Potential
of
Public Private Partnership
for NSDI Implementation
in Pakistan

Asmat Ali

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by

Asmat Ali

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Thesis Assessment Board:

Chairman: Prof. Dr. M. Hale
External Examiner: Prof. Dr. Ir. A.K. Bregt
Supervisor: Dr. Ing. P.Y. Georgiadou
Second supervisor: Dr. A.M. Tuladhar

INTERNATIONAL INSTITUTE FOR GEO-INFORMATION SCIENCE AND EARTH OBSERVATION
ENSCHEDE, THE NETHERLANDS

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Dedicated to those

Who prefer Learning to Earning

Abstract

Special characteristic of spatial information is that it can be shared and used for many other purposes than the one, for which, it was originally produced. To facilitate its efficient sharing and reuse, it needs to be properly managed. This is one of the reasons that many countries are developing National Spatial Data Infrastructure (NSDI). But the challenge of developing a successful NSDI depends largely on its implementation which is so significant that none of the two key stakeholder groups i.e. public or private sectors can address it at their own.

However, Public-Private Partnership (PPP) seems to be a means of addressing this most fundamental challenge as many physical infrastructures such as transportation networks, health facilities, education, wired and wireless communication networks are being implemented through PPP approach in countries like Pakistan. Yet the scenario poses the question, what is the potential of PPP for NSDI implementation in Pakistan.

This research is about determining the potential of PPP for NSDI implementation in Pakistan with an objective to share practical experiences learnt during field operation in Pakistan as a segment of research work and to give recommendations for PPP-based NSDI implementation strategy in the country. The focus is on the organizations dealing with spatial or Geographic Information (GI), as these organizations have fundamental role to play being the primary drivers in the implementation of NSDI. As the GI sector of Pakistan operates in a region characterized by privacy conscious environment, it is therefore, necessary to determine that to what extent Pakistan's socio-administrative culture and the state of GI private sectors are conducive to PPP before giving any recommendations.

The research is not limited to PPP for NSDI implementation in Pakistan but also presents lessons learnt in the context of PPP and NSDI development from other countries such as India. The research also provides evidence not only of the viability of PPP (i.e. can it work?) but also the evidence that PPP approach can deliver substantially better outcomes for all partners and can add more to the traditional approaches for NSDI implementation.

Keywords: NSDI, Spatial data infrastructure, Geoinformation, Public Private Partnership, E-government, Private Sector, Public Sector, Policy framework, Institutional arrangements, Technology, Pakistan, India.

Acknowledgements

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List of Acronyms

eGov	E-Government
ESA	Egyptian Survey Authority
ESRI	Environment System Research Institute
EU	European Union
FGDC	Federal Geographic Data Committee
GI	Geographic Information
GIS	Geographic Information System
GOI	Government of India
GOP	Government of Pakistan
GSDI	Global Spatial Data Infrastructure
GSP	Geological Survey of Pakistan
ICT	Information and Communication Technology
IGIS	Institute of Geographical Information System
IIRS	Indian Institute of Remote Sensing
IPDF	Infrastructure Project Development Facility
NGO	Non-governmental Organization
NMO	National Mapping Organization
NSDI	National Spatial Infrastructure
PARC	Pakistan Agricultural Research Council
PPP	Public Private Partnership
RS	Remote Sensing
SDI	Spatial Data Infrastructure
SoP	Survey of Pakistan
SSP	Soil Survey of Pakistan
SUPARCO	Space and Upper Atmosphere Research Commission
SWOT	Strengths Weakness Opportunities and Threats
WHO	World Health Organization
WWF	World Wildlife Fund

1. Introduction

1.1. Background

Geographic information is vital to make sound decisions (GSDI Cookbook, 2004). But sound decisions require information that has been evaluated and synthesized persuasively. Information that is developed or accumulated from multiple sources and is objective, reliable, accessible and usable. Then this information is benefited for decision-making in disciplines such as transportation, environment, natural resources, agriculture, telecommunications, mapping, health, emergency services, homeland security and research. Special characteristic of spatial information is that it can be shared and used for many other purposes than the one, for which, it was originally produced. But its importance was not realized for decades by the governments until last few years in countries such as Pakistan.

The reasons behind this reactive approach by policy makers were related to the relatively underestimated socio-economic value of Geographic Information (GI) in the past. There had been a lack of political will to regard GI as national asset (Masser, 2005). Consequently, the establishing of appropriate policy, institutional and legal arrangements to deal with matters of GI was not given priority at higher levels. Therefore, Pakistan lacks in such institutions (e.g. NSDI). However, Government of Pakistan (GOP) has started listening to GI needs now to address the socio-economic problems. Among others, some of the driving forces include economic, social and technological benefits from investments already made in GI-resources (such as information collection, processing, hardware, software and capacity building etc). It also includes driving forces such as changes in societal priorities (such as reliable, quick, round the clock availability, updated, diverse and user demanded GI), natural resource management and community protection (emergency management and homeland security) etc. The launch of E-government program in 2003, which included GIS for Agriculture, Natural Resources & Urban Property of Pakistan, Mapping & Database of National Cartographic data is the first example. Second example is the establishment of National Disaster Management Authority (NDMA) in 2006 that requires different kinds of GI for rescue operations. Another example includes establishment of Land Records Management Information System as E-government initiative. These examples are seen as "SDI-supporting initiatives" Masser (2005, p.258).

The challenge of developing a successful SDI/NSDI depends largely on its implementation which is so significant that none of the two key stakeholder groups i.e. public or private sectors can address it at their own. Moreover, Geographic Information (GI) comes from both public and private sectors and none of these sectors alone can create and serve with all kind of GI without partnership. Therefore, partnership between public and private sector i.e. Public-Private Partnership (PPP) is a solution in this scenario as many physical infrastructures such as transportation networks, health facilities, education, wired and wireless communication networks are being implemented through PPP as a sustainable approach in countries such as Pakistan.

Public-Private Partnership (PPP) is instrument to implement NSDI as literature (e.g. Radwan et al. 2005) recommends this approach. GOP also supports PPP (Pakistan E-Government Strategy, 2005).

1.2.   Research Problem

More than half the countries in the world are developing NSDI (Masser, 2005). However, research made by Georgiadou (2006), Crompvoets (2006) and Masser (2005) shows that such initiatives are partially successful and lack in systematic benefits. This situation challenges the usefulness of such initiatives and doubts the involvement of key stakeholders such as private sector as usually NSDIs are victim of public sector due to their monopoly and mandates. In other words, there is a need to attract the participation of GI private sector not only to better understand user needs but also to make such initiatives a success story through implementation mechanism such as PPP in the 21st century as literature (Masser 2005, Radwan et al. 2005) suggest.

Public-Private Partnership (PPP) is not a simple and linear mechanism. It offers opportunities such as sharing of resources, expertise, risks and rewards as well as efficient service delivery but also poses challenges such as differences in understanding, priorities, roles, responsibilities and expectations of its partners. For example, GI public sector in Pakistan is collecting, updating and disseminating GI as a mandated task. Public sector considers GI as sensitive information and follows strict policies in its dissemination. Whereas private sector does not has such responsibility and is involved in GI collection, and disseminating activities to generate revenue from the market.

Therefore, differences in roles, responsibilities and understanding of GI public and private sector partners can make PPP arrangements problematic to NSDI implementation in a privacy conscious country such as Pakistan.

1.3.   Research Objectives

Main objective:

- To determine the potential of Public-Private Partnership (PPP) for NSDI implementation in Pakistan

Sub objectives:

 I.   To explore Public-Private Partnership (PPP) as a mechanism of NSDI implementation

 II. To understand to what extent the current state of Indian NSDI is due to lack of PPP as an implementation mechanism

 III. To determine to what extent Pakistan's socio-administrative culture and the state of GI private sector is conducive to PPP

 IV. To spell out elements for PPP-based NSDI implementation strategy in Pakistan

1.4.   Research Questions

Many physical infrastructures such as transportation networks, health facilities and communication networks are being implemented through PPP as a sustainable approach. This poses the question, what is the potential of PPP for NSDI implementation. Therefore, main research question is: **what is the potential of PPP for NSDI implementation in Pakistan?** The main research question is split in partial questions that are answered chapter-by-chapter.

Potential

?

PPP
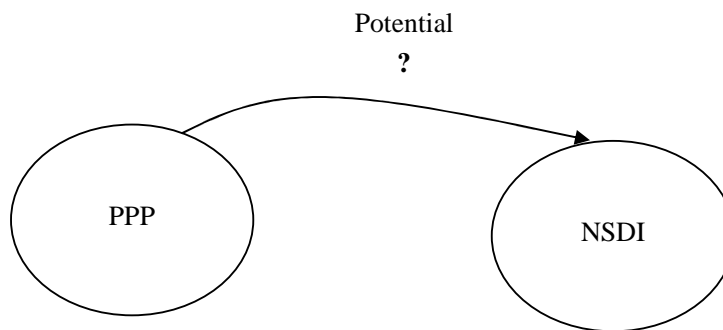
NSDI

Figure 1.1: Main research question

Sub objective I

1. What is the nature of PPP, which purpose does it serve and how is it different from traditional forms of collaboration in government? Which other NSDI implementation mechanisms exist?

2. What is the rationale for PPP as part of NSDI implementation strategies? What is the added value of PPP over traditional arrangements (bureaucratic hierarchy; privatization, etc.) for data sharing/exchange, authority and responsibility of data collection and distribution? Which are examples of successful PPP to date internationally?

Sub objective II

3. Which has been the overall trajectory of NSDI development in India? Which GI stakeholder groups were considered and which were not in India?

4. What kinds of partnership arrangements were made and how were they implemented?

5. What have been the effects of PPP and other mechanisms in Indian NSDI implementation?

Sub objective III

6. What is the size & nature of GI private sector in Pakistan and to what extent can private sector build NSDI technical components in Pakistan?

7. Is there any PPP in GI or ICT or eGOV-related projects in Pakistan and what have been the effects of this PPP on the successes of the GI or ICT or eGOV-related project implementation?

8. What is the attitude of government and private sector as well as the policy framework in Pakistan towards PPP?

Sub objective IV

9. What are the recommendations for PPP-based NSDI implementation strategy in Pakistan?

1.5.   Research Methodology

Research methodology varies according to research question. Research question 1 to 5 is addressed through literature review and secondary data sources i.e. government publications, earlier research papers, published interviews, electronic journals and newspapers available on internet and in the ITC library as well as websites e.g. GSDI, The National Council for Public-Private Partnership (NCPPP), public and private organizations etc. Where as research questions 6, 7, 8 are approached through filed work which included seminar, questionnaire, site visits, interviews as primary source of data collection and also secondary sources of data collection i.e. policy documents, websites of GOP coupled with public and private organization websites. Research question 9 is addressed through findings of all previous chapters. Research methodology in detail is displayed in Table 1.1.

Table 1.1: Research methodology

Research Question	Methodology			Source
	Literature Review	Lessons from Indian NSDI	Field Work	
1	✓			Earlier researches, websites of public and private organizations, journals, published interviews, newspapers, workshops, conference papers etc
2	✓			Earlier researches, websites of public and private organizations, journals, published interviews, newspapers, workshops, conference papers etc
3	✓	✓		Earlier researches, Indian websites of public and private GI organizations, journals, published interviews, newspapers, workshops, conference papers etc
4	✓	✓		Earlier researches, websites of public and private organizations, journals, published interviews, newspapers, workshops, conference papers etc
5	✓	✓		Earlier researches, websites of public and private organizations, journals, published interviews, newspapers, workshops, conference papers etc
6	✓		✓	Questionnaire, interviews, documents collected, company and other websites
7	✓		✓	Questionnaire, policy documents, websites of GOP e.g. eGOVand IT, companies websites, newspapers, world bank websites and documents etc
8	✓	✓	✓	Questionnaires, interviews, site visits, GOP websites e.g. IPDF website, and Global E-government websites/reports
9	✓	✓	✓	Outcome of Questions 1 to 8

1.5.1. Justification for field work

To undertake the proposed research, four weeks field work was carried out in Pakistan to interact with GI stakeholder groups from GI public and private sector in the country and to collect:

- Data about GI resources (GI being produced, services provided, and human resources etc)

- Information through individual interviews to validate data collected

- Policies such as IT, PPP, and map policy etc as well as other relevant documents e.g. minutes of meetings and previous project report for supporting and validating facts and figures known through other sources such as website visits

- Information about size and technical capacity of the sectors especially private GI sector
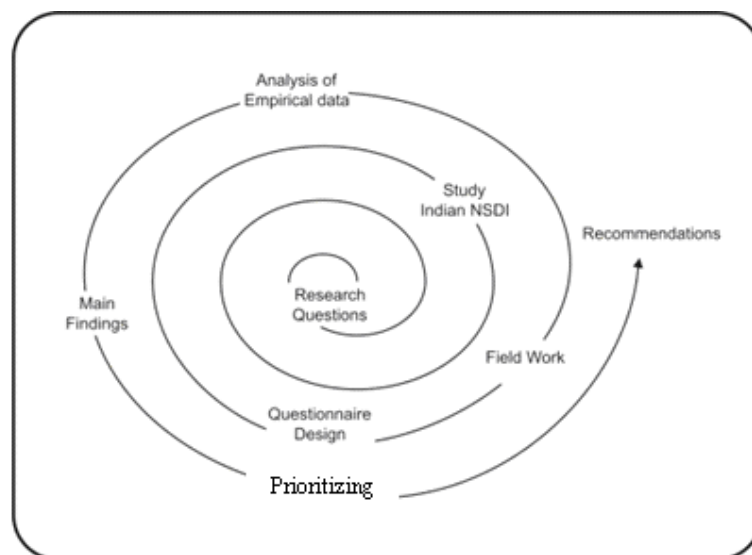
Figure 1.2: Research methodology

Scope of the research

The research deals with determining potential of using PPP for NSDI implementation in Pakistan. Indian NSDI is explored to learn lessons for the implementation of such infrastructure. Purely technical aspects such as spatial modelling, networks, interoperability, database technology etc is not be considered.

1.6. Research Deliverables

In a practical sense the research will deliver recommendations for PPP-based NSDI implementation strategy in Pakistan.
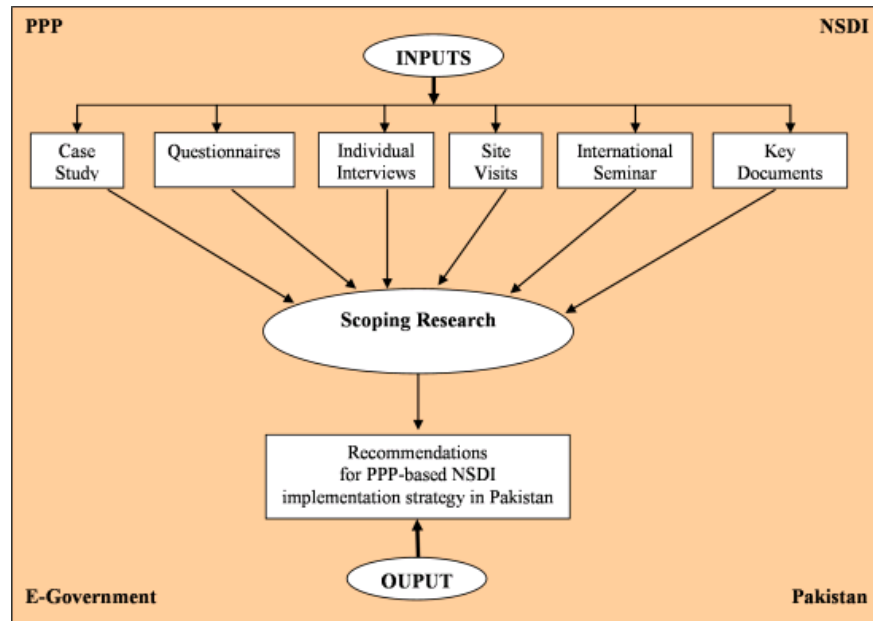
Figure 1.3: Research deliverables

1.7. Structure of the Thesis

The thesis would contain six chapters as follows:

Chapter 1- **Introduction**
This chapter provides a general overview of the research, to have a quick idea of what thesis is about and how it is organized. Some of the contents of the chapter are: background, research problem, research objectives, research questions, research methodology and thesis structure.

Chapter 2- **Theoretical Background**
This chapter gives literature review about PPP and NSDI, their related terms, rationale for PPP as part of NSDI implementation, its added value over traditional arrangement such as bureaucratic hierarchy and privatization for data sharing/exchange, authority and responsibility of data collection and distribution. Few examples of successful PPP to date internationally are included in the chapter. Research questions 1 and 2 are answered in this chapter.

Chapter 3- **Lesson from Indian NSDI**
This chapter explores why Indian NSDI is more relevant to Pakistan to learn lessons from her experience. And how Indian NSDI was conceptualized by the think tank, which stakeholders were considered, PPP existed there or not and what is problematic in its implementation. Research questions 3, 4, and 5 are answered in the chapter.

Chapter 4- **Field Data Collection, Analysis and Findings**

This chapter deals with field data collection, analysis and findings. It includes questionnaire design and distribution, interviews conducted, organizations visited, PPP projects and policy framework as well as summary of data analysis results. Research questions 6, 7 and 8 are addressed in this chapter.

Chapter 5- **PPP-based NSDI Implementation Strategy**

This chapter synthesises findings of all above chapters to give recommendations for PPP-based NSDI implementation strategy in Pakistan to answer research question 9.

Chapter 6- **Conclusions and Recommendations**

This chapter gives summary of over all conclusions of the research followed by recommendations for further research.

Introduction

> **Chapter 1**
> Background to research
> Research problem, objectives
> Research questions, methodology

Literature Review

> **Chapter 2**
> Nature and purpose of PPP
> PPP-NSDI links
> **Answer Question 1, 2**

Analysis
&
Results

> **Chapter 3**
> Lessons from Indian NSDI
> **Answer Question 3, 4, and 5**

> **Chapter 4**
> Field data collection
> Analysis and Findings
> **Answer Question 6, 7, and 8**

> **Chapter 5**
> PPP-based
> NSDI Implementation Strategy
> **Answer Question 9**

Synthesis

> **Chapter 6**
> Conclusions
> and Recommendations

Figure 1.4: Structure of the thesis

2. Theoretical Background

2.1. Introduction

Management is the key to speed up service delivery. That's why all over the world infrastructure projects are being managed to ensure quick services to the citizens. Most of these projects are being implemented through Public-Private Partnership (PPP) approach in countries such as Pakistan. This situation demands to explore PPP as implementation mechanism for other kinds of infrastructures also such as National Spatial Data Infrastructure (NSDI). Therefore, this chapter explores PPP as implementation mechanism for NSDI.

The chapter answers research questions 1 and 2. In the beginning, definition of Public-Private Partnership (PPP) is presented then follows its purpose, nature and added value over traditional forms of collaboration. Then elements of PPP as guidelines are discussed.

The next section serves definition of NSDI and then rationale for PPP as part of NSDI implementation strategy is argued. Mechanisms other than PPP to implement NSDI are also discussed with some examples of successful PPPs. Summary and conclusions warps up the chapter.

2.2. Public Private Partnership (PPP)

After critical study on Public Private Partnership (PPP), it reveals that no universal definition of PPP exists. However in the context of current research following definition is included:

A partnership between a public organisation and a private company, which takes the form of a medium to long term relationship in which the partners have agreed to work closely together to deliver improvements to services in the interest of the public. There would be agreed arrangements for the sharing of risks, benefits and rewards and the utilisation of multi-sector skills, expertise and finance. Such partnerships are usually encouraged and supported by government policy (Guiding principles for public - private partnerships PPP in land administration, HBP/WP.7/2005/8, p.3).

2.2.1. Purpose and nature of PPP

A number of policy documents (e.g. Pakistan E-government, Investment, Environment and IT policy) and project documents (e.g. WHO, and European Commission's INSPIRE Initiative) were studied to explore purposes that PPP is serving for better understanding of its nature. In addition to that, publications and research papers (e.g. Putting Partnerships to work by Michael Warner and Rory Sullivan, creating spatial data infrastructures by Masser, Partnerships for better service by Molen, Reflections on the Indian NSDI by Georgiadou) and editorials published in newspapers as well as in journals (e.g. The News-International, GIM International, GIS Development and Coordinates) were reviewed in this context. After this study, it was known that PPP does not serve a single purpose.

Being largely an instrument to implement polices, it is used for multiple purposes depending on the needs and aims of the partners within policy framework of a country. Some of the purposes it can serve include:

For Political Support: One very important purpose PPP does serve is to bring political support as argues Guiding principles for public-private partnerships PPP in land administration (HBP/WP.7/2005/8, p.3).

For Policy Implementation: PPP serves the purpose of policy implementation as close study on PPP reveals. Pakistan has adopted PPP as key instrument to implement policies some of which include, National Environment Policy (2005-15), E-government Strategy, and IT Policy. For example, National Environment Policy of Pakistan (2005-15, p.15) argues:

The following key instruments shall be employed for implementation of the Policy
- Integration of environment into development planning;
- Legislation and regulatory framework;
- Capacity development;
- Economic and market based instruments;
- Public awareness and education; and
- **Public-private partnership**

The former GSDI president, Mukund Rao stresses in an article, "Let us also face it - NSDI can just not be **implemented** by government alone (and it is not right too when a lot of enterprise/ development activities are also done outside government domain). Private enterprise will have to play a vital and complementary role - be it in solutions, be it in joint-venture initiatives with data-owners or in working the way ahead to deliver." (Coordinates, August 2007).

Policies are an integral part of NSDI as confirms SDI Africa: An Implementation Guide (Chapter 2, p.6) therefore, PPP is an instrument for NSDI implementation, too.

For Service Delivery : Another purpose of PPP is to deliver a public service which does not exist or an existing public service which needs to be enhanced in terms of quality, efficiency or coverage area as argues Stephen P. Osborne (2000, p.75), "This provides a more integrative service overall to community". Molen (2002) also finds"………partnerships with both private and public partners would provide opportunities to enhance customer service substantially", (p.3).

For Resource Management: Governments progressively turn to the private sector for additional resources…….. (Guiding principles for public - private partnerships PPP in land administration, HBP/WP.7/2005/8, p.7). Therefore, PPP can be used to utilize resources from both the public and private sphere, Stephen P. Osborne (2000, p.2) which means better management and more access to available resources. For example, GI public sector organizations usually have lot of data available but may not have the expertise to manage this information into databases. This job can be done by private sector and ultimately GI will be available in a managed form.

For Funding: PPP brings financial partners to the governments form the private sector. Countries such as   Pakistan benefit from PPP for reducing financial burden to develop infrastructures as said the

former Prime Minister of Pakistan, " … to address the overall infrastructure needs, it has to work jointly with the private sector in order to bring in the massive investment needed for major improvements", (Public Private Partnership Forum Report 2006, p.17).

For Reduction of Bureaucratic Inertia: Most of the national resources are controlled by public sector organizations which develop inertia that restrict other sectors of the society to get benefit from those resources. Radwan et al. (2005, p.1) argues the need of PPP for Egyptian Survey Authority (ESA) to free large public institutions like ESA from the government's bureaucracy. This situation exists not only in developing but also developed countries. This is illustrated with an example in the next paragraph. Therefore, PPP can be used to reduce this inertia i.e. bureaucratic inertia with the involvement of private sector.

The ex-prime minister of Britain wanted to use PPP as reported by BBC News website (http://news.bbc.co.uk/1/hi/uk/1518523.stm), "Tony Blair, is keen to expand the range of private public partnerships because he believes it is the best way to secure the **improvements in public services**………". Highlighting its **worth over bureaucratic approach**, website further adds, "He believes **private companies** are often **more efficient** and better run **than bureaucratic** public bodies." This example indicates three very important purposes that are quality services which are efficient as well, and to overcome bureaucratic inertia.

For Promotion of Professionalism: In PPP resources are pooled which include not only assets but also experiences of different partners in a way that guarantees maximum benefit……. Report on 'Guiding principles for public - private partnerships PPP in land administration, (HBP/WP.7/2005/8' (p.7).

For shared values: In PPP risks, rewards, responsibilities and benefits are shared among partners with clear description of roles as stated in definition of PPP under section 2.2. Therefore, it promotes shared values that develop trust of being safer among partners.

Innovative Solutions: It is widely recognised that the future wealth of society is dependent on knowledge capital rather than physical capital, Don Grant and Williamson (2004, p.120). From discussion made up till now, it is clear that PPP integrates expertise and knowledge of partners which obviously help "the creation of value-added, diverse services by private companies" (Radwan et al.2005, p.2).

For Accountability: Processes which are not monitored may face serious problems to achieve expected goals. Therefore, to ensure that moves are in the right direction, accountability is essential. Usually public sector organizations are expert in this aspect due to specific working culture according to the website of Pakistan Privatisation Commission, "Liberal incentives coupled with accountability in the private sector result in greater efficiency" (http://www.privatisation.gov.pk/). Hence, PPP can serve the purpose of bringing accountability to a partnership as report on 'Guiding principles for public - private partnerships PPP in land administration, (HBP/WP.7/2005/8', p.2) confirms it, too.

It is concluded from discussion up till now that PPP is a multipurpose approach. The purpose PPP serves depends largely on the needs and objectives of the partners. Being largely an instrument to

implement polices, some of the purposes it is used for include: political support, (better) service delivery, resource management, funding, reduction of bureaucratic inertia, projection of professionalism, equality, innovative solutions and accountability.

Nature of PPP

After above discussion some of the aspects about nature of PPP are summarized as:

- PPP is creative in nature because it integrates and multiplies inputs from both sectors i.e. public and private in terms of not only assets or resources but in terms of skills also.
- It is not static in nature but flexible and can be shaped by the partners according to their specific needs (within the policy framework of a country).
- It has cyclic nature
- It is an instrument in nature to implement policies
- It is efficient and economical for service delivery
- It is social in nature because it includes those organizations also, that are out side of official boundaries
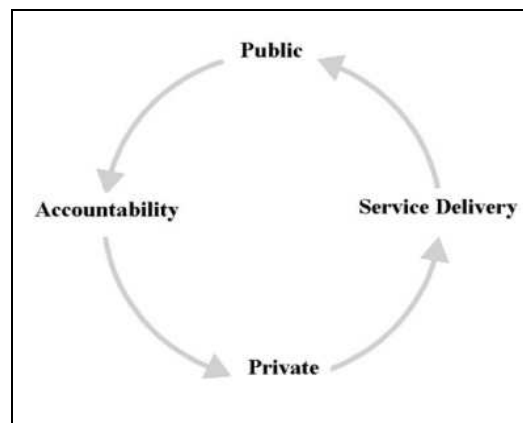
Figure 2.1: Cyclic nature of PPP

Therefore, PPP is not static but flexible, cyclic and dynamic in nature based on the needs of the partners. It is a safer and better choice for partners due to shared risks and rewards. PPP does not offer 'one size fit for all' situation and it needs to be realized and devised from case to case basis. It integrates accountability strength of public sector and service delivery expertise of private sector in a single place.

2.3.   PPP versus Traditional Forms of Collaboration

Traditionally, governments relate to the private sector through procurements (tenders), where scope of a service is created inside government. Then tenders are invited and contract is awarded to the wining company.

In the traditional forms of collaboration (e.g. procurements) the government bears the entire risk e.g. cost of product or service to be acquired, cost of new technologies, delays and cost of adding new features and requirements to the original specifications for the contemplated work to have the functionality truly intended. But now the governments recognise that the appropriate use of PPPs can

provide significant benefits to the public sector, such as access to specialist expertise and innovation, and the opportunity to transfer risk to those better able to manage it (Australian Government Policy Principles for the Use of Public Private Partnerships, 2006).

PPP offers incentives such as flexibility, shared values, risks and rewards not only to public sector but also to the private sector in a project for innovative and improved outcomes, while being assured that their risks and rewards of innovation will be shared with the government.

Thus, PPP is a safer and better choice for both partners i.e. public and private to experiment and take iterative, smaller steps towards innovative solutions.

This is how PPP is different from traditional forms of collaboration.

Privatization

Privatization involves shifting of government assets from public to private sector. Though it is horizontal in nature but it is problematic too as de Vries and Beerens (2002) terms it as an issue while arguing financial and capacity aspects of national geospatial data infrastructures. The reason is that privatization neglects possible governmental contributions in expertise, technical information, manpower, institutional networks, or other resources. Public good will become individual company's property resulting in controlled by norms and policies of the private company i.e. private law .Then the public good e.g. GI may not necessarily be provided at nominal cost as is happening in countries such as Pakistan.

Therefore, privatization may severely hamper data flow activities such as sharing/exchange and distribution by giving totally authority and responsibility to private sector which may be interested in financial benefits only instead of provision of quality services to the citizens. Don Grant and Williamson (2004, p.116) argue for the same aspects.

Bureaucratic hierarchies

Bureaucratic hierarchies are vertical in nature. More complex are vertically related activities (Wearne 1993, p.50). The organization that possesses more authority can shift its responsibilities to the subordinate organizations e.g. in sub-contracting. Subordinate organizations may have to do extra hard work against no extra benefits due to less authority. More over, goals are set by the organization that possesses higher position in the hierarchy. Therefore, in these types of collaborations sharing of responsibilities, roles and rewards is not justified rather it is a kind of possession approach to get control over other organizations. It can create problems in smooth data flow i.e. sharing/exchange and incomplete or overlaps in data collection due to jurisdictional disputes.

Therefore, the solution is shared roles and responsibilities of both sectors instead of monopoly of a single actor which lies in PPP. A good example has emerged recently in Japan where NSDI Act has been approved as reported by GIM International Magazine (http://www.gim-international.com/index.php) in its February 2008 edition. In Japan, the Geographical Survey Institute and private companies have jointly created and updated the Japanese Standards for Geographic Information….. (Implementation tests and utilization manuals based on Japanese Standards for Geographic Information, http://www.gsi.go.jp/ENGLISH/RESEARCH/GIS/jsgi.htm).

PPP is different from these collaboration arrangements as it does not involve hierarchies and it brings equality among partners in their roles, responsibilities, risks and rewards. This is its added value over traditional collaboration arrangements. Added Value of PPP in terms of data sharing/exchange, authority and responsibility as well as for data collection and distribution is summarized in Table 2.1.

Table 2.1: Summary of added value of PPP

Activity	Added Value of PPP
Data Collection	No single organization can collect every kind of data. Public sector organizations have mandate from government for data collection "Such control over information gives them considerable market power, thus restricting competition and having negative impact on the GIS market" Radwan et al (2005). In case of privatization it will continue as one sector i.e. private will be collecting data. This will be just a kind of shift for data collection from public to private and role of the other sector will be eliminated. PPP can strengthen the data collection efforts by bringing the government support for the private sector (because usually private sector is not allowed to collect data from entire country e.g. in Pakistan) and latest trends and technology from private sector to public sector e.g. GPS and handheld devices for data collection.
Data Sharing/ exchange	Data sharing and exchange needs standards. Standards can not be decided by one actor. There is need to involve all key stakeholders in this decision such as private and public sector organizations. In case of privatization or bureaucratic hierarchy a kind of monopoly comes into existence that hampers participation of rest of the stakeholders. PPP has added value in this scenario, too as it unites two key stakeholder groups i.e. public and private sectors.
Data Distribution	Private sector has efficient service delivery capability where as public sector has the authority and responsibility of data collection as a mandated task , Privatization put data under custody of one company which may not be acceptable to public sector organizations and bureaucratic hierarchy impose pseudo security measures to maintain monopoly , in both cases data distribution suffers. There, "…… implementing 'PPP', including the networking of the various public and private Mapping and GIS institutions … for the delivery of mapping services that beyond their individual capacity" (Radwan et al. 2005).
Authority Responsibility	Authority and responsibility is a sensitive issue and needs to be negotiated and settled among partners instead of imposed from top slot. Due to legality aspects involved in it PPP would provide a wider forum i.e. from local to national and public to private partners to seek common solution. Privatization and bureaucratic hierarchy lacks these aspects. But, "PPP approach recognizes that responsibility and accountability remain within government….." Guiding principles for public - private partnerships PPP in land administration, (HBP/WP.7/2005/8, p.2).

2.4.   Elements of Public Private Partnership

After review of literature on PPP it reveals that there are six critical components of any successful Public-Private Partnership (PPP) according to The National Council for Public-Private Partnerships (2007). The interpreted summary of the components is as follows:

Political Leadership: It is essential for the success of PPP that political leadership must support it. It would help in the implementation of PPP. A political leader can help to eliminate misconceptions and ambiguities if at any time rise among the masses.

Public Sector Involvement: Active participation of public sector not only in establishing PPP but through out the partnership period brings success for the partners involved. Public sector should monitor performance of the partnership regularly or as defined in the business plan and/or contract.

A Well Thought-Out Plan: For the success of PPP, a well though-out plan with detailed and clearly defined roles and responsibilities of the partners is vital. It is better to prepare such plans with the assistance of third party that has sound experience in drafting these kinds of plans. Dispute resolution is an important part of a plan. Therefore, plan must include a clearly defined method of dispute resolution as not all contingencies can be foreseen.

A Dedicated Income Stream: There must be assured dedicated income stream for the entire length of the partnership. Though the private partner may provide the initial funding for capital improvements, there must be a means of repayment of this investment over the long term of the partnership.

Communications with Stakeholders: Stakeholders of PPP are not just the public officials and the private-sector partner but it also includes employees, end users, the press, labour unions and relevant interest groups such as local communities. It is important to communicate with all the stakeholders to minimize potential inertia in establishing a partnership.

Selecting the Right Partner: It is essential for the success of a partnership in the long run that utmost care should be taken in selecting a partner. According to the nature of the project, potential partner must have considerable experience in the specific domain.

2.5.   National Spatial Data Infrastructure (NSDI)

After critical study of literature (e.g. SDI Africa: An Implementation Guide, GSDI Cookbook Version 2.0, Creating Spatial Data Infrastructures, FGDC documents and research papers etc) it is revealed that no generally agreed upon definition of National Spatial Data Infrastructure (NSDI) exists like PPP. Due to its multifaceted character (de Man 2007), in literature NSDI is described in various ways. For example Williamson view NSDI as "navigating the complexities of communications and relationships between sectors and agencies to achieve a common understanding of spatially-related issues across a nation is paramount for any economy, management of the environment, social issues and security", Williamson (2004, p.95). According to Federal Geographic Data Committee (FGDC), "The NSDI is seen as the technology, policies, and people necessary to promote geospatial data

sharing throughout all levels of government, the private and non-profit sectors, and academia", (FGDC 2005).

2.5.1. Rationale for PPP as part of NSDI implementation strategy

Implementation of NSDI means lot more than just data collection and data sharing as viewed for example by Crompvoets (2006, p. 3). He viewed SDI as about facilitation and coordination of the exchange and sharing of spatial data between stakeholders in the spatial data community. Georgiadou et al. informs, "Implementation of SDIs is inherently complex for both technical and institutional reasons (2006, p.247). Multifaceted character (de Man 2007) of SDI becomes clearer at implementation stage if overlooked at strategy formulation stage. The role of social values the knowledge of which is better known to local communities and NGOs becomes significant for NSDI implementation. As, "The social SDI discourse sensitizes us to social issues of importance to SDI implementation, such as the need for sustained political support, for legislative backing, for building and maintaining of trust, for a level playing field and clear rules, and for involvement of the private sector", Georgiadou et al. (2006, p.248).

From literature cited above, it appears that implementation of NSDI is a challenge in itself and therefore, needs to be explored in terms of ingredients of NSDI i.e. components of NSDI, first.

Components of NSDI

The Federal Geographic Data Committee (FGDC) highlights components of NSDI in these words, " The NSDI is seen as the technology, policies, and people necessary to promote geospatial data sharing throughout all levels of government, the private and non-profit sectors, and academia", (FGDC 2005, p.1). Later on, realizing the importance of partnerships, FGDC included it in components of NSDI as mentioned in the figure below:
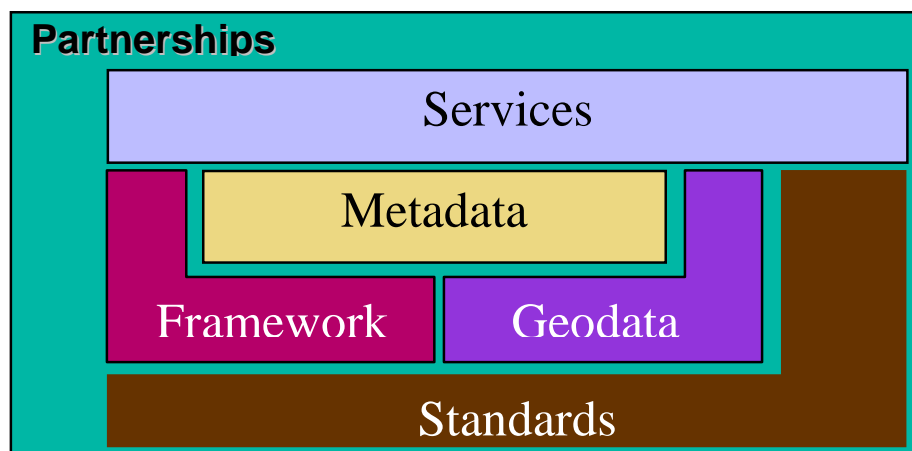
Figure 2.2: Overview of NSDI

Source: http://www.fgdc.gov/training/nsdi-training-program/materials/NSDIOverview#289,29,Partnerships

SDI Africa: An Implementation Guide Chapter 2 describes five elements of SDI. These can be summarised as:

- Geospatial Data
- Standards
- Metadata
- Data policies and legislation
- Partnerships and leadership

In 2006, Satish Puri, Sundeep Sahay and Yola Georgiadou identified seven SDI components with rainbow metaphor arguing socio-technical and Information Infrastructure (II) related paradigms. As the rainbow colours add up one by one and combining all produce white colour, the components form the overall structure of SDI development which is, no doubt, quite practical and a real approach in the context of SDI development.

According to them, following are the components of SDI development:

Carriage: This component can be compared with telecommunication infrastructure and related policies to facilitate access and share information.

Devices: Speaks of development of ICT devices based on local needs for sharing resources.

Software: The focus of this component is to give boom to locally developed open source software instead of costly commercial software.

Content: It underscores the need of local participation instead of top-down approach.

Provision: Underpin the need of more user friendly environment of government organizations. It emphasizes the importance of NGOs, because they have local knowledge.

Literacy: Highlight the need of capacity building and role of capacity building institutions

Governance: Central idea of this component is bottom-up approach as most of NSDIs are victims of central/ federal governments/ and NMOs.

A layered approach like this to the SDI implementation needs to be adopted as momentum of the work i.e. NSDI implementation can not be completed in a single phase. With this way, the existing policies and telecommunication infrastructure that inhibit access to maps and other sources of spatial information by the civil society need to be urgently and realistically reviewed. More over, three layers i.e. provision, content and governance argue about local participation and bottom up approach which are indeed important ingredients of a PPP. Where as carriage and devices layers are fundamental for data exchange and communication as argues SDI Africa, "**Partnerships and communication are the heart of SDI**, (SDI Africa: An Implementation Guide, Chapter 1, p.1).
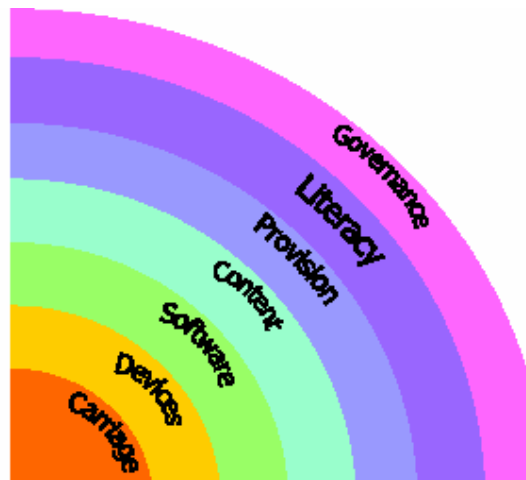
Figure 2.3: The Rainbow Metaphor for II (Clement and Shade, 1998)

In April 2006, GSDI newsletter envisioned its readers about the following eight components: Geographic data, metadata, framework, services, clearinghouse, standards, partnerships, education and capacity building.

Former GSDI president, Mukund Rao argues in an article published in the journal "Coordinates" of August 2007 edition about six components of NSDI including partnerships.

Therefore, it reveals from most part of the above discussion that partnership is a component of NSDI. PPP is a partnership so it is the first reason to have PPP as part of NSDI implementation strategy.

Rationale for PPP as part of NSDI implementation strategy in detail

The needs to have PPP as NSDI implementation instrument is argued as:

Political Support

PPP brings political support as discussed under section 2.2.1 and "*the need for sustained political support*" Georgiadou *et al*. (2006, p.248) is required for NSDI implementation because "…..*government leadership is essential to the SDI development Process*, (SDI Africa: An Implementation Guide, Chapter 1, p.3).

Finance

As in any development it is important to understand who the stakeholders are what roles each can play, how much finance, time and level of expertise is available. This holds true for NSDI development, too as argues SDI Africa: An Implementation Guide, "If an SDI is to be implemented in a timely and efficient manner, funding mechanisms must be in place……. (Chapter 7, p.1). Therefore, PPP will bring finance for NSDI implementation.

Data Democratization

Data democratization can be seen and envisioned as one of the ultimate goal of NSDI. Data sharing/exchange does not guarantee that every citizen would be able to access data/information with or without fee. As PPP include federal, state, local governments, NGOs, academia, research institutes and citizens as stakeholders therefore, it would enable a democratic environment for the data user community rather than a bureaucratic environment which creates hurdles for data sharing, exchange, and use. Simply said, NSDI development through PPP approach has this added advantage. Therefore, PPP becomes rationale not only for funding, sharing benefits and risks but also it would further develop *"……democratisation of access to geospatial data thus enables value-added suppliers to create new data products and services"*, (GSDI Cookbook 2004, p.69).

Importance of PPP for NSDI – in Brief

Importance of having PPP approach and its perceived value for NSDI development is structured in tabular form in Table 2.2.

Table 2.2: Summary of importance of PPP for NSDI

PPP	Value for NSDI
Why PPP?	*"NSDI can just not be implemented by government alone"*. (Mukund Rao, 2007)
Funding	NSDI can't be developed and kept running without a dedicated income stream. Where as *"Public infrastructure and service needs far exceed the capability of government budgets to meet them"*. (The National Council for Public-Private Partnerships *2007).* But private sector partners are financially powerful actors such as property developers and real estate companies. Therefore, PPP would bring finance for establishing NSDI.
Personnel & expertise	Public sector is usually rich in human resources but lacks in expertise where as private sector has more expertise but lacks in human resources. NSDIs need lots of personnel but who have expertise.
Political support	NSDI is not getting as much political support as other infrastructures such as telecom, road, and health. Therefore, *"the need for sustained political support"* Georgiadou *et al.* (2006, p.248) would be possible through PPP approach.
Speedy implementation	The private sector can often react more quickly (no bureaucratic hierarchy for decision making so can decide quickly on activities). Therefore, PPP would make possible speedy implementation of NSDI because benefits of NSDI can only be harvested if it is implemented on ground.
Innovations solutions	In public sector tasks are carried out on predefined set patterns therefore, innovative ideas are generally discouraged. Private sector believes in innovations and new market

	oriented ideas. Therefore, instead of giving just access to GI data/information, NSDIs are supposed to provide news and innovative value added services because days of first generation of SDIs are gone now.
Quality services	NSDIs are required to provide quality services to cope up with rapidly changing GI market. E.g Google Earth.
Cost saving	Data/information collected once is reused for many applications to avoid duplication and reduce cost. Ultimately, user has to pay less for the desired data. And it would attract more data users.
Local solutions	Due to participation of private sector, more local and customized solutions would be possible instead of global solution that may not necessarily fit into local situation.
Transparency	It would help to overcome doubts of all the stakeholders involved in NSDI. It is a confidence building measure. "It seems that stakeholder involvement (participation), collaboration, and trust are important conditions". *(De Man, 2007).*
Bottom-up approach	It will ensure participation of key NSDI stakeholder groups and promote team work spirit enabling better working environment which is essential for any service providing organization. "*Most countries in the world have some form of SDI program. These programs have names like CGDI (Canada), NSDI (USA), NSDI(Japan), .. and so on. The main problem with these programs is that they have been national and top down - rather than bottom up and driven from the data sources*". Geoweb. Visited on 12th Nov2007. (http://www.galdosinc.com/technology/geoweb/)
More focus on infrastructure	NSDI is also infrastructure.
Sharing	Sharing of resources in terms of data, expertise and finance are just one aspect of PPP that is essential for NSDI. But important is, it would remove bureaucratic barriers and hurdles resulting in more access to public good. For example data. Hence, more data sharing would be possible as highlighted the data sharing aspect of SDI by Georgiadou et al., "*They are shared, as they seek to make available expensive, geo-referenced spatial data digitally to a variety of users for diverse application needs......*", (Georgiadou et al. 2005, p.1115)
Risks and rewards	Sharing of risks and rewards develop sense of responsibility. As a result, responsibility will be given to the most capable partner for a specific job. For example delivery of services to private sector. It would result in more practical measures for NSDI implementation.

Combine public and private sector	The tasks involved in these programs are beyond the capacity of single organizations and require the collaboration of many public and private mapping and GIS institutions Radwan et al. (2005).
Efficient service delivery	"SDI goals are changing from data access to service delivery…."Williamson (2004).

Therefore, it is concluded that reasons for PPP as part of NSDI implementation strategy are many, some of which are: political support, funding, enