

**A training program of the Natural Resources Data Management System (NRDMS),
Department of Science and Technology, Government of India**



Government of India
Department of Science & Technology

Capacity Building and Training on Geospatial Technologies



In India's recent journey of sustainable economic growth, knowledge has been identified as one of the key drivers. In this odyssey, India has adopted a new information regime through its 'Digital India' program to support good governance, sustainable development goals empowerment its citizens. The challenges of this developmental path are inclusiveness, transparency, efficiency and productivity while balancing economic growth and sustainable development. Over the last three decades, geospatial technologies have proven to be an effective enabler to meet these challenges.

In India's evolving geospatial ecosystem, the current focus is on improving the publicness in the provision of geospatial data and information through institutional strengthening for enhancing the performance of the organizations. In this context, developing technical capacity at the individual level, remains the key factor for the success of this change process.

Capacity refers to the ability of individuals and organizations to make and implement decisions and perform functions in an effective, efficient and sustainable manner. Capacity building is an ongoing process and involves changing attitudes, imparting technical knowledge and developing skills while maximizing the benefits of participation, knowledge exchange and ownership.

Capacity building initiatives of the NRDMS, Department of Science and Technology, Government of India

Recognizing the above needs, the goal of the Natural Resources Data Management System (NRDMS) program of the Department of Science and Technology, Government of India is to develop tools and techniques for integrated resource management and capacity building at various levels, for planning and implementation in a spatio-temporal context within a multilevel framework.

Initiated in 1982, as a mission mode project, the **Natural Resources Data Management System (NRDMS)** program is a multi-disciplinary and multi-institutional R&D program of the Department of Science and Technology, aimed at developing methodologies for building and promoting the use of spatial data management and analysis technologies in local area planning.

Vision

Enabling people, communities and Institutions of self-governance, with spatial data technologies, for informed participation in decision-making for integrated development.

Objectives

1. Demonstrate and promote the use of spatial data technologies for micro level planning under diverse terrain conditions
 - Provide software support for data management, modeling and operation research
 - Promote R & D in spatial data technology
 - Technology transfer & capacity building of potential users
 - Forge linkages with the users at different levels
2. Provide S&T inputs in policies related to spatial data technologies
3. Develop and demonstrate pilot local spatial data infrastructure and linking with National Spatial Data Infrastructure (NSDI).
4. Documentation and dissemination

NRDMS has instituted a capacity building program the goals and objectives of which are outlined below.

Goal

To build knowledge and adaptation capacity of geospatial technologies at various levels.

Objectives

- Capacity building in teaching, research and development and use of geospatial technologies.
- Promote the use of open source GIS.
- Promote networking of government, academic, research and industrial organizations.

The call for proposals for this are invited every year under the following categories :

