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CHAPTER 1: BACKDROP TO FINANCIAL STRATEGY FOR THE NSDI

1.1 INTRODUCTION

Spatial data infrastructure is now widely recognized as a important spoke in the wheel of information society. It provides the tool for continents, countries, regions and local governments to better organize, plan and manage their natural, cultural and economic resources.[1]

One of the key issues related to creation of NSDI is funding. Economic issues associated with the development, implementation and maintenance of SDI have not been debated and discussed in a manner that technical issues have been researched on, especially in developing economies like India. Some of the queries that arise during debates and discussions include the following:

- What are the costs associated with the building of SDI?
- Cost vs. benefit issues
- Where will the resources come from to fund the development and maintenance of SDI?
- Over what period will the funds be disbursed?
- What are the effects of funding on pricing policies?

In this regard, Feedback Strategic has been involved with NSDI over the last year in addressing the economic issues impacting NSDI in India and developing a financial strategy for the organization. This report presents funding requirements for NSDI and alternate funding mechanisms for the organization. This report has evolved after extensive primary interactions with public and private sector organizations in India and extensive analysis of models being followed internationally.

1.2 GEO SPATIAL DATA INFRASTRUCTURE

Geo spatial data infrastructure encompasses the networked geo spatial data bases, and data handling facilities, the complex of institutional, organizational, technological, human and economic resources which interact with one another and underpin the design, implementation & maintenance mechanisms facilitating the sharing, access to, and responsible use of geo-spatial data at an affordable cost for specific domain application or enterprise[2].

[1] Sorensen 1999
[2] Richard Groot & John McLaughlin

Many nations have recognized the importance of spatial data infrastructure to their economic, environmental, political, and social prosperity and thus have taken steps to formalize their existing SDIs. The national surveying and mapping agencies of these countries have recognized the need to create strategies & processes for standardizing the access to, and application of, geo spatial data. The infrastructure concept goes beyond the computer and communication technology perse to providing a framework to address more comprehensively the wide array of technical, legal, financial, organizational and other issues at stake in providing effective data access.

Before evolving a financial strategy for NSDI it is important to address the economic and market environment in India. The market realities are:

- θ Not a very vibrant market – especially in spatial information
- θ Spatial information sector contributes only 0.1% of the GNP
- θ Policies limit market activities
- θ The supporting infrastructure for SDI implementation not in place – successful implementation of an SDI requires the support of both technical and social infrastructure. If the supporting infrastructure is not in place, then the funding models do not carry any significance. Some of the support infrastructure issues include the following:
  - Reliable telecommunication services only in urban areas
  - Ratio of telephone line (basic telephony) to population is very low
  - Unreliable power supply
  - Insufficient internet penetration
  - Lack of qualified personnel to support SDI implementation
  - Insufficient hardware & software to support SDI implementation

Therefore, the financial strategy should not only be in consonance with the vision of NSDI but also be in sync with the market realities.

1.3 STRUCTURE OF THIS REPORT

It traces the vision and objectives of NSDI in India, its role and key issues impacting the implementation of the vision. Thereafter, it analyses the key drivers for creating a financial strategy for the organization. Then it looks at typical funding models for NSDI and suggests options for India. The report concludes with organizational imperatives for NSDI and action plan for moving ahead.

CHAPTER 2 - VISION OF NSDI IN INDIA

2.1 THE BACKDROP TO NSDI VISION

Historically, the geo-spatial industry in India has been characterized by the following:

- Strong tradition of analog and paper based map data – in this regard, Survey of India has been a pioneer in generating paper based maps for the last 200 years and these maps have so far served the strategic needs of the nation. The National Atlas & Thematic Mapping Organisation (NATMO) has been generating atlases (paper based maps) over the years fulfilling the needs of research and educational institutions.
- Multiple central organizations responsible for collection of data, in some cases on specific request. In the past, there was only one organization, the Survey of India for collecting geo-spatial data for the nation. However, Survey of India was broken up into multiple organizations focused on specific requirements. There emerged organizations like Forest Survey of India, the Zoological Survey of India, the Geological Survey of India, The Archeological Survey of India etc. – agencies that would collect data either on a regular basis or on specific request.
- Limited common standards and absence of coordinated efforts inhibiting development of common spatial data infrastructure – each organization follows its own standard operating procedures that includes standards on information collection, standards on output, standards on quality etc. and there have been limited efforts in standardizing operating procedures among the organizations. This has inhibited development of common spatial data infrastructure.
- Severe budgetary and funding constraints – in a developing economy like India, budgetary allocation is more often concentrated on areas where the benefits are more visible and immediate. As a result, infrastructure sectors like roads, railways, power and water supply do not face any significant budgetary constraints. The awareness levels of spatial data infrastructure is abysmally low which results in lower budgetary allocation for spatial data infrastructure
- Specific programs initiated towards GIS database development are characterized by absence of inter-operability and focus on user needs
  - National Resource Information Systems (Dept. of Space)
  - Digital Cartographic Database (Survey of India)
  - National Resources Data Management System (Dept of Science & Technology)
  - Other initiatives through GSI, FSI, NATMO etc.

