in the country.
4.2. Access to and use of any available GIS content and applications must be governed by "criteria of use" rather than any limiting-principle. Proper Do's and Dont's and mechanisms are to be worked out with appropriate Service Level Agreements (SLA) and response-metrics for demand of map/image/GIS data in the country.
5. It will be essential that INGO steer and manage this National GIS Policy formulation and its sustenance on a continuous basis. INGO could work closely with Department of Space, Survey of India and other data and user agencies to help position a pragmatic National GIS Policy from time-to-time.

GIS based initiative in India

Several GIS based initiative are being implemented in the country, such as National Natural Resources Management System (NNRMS) of Planning Commission, National Spatial Data Infrastructure (NSDI) of the Department of Science and Technology (DST), Bhuvan Image Portal of the Dept. of Space (DOS), Delhi State Spatial Data Infrastructure (DSSDI) of Delhi State, National Urban Information System (NUIS) of Ministry of Urban Development (MUD), recent efforts at modernisation of land records under NRLMP, various city etc.). The major regulations governing the geospatial sector in India are:

1. National Map Policy 2005 The National Map Policy 2005 provides an innovative approach to deal with the country's security concerns. For the first time, maps were segregated into two categories - Defence Series Maps (DSMs) and Open Series Maps (OSMs). DSMs are meant to cater to the demands of security agencies and OSMs are for civilian use, that is, all those areas which are 'vulnerable' from security point of view are not covered in OSMs. These maps are available in 1:50K for public use. In the last few years the industry has grown considerably and this calls for a relook at the policy to incorporate the demands in keeping with the present requirements of stakeholders.

2. Remote Sensing Data Policy 2011 This policy contains the modalities for managing and/ or permitting the acquisition/dissemination of remote sensing data in support of developmental activities. The policy was originally introduced in the year 2001 and was recently revised in 2011. The new regulation allows all data of resolution up to 1 m to be distributed on non-discriminatory basis and on "as requested basis". The original regulation allowed distribution of data only upto 5.8 m resolution. The RSDP 2011, apart from opening up the remote sensing sector, will remove certain restrictions to

facilitate more users to access high resolution data for developmental activities

3. National Data Sharing and Accessibility Policy 2012: This policy is designed to allow the sharing of all non-sensitive data available either in digital or analogue forms but generated using public funds by various Ministries/Departments/ Subordinates offices/ organisations/ agencies of GOI. The policy promotes data sharing and enables access
to government owned data for national planning and development.

Role of Ministry of Human Resources Development (MHRD) in Geospatial Technology capacity building process

The National Task Force on Geospatial Education:

The Ex Union Minister for Human Resource Development Dr M M Pallam Raju was presented a report on "Geospatial Education" by Dr K Kasturirangan, Member Planning Commission who headed the National Task Force on 'Evolving Geospatial Strategy'. Realizing the significance of Geospatial Education, a National Task Force on 'Evolving Education Strategy' was constituted by the Ministry of Human Resource Development (MHRD) under the Chairmanship of Dr K Kasturirangan. The Task force now has come up with its recommendations on overall issues with Geospatial Education in the country at School Level, University level, Training and outreach needs, need for high end research, and also the possibility of setting up of an institution for Geospatial education. Dr. K Kasturirangan highlighted the salient points of the Report. According to report that National Task Force has given a four-pronged recommendations on Geospatial Strategy which includes (i) School Geospatial Education Project (SGEP) led by the Department of School Education, MHRD; (ii) Geospatial University Networking Project (GUNP) led by the Department of Higher education, MHRD; (iii) Geospatial Training and Outreach Project (GTOP) led by Department of Science & Technology (DST); and (iv) National Institute of Geospatial Knowledge, Engineering and Management (NGKEM) led by MHRD and DST. He further mentioned that a high-level management council is also recommended with Minister, MHRD as Chair and Member (Science), Planning Commission as Co-chair, with various Secretaries as Members and experts as Members, for guiding and supervising the implementation of recommendations. XII Five Year Plan has a vision of rapid, sustainable and more inclusive growth and to meet the ambitious targets enlisted in Plan document and beyond, harnessing and augmenting Information and Communication Technology (ICT) is the need of the hour. Geospatial Technology assumes special importance as it facilitates planning, implementation, and monitoring of projects of national importance.

Ministry of Human Resources Development (MHRD) Task Force of 2010 has determined that geospatial professionals would be required in the country at 5 levels

1. A wide programme of making school children well knowledgeable with geospatial technology at high-school level.

2. Large number of user community in government (state/central); private sector and even citizen-service providers that would be the user base for national GIS activities in the country. These would require 1-2 week orientation to use GIS Application services for their processes and for their activities.

3. Geospatial skilled work-force – a category of large number of human resources required for meeting the "pyramid-base" as the large work-force for survey/mapping/ GIS operators etc. This requirement can be met by more professional training through special training programmes.

4. Technical Geospatial Professionals - large number of geospatial professionals who have specific training and knowledge for specific tasks – these form the "pyramid middle". These are the specialized training by private industry and technical institutions in the country.

5. Good number of Geospatial Experts who specialize in geospatial technology and form the "pyramid top". These are basically BTech / M.Sc, MTech in Geomatics / GIS Science etc from the University systems. The MHRD Task Force in its draft report has mentioned the human resource requirements for India, in the next five years as given below:

While MHRD can initiate its own Geoinformatics education and research programmes for schools and universities, these would bring significant impact over few years with geoinformatic knowledge embedded in the future generation. However, there is an urgent need to address the present large number of professionals and decision-makers from government and private sector in their decision- and work-processes. A significant increase is expected in productive capacity after 2012 as India's geospatial industry builds out capacity for new international and internal markets. Like India's GDP, the growth of India's geospatial market will outpace growth rate for geospatial markets in the rest of the world. Capacity building will be crucial in exploring the wide range of opportunities available for the growth of the Indian geospatial industry. There is an urgent need for trained manpower to handle the growing number of projects in the geospatial domain. Well articulated policy mechanisms, Government support and the ever-increasing domestic demand would go a long way in popularizing geospatial technology in India and bring it into the mainstream as an aid for effective governance and developmental planning. The Indian geospatial industry is in a progressive mode and can make rapid growth with adequate support and encouragement from the Government by way of the right policies, incentives and initiatives. The Government in turn has whole heartedly accepted this technology as being pivotal in facilitating good governance. The need is for the public and private domains to join hands for the development of a mutually conducive and innovative environment for mainstreaming geospatial technology in India.

A mission mode would be required to address this requirement. It would be important to undertake a continuous drive for Training/Orientation within government and enable a capacity-building programme in the country that can also cover private

Geospatial Activity	Survey/ Mapping/ Trained skill- workforce	Trained workforce for Survey/ Mapping, Geo-database and GIS Apps	Educated professionals for Survey/ Mapping, Geo-database and GIS Apps	Trained users development who would be users	School-level awareness
Present Availability Estimate	~15000-20,000	~6000-10000	~800-1200	~25000-50000	NA
Estimated additional need by end of 2015	~20000 @4000-5000 per year	~15000 @~2000-3000 per year	~5000-8000 @ ~1000-1500 per year	~500,000 @ ~50-100K per year	Estimated in phased manner thru NCERT/State School Boards
Knowledge/ Skill-interventions required	Industrial Training in Specific Geospatial Operations (2-4 weeks)	In-depth specialised training in operations/ managing (3-12 months)	4-Year Graduate/ 2- Post-Graduate/ PhD in Geospatial Technology thru University	User Training on specific GIS apps operations (1-2 week orientation)	Basic chapters curriculum; in 9-12 science aditional GIS Kit Knowledge exercises
Min Qual for knowledge/ skill interventions	10th OR 12th Grade school	Graduate in Science/Arts Or Diploma in Comp Apps	12th Grade leading to BTech/BTech leading to M.Sc, MTech/PhD	Basically a Geospatial technology user in Central/State governments	School at 6-8 AND 9-12 Grade
Knowledge Credits	Professional Certificate	PG Diploma	BTech OR M.Sc, OR MTech OR PhD	Applied Certificates	Proficiency Certificate

Source: Establishment of "NATIONAL GIS" Under Indian National GIS Organisation (INGO) ,Government oF India Ministry of earth sciences national GIS interim core group october, 2011.

enterprise (on commercial terms) and citizens/academia/ schools. A concerted effort for training to different ministries and user groups needs to be taken up. Indian national GIS organization (INGO) could enable a network of institutions, technologies (including satellite based instruction and training), standardisation of basic curriculum for training/orientation – thereby, playing the role of a critical-agent for achieving this goal. Training will be a very important element widely used and also get embedded into the nation's governing, development and democratic processes. With above in mind, Indian national GIS organization (INGO) would have to initiate a large capacity-building programme (estimated at training 500,000 professionals over 5 years atleast) and could involve existing institutions (public and private) involved in Training and Capacity-Building.

Education Needs in Geoinformatics

1. In a long-term perspective for National GIS, it would be essential to have a school-level programme for GIS awareness and knowledge – this must be aimed at making our next generation GIS-aware and thus preparing them to develop and sustain the National GIS activities. National GIS must include a concerted programme to "ignite the GIS spark" for school level students by incentivizing and facilitating GIS education at schools. Such an activity can be taken up by MHRD and involving INGO.

2. There are quite a few universities that have geospatial education leading to MS, BTech/BE,M.Sc, MTech and some to PhD programmes also. However, the major challenges these institutions face is that they lack modern facilities and do not create the ability to modernize and upgrade constantly, lack teaching faculty that is upto-date and have not yet made the thrust for a career orientation for the university education. This needs urgent attention and reversal by way of a boost to university level education – which MHRD can consider positioning with technical support from INGO.

3. It is important that an Inter-University Centre for GIS Education and Research is established by MHRD to integrate the universities under a "knowledge umbrella" and bring focused education and research in GIS to forefront. Such a Centre would help build and maintain

leadership in knowledge pool in the country and build technological edge and leadership in the area of GIS. MHRD could establish such an Inter-University Education and Research Centre and Indian national GIS organization (INGO) could help MHRD on technical aspects.

Research Needs in Geoinformatics

1. There is considerable gap of high-quality research in GIS and remotesensing technology and applications. This, in fact, is causing a limitation in building the knowledge base in GIS and also developing indigenous software/solutions in GIS. It is felt that if a good and high-quality GIS research is enabled within the existing university system then the nation would benefit much more by way of creating a fundamental knowledge base in GIS and also enabling the nation to benefit from GIS in terms of good applications and also would enable the nation to maintain leadership in the international arena. The Inter-University Centre must work on these lines.

2. Advanced GIS research is required in many areas – related to standardization, ontology, 3D GIS, Representation theory, Graph Theory, Topology, Geographic Information System (GIS), Spatial analysis, Spatial autocorrelation, Complete spatial randomness, Modifiable Areal Unit Problem, Cartography, Geo-visualization, Spatial Decision Support Systems, Cellular automaton, satellite remote sensing, airborne remote sensing, geodesy and developing gravity model for India, cartography and mapping, re-defining Indian Mean Sea Level (MSL), adjusting Indian Great Trignometrical Survey, photogrammetry mapping, developing an Indian Terrestrial Reference Frame within the framework of the International Terrestrial Reference Framework and transformation model between Indian reference system and International Terrestrial Reference Framework (ITRF), Geographical Information System (GIS), global positioning system (GPS), electronic surveying, laser scanning, mobile mapping, image processing, algorithms, data structures and computer programming, application modelling research, cost-benefit research, research in social aspects of GIS, GIS Policy research and many other areas.

The higher education institutions which offer Geoinformatic courses in India

There are different types of universities and colleges in the higher education system in the country. They vary in terms of their academic, administrative and financial arrangements. Universities can either be established by an Act of Parliament or by the state legislatures. Those established by the Act of Parliament are the central universities and the ones set up by the state legislatures are state universities. Some higher education institutions are granted the 'deemed to be university' status by the central government through gazette notifications. A few institutions are established by the Parliament / state legislatures as institutions of national importance. Universities, deemed to be universities and institutions of national importance are degree-granting institutions.

Non-university sector

The growth of the non-university sector to meet the immediate demand of skills from a growing Geospatial industrial. There was rapid expansion of industrial training institutes for the training of supervisors in industrial setting, training of workers in various skills, respectively. The capacity addition in these two categories of institutions was largely through private sector. In addition, private for-profit training providers emerged to meet the growing demand for usable training. Capacity building will be crucial in exploring the wide range of opportunities available for the growth of the Indian geospatial industry. There is an urgent need for trained manpower to handle the burgeoning number of projects in the geospatial domain. Well articulated policy mechanisms, Government support and the ever-increasing domestic demand would go a long way in popularising geospatial technology in India and bring it into the mainstream as an aid for effective governance and developmental planning.

Government and Semi-Government Geospatial Technology Organizations in India

Organization Name	Description	Location
Space Applications Centre (SAC)	Engaged in the research, development and demonstration of applications of Space Technology in the field of Communications, Remote Sensing, Meteorology and Satellite Navigation.	Ahmedabad
National Centre for Human Settlements and Environment (NCHSE)	Under the financial assistance from Government of India Department of Electronics (Ministry of IT now), a GIS application centre was established in NCHSE. It deals in various dimensions of GIS and GIS Applications	Bhopal
M.P.Council of Scienc & Techlogoly (MPCST	A constituent of the Council of Scientific & technological Research an autonomous body under the state Government of M.P. was established in 1982.	Bhopal
NIOT	An R&D institute under ministry of earth science.using GIS for scientific studies in ocean.	Chennai
Survey of India	The National Survey and Mapping Organisation of the country under the Department of Science & Technology, is the oldest scientific department of India.	Dehradun
U-SAC	Uttarakhand Space Application Centre	Dehradun
Indian Institute of Remote Sensing (IIRS)	Under Indian Space Research Organisation, Govt. of India is a premier training and educational institute set up for developing trained professional in the field of Remote Sensing, Geoinformatics and GPS Technology for Natural Resources, Environmental and Disaster Management.	Dehradun
Bhaskaracharya Institute For Space Applications and Geo-Informatics	BISAG is a State level nodal agency to facilitate the use of spatial and geo-spatial technologies for the planning and developmental activities pertaining to Agriculture, Land and Water Resource Management, Wasteland/Watershed Development, Forestry, Disaster Management, Infrastructure and Education.	Gandhinagar
Haryana Space and Applications Center	Handling a number of projects of DRDO.	Hissar
The National Geophysical Research Institute (NGRI)	A constituent of the Council of Scientific & Industrial Research (CSIR, an autonomous body under the Government of India), was established in 1961 with the mission to be the premier geophysical research institute in India.	Hyderabad
National Remote Sensing Centre	NRSC is responsible for acquisition, processing, supply of aerial and satellite remote sensing data and continuously exploring the practical uses of remote sensing technology for multilevel (global to local) applications	Hyderabad
Institute of Environmental Studies & Wetland Management (IESWM)	Under Dept. of Envt., Government of West Bengal, is primarily working on coastal zone management and Sundarban estuary. The institute is also working on ICZM Project.	Kolkata
National Atlas And Thematic Mapping Organisation:	Under the Department of Science & Technology, the Organization is at present having 15 Divisions spread out into 4 different Units	Kolkata
Punjab Remote Sensing Centre (PRSC)	An autonomous organization under the Department of Agriculture, Government of Punjab, is the apex body in the State for all Remote Sensing (RS), Geographic Information System (GIS) and Global Positioning System (GPS) related works. It is designated as a Nodal Agency by the Govt. of Punjab for geospatial needs of the State and also acts as the centralized hub for the geo-spatial data to all the user departments.	Ludhiana
Remote Sensing & Geoinformatics Division (MERI, Nasik)	Maharashtra State Govt. Organisation, Remote Sensing and Geoinformatics.	Nasik
Centre for Development of Advanced Computing (C-DAC)	C-DAC is engaged in geomatics activities for over a decade. The Geomatics Solutions Development Group (GSDG) offers technology solutions in areas like Thematic Mapping, Spatial Database Development, Terrain Visualisation, Spatial Decision Support System and Web GIS.	Pune
Science and Technology Park	Remote Sensing and GIS Consultancy Organization	Pune
Jharkhand Space Application Center	Under Department of Information Technology, Govt. of Jharkhand is a premier Remote Sensing Center established in the year 2003 with its space application activities taking the lead and initiative for the overall development of the State.	Ranchi

NIOT	An R&D institute under ministry of earth science.using GIS for scientific studies in ocean.	Chennai
Survey of India	The National Survey and Mapping Organisation of the country under the Department of Science & Technology, is the oldest scientific department of India.	Dehradun
U-SAC	Uttarakhand Space Application Centre	Dehradun
Indian Institute of Remote Sensing (IIRS)	Under Indian Space Research Organisation, Govt. of India is a premier training and educational institute set up for developing trained professional in the field of Remote Sensing, Geoinformatics and GPS Technology for Natural Resources, Environmental and Disaster Management.	Dehradun
Bhaskaracharya Institute For Space Applications and Geo-Informatics	BISAG is a State level nodal agency to facilitate the use of spatial and geo-spatial technologies for the planning and developmental activities pertaining to Agriculture, Land and Water Resource Management, Wasteland/Watershed Development, Forestry, Disaster Management, Infrastructure and Education.	Gandhinagar
Haryana Space and Applications Center	Handling a number of projects of DRDO.	Hissar
The National Geophysical Research Institute (NGRI)	A constituent of the Council of Scientific & Industrial Research (CSIR, an autonomous body under the Government of India), was established in 1961 with the mission to be the premier geophysical research institute in India.	Hyderabad
National Remote Sensing Centre	NRSC is responsible for acquisition, processing, supply of aerial and satellite remote sensing data and continuously exploring the practical uses of remote sensing technology for multilevel (global to local) applications	Hyderabad
Institute of Environmental Studies & Wetland Management (IESWM)	Under Dept. of Envt., Government of West Bengal, is primarily working on coastal zone management and Sundarban estuary. The institute is also working on ICZM Project.	Kolkata
National Atlas And Thematic Mapping Organisation:	Under the Department of Science & Technology, the Organization is at present having 15 Divisions spread out into 4 different Units	Kolkata
Punjab Remote Sensing Centre (PRSC)	An autonomous organization under the Department of Agriculture, Government of Punjab, is the apex body in the State for all Remote Sensing (RS), Geographic Information System (GIS) and Global Positioning System (GPS) related works. It is designated as a Nodal Agency by the Govt. of Punjab for geospatial needs of the State and also acts as the centralized hub for the geo-spatial data to all the user departments.	Ludhiana
Remote Sensing & Geoinformatics Division (MERI, Nasik)	Maharashtra State Govt. Organisation, Remote Sensing and Geoinformatics.	Nasik
Centre for Development of Advanced Computing (C-DAC)	C-DAC is engaged in geomatics activities for over a decade. The Geomatics Solutions Development Group (GSDG) offers technology solutions in areas like Thematic Mapping, Spatial Database Development, Terrain Visualisation, Spatial Decision Support System and Web GIS.	Pune
Science and Technology Park	Remote Sensing and GIS Consultancy Organization	Pune