Courses	21 day summer/winter schools in geospatial technologies (Level-1)	21 day advanced summer/winter schools in geospatial technologies (Level-2)	Three day orientation on geospatial technologies for decision makers																																
Aim	To build capacities in teaching, research and development as well as use of geospatial technologies using open source software among the participants.	To build capacities in specific sectoral areas eg: water, energy, biodiversity, health, infrastructure, disaster management, etc., through a comprehensive hands on approach using open source software.	To create awareness about the value of geospatial technologies among decision makers and its utility in their organizational workflow processes. Preference will be given to proposals addressing the needs of railways, electricity, water supply and smart cities.																																
Who can apply?	Faculty members, scientists, technologists from organizations that include post graduate colleges, UGC recognized universities, national institutions of research and research management, that have requisite faculty, lab infrastructure and expertise in geospatial technologies preferably with knowledge of open source geospatial software are eligible to apply.	Same as level one. Preference will be given to coordinators who have already conducted at least two level-1 or equivalent courses.	Same as level one. In addition Administrative Staff Colleges are also eligible to apply.																																
Financial support	<p><i>Recommended budget breakup</i></p> <table> <tr><td>Boarding / lodging</td><td>Rs.4.00 Lakh</td></tr> <tr><td>GPS/ Other hardware</td><td>Rs.1.00 Lakh</td></tr> <tr><td>Training Kit</td><td>Rs.1.00 Lakh</td></tr> <tr><td>Travel cost</td><td>Rs.2.00 Lakh</td></tr> <tr><td>Honorarium to experts</td><td>Rs.1.00 Lakh</td></tr> <tr><td>Contingencies</td><td>Rs.0.50 Lakh</td></tr> <tr><td>Overheads</td><td>Rs.0.50 Lakh</td></tr> <tr><td>Total</td><td>Rs.10.00 lakh</td></tr> </table>	Boarding / lodging	Rs.4.00 Lakh	GPS/ Other hardware	Rs.1.00 Lakh	Training Kit	Rs.1.00 Lakh	Travel cost	Rs.2.00 Lakh	Honorarium to experts	Rs.1.00 Lakh	Contingencies	Rs.0.50 Lakh	Overheads	Rs.0.50 Lakh	Total	Rs.10.00 lakh	<p><i>Recommended budget breakup</i></p> <table> <tr><td>Boarding / lodging</td><td>Rs.4.00 Lakh</td></tr> <tr><td>GPS/ Other hardware</td><td>Rs.1.00 Lakh</td></tr> <tr><td>Training Kit</td><td>Rs.1.00 Lakh</td></tr> <tr><td>Travel cost</td><td>Rs.2.00 Lakh</td></tr> <tr><td>Honorarium to experts</td><td>Rs.1.00 Lakh</td></tr> <tr><td>Contingencies</td><td>Rs.0.50 Lakh</td></tr> <tr><td>Overheads</td><td>Rs.0.50 Lakh</td></tr> <tr><td>Total</td><td>Rs.10.00 lakh</td></tr> </table>	Boarding / lodging	Rs.4.00 Lakh	GPS/ Other hardware	Rs.1.00 Lakh	Training Kit	Rs.1.00 Lakh	Travel cost	Rs.2.00 Lakh	Honorarium to experts	Rs.1.00 Lakh	Contingencies	Rs.0.50 Lakh	Overheads	Rs.0.50 Lakh	Total	Rs.10.00 lakh	Three lakhs
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How to apply?

Central and state government universities and research organizations should submit the proposal to ngcps.dst@gov.in. Non-governmental organizations (Deemed and private universities and research and development organizations) should submit the proposal through the ngodarpan.gov.in portal.

Interested coordinators can submit their proposals in the requisite format (provided on page 7 of this brochure) along with their biodata on or before the date mentioned in the call for proposals to:

Dr. D. Dutta, Scientist 'G'/Dr. A.K. Singh, Principal Scientific officer

NRDMS Division, Department of Science & Technology

Technology Bhavan, New Mehrauli Road

New Delhi - 110 016 (Telefax: 011-26851967)

Email: ddutta@nic.in / ashokk.singh@nic.in

NOTE: Please ensure submission of the hard copy of the proposal duly endorsed from the Head of the organization. The e-version of the proposal should be submitted as a single pdf document including all attachments.

Knowledge support

A specialized portal (<http://dst-iget.in>) as a one stop knowledge resource has been developed.

The main features of this portal are :

- Structured curriculum with a tentative program schedule. The course curriculum followed for the three week program includes: theory, practical (hands on sessions) with open source geospatial software, field work, interactive sessions with experts and project work.
- Open source geospatial software
- Tutorials with data
- Teaching and learning resources

Implementation Support

Monitoring and assessment are key components of a successful program. In order to ensure uniformity in implementation, assessment and evaluation as well as enable the development of a national database of trainees, the portal provides the following tools:

- Common application form for participants
- Pre-assessment knowledge assessment tool
- Post program knowledge and skill assessment tool
- Online feedback form

Expectations from the coordinators

- It is mandatory for the PIs to attend a two day orientation program at the Institute of Environment Education and Research, Bharati Vidyapeeth, Pune prior to conducting the capacity building program.
- Brochures of their proposed training program need to be uploaded on the portal atleast two months prior to conducting the program for wide publicity.
- PIs are expected to follow the course curriculum outlined in the portal and conduct the hands on session with open source geospatial software.
- PIs must facilitate the implementation of a mini project by the participant. The projects in the form of a tutorial is to be uploaded on the portal on successful completion of the project. This is a pre requisite for final financial settlement of the project.
- Pre and post assessment and feedback must be conducted by the PIs through the IGET portal.

Expected participant profile of the 21 day summer/winter school in geospatial technologies

- Faculty of colleges and universities
- State and central government officials
- Personnel from research institutions
- School teachers

Research scholars from host and other institutions should not exceed ten percent of the total participant strength in a particular program.

Expected participant profile of the three day orientation program in geospatial technologies

- State and central government officials
- Personnel from research and management institutions

Application Format

All proposals must be in the following format:

1. Name of the Principal Investigator

<i>S. No.</i>	<i>Dates of training program conducted</i>	<i>Venue</i>	<i>Focus area of training program</i>	<i>Participant profile (teachers, govt. employees, other)</i>	<i>Number of participants</i>

2. Designation

3. Date of Birth

4. Gender

5. CV in the following format

<i>Highest qualification</i>	<i>Subject area expertise</i>	<i>Teaching experience in years</i>	<i>Research experience in years</i>	<i>Research projects completed</i>	<i>Funding secured till date</i>	<i>No. of research publication including books, etc. (last five years)</i>

6. Name of the Institution

7. Address of Institution

8. Website of Institution

9. Please indicate level of training program to be conducted: *Level 1/ Level 2/ Orientation*

10. Status of present infrastructure

- Number of computers with configuration
- Availability of licensed geospatial software with numbers
- Availability of handheld navigation systems
- Availability of internet with bandwidth

11. Particulars of courses being offered / training programs conducted by the organization in the last three years in the following format

<i>S. No.</i>	<i>Dates of Training program conducted</i>	<i>Venue</i>	<i>Focus area of training program</i>	<i>Participant profile (teachers, govt. employees, other)</i>	<i>Number of participants</i>
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12. Names of the faculty with relevant qualification who will be involved in the training program (Attach CV)

13. Particulars of facilities available with the institute for boarding and lodging of participants and external resource persons.

14. Account details for fund transfer viz. Account holder name, Savings Bank Account Number, Name of the Branch and Branch, IFSC Code etc.

15. Proposal should be duly forwarded by the Head of the organization as well as endorsement from the PI.

16. Attach Any other information that may be deemed necessary by the organization.

17. The PI should access the IGET portal prior to preparation of the proposal.

Endorsement from the Head of the Institution

A. Certified that the Institute welcomes of Prof./Dr. _____ as coordinator for conducting the training programme on geospatial technology (Level ___) submitted to the Department of Science & Technology, Government of India.

B. Certified that the Institute will provide all the required technical and administrative facilities for conducting the training program on geospatial technology submitted by the coordinator.

C. The Institute assumes the financial and other management responsibilities for conducting the training program on geospatial technology submitted by coordinator.

Name and Signature of Head of organization

Date:

Place :

Certificate from the Investigator

- A. I agree to abide by the terms and conditions of the DST grant for conducting the training program on geo-spatial technology.
- B. I undertake to submit technical reports, statement of accounts, utilization certificates etc., for the sanctioned training program as prescribed by the DST.
- C. I have enclosed the following materials:

Items	No. of copies
Endorsement from the head of the Institution (on letter head)	One
Soft copy and hard copy of the proposals as per the format	Two

Name and signature of PI

Date:

Place:



Incentives

In order to improve the effectiveness of the program DST plans to provide incentives to the coordinators and trainees through a rigorous evaluation process in the following manner:

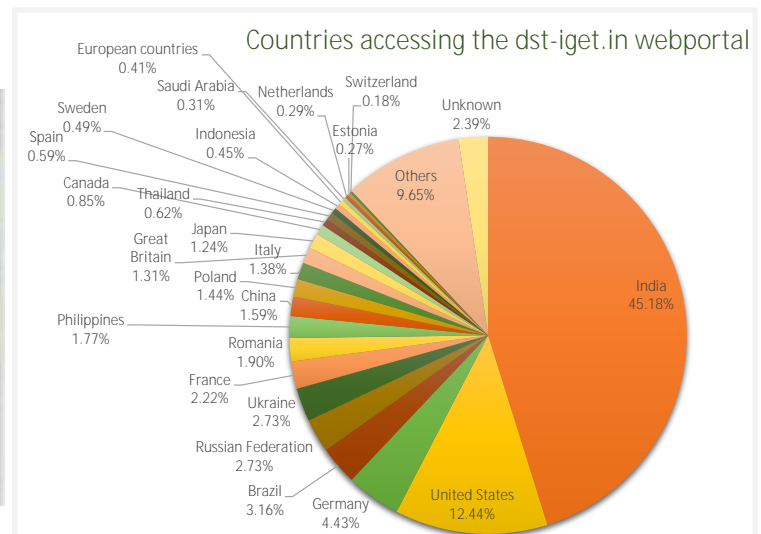
For Coordinators: Coordinators will be evaluated based on their performance in implementing the capacity building program. Selected coordinators may be sent to international organizations for further strengthening of their capacities under Training of Trainers program.

For trainees: Performance of the trainees during the courses will be strictly evaluated to select limited number of excellent candidates for further international training programs.

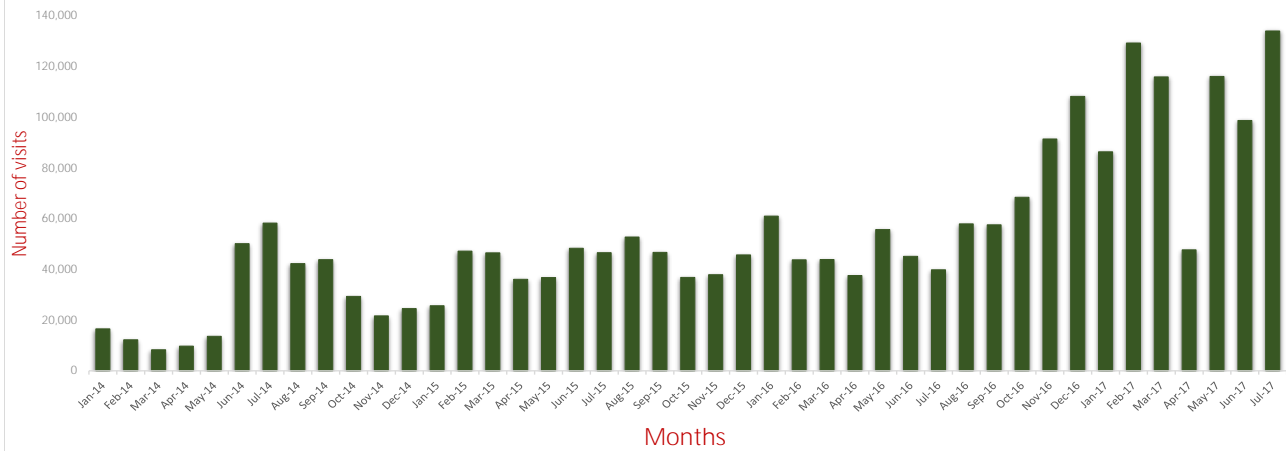
The IGET Portal

The portal which can be accessed from www.dst-iget.in is an innovative venture and is the first Indian portal of its kind that is a one stop resource for teaching-learning geospatial science besides networking educators, professionals and scientists.

The portal provides software, tutorials for teaching GIS, digital image processing, spatial analysis, customization and new trends such as web GIS and mobile GIS using open source software and data from the Indian sub-continent making it easy for the learner to relate to. The training manual has framed a common curriculum for geospatial training in the country and has helped build a cadre of professionals with the requisite expertise to meet the needs of the growing geospatial industry. Apart from this it has database of Indian experts who can be called upon by various institutes as a resource person. It has provided a common platform for networking of geospatial educators in the country besides providing access to a large section of society to acquire skills and knowledge related to geospatial technology at relatively cheap costs at their own pace.