In this backdrop, a need was felt for an NSDI with common standards of operability and offering greater availability and accessibility of geo spatial data.

2.2 THE VISION OF NSDI

A vision defines the reasons for existence of an organization, aids in identifying clear goals of the organization, is rooted in the strengths and needs of the organization, is commonly understood and accepted by all stakeholders and achievable in reasonable amounts of time.

National Spatial Data Infrastructure (NSDI) envisions the establishment of national infrastructure for the availability and access to organized spatial data and use of this infrastructure at community, local, state, regional and national level for sustainable economic growth. In short,

- θ To be the gateway for the dissemination of spatial data being generated by different government agencies
- θ To create an enabling environment for the use of geo-spatial data in India across different types of applications. The key to an enabling environment would be:
  - Standardization in data collection, data delivery, information management and information dissemination
  - Quality and certification
- θ To enhance the availability and accessibility of geo-spatial data with key objectives of :
  - Access on demand
  - Access across user communities, with relevant pricing models
- θ To specifically promote the use of geo-spatial data in delivering better governance
  - Socially relevant data sets for Urban & Rural Local Bodies (for Master Planning and zoning at periodic intervals, utility planning, revenue enhancement), Natural Resource Management (agriculture, forestry, soil & land use, water resources), and Disaster Planning Management etc.

Today, it is recognized that ready availability and easy access to spatial information is extremely critical for good governance and improved quality of life. In lieu of this, the role envisaged for NSDI is:

- θ Regulatory
  - In definition of standards (for data, for data presentation, and ensuring adherence to defined standards) – all participating agencies will be required to generate and present data as per the standards defined by NSDI
  - In mandating the participation of various Government and non government agencies in the NSDI
- θ Policy making role – policy regarding geo-spatial data infrastructure would be the domain of NSDI and not any government agency / department
- θ Developmental / promotional role (stopping short of actually “selling” information), likely to be achieved through the establishment of NSDI standard as a symbol of quality in the field of geo-spatial data

- Assisting in product development and delivery, with a focus on certain well defined and carefully selected social applications
- Quality assessment and maintenance role

Having defined the vision and role of NSDI, it is equally important to address the issues impacting the implementing of the vision of NSDI. Some of these are presented below:

- The awareness levels in the country about the importance and requirement of a geo-spatial data backbone is abysmally low. There is a need for geo-spatial infrastructure to be accorded similar priority as other infrastructure elements. Enhanced awareness levels within the government (Centre and State) would ultimately percolate down to the municipal level thereby resulting in better governance.
- Current nature of NSDI – it is a community built through voluntary participation. Therefore, there is a possibility of roadblocks in the implementation of common standards, and in optimizing resource utilization
- The size and structure of geo-spatial data market in India is small and there are constraints that impinge growth. The market is relatively unsophisticated characterized by low spends. Significant investments are required to action the vision.
- Regulatory issues – the national security and defense issues will need to be placed in perspective. The map policy of Ministry of defense covering topographic maps, aerial photographs, digital data, geo-physical data and satellite imagery inhibits commercialization through dissemination restrictions. The new map policy (to be introduced by the Central Government) is likely to address some issues of map restrictions.
- Availability of financial resources to fund NSDI – funding of NSDI is an issue not just in India but also globally. Significant studies and research have been undertaken to determine the ideal funding model for SDI. Combination of funding models are used both in developing and developed economies (this is discussed later in this report)

The economic imperatives for NSDI therefore, are that the financial strategy would have to be in consonance with the vision element & role of NSDI and would have to address the issues impacting implementation of NSDI.

The next chapter discusses the philosophical underpinnings for creating a financial strategy for NSDI, analyses issues impacting NSDI funding (taking learnings from international case studies) presents the drivers of a financial strategy for NSDI and concludes with proposing certain funding models for India.

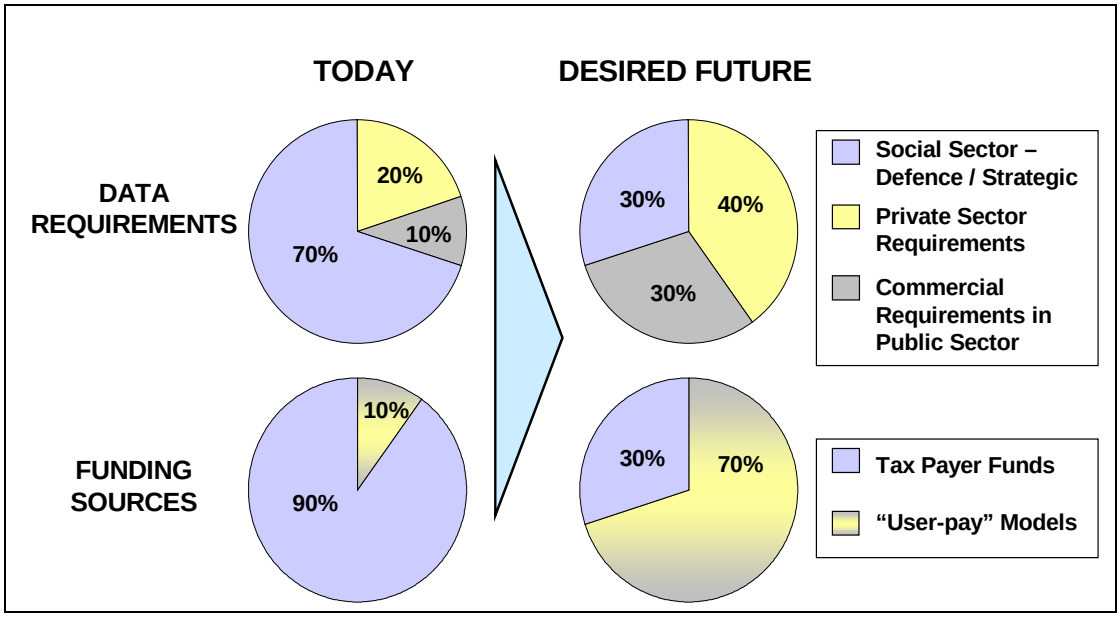
CHAPTER 3: FINANCIAL STRATEGY FOR NSDI

The economic issues involved in implementing a SDI have been the topic for debate in the developed economies in the last few years. Successful implementation of an SDI to some extent depends on ability of the SDI community to sell the benefits/gains of an SDI to the financiers. Infrastructure financiers generally tend to look for two main types of benefits/gains when investing - competitive financial return on investment and the creation of a product that will generate growth (e.g. economic, political, and environmental) within the implementation environment or across the wider society. In developing economies like India where funding is a severe constraint, financial strategic initiatives become all the more important for development and sustenance of NSDI.

This chapter discusses typical financing structures in public-private interface initiatives, looks at international examples of SDI funding (different funding models), analyses issues in SDI funding in India, arrives at drivers of financial strategy in India and proposes funding models for NSDI India.

3.1 FINANCING STRUCTURES FOR PUBLIC-PRIVATE FINANCING INITIATIVES

The figure below presents typical financing structures for public-private financing initiatives in India:



Today, data is required by three broad user segments viz. the government (for strategic and governmental needs), the private and the public sector (for commercial applications). The strategic data requirements constitute around 70% of all data requirements in the country. Private sector requirements and commercial requirements in the public sector constitute the remaining 30%. However, 90% of all

data requirements are funded through taxpayers money and only 10% is met through "user pay" models.

NSDI needs to focus on changing the use mix of geo-spatial data. To do this, the market needs to expand (because NSDI would continue to meet the strategic data requirement needs of the nation) and NSDI needs to increase the awareness of importance of geo spatial data and services so that such data can be put to greater commercial use.

In addition, NSDI needs to establish clear linkages between use and funding sources. For example, one of the successful funding models in the infrastructure arena is based on user pay. The funding requirements of the golden quadrilateral (the National Highway Development Project initiated by the government) is partly met by toll that the user pays for using that road. This model could be introduced in the geo-spatial data infrastructure also.

3.2 ISSUES IN NSDI FUNDING

There are certain issues that need to be addressed while framing a comprehensive financial strategy for NSDI. Some of these issues include the following:

- Data available in most cases is not of the quality / resolution or timeliness that makes it commercially exploitable. For example, the time taken to collect data and convert it into a finished product is so huge that the data becomes redundant by the time it is introduced in the market. There is a clear time lag between investment spend and commercial return.
- Current spend is spread across a number of organizations, with inevitable duplication of activities and resources. Today, government agencies compete rather than complement one another for undertaking similar work.
- NSDI cannot be seen to be in any form whatsoever in competition with its constituent bodies. All revenue would therefore need to be channelised though these institutions
- No clear mechanism for establishing public private partnerships either in data generation or in payment mechanisms
- Government policies on SDI classification - classic infrastructure (public good) vs. network infrastructure (network based); is there a need to earn returns on investments?
- Constraints on direct budgetary funding for NSDI
- Legislation – the different laws that affect infrastructure financing in general and SDI pricing policies

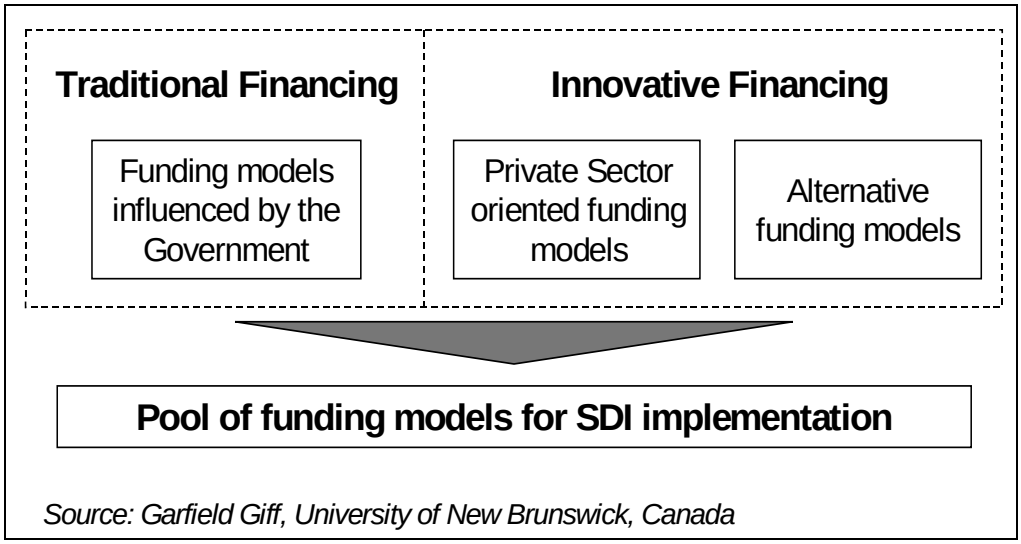
3.3 DRIVERS OF FINANCIAL STRATEGY FOR NSDI

Some of the drivers of financial strategy for NSDI are presented below:

- θ Current public and private investment environment vis a vis spatial data
- θ Requirement of the NSDI to be "above" constituent organisation interests (both public & private)
- θ The need for near term high impact results – in the government, commercial and societal sectors to build long term commitment across interest groups
- θ Potential for a phased strategy – with an increased breadth of funding, once visible impact is seen.

3.4 SDI FUNDING – INTERNATIONAL EXAMPLES

In the developed economies, the first generation SDIs were funded through the budgets of National mapping agencies, or grants and these evolved without long term financing mechanisms. Today, these funding sources are no longer sufficient to finance the next generation of SDI. Therefore, there has been a shift towards structured long term financing mechanisms. The figure below presents the funding models being followed by international SDIs.



Source: Garfield Giff, University of New Brunswick, Canada

- θ The traditional infrastructure financing models include the following:
  - Government budget (general taxation)
  - Funding of SDI through government financing through special taxation measures – taxation can either be positive (tax incentives – reduction or removal of taxes to encourage spatial information initiatives) or negative (tax increment) or a combination of both. The revenue generated from these taxes go directly to the development of SDI and not general treasury. e.g. Portuguese national SDI
  - Issue of medium or long-term tax-free bonds targeted at large spatial data user (public or private) and spatial data software developers.
- θ Private sector oriented funding models include

- Capital Investment in SDI based on expected returns on investment through value added products
- Re-investment of returns (sales, charges, royalties)

θ Innovative / alternative financing models include

- Partnerships – the creation of partnerships amongst local and international private sector with interest in spatial information. Partnerships could be between the government and the private sector, between donor agencies and private sector, government agencies, donor agencies and private sector, partnerships with international private sector, etc. The contribution of the private sector to these partnership are not necessarily monetary. They are also in the form of management services, consultancy, provision of technical services etc.
- Consortia - consortia of privately-led, publicly-accountable Service Bureaus to leverage Spatial Data transactions into the NSDI - just like Service Bureaus process credit cards, mortgages and many other commercial transactions. These service bureaus can be bundled into 3 types of Consortia:
  - Regional (such as San Diego Regional Urban Information System or the Pacific Disaster Center in Hawaii)
  - Industry (such as Energy, Financial Services, Healthcare, Insurance, Real Estate and Telecommunications) and
  - Interest Groups

  These Consortia provide an architectural unit for public-public, public-private and private-private partnerships (where private includes nonprofit and academic users) to align their investments for projects. Federal Agencies become members of such consortia, and Private Data Developers & Technology Suppliers service the outsourced needs of such consortia as a new line of their business.

  To coordinate the Consortia, an Association of the Consortia evolves to help remarket, finance and procure Spatial Data for them and their state, county, regional, industry and interest group client/members, manage the intellectual property of a Brand for reliable Spatial Data specifications and procedures and develop public policy implications, initiatives and guidance.
- Financing of an SDI through the usage of “retention” schemes – under this scheme SDI related organizations are allowed to retain a significant portion of the revenue they generate to reinvest in the development of components of the SDI.
- Limited recourse structures – this model has been used for the last many years to increase private sector contribution to public infrastructure financing. Limited recourse loans are also used where repayment depends upon the cash flow of he business

- Contribution from stakeholders (eg. Utility companies)
- Non monetary contributions – in the form of rent or lease free premises to house the coordination bodies and other elements of the SDI, personnel, provision of equipment, expertise etc.
- Alignment to special projects
- Special Banks – establishment of special banks or financial institutions to underwrite low interest loans for the investment in SDIs. This can be done in conjunction with international lending agencies.

The application of these models vary from 'stand-alone' to a combination of one or more or all of the above models. Government funding is the most widely used model in the international scenario followed by income generated through sale of geo-spatial data. A number of spatial data producing organizations around the world are in the process of putting in place policies and procedures aimed at making them more self sufficient. For example, Ordnance Survey of Great Britain and the Dutch Kadastre have reduced their dependence on government funding and are concentrating on generating their own resources. It is also felt that increase in the supply of affordable spatial data in the format required by the consumers may in the long term result in an increase in demand. This increase in demand may lead to increased revenues, thus the possibility of funding a SDI through fees derived by statutory bodies and the private sector.

It has also been witnessed in developed economies that as the sophistication of data availability increases, the range of funding options also go up.

In the developing economies, infrastructure financing was primarily the function of he government and the international funding agencies. However, budgetary constraints on the part of governments resulted in governments cutting back on infrastructure funding and also significant reduction in the funds available to international funding agencies for infrastructure financing. However, despite governments cutting back on spatial infrastructure financing, they continue to be the largest spenders on geo spatial data infrastructure in the developing economies. The typical funding models for SDI in these economies include the following:

- θ Government funding – especially from the budget of ministries closely related to the production or usage of spatial information. For example, in South Africa, the National Spatial Information Framework is funded from the budget of the department of Land affairs.
- θ Government and donor agency partnerships – wherein the government shares the cost of implementation with one or more donor agencies. For example, in Zambia, the central government supports an initiative in conjunction with donor funds (World bank and Nordic Development Fund)

- θ Large public and private utilities – utility companies have the greatest need for spatial data and part of the data collection is funded by these companies (both public and private)
- θ Low interest loans through SPVs
- θ Policy for "soft funding"

3.5 PROPOSED OPTIONS FOR NSDI INDIA

All the funding models (or a combination of them) prevailing in the developing or developed economies may not be relevant for India primarily because of the current state of the geospatial data market. However, there are significant learnings from each of the existing models being followed by various economies. Having undertaken a detailed study of international funding models, the model(s) proposed for India is:

- θ Government funding
  - Direct allocation – budgetary allocation for NSDI by the government similar to the lines of its budgetary support to core infrastructure sectors.
  - Creation of a pool of funds through relevant ministries mandating a non-lapsable annual spend (based on the DONER example)
- θ Donor agency funding – this will alleviate the lack of coordination amongst projects funded by external agencies and will also minimize the occurrence of lapse funds since it is expected that the pool will facilitate carry-over funding. This type of funding arrangement is necessary since spatial information activities are normally developed on project basis with no funds allocated for continuation or maintenance. If a funding pool exists, it will be easier to plan for the continuation and maintenance of NSDI. The donor pool should be organized in such a manner that it will ensure there is sufficient funds to sustain the SDI until it becomes self sufficient or other methods of funding are secured.3

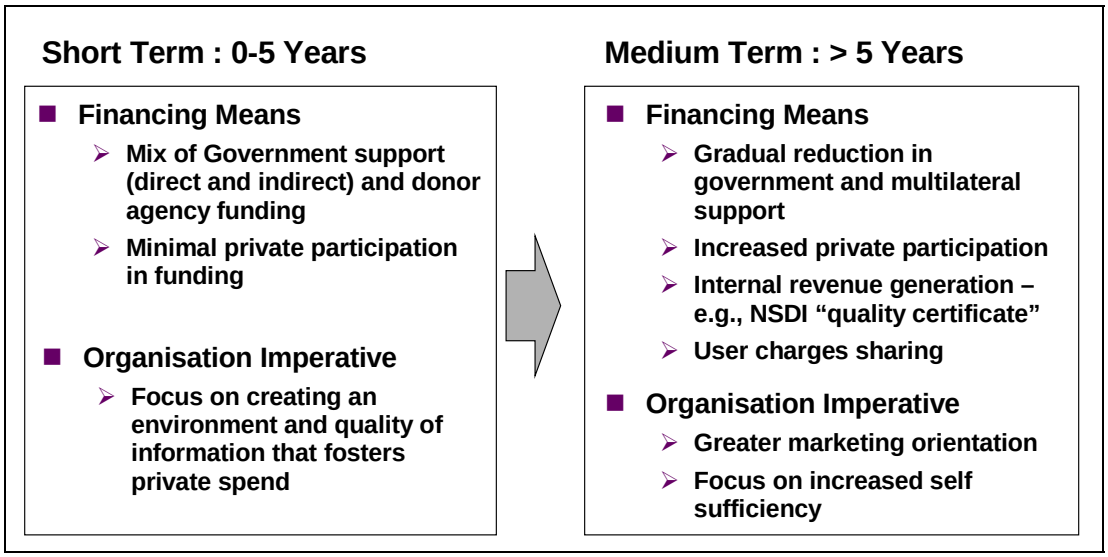
  Options for donor based funding include the following:
  - Specific project based funding
  - Creation of administered lines of credit for database creation through single donors or consortia
  - Mix of grants and debt funds
- θ Utility companies
  - Creation of a NSDI cess for a specific term either on all new project investments, or on revenues, or on a combination of both
- θ Policy issues
  - Classification of NSDI as infrastructure to obtain all tax benefits for investments in this sector. This will lead to greater private sector participation (and enhanced funding) for NSDI

[3] ECA, 2001

The objective is to create an environment that will lead private capital to the NSDI.

3.6 PHASING OF THE FINANCIAL STRATEGY

The figure below presents the phased financial strategy for SDI in India



A phased financial strategy is proposed for the successful implementation of NSDI. In the immediate term, it would not be possible for NSDI to tap the private sector for funding because the private sector would come only after an enabling environment is put in place. The private sector would also be interested in successful precedences. Therefore, in the short-term, NSDI should focus on a mix of government support (direct and indirect) and donor agency funding. Significant initiatives have been taken by multilateral institutions in India in augmenting infrastructure in the country. Therefore, getting the requisite funds from donor agencies would not be an issue.

The organizational imperative for NSDI is that it should focus on creating an environment and develop quality of information that fosters government spend.

In the long term (> 5 years), it is proposed that NSDI focus on limiting the exposure to government and multilateral funding thereby becoming either more self reliant or reliant on the private sector. To do this, it should encourage increased private participation. As mentioned earlier, the private sector would participate only if they see some economic return from the investment.

Some of the revenue sources could include internal revenue generation wherein NSDI could become a standard setting body on the lines of BIS and all data / information from NSDI comes with a quality certification for which NSDI charges a fee. NSDI cold also look at sharing of user charges.

The organisation imperative for NSDI is that significant marketing initiatives would be required to increase the awareness of SDI.

3.7 FUNDING REQUIREMENTS

There are no direct models to estimate funding requirements for NSDI. The current total annual spend (both public and private) on SDI activities is estimated to be around Rs. 2500 cr. An annual outlay of Rs. 7500 cr. is proposed for NSDI through combinations of funding.

3.8 BENEFITS OF NSDI INVESTMENT

Clear multiplier effects of investment in NSDI are seen in both developed and developing economies. A report by the Economic Studies and Strategies Unit of Price Waterhouse on the economic benefits arising from the acquisition and maintenance of the nation's land and geographic information has estimated that for the period 1989–94 approximately $1 billion has been spent in Australia on investment in geographic data. This investment produced benefits within the economy in the order of $4.5 billion. The study also found that this investment has saved users approximately $5 billion. This implies that there is a saving of $5 on the in-vestment of $1bn.

Some of the benefits include the following:

- Being involved in the NSDI can save money and time. Cooperation is one of the basic principles of the NSDI. Organizations in overlapping or adjacent jurisdictions are likely to find that economies of scale bring down the total cost and time involved in developing spatial data as well as reduce the net cost to individual organizations.
- An NSDI enables an organization to acquire data resources it might not otherwise be able to acquire. The ability to share costs and efforts with others often helps move a project across a line of inertia.
- Any organization is better off when the entire enterprise is successful. In the case of the NSDI, there is great potential for every state and local government to be better off when the entire country is enjoying economic success partly as a result of spatial data from the NSDI.
- Standards are inevitable. The success of any new device, technology or technique relies on the creation of standards to ensure widespread adoption. Similarly, standards will determine the form and function of the technologies, data and techniques that comprise the NSDI. Thus, state and local input into the standards-making process will influence whether these standards meet their needs.
- The NSDI saves money, improves data consistency and enhances decision-making for any participating organization. Furthermore, these same benefits are realized by multiple organizations and thereby create a positive synergy and benefits for all.

- Improvement in revenue collections – cities and towns are expanding but this is not reflected in the data available with urban / rural local bodies. Updation of data is seldom undertaken as a result of which these local bodies lose out on possible revenues from municipal level taxes. Better information leads to enhanced revenues for all local bodies. This has been proved in Bangalore where better cadastre data has resulted in increased revenues for the Bangalore Development Authority.
- Significant decision support during times of natural calamity and emergency – current (updated) spatial data is extremely important in times of natural calamities. It helps in effective disaster planning management.
- Improvement in governance

3.9 ORGANISATIONAL IMPERATIVES FOR NSDI

The organizational imperatives for NSDI are:

- Requirement to create capacity for obtaining and administering funds
- Creation of a policy for partnership development and administration, with the private sector as well as within constituent organizations
- Vehicle for quality control and administration
- Marketing capability: to propagate the NSDI concept, as well as to assist constituent organizations
- Inculcation of Product Development Process management skills
- Ensuring participation and conformance to a common code of standards and quality through a combination of regulatory control and fiscal and organisational support

The structure of NSDI must reflect these imperatives, to achieve financial goals.

3.10 ACTION PLAN

In the immediate term, NSDI needs to undertake the following as the first steps towards implementation of the financial strategy:

- Freezing funds requirement for the NSDI
- Identifying specific sources of funding and initiating dialogue
- Putting in place the skill sets and capabilities required in the implementation of NSDI
- Identifying and implementing near term high impact projects (e.g. detailed mapping of large metros)

ANNEXURE 1

LIST OF ORGANISATIONS MET DURING THE COURSE OF THIS STUDY

Private sector

- Spatial Data Pvt. Ltd.
- Indian Resources Information ad Management Technologies Ltd.
- TCS
- Speck systems Limited
- ESRI
- ITC Netherlands
- Centre for Spatial Database Management & Solutions
- Rolta India
- Integrated Techo Systems Pvt. Ltd.
- Reliance Infocomm

Government Organisations

- Department of Science & Technology
- Karnataka State Remote Sensing Applications Center
- National Institute of Disaster Management
- Forest Survey of India
- Geological Survey of India
- Indian Space Research Organisation
- National Informatics Centre

International Agencies

- Ordnance Survey
- Natural Resources Canada
- Open GIS Consortium
- Oracle Corporation