Geoinformatics Training Institutes in India

Institute Name	Description	Location
Faculty of Geomatics and Space Applications, CEPT University	M. Tech in Geomatics, specialisation in Enterprise-GIS M. Sc. in Geomatics, specialisation in Enterprise-GIS Post Graduate Diploma in Geomatics	Ahmedabad
Scanpoint Education Research Institute	SERI has three courses; a six month certificate course; a one year post graduate diploma course and a two year post graduate degree course. All these courses are recognised by the Gujarat University. Students of the two year course are given a first choice of joining Scanpoint Geomatics on completion of their course successfully.	Ahmedabad
MDS University	M.sc Remote Sensing & Geo- informatics, P.G. Diploma in Remote Sensing & Geo - informatics	Ajmer
Shri Shivaji College	Conducting 2 year full-time M.Sc. (Geo-informatics) course at Shri Shivaji College, Akola. Both the theoretical and practical classes will be conducted.	Akola
Deppt of Geography, University of Allahabad	PG Diploma in Remote Sensing & GIS	Allahabad
MNNIT Allahabad	MTech and PHD courses in GIS and Remote sensing.	Allahabad

Sam Higginbottom Institute Of Agriculture, Technology & Sciences (Allahabad Agriculture University)	Offers PG Diploma in Remote Sensing and Geographical Information System (GIS)
Sri Krishnadevaya University	Offers UG/PG GIS Courses
Akhyansha Technology	Gives all GIS training on topics such as lidar, Aerotriangulation, Photogrammetry, orthophoto mobile mapping,3d city modeling etc..
Alpen Associates	We have a Training Section - for Fashion / Apparel CAD and have also added a GIS training Course.
Bangalore University	PG Diploma 1 year course in Geoinformatics
Civil Simplified	Group of IIT Kanpur graduates started this company and offer workshops/training programs for the students of Civil Engineering. Offer one course on GIS also.
Edgemap Softwares [P] Ltd.	A Unique GIS Training and Recruitment by the company. Enhance your career in Geographic Information System with a unique & comprehensive curriculum. Well equipped infrastructure and highly qualified faculty.
Karnataka State Remote Sensing Applications	Recogising the excellent Human Resource and Infrastructure available at KSRSAC, the Visvesvaraya Technological University (VTU) has been offering 2 years full time M Tech Geoinformatics course since 2004-05 at its Extension Centre at KSRSAC, Bangalore. 25 seats are available for admission through GATE/PGCET entrance examination followed by counselling conducted by VTU every year.
Sunsoft Technologies Inc.	GIS CADD ArcGIS with ArcObjects Training & Projects for final year students. Sunsoft Technologies, Australia represents the India office situated in Bangalore. Sunsoft Training center offers a wide range of training & Projects options to expand your knowledge on GIS /CADD. Trainers are mostly NRIs from reputed companies around the globe.

DDE, Burdwan University	Distance education program M.A./M.SC. in Remote Sensing and GIS. Degree Offered:M.A./M.Sc. Duration:2 Years.
North Orissa University	2 year course of M.Sc. RS & GIS
Barakatullah University	Offers M.Sc. Applied Geology, M.Sc. (Tech.) Remote Sensing and (Hi) M.Sc. Geoinformatics.
Maulana Azad National Institute of Technology	The institute offer two year M.tech course in Remote Sensing and geo-informatics. The eligibility for the course is BE/B.Tech in any discipline. The department is center of exellence at MANIT. Student of this branch is conducting many research work in the field of remote sensing.
National Centre for Human Settlement and Environment	Diploma in GIS.
School of Planning and Architecture	Provide the best knowledge regarding GIS and other software for well development of the nation in our institute.
CADCAM Academy	One of leading CAD/CAM organisation at Bhubaneswar Providing Training & Live project work On GIS & GPS system.
GIS Odisha	GISODISHA is the training Academy of Cadcam Acamedy. Provides GIS Short term & Diploma courses. Basics of GIS & Mapping, Basics of Geography & Spatial Reference System (Projection), Data Structures, Data Acquisition, Data Analysis & Thematic Mapping etc.
Utkal University	P.G. Diploma in RS & GIS, Department of Geography. Providing training on various application of Remote Sensing & GIS with different field of studies like Regional Planning, Waste Management, Watershed planning, Costal Management, Forest Management etc.
I-Space (Institute for Spatial Planning And Community E-services) India	GIS Training for Professionals & Engineering Students
Panjab University - Department of Geography	Offers a 2-year course for Masters in GIS and Remote Sensing
UNIGIS@PU_Chandigarh	Offers internationally recognised distance learning program within the provisions of UNIGIS Joint-study programme in cooperation with the Centre for Geoinformatics (Z_GIS), University of Salzburg, Austria (Europe).
Indian Geoinformatics Centre	IGC imparts "Instructor Led" training on the most powerful and flexible software family suite - "ArcGIS 10" from ESRI. Training is also provided on Open Source GIS and DIP software like GeoServer, OpenLayers, Quantum GIS etc.
Institue of Remote sensing (IRS), Anna University	OOffering four year engineering degree program B.E.GeoInformatics
ITechIdeas Consultancy Services	ITechIdeas Conducts training Program on GIS & Remote Sensing.
KCube Consultancy Pvt. Ltd	KCube provides extensive training on real time basis in Open source GIS.
UNIGIS@Madras University	Offers internationally recognised dual-degree program within the provisions of UNIGIS Joint-study programme in cooperation with the Department of Geoinformatics - Z_GIS, University of Salzburg, Austria (Europe).
Annamalai University	2 year M.Sc. Geo-informatics through Distance Learning
Centre for Geoinformatics, All India Institute of Local Self Government	Offers UNIGIS Professional Diploma in Geographic Information System in Association with Salzburg University, Austria. This one year course is offered in full-time mode. Also the students have opportunity to specialize in the interest area of their choice during intership with leading GIS firms in India.
Bharathiar university	M.Tech. in Remote Sensing & GIS
Indian Institute of Remote Sensing (IIRS)	Offers variety of short and long term Geomatics courses.
University of Petroleum and Energy Studies	B tech in Geoinformatics 4 yrs, B tech in Geosciences 4yrs
Institute of Environment & Geo-Informatics	2 years M Sc Programme in GIS & Remote Sensing, Environment Science, Disaster Management, Urban Planning & Sustainable Development and Short duration Certificate course in GIS and Remote Sensing are also conducted as per requirements of the corporate/students.
Institute of Photogrammetry and Geo-Informatics (IPGI)	Provide the best knowledge regarding Photogrametry & GIS for well development of the nation in our institute. Photogrametry GIS Courses: AutoCAD, MAPINFO, ARCGIS, ERDAS, Global mapper,Cadcum,Civil3D researchive training with GIS project.
PSNA College of Engineering and Technology	M.Tech Remote Sensing
Centre of Excellence in GIS (NPTI)	Established at National Power Training Institute (NPTI) in 2007 with strategic alliance with CES Technologies Private Limited on the Public, Private-Partnership. Centre of Excellence in GIS has been conducting one year Post Graduate Diploma in GIS & Remote Sensing from 2007 and recently short GIS courses have been conducted for power professionals at NPTI

Natural Resources Management Geomatics	Provide Job oriented 3 month intensive Remote sensing and GIS courses in field of Enviromental secience,Forestry,Urban Development,Rural Development,Utility Mangement,Agriculture and Marketing Mangement for student,University staff and Goverment Department Staff	Faridabad
Gandhigram Rural University	2 year M.Sc., program in Geoinformatics. 1 year Diploma program in Geo Spatial Technologies.	Gandhigram
NCRGIS Classes	NCR GIS Classes has been recently started by a group of professional having industry experiences of more than 15 years. The institute understands the industry requirements in GIS, Remote Sensing and Associated domains and prepares you accordingly.	Ghaziabad
COWI India Pvt. Ltd.	Photogrammetry, gis, arcmap, autocad, orthophoto and live project with placement	Gurgaon
Institute of Geoinformatics and Technology	Two years M Sc Programme in Geoinformatics and One year PG Diploma in Geoinformatics from Jamia Milia Islamia, New Delhi(A Central University). Short duration Certificate course in GIS and Remote Sensing are also conducted as per requirements of the corporate/students.	Gurgaon
SGS Infotech GIS Training Institute	This course is to provide students with methodologies and specific personal skills that will assist them in developing awareness, acquaintance and understanding of recent advancements in computing technology and software methods which are pertinent to GIS, Remote Sensing and Photogrammetry applications. Teaches ArcGIS 9.1, AutoCad, Cadian 2004, Erdas 9.2, PhotoMod 4.2.	Gurgaon
TIET	TIET is set up with an objective of bringing in the international standards of industry to India. In TIET different courses are designed such that they meet the real world needs, give in-depth details of the concepts and processes, encourage students to explore their skills, and fulfill their passion.	Gurgaon

ACCELCRAFT	1st Institute in Northeast offering professional Geoinformatics courses. Diploma and certificate courses are conducted. Emphasis on practical and professional aspect of geoinformatics. Providing placement after succcessful completion of courses.	Guwahati
Assam Engineering College	Training on erdas software	Guwahati
Cotton College	Certificate course on basic concept of GIS, GPS and application of remote sensing.	Guwahati
En-Geo Consultancy and Research Centre	Provide end to end knowledge based training - on GIS & Remote Sensing software's as well as Survey Equipments with hands on practical classes.	Guwahati
Jiwaji University	Master Degree in Remote Sencing and GIS	Gwalior
The Indian Institute of Geospatial	Established in 2012, imparts state-of-the-art education and training in Geospatial technologies. Offers following courses. Certificate in GIS (3 months), Advanced Certificate in Geo-informatics (3 months), Diploma in Auto CAD (21days), Certificate course in Surveying(Total Staion, DGPS). Provide Career guidance, placement assistance and job guarantee.	Gwalior
Guru Jambeshwar University	M.Tech Geoinformatics, MOU with HARSAC	Hissar
Adhiyamaan College of Engineering	M.Tech Remote sensing	Hosur
Centre for Environment, Institute of Science and Technology	2 year M.Tech program in Environmental Geomatics. 2 year M.Sc program in Geo Spatial Technologies.	Hyderabad
Geological Survey of India Training Institute(GSITI)	The Institute has specialised divisions such as Photo Geology and Remote Sensing (PGRS), Geophysics and the Centre for Geoinformation Management Training (CGMT).	Hyderabad
GeoSpace Technologies	Offers extensive training on Desktop, web, mobile GIS, Photogrammetry and ERDAS softwares with live projects.(ArcGIS Desktop, ArcGIS Server,ArcObjects,ArcSDE,ArcGIS API for Silverlight,ArcGIS API for Flex, ArcGIS API for Java Script etc..) Highly qualified and real time experienced faculty. Career guidance, placement assistance and job guarantee.	Hyderabad
Indian Institute of Surveying and Mapping (Survey of India)	Offers MTech(Geomatics)course in collaboration with JNTU, Hyderabad	Hyderabad
JNT University	Department of center for Environment,Institute Of Science & Technology is offering 2-years M.Sc in Geo-Spatial Science & Technology course.	Hyderabad
Lambodara Technologies	Training for freshers who are job seekers with 100% job guarantee and also for experienced persons who want to enrich their career by becoming more professional in their work. We also have the provision for persons who wants to become programmers in geospatial technology by training them in ArcGIS + Arc Objects Database (VBA, SQL, SQL SERVER) or Arc objects with .NET	Hyderabad
Leonars Techno Services Pvt. Ltd.	ArcGIS Online Training . Faculty with 5+ Years Experience in ArcGIS (UAE). No. of Seats: 10. Courses offered: ArcObjects with .NET, ArcGIS Desktop Customization, ArcGIS Engine – Programming, ArcSDE, ArcGIS Server. Duration: 4 Weeks	Hyderabad
Osmania University	Offers a 2-year M.Sc. Geoinformatics course	Hyderabad
Star Technologies	GIS and its importance, basics of arcmap, autocad and erdas coaching will be given with certification to the students with placement. Limited seats only.	Hyderabad
Survey Training Institute	The Institute runs all levels of user oriented courses in various aspects of surveying and mapping	Hyderabad
Mehul Institute of Technology Remote Sensing (DAVV)	Two years M Sc Programme in Geoinformatics and One year PG Diploma in Geoinformatics from DAVV Indore. Short duration Certificate course in GIS and Remote Sensing are also conducted as per requirements of the corporate/students.	Indore
School of Electronics, Devi Ahilya University	Department is provinding 2 Year Full time AICTE Approved M.TECH. Course in Spatial Information Technology. The key skill of curriculam are GIS, GPS, Remeote Sensing, Digiatl Image Processing, Spatial Database and tools are ArcGIS, Geomatica, GPS Data Logger, Spatial Database, MATLAB, LabView.	Indore
IIRMR	A leading research & training institute in the field of Geoinformatics. IIRMR offers many graduate,post graduate degree courses in the field of Geography, Geoinformatics (Remote Sensing & GIS), Environmental Management and Natural Resource Management	Jaipur
University of Jammu	Post graduation in Remote Sensing and GIS	Jammu
Bundelkhand University - Institute of Geology & Remote Sensing	Offers academic programmes for M.Sc and PH.D degrees. The M.sc (RS &GIS) Programme is a very specialised one with a heavy inputs on applied aspects of the discipline especially GIS, and Remote sensing.	Jhansi
Magendhiran Consultancy Services	Open Source GIS Training, Remote Sensing And Image processing Training, GPS surveying training	Kanchipuram
NeST- IT	NeST Cyber Campus offers job oriented certificate course in Geospatial Mapping for aspirants who would like to be part of the GIS industry. Candidates with graduation / PG in Geology, environmental science, computer science, georgaphy, urban planning, civil engineering and other related fields can apply.	Kochi
Bengal Engineering and Science University	BESU offers two years M.Tech course in Geoinformatics.	Kolkata
Cad Centre - Jadavpur University	PGDiploma in applied GIS & RS (1 year/ BE/BTECH/MSc) and Short term courses on GIS.	Kolkata
GeoInformatics & Remote Sensing Cell, WBSCST	Offers 1 year course in P.G. Diploma in Geoinformatics	Kolkata
Institute of Geoinformatics & Remote Sensing	Various certificate courses & training program on RS&GIS. Suitable placement also available.	Kolkata
School of Oceanographic Studies - Jadavpur University	Well designed 6 months Certificate and 1 year Post Graduate Diploma programme covering relevant aspects of Remote Sensing and GIS, and their applications.Both the theoretical and practical classes will be conducted.	Kolkata
Government College Kota	Starting a certificate course in collaboration with with IIRS institute of remote sensing Dehradun. A state of art GIS lab has been established in the college for training and research purpose.	Kota

University of Kota	PG one year diploma in Remote sensing and GIS.	
Yogi Vemana University	Msc in Geoinformatics	Kuddapah
Madurai Kamaraj University	2 years post graduate in msc. earth remote sensing and geo information technology. 100 percentage placement there. well equiped gis lab also there. our students also placed isro, usa, gulf, uk, soi and many organisation.	Madurai
Mangalore University - Department of Geoinformatics	Well equipped isro-sponsored geoinformatics laboratory. Remote sensing, gis, software. Satellite imageries, satellite data products, digitizers mirror stereoscopes, simrad navigation ce33 sdgps, simrad navigation echo sounder ceq33 field spec spectroradiometers, gpss, ocean mechanical current meters, anemometers, d.O/temp/ph meters, chl-filteration units, aqua trap ocean water samplers, vanveen grabs, etc.	Mangalore
Smt. Parvatibai Chowgule College of Arts and Science	Offers post graduate diploma in advance geoinformatics. world class labs with GPS, DGPS trained staff	Margao
Vidyasagar University	2 yrs M.Sc. in remote sensing and gis	Midnapur
CSRE, IIT Bombay	Since its inception in 1976, the Centre has been actively involved in developing Remote Sensing technology and its application to natural resources management and Environmental monitoring. It offers M.Tech and Ph.D. courses.	Mumbai
Khagolam Institute of Geoinformatics	Provide training on ESRI, Autodesk and Open Source Platforms. Training at you location to group of 5 or more people by experienced instructor.	Mumbai
K J Somaiya college of Science & Commerce	Centre For Remote Sensing And Geographic Information Systems offers Diploma and Certificate courses	Mumbai
Rolta Academy	3 months intensive GIS course.	Mumbai
V.J.T.I.	B. Tech (Civil) a full time Geomatics course and Labwork is taught at second year level of UG students where basic of GIS, GPS is coverd and integrated application of GIS - GPS in civil engineering is taught M.Tech (Construction management) students	Mumbai
University of Mysore	M.Sc. GIS for Sustainable Development, delivered at the University of Mysore is for creating student-professionals to expertise in Geographical Information Systems, Remote Sensing and Global Positioning Systems technologies.	Mysore
Department of Geography - Jamia Millia Islamia	Advanced Diploma in Remote Sensing and GIS Applications.	New Delhi
Global Coordinates	A GIS company situated in Okhla, New Delhi. We've been in the business of GIS since the last 10 years, and we're now starting a short term specialized GIS course for aspiring students. The course will last for 4 months and will cover - Basics of GIS, Remote Sensing, ArcGis, MapInfo, AutoCad, Cartography and experience with live projects.	New Delhi
Imperial Institute of Professional & Management Studies (IIPMS)	Diploma in Geo-Informatics (3 Months Duration- Theory & Practical classes conducted by renowned technical experts & Professors from Delhi University.Provide Career guidance, placement assistance and job guarantee.	New Delhi
NAM Institute of Professional Studies	Diploma in Remote Sensing & GIS: 3 Months (12 Weeks) or 20 Days in Fast Track mode.	New Delhi
Taavi Educational Institute	Various Certificate Courses & Training Programs in CAD / GIS / Remote Sensing / Photogrammetry available for Part Time as well as Full Time. Training on Live Projects. Placement also available for Eligible students.	New Delhi
Amity University	Amity Institute of Geo-Informatics and Remote Sensing (AIGIRS) is an interdisciplinary centre, offers post graduate degree level programs of M.Tech in Geo- Informatics and Remote Sensing and MSc.	Noida
CDAC-Noida	Institute is conducting GIS and Remote Sensing PG diploma of 6 months duration, Covering Desktop GIS, Application GIS and Remote sensing Modules with project work.	Noida
GIS Square	Courses are available as instructor-led online courses. We can also provide customized training program catering to your organizations specific needs.	Noida
KABG TechGIS Services	GIS Courses: AutoCAD, MAPINFO, ARCGIS, ERDAS, Global mapper on line training with GIS project. 100% job placement.	Noida
Sara Infosoft	GIS Training(GIS, REMOTE SENSING & PHOTOGRAMMETRY) Basics of GIS & Mapping, Basics of Geography & Spatial Reference System (Projection), Data Structures, Data Acquisition, Data Analysis & Thematic Mapping, Visualization and Cartography, Remote Sensing, Microwave remote sensing, Aerial Photography & Photogrametry, Digital Image processing with ERDAS. Training Fees: 40 Thousand. Training Duration- 3 Months + Live Project 100% placement.	Noida
UNIGIS@Goa University	Offers internationally recognised online distance learning program within the provisions of UNIGIS Joint-study programme in cooperation with the Department of Geoinformatics - Z_GIS, University of Salzburg, Austria (Europe).	Panaji
Shridhar University	Offers M.Sc. & M.Tech Geoinformatics	Pilani
Advanced Computing Training School (ACTS)	C-DAC's Advanced Computing Training School (ACTS) imparts quality training in high-end technologies to existing and prospective users of advanced computing. Offers Diploma in Geoinformatics (DGI)	Pune
All India Institute of Local Self Government	AIILSG offers three months' 'Certificate Course in GIS'	Pune
CDAC-Pune	Offers Six Months Post Graduate Diploma in Geoinformatics. Has excellent faculty from the R&D division of C-DAC, i.e., Geomatics Solutions Development Group, which works on real time Geoinformatics projects. Offers phenomenal placement of students in the industry.	Pune
Institute of Environment Education and Research, Bharati Vidyapeeth University	Conducts a Ph.D. and two years full time Masters in Geoinformatics. Offers international internships with the University of Cologne, Germany and University of Maastricht, Netherlands. Well designed curricula encompassign all aspects of Geoinformatics with state of art laboratory and experienced faculty.	Pune

Pune University	M.Sc Geoinformatics, PGBSc (Applied) in GIS & RS	Pune
Sinhgad College of Science	STES's Sinhgad College of Science (SCOS) offers a fully focused and dedicated, industry oriented Masters Program in Remote Sensing and Geographic Information Systems (M. Sc. in Geo-Informatics) since 2010 in affiliation with University of Pune (since 2006 as an autonomous program). It encompasses a dual challenge of equipping students with a strong scientific foundation as well as training them in latest methodologies and technologies.	Pune
Symbiosis Institute of Geoinformatics	Two years full time M Sc Programme in Geoinformatics. The course is graded for 100 credits and divided suitably into six modules.Short duration customized capsules from two to 12 weeks are also conducted in small groups as per requirements of the corporate/students.	Pune
Adikavi Nannaya University	Masters in Geoinformatics.	Rajahmundry
Birla Institute of Technology (BIT) - Mesra	Department of Remote Sensing at BIT is one of the pioneer place for imparting edcuation and research in Remote Sensing and GIS in India since 1990s. The Department of Remote Sensing is a FIST-DST sponsored department and is also SAP (Special Assistance Programme) supported by UGC. It runs M.Sc., M.Tech., Ph.D. degree courses in Remote Sensing and Geoinformatics.	Ranchi
Central University of Jharkhand	Centre for Land Resource Management offers M.Sc Geoinformatics After B.Sc. B.Tech, B.E. , Integrated M.Tech after 12th or 10+2 with science	Ranchi
Xavier Institute of Social Service (XISS)	GIS course is offered for Post Graduate students of Rural Development as elective paper from 2011, after revision the course of Rural Development.	Ranchi
IIT Roorkee	Full Time 2 years M.Tech in Geomatics. Remote Sensing, Digital Image Processing, GIS modeling are basically taught with advanced s/w like ArcGIS, IDRISI, Envi, ERDAS etc. Graduates from all branches are invited to apply through GATE since its an interdisciplinary branch.	Roorkee
Mahatma Gandhi Chitrakoot Gramodaya Viswavidyalaya	MGCGV Chitrakoot is offering M.Sc in RS& GIS(2Years), Diploma in RS& GIS(1 Year) regular Courses from 2002. Qualification -Graduate In SCience or B.A. in Geography.	Satna
North Eastern Hill University	Post graduate diploma in Geoinformatics.	Shillong
Himachal Pradesh University	One year Advanced PG Diploma in Remote sensing and GIS .	Shimla
Kuvempu University	Masters in Remote Sensing and GIS Application (MRSA), Two year full time M Sc course. Good lab facility both in RS and GIS.	Shimoga
Solapur University	2 yrs full time M.Sc in Geoinformatics.	Solapur
Kashmir university	One of first institute in north india who have started pg courses in GIS with 100% placement.	Srinagar
Anna University Of Technology	BE Geoinformatics 4years MTech Remote Senisng (FT/PT)	Tirunelveli
Bharathidasan University	Online course for post graduate diploma in Geoinformatics.	Trichy
Centre for Environment and Development	CED conducts three months training programme on GIS and Remote sensing at Thiruvananthapuram, Kerala,since 1996 and Bhubaneswar in Orissa from 2009.Major modules in the ARCGIS and Erdas Imagine are taught as part of this in addition to other softwares.Around 1500 students are trained during these period in Kerala which includes people within and outside the country	Trivandrum
Indian Institute of Information Technology and Management - Kerala	Msc in Geoinformatics. Course accredited in CUSAT	Trivandrum
Banaras Hindu University - Department of Geography	Conducting one year P.G. Diploma in Remote Sensing and GIS, Having Projects based on RS and GIS, several Research scholars are pursuing their Ph.D based on RS and GIS. Well equiped with hardware and GIS & RS Software.	Varanasi
Andhra University - College of Engineering	Depatment of GeoEngineering.	Visakhapatnam
IIC Academy	The learning arm of IIC Technologies Pvt. Ltd., the acclaimed leader in geospatial sciences, both terrestrial and marine, with proven two decades of world-class excellence, offers "industry-focused short programs" to accelerate your career on fast-track.	Visakhapatnam
NIT Warangal	MTech and PHD courses in GIS, Remote sensing and Photogrammetry.	Warangal

Geospatial Technology Magazines and Journals for India

Name	Description
Asian Surveying and Mapping	News on GIS, GNSS, spatial information, remote sensing, mapping and surveying technologies for Asia – ASM
Coordinates	A monthly magazine on positioning, navigation and associated technologies.
Directions Magazine	Directions Magazine is a member of the Directions Media publishing group. The magazine was first published in 1998 and remains the premier news and resource guide for geospatial professionals.
GEO Informatics	Knowledge for Surveying, Mapping and GIS professionals
Geospatial World	GIS Development publishes a leading print magazine and the company's flagship product, 'GEOSPATIAL WORLD' magazine. GEOSPATIAL WORLD - The Geospatial Industry Magazine is a monthly print publication covering latest happenings and relevant issues of the Geospatial domain worldwide.
GIM International	The global magazine for geomatics, is published 12 times a year. GIM International is focussed upon key decision-makers active in the international geomatics field and is directed at commercial, academic and government professionals worldwide. Its readership is involved in land surveying, GIS, photogrammetry, remote sensing, LBS, Lidar, cartography, GPS/GNSS, cadastres, 3D city modelling and geo-databases. Publishes a weekly newsletter as well.
GIS India	Started in 1992, this is the first GIS journal from India/Asia.Besides publishing the monthly, GIS India also organises events regularly. GIS India reaches most of the organisations/individuals in India associated with maps/GIS/RS.
Journal of Indian Society of Remote Sensing	Journal of The Indian Society of Remote Sensing (earlier known as Photonirvachak) is a quarterly journal dealing with all aspects of remote sensing and its applications and publishes scientific papers on related topics.
Professional Surveyor Magazine	Published by Reed Business Geo, Inc., Professional Surveyor Magazine covers all aspects of land and hydrographic surveying, targeting professionals in the surveying, mapping, engineering, GIS, and related geomatics fields.
Springer	eBooks, journals and Magazines covering Asia and India regionals also.

Geospatial Conferences, Forums and Events in India

Event Name	Date	Description	Location
India Geospatial Forum 2014	February 5, 2014	Highlighting the significant economic growth in India aided by cutting-edge technological advancements, the India Geospatial Forum 2014 – the most premier geospatial event in the country and this region will put in to perspective the Country's continued march towards a sustainable economic development. Revolving around the theme "Converging Geospatial Trade and Practices".	Hyderabad
National Conference on Water Resources Management	November 29, 2013	The main objective of National Conference is to create awareness among school children, college students and professionals in this area about Water Resource Management using latest tools	Hyderabad
GIS-An Emerging Tool For Sustainable Development	September 23, 2013	This conference will provide the community, a forum with inimitable access to their knowledge sharing and understanding. It is aimed to expose the "Basic fundamentals of Geospatial technology" and to sensitize them to the various opportunities in this upcoming field of geospatial technology development.	Raipur, Chhattisgarh
Applied Geoinformatics for Society and Environment (ASGE) 2013	September 9, 2013	An interdisciplinary, international forum for sharing knowledge about the application of Geoinformatics with focus on application and on developing countries.	Center for Environmental Planning and Technology University (CEPT University), Ahmedabad
GEOVISION-2013	August 31, 2013	One day workshop on Water Sustainability – 2020 (GEO-VISION-2013) is envisaged by ISG (Pune chapter), in association with Indian Water Resources Society (IWRS)- Pune centre	Pune
Geointelligence India 2013	June 12, 2013		
International Conference on Interdisciplinary Applications of Remote Sensing and Geographic Information Systems	April 25, 2013	The Conference Theme revolves around "Interdisciplinary Applications".	
IGU Conference on Geoinformatics for Biodiversity and Climate Change	March 14, 2013	This International Conference aims to highlight the various environmental problems associated with development and changing climatic scenarios. The problem of climate change and ensuing transformations that are to manifest in various sectors of human life on the earth is an important area where the geoinformatics can play a vital role.	Rohtak, Haryana
GEOHORIZON '13	March 7, 2013	Society of Geoinformatics Engineers (SGE), College of Engineering, Guindy, Anna University are proud to present GEOHORIZON 2013. One of the first Geospatial symposiums to be organized and held in India, GEOHORIZON, has always attracted the young and the brightest of those who think spatially.	Chennai
Google Maps Mapathon	February 12, 2013	Mapathon 2013 — which starts on February 12 and culminates on March 25, 2013 — is an India-wide mapping contest open to just about anybody who lives in India.	India
India Geospatial Forum 2013	January 22, 2013	Highlighting the growing economic power like India and its significant plans impacting within and even globally, India Geospatial Forum – one of the premier geospatial events, represents an arena of Indian technological and economical advancements	Hyderabad International Convention Centre (HICC), Hyderabad
Intergraph India 2013 Users' Conference	January 21, 2013		Hyderabad
Geo-enabling Uttarakhand	November 30, 2012	Opportunities and the Way Forward: Federation of Indian Chambers of Commerce and Industry (FICCI) is organising a one-day seminar on "Geo-enabling Uttarakhand: Opportunities and the Way Forward". The seminar aims at awareness generation and sensitization of various line departments and industry sectors that would benefit immensely through the use of geospatial technologies.	Indian Institute of Remote Sensing, 4 Kalidas Road, Dehradun, Uttarakhand
FOSS4G-India 2012	October 25, 2012	The First in a series of National Conferences on Free and Open Source Software for Geospatial (FOSS4G) that are planned to be held every year with a mission to foster the development and promote the widespread use of Open Source Geospatial Technologies including support for software development and publicly available Geo-data	IIIT, Hyderabad
Cartonama	September 22, 2012	The Cartonama conference is about geographic data, the technology behind it, the applications built around it and the overarching aspect of community and mobility.	MLR Convention Centre, JP Nagar, Bangalore
GeoIntelligence Asia	June 15, 2012	th Annual conference on defence and internal security	New Delhi
Short course on GIS	May 11, 2012	The short course on "Working with Maps" is a unique and intense 3-day programme for working professionals from diverse backgrounds working on different aspects of human settlements.	Bangalore
Geospatial Technologies in Research, Development and Teaching	April 10, 2012	Harnessing Free and Open Source GIS	Mahatma Gandhi University, Kottayam
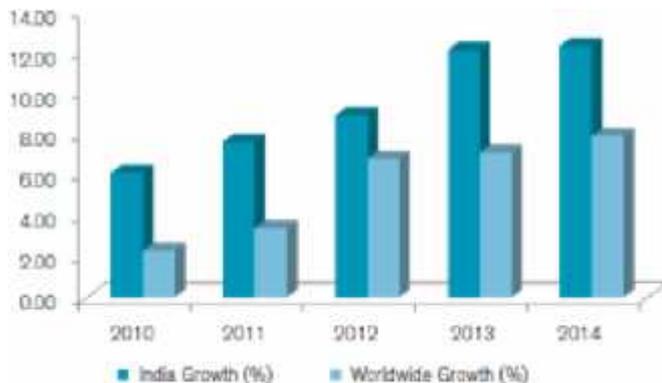
Fig 1. Percentage growth of Indian geospatial industry vis-à-vis world growth (Source: Geospatial World Market Research 2010)
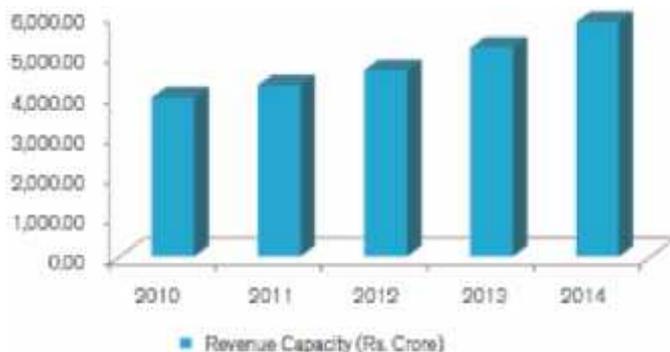

Fig 1. Projected revenue capacity of Indian geospatial industry (Sourse: Geospatial World Market Research 2010)

Levels of capacities

The identified three points where capacity should be grown and nurtured: within individuals, in organizations, and in the enabling environment. These three levels influence each other in a fluid way, and the strength of each depends on, and determines, the strength of the others. This approach goes beyond the traditional capacity 'building' through training and technical assistance.

Core issues that have the greatest influence on capacity development

The Identified four core issues that seem to have the greatest influence on capacity development; it is in these four domains that the bulk of the change in capacity happens.

Capacity exists at different levels –within individuals, as well as at the level of organizations and within the enabling environment; these form an integrated system. Attention must be paid to this inter-relatedness, implying that any strategy and intervention to assess or develop capacity necessarily for geospatial information activities needs to take into account capacity at each level; otherwise it becomes skewed or ineffective (UNDP, 2008). The Capacity Development Strategic Framework (CDSF) is founded on six cornerstones which inherently identify broad groups of actors to be involved in all capacity development activities:

Individual level:	Skills, experience and knowledge that allow each person to perform. Some of these are acquired formally, through education and training, while others come informally, through doing and observing. Access to resources and experiences that can develop individual capacity are largely shaped by the organizational and environmental factors indicated above, which in turn are influenced by the degree of capacity development in each individual.
Organizational level:	Refers to the internal structure, policies, systems (including technology and infrastructure), processes, and procedures that determine an entity's effectiveness. It is here that the benefits of the enabling environment are put into action and a collection of individuals come together. The better resourced and aligned these elements are, the greater the potential for growing capacity.
The enabling environment:	The broad social system within which people and organizations function. It includes all the rules, laws, policies, power relations and social norms that govern civic engagement. It is the enabling environment that sets the overall scope for capacity development.

Source: Adapted from "Capacity Development: A UNDP Primer (UNDP, 2009)

Core Issue	Description	Geospatial information Issues
Institutional arrangements	The policies, practices, and systems that allow for effective functioning of an organization or group. These may include 'hard' rules such as laws or the terms of a contract, or 'soft' rules like codes of conduct or generally accepted values [and norms].	ICT policy frameworks & legislation Data producers, custodians& brokers Stakeholder engagement mechanisms Data standards, protocols and norms Data and information access/exchange policies, mechanisms, and procedures Institutional strengthening/reforms Resourcing (skill sets, financial) Human resource management Infrastructure to support the discovery, access and applications of geospatial information
Leadership	The ability to influence, inspire and motivate others to achieve or even go beyond their goals. It is also the ability to anticipate and respond to change. Leadership is not necessarily synonymous with a position of authority; it can also be informal and be held at many levels; it also exists within the enabling environment and at the organizational level.	Visionary leadership that creates an imperative and space for various actors to engage, innovate, and chart a clear course for the development and application of geospatial information in new ways. Examples: The leadership and authority for the establishment of the US Federal Geographic Data Committee in 1990 Leadership demonstrated by Google in democratizing geospatial information

Knowledge	Knowledge, or 'literally' what people know, underpins their capacities and hence capacity development. Seen from the perspective of the three levels of capacity (identified above), knowledge has traditionally been fostered at the individual level, mostly through education. But it can also be created and shared within an organization, such as through on-the-job training or even outside a formal organizational setting through general life experience, and supported through an enabling environment of effective educational systems and policies.	Knowledge systems that provide for: Maintaining relevance of(policy oriented) content, and for generation and production Mechanisms and facilities for the capture, utilization, and exchange of knowledge, as well as incentives for innovation in geospatial information technologies and services Mechanisms for the access, acquisition, and transfer of knowledge (including appropriate institutional frameworks and capacities for geospatial information training, education, and research) Geospatial information products and services (e.g., metadata, spatial data directories, atlases, on-line cadastral-based services, community resource centres) Geospatial information management toolkits Planning &decision support tools
Accountability	Accountability exists when rights holders are able to make duty bearers deliver on their obligations. From a capacity development perspective, the focus is on the interface between a service provider and its clients or service providers and oversight bodies. More specifically, it is about the willingness and abilities of [service-oriented]institutions to put in place systems and mechanisms to engage [user] groups, capture and utilize their feedback, as well as the capacities of the latter to make use of such platforms. Accountability is important because it allows organizations and systems to monitor, learn, selfregulate and adjust their behaviour in interaction with those to whom they are accountable. It provides legitimacy to decision-making, increases transparency and responsiveness, and helps reduce the influence of vested interests.	More dynamic, less structured, and service oriented relationship between data users and data suppliers Direct engagement between industry actors and user communities that include civil society Stakeholder engagement mechanisms (including capturing and utilization of Open engagement with engagement with nontraditional users, civil society Demand-driven products and services Interactive stakeholder feedback to make geospatial information more demand-driven and service-oriented Collective learning and creation of demand side capacity through awareness creation and user-oriented products and services (through collaborative computing – wikis, social networks, etc.)

Source: Adapted from "Capacity Development: A UNDP Primer", (UNDP, 2009).

Cornerstone	Description	Suggested geospatial information capacity development Target
Leadership Transformation	Leaders at political and technical levels committed to collective transformation and performance while fostering the growth and development of nation human potential.	Senior sector policy makers Legislature (Parliamentary Committees) Industry leaders
Citizen Transformation	Well-informed and empowered citizenry to foster and claim accountability for quality services, while taking full ownership of the development agenda and processes alongside state and non-state actors.	Professional associations, e.g., Institutes of Surveyors, Engineers, Architects, etc.; Trade Associations (Chambers of Commerce, Mines, etc.) Providers of location-based services
Evidence-Based knowledge and Innovation	Knowledge-based and innovation-driven processes that enhance evidence-focused decision making and encourage increased investment in knowledge, and science and technology, including scientific institutions.	Academics Technicians and earth scientists Researchers Experts in thematic application areas Management and professional staff ICT sector professionals Technical support staff
Utilizing nation potentials, skills and resources	Mobilizing nation financial and human resources for development and transformation – nationally, continentally and globally	
Capacity of Capacity Developers	Adaptive capacity development institutions driving a progressive agenda for capacity development and producing an entrepreneurial client-oriented product.	
Integrated Planning and Implementation for Results	Integrated and coordinated approaches for planning and implementation of development programmes/projects within and across levels aligned to key sustainability principles, to promote development results.	Planners Policy-makers Mid-level development managers Technical support staff

Information and Communication Technology (ICT)

Introducing information systems often requires, and causes changes. Societies that have understood developed or and adapted policies, legislation, systems, and business processes to this reality have, and continue to, benefit from challenges and opportunities from ICT. The domain of ICT is constantly changing, and the ICT movement has become highly adaptive and capable of responding and contributing to advances in technology in ways that create wealth and improve decision-making This implies that the whole society needs to be capacitated in order to bring about change.

This requires that the capacity development strategy for geospatial information should not only address technician and policy makers, but people across and at all levels of society –

thought leaders, knowledge workers, as well as all categories of implementers (doers) alike. A broad base of stakeholders should be exposed to and be part of the capacity development process which creates space, infrastructure, engaging process and capacity for change to become an information society that is spatially enabled. Without appropriate national ICT policies that create space for responsive procedures and associated processes to be designed and implemented to facilitate, encourage and even force such changes in behaviour, potential benefits to economies from geospatial information would remain a pipe dream. The domain of ICT is constantly changing, and the ICT movement has become highly adaptive and capable of responding and contributing to advances in technology in ways that create wealth and improve decision-making.

Educational networking

One of the ways of minimizing the afore-mentioned obstacles is through educational networking. The one type of education network is where the network is limited to collaboration among two or more institutions of learning on joint education, research and consulting thereby sharing facilities. The collaboration can be among institutions that are located in the same country (intra-national) or in different countries (international) but only involving LDCs. Examples of intra-national collaborations exist in various countries. In Nigeria for example, working collaboration exists between RECTAS and Obafemi Awolowo University for Masters degree programmes (MSc and Professional Masters), which started in 2003. The second education network on the other hand involves the collaboration of one or more institution(s) in the developed countries. This type of network has the advantage of regular update of curriculum including staff and student exchange programmes. The network on Geo-information Science will contribute to rapid national and regional development by Providing qualified graduates for immediate employment and productivity. Retraining existing personnel for improved productivity and introduction of modern production techniques. Retraining academic staff of other institutions so as to be able to modernize their curricula in line with modern trend.
  Significant saving in foreign exchange through efficient local training and reduced stay abroad. Assisting production organizations through well-equipped consultancy services.

Centre on Integrated Rural Development for Asia and the Pacific (CIRDAP), Dhaka

Objectives of the Training Prorogramme

A. Specific

1. To study the Geo-informatics Best Practices, Pilots, Projects and Programmes in India, and to identify the potential areas where the GIS applications can play a key role in CIRDAP Member Countries, from India's experiences
2. To exchange ideas and experiences in formulating and implementing the GIS technologies, assess the feasibility of meeting the regional needs based on existing manpower, software, hardware and data availability and assess the training needs and resources requirements at the CIRDAP country level

B. General

1. To promote effective networking among the relevant institutions in the countries of the region and to address common challenges, mitigation and issues and promote information sharing and for South-South cooperation;
2. To present case studies on application of the Geo-informatics in rural development, natural resources, disaster management and governance and disseminate the same at the regional level; and 3. To strengthen capacity building efforts of member countries through training so as to accelerate application of Geo informatics application in the region to achieve MDGs.

Output

1) Sharing of GIS Processes, Best Practices, OSS (Open Source Software) and customized GIS Software Applications in Natural Resources Management among CIRDAP member countries in Asia for networking and future collaboration in disaster management and mitigation efforts of member countries.
2) Support to the capacity building efforts of Asian region, through knowledge dissemination, with the support of the Government of India.
3) To create better institutional and governmental linkages for cost effective and better management practices through GIS Applications in the CIRDAP region and to fulfill the mandate for poverty reduction and enhance regional cooperation, disaster mitigation, early warning, preparedness and better monitoring and planning.

Federation of Indian Chambers of Commerce and Industry (FICCI)

FICCI aims to play the role of a facilitator in the growth of this industry in India as well as serve as an interface for public-private interactions in this space.
FICCI strives towards achieving the following objectives through its activities in this sector:

- Raise awareness among the stakeholders and encourage use of geospatial technologies for better information generation and decision making
- Identify successful case studies and models of application of geospatial techniques for replication
- Collaborate with Government at all possible levels to identify and address policy issues in this sector
- Efforts toward recognition to the subject as one of the mainstream options for higher education
- Facilitate a common platform to all stakeholders so as to strengthen feed-back mechanism among Government, Industry & Academia
- Assess and enhance the level of engagement across different sectors of economy
- Capacity Building

Evolving Industry-Institution Network for Capacity Development

The greatest threats to the future of the geospatial industry are not economic or technological, I believe they are related to the low levels of geospatial awareness in political circles and especially among policy makers who are tasked with providing education and training systems with the capacity and capability to meet the needs of society. Networking involves consistently communicate the shared visions, needs and concerns of the geospatial stakeholders into the political arena but also to define and offer genuine viable options. the time has come to scale-up our successful projects with the goal to integrate spatial literacy, spatial thinking and geospatial technologies into schools, colleges, higher education and initial and continuing forms of teacher training.

Therefore we will need to struggle with the most difficult challenges, namely how to work together in the political arena to get geospatial learning as a component vertically integrated into education and training structures. To assist economic revitalization and stimulate growth, forecasters predict growing industrial demands for a workforce with geospatial information skills. Across our societies and cultures, citizens are being empowered by open sources of geo-data, but in the main they do not have the fundamental skills necessary to enable them to benefit from this emancipation. If we are to meet changing needs and stimulate further geospatial industry developments, we have to establish ways to influence policy makers so that they actively respond to this rapidly changing environment. It is significant that many politicians are not even aware the geospatial industry exists, most still think in terms of last century needs and technologies. Therefore an Exchange Forum considering an evolving Industry-Institution Network for Capacity Building is a very timely opportunity to address this. The Exchange will provide us with opportunities to think strategically, create a dialogue, establish a broad picture of what capacity building needs to take place and confirm the long-term commitment of key stakeholders to unite, establish an infrastructure whereby regular collaborative action can occur in order to take these challenges forward. A new role for institutions, to give voice and tools to society in solving the world's problems. Crowd-sourcing, citizen science, human computation, collaborative intelligence are all hot keywords in the research field.

Organizations are collection of individuals whom come together for the accomplishment of certain goals and objectives. Our society is an organizational society. The progress and welfare of a society depends on organizations. So it may be said that organizations play a dominant role in our lives. Human beings are involved in organizations as employees, students, clients, patients and citizens. Every aspect of an organization is determined by the competence, motivation and effectiveness of its employees. The ability of the organization to survive and respond to competitive challenges can be sustained and mobilized only if the organization has competent, efficient and motivated manpower. Therefore, it can be assumed that the effectiveness of the organization depends on the nature of human resources it possesses. Organizational effectiveness reflects how effectively the organization can discharge its obligations with respect to all its constituencies in its internal and external environments.

The last few decades have witnessed an immense focus on contemporary issues and challenges in Human Resource Management, which has made the study of organizational environment a very popular one. Managing organizational climate determinants has become very important for the development of organization. The theme of this study is to establish relationship of organizational climate towards employee performance and organizational effectiveness. The study on organizational climate helps to identify the areas of employee satisfaction and dissatisfaction to facilitate management in the creation of greater workplace harmony and, therefore increased productivity.

Training and Capacity Building Projects

Capacity building through training workshop on GIS for environmental awareness for environmental officers. The Environment Agency in Abu Dhabi appointed the Centre for Science, Development and Media Studies (CSDMS) for conducting a six-day-workshop on integrating GIS in environment education for students. These programmes included studies of various ecosystems and the impact of humans on these ecosystems involving a number of qualitative and quantitative methods of study. CSDMS was involved in initiating and implementing GIS programmes and conducting training in GIS and its application for researchers, government officials and corporates. The aim of the exercise was to facilitate the environment awareness officers to integrate GIS in environmental training and awareness building programmes in schools. Integrating GIS in these studies would not only improve the scope of better analysis through spatial representation but would also build the capacities of the students in this new cutting edge technology of GIS.

Restructuring of Survey of India (SOI) and Capacity Building, Sep-Dec 2002

SOl had recognized that a critical review was required in respect of its mandate, mission, method of work, and professional and organizational structure to meet the user needs. Hence, with the aim of developing a strategic plan for the re-engineering of SOl to make it a user responsive organisation for sustainable economic growth of the country at local, regional, and national level, it was proposed to build strategy to chalk out the changing mandate and mission of Sol., new products and services expected by the users, methods of work, different options for financing Sol activities, professional restructuring of SOI Staff and organizational capacity building required for SOI.

CSDMS was invited to partner with SOI to lead the process of the strategy building. CSDMS has been involved in research and documentation of the use of GIS, remote sensing and surveying for decision-making for development. CSDMS has been continuously organising national and international conferences and consultative discussion forums for facilitating knowledge exchange, policy advocacy and business collaborations. As a part of this activity of strategy building, CSDMS carried out the following:

1. Background study that served to assess the existing role of the SOI and identify the key areas that needed intervention for re-engineering.
2. Stakeholder consultation to explore new ideas of re-engineering of SOI and build consensus on the keys areas and methods of intervention
3. Along with SOI and key experts from India, drafted a strategy for re-engineering of SOI
4. Built a capacity building plan for the SOI

Capacity building of IT secretaries to use GIS for governance, Dec 2002

In an effort to support local government to best use spatial data for decision-making for development, CSDMS was invited by the Department of Information Technology (DIT), Government of India to build and conduct a capacity building programme

for IT Secretaries of the States of India. The objective of the capacity building programme was to increases the officers awareness, understanding and skills for data and information management in local government and assists them to identify the capacity building needs at local levels to manage, utilise and share spatial data and information more effectively. The training programme helped the officers to understand the current situation and the starting point for improvement; build awareness on the development and adoption of internationally accepted standards and guidelines for information management and thereby promote best practices in information management; sensitize the officers to give staff responsible for spatial information in local government access to practical information management tools to reduce set up costs and duplication of effort. The training also focused on how the officers could support the development of networks through open and efficient sharing of information resources and knowledge, and assists the establishment of information loops between regional, state/territory and national levels The officers also learned how to fully exploit the information generated from local government projects at the same time ensure the sustainable management of data used or created within local government and promote the sharing and distribution of data, thus reducing costs and increasing their value.

Capacity building of DST, GOI officials to use GIS for Earthquake Disaster Management

In an effort to support internal capacity building activities of Department of Science and Technology, GOI, and its related agencies to best use spatial data for decision-making for earthquakes prediction and mitigation, CSDMS was on invitation by DST, and conducted a capacity building programme for the officials. CSDMS has been involved in research and documentation of the use of GIS, remote sensing and surveying for decision-making for development. GIS has potential use in various aspects of earthquake related studies such as active tectonics, hazard zonation and damage assessment and even act as possible precursors for earthquake. SRTM data, multi-spectral data, SAR data, IRS stereo data and aerial photos, allow us to map terrain properties, such as crustal deformation, thermal anomaly, geology etc, both temporally and spatially. SAR interferometer and GPS survey are the only avenues for mapping of deformation. High-resolution satellite data can be used in real-time damage assessment. GIS is a key for patio-temporal analysis of earthquake data for hazard zonation and damage assessment. GIS provides a platform for gathering and organizing the information and hence proven their usefulness in earthquake management.

Capacity building of health professional in health GIS, August, 2001

CSDMS was approached by key health organisation to develop a capacity building programme for managers and decision makers to use GIS for mapping, analysis and decision-making. CSDMS had been involved in key researches on use of GIS for the Health sector. CSDMS conducted a need assessment to assess the training requirement of health sector professional

and build a training programme for the professions that included representatives from government health departments and policy makers, health planners, representatives from International organisations and key NGO's, managers from hospitals involved in large scale health service delivery programmes. CSDMS also organised and conducted a three day training programme from (1 – 3 August 2001) for these professionals on the use and relevance of GIS in health along with a hands-on training in the use of GIS in decision-making in Health services. The Training Programme was aimed to strength the knowledge level of the professional.

The training content was prepared after assessing the needs of the target group and in a manner that the participants could easily comprehend and could use their skills for the maximum benefits. While the possibilities that can be explored though GIS are limitless, depending on the skill and imaginative use of the researchers and the willingness of health sector management to resource its implementation, the training mainly included equipping the professionals with a clear understanding of the ways and methods in which GIS tools could be used for analysis of health issues and building action plans for delivery of effective health services. The training focused on how can apply GIS to support the goals of strategic decision making using spatial technologies to develop a coordinated and well-networked system of all the health service unit of a region, analyse spatial and temporal trends, document health care needs of a community and assess resource allocations, plan and target interventions and publish health information using maps on the Internet.

Capacity building of GIS for Disaster Management, March 2003

Natural disaster has shown in the last decades a drastic increase in magnitude and frequency, it is also imperative that there is a dramatic increase in technical capabilities to mitigate them. There was a need to train the professionals involved in research and implementation of disaster management plans to broaden their knowledge and develop skill sets on the on the use of various GIS applications in disaster management which include prevention, reduction or mitigation of risks, and planning for preparedness, response and recovery for the probable or real-time natural or human caused disasters. Trained Managers could utilise their skills to prepare detailed simulation and modeling to carry out analysis of scenarios, a very strong detailed spatial database .They could make a proactive initiative to compile, standardize, quality test and share the existing database as well as work out a mechanism to avoid repetition of efforts by different organisations. CSDMS, keeping in view the above situation and on the basis of the need assessed of the target group build and conducted a six days Training programme (24th – 29th March 2003) based on the new disaster management paradigm that stressed on prevention, mitigation and preparedness, while strengthening its emergency response (rescue, relief, rehabilitation and recovery) through GIS technology and other related aspects. The focus was also extended to include aspects like responding to disasters from preparation to mitigation, planning to prediction and response to recovery.

Conclusion

The use of Geo-informatics shows remarkable improvement in project implementation. The geoinformation prioritized and ensured the investment at right place. The planning monitoring and decision making becomes very effective using Geo-informatics. Geo-Information helped in building transparency in the system. The developed Geo-information made future planning easier. To achieve a rapid capacity building in geoinformatics in india, it is essential to put in place education networks and partnership at national level (intra-national network) and international level. Such collaboration will facilitate the training and retraining of personnel at various levels in order to bridge the digital divide between the developed countries on the one hand and developing countries on the other hand. The partnership will be further invigorated if the joint education can be run on multi-lateral basis such that a student will be able to take courses from different partner institutions according to the education requirements of the student. The growth of the Indian geospatial industry could be constrained by the following factors: Lack of skilled manpower and inadequate education/ training for geospatial technologies. Policies and planning for GOI geospatial projects not being adequate in certain sectors. Competition from other Asian countries. Security impediments to data acquisition/dissemination. Technological innovations which may shrink demand for traditional geospatial data acquisition and software programming services. For organizational effectiveness are every organization must provide an ethical working climate to the employees for enhancing productivity. Standard working norms, scientific performance appraisal, genuine promotion system etc. are need to be established in the organization. Ensure participative management together with delegation and decentralization. Ensure efficiency of communication (upward, downward, horizontal. Retain healthy and cordial relationship with all levels of employees. Capacity development strategy for geospatial information should not only address technician and policy makers, but people across and at all level of society. Capacity building will be crucial in exploring the wide range of opportunities available for the growth of the Indian geospatial industry. There is an urgent need for trained manpower to handle the burgeoning number of projects in the geospatial domain. Well articulated policy mechanisms, Government support and the ever-increasing domestic demand would go a long way in popularising geospatial technology in India and bring it into the mainstream as an aid for effective governance and developmental planning.

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