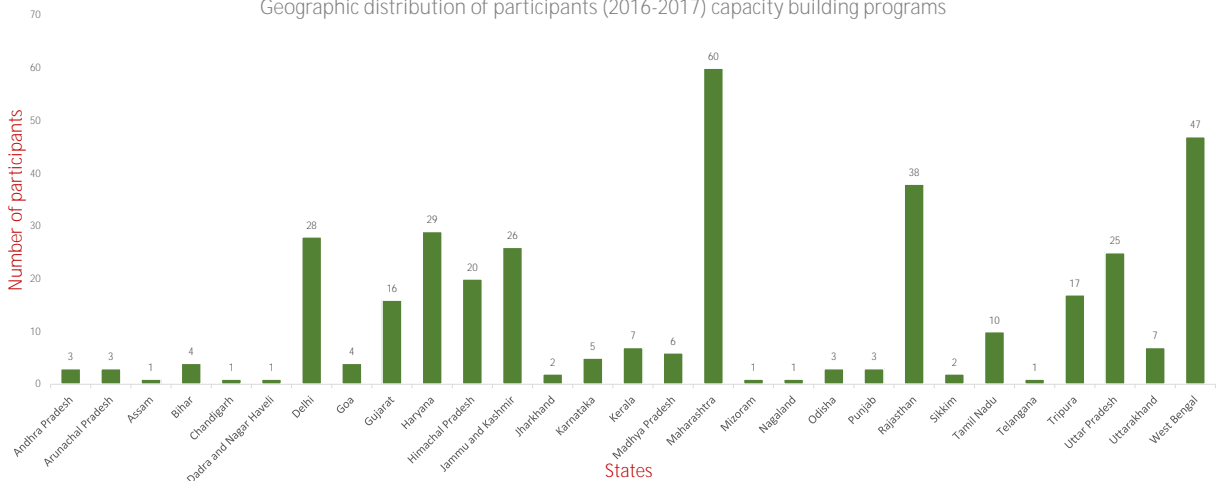
Monthly visits of dst-iget.in webportal



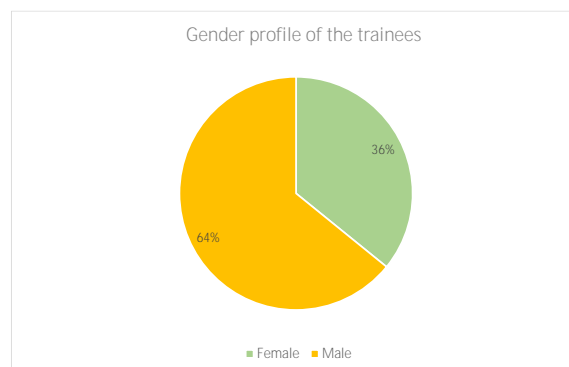
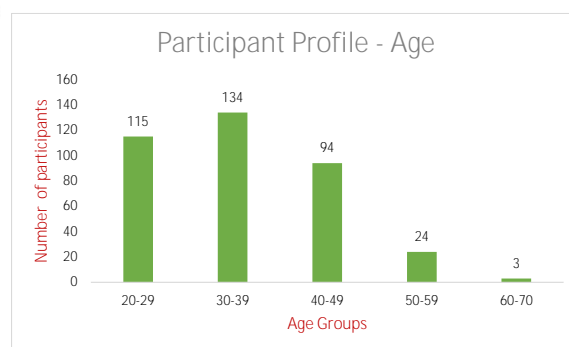
While 116 training programs have been conducted till date, this analysis pertains to the training programs conducted last year. In the year 2016-17, 18 training programs were sanctioned and conducted across the country covering 371 participants from 29 states across India. The largest number of trainees

are from Maharashtra followed by West Bengal and Rajasthan. This indicates the need to popularize the program in other states and encourage participants from other states to attend the summer/winter schools.

Geographic distribution of participants (2016-2017) capacity building programs

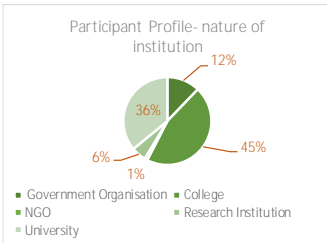


Coverage of DST-NRDMS capacity building program (2016-17)

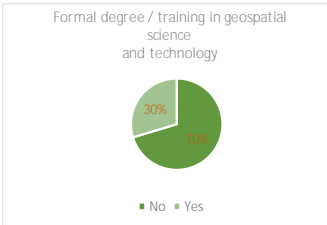


The data indicates that the majority of the participants are mid career professionals who are the primary target of this training program followed by early professionals indicating a healthy mix of youth and experience. The data indicates that 36 percent of the participants are female and 64 percent are male. While certain training programs have had a large number of women, there is a need to encourage women to attend the training programs.

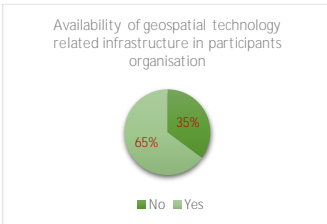
Applications for conducting the training programs are specifically invited from organizations located in regions not represented on the above map.



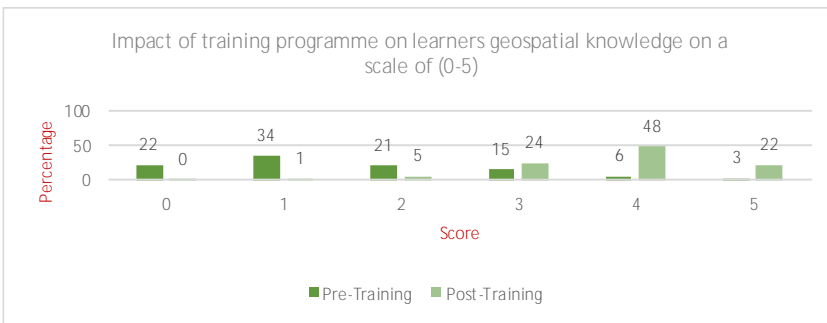
The participants were drawn from a mix of institutions ranging from government organizations, academia – both colleges and universities, research institutions and a small number of non-government organizations again indicating a good overall mix. This trend was seen in most of the training programs across the country, thus enriching the learning environment.



Seventy percent of the participants did not have a formal degree or prior exposure to this technology while thirty percent who had some kind of prior training did not have exposure to open source technologies. This too indicates a healthy mix as peer interaction serves as an important learning tool.



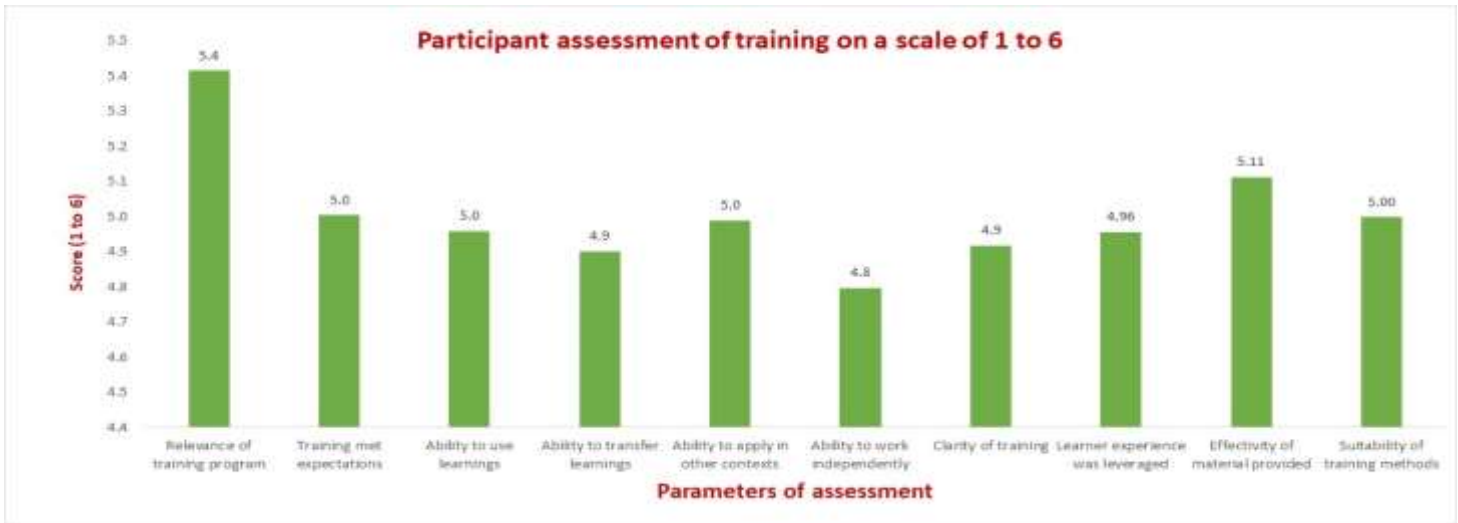
It is heartening to see that sixty five percent of the participants reported the availability of infrastructure essential to conduct training. However on closer inspection it was observed that the computers do not have the necessary configuration and steady internet connection is a major problem. A majority of them did not have adequate licenses and if available, they were not updated versions.



scored 2 while only 3 percent scored 5 before the training program. Post training 48 percent of the participants scored a 4 while 22 percent scored a 5, while one percent score a low of 1. The further impact could be judged through continuous monitoring indicating upgradation of existing courses and initiation of new courses by the participants. The significant impacts

Assessment of training impact: Pre training value and post training value for each candidate has been generated through an assessment of knowledge, skills and project implementation. As is evident in the figure above, 22 percent of the participants were not aware of any geospatial related concepts, 34 percent of the participants scored a rating of 1, 21 percent

have been the vast network of educators that have been oriented to this technology. While most of the participants wanted more technical training, several of them have developed ideas to extend the training to new fields of health, disease management, business, mining, etc.



The figure above provides an assessment made by the participants on various aspects of the training program, on a scale of 1 to 6. The content of the program was found to be highly relevant and thus met the expectations of the participants due to a healthy mix of classroom lectures, hands on practical sessions, field data collection and conceptualization and implementation of mini projects. The use of open source software supported with learning modules and material provided has made the use of the learning beyond the training program and thus transferability possible. However participants felt that they need handholding and enhanced support in terms of advanced exercises to enable them to work independently. The fact that more than fifty percent of the training program consisted of practicals through the use of open source software was highly appreciated by all the participants. While all the participants felt that the training was

extremely relevant and they had concrete ideas about application of the training, some of them with exposure to geospatial technologies felt that topics such as advanced remote sensing, advanced modeling, programming, etc. could have been incorporated. This thus indicates that an advanced training program using open source GIS could be designed as the next progression. Most of them had concrete ideas of how they would use the training and this ranged from acquiring more expertise on open source software by enhancing their own practice to making their superiors aware of the potential of this technology and its use in their sphere of work, developing research projects, better analysis on existing data sets, use in existing research, introduction as a core paper in post graduate courses and setting up open source geospatial laboratories in their place of work.

The way forward

There have been several crucial lessons from the implementation and assessment of this capacity building program. The development of a standardized curriculum, supported with teaching learning material with data from the Indian context in open source GI software has tremendously enhanced the learning value. A large majority of participants were not aware of the ease of use open source software and this three week exposure has thus opened up multiple opportunities in upscaling the implementation of short courses in several post graduate and undergraduate courses in the country. To ensure the effectivity of the program the following major suggestions could be considered.

One time support for infrastructure: Considering the poor infrastructure that is generally available, the DST may consider giving performance linked seed grants to selected institutions to set up basic geospatial laboratories.

Orientation of PIs conducting the training: It is essential that PIs conducting the program be thoroughly oriented to the philosophy and modality of conducting the capacity building program to maximize the impact.

Development of advanced training modules and programs:: Future training programs could be divided into basic and advanced courses with participants being enrolled in advanced courses after having completed the basic courses. This could focus on advanced remote sensing, modeling, web GIS, use of R, etc.

Research support: Excellent candidates from the advanced course could be encouraged to apply for research grants of the DST-NRDMS and could be potential candidates in networked research projects.

Development of online assessment: The possibility of conducting the basic course entirely in online mode may be considered with a certificate being issued by DST.

Conduction of regular webinars: A series of webinars that could involve talks by resource persons on the latest advances in geospatial technology can be instituted. This will enable continued interaction with the participants and their extended sphere of influence besides providing them with continued support.

Listing as a skill development program with National Council for Skill Development: The Indian government has invested billions in our space program. We however need a workforce that is fully skilled to understand and use this data for solving problems of local, national and global concern. This program is thus an excellent skill development at an effective technician level. and can be opened to students as well.

The capacity building program of the NRDMS has gone from strength to strength and has created an expanding community of educators who can now give students a solid foundation in geospatial technologies.

NRDMS, Department of Science and Technology, Government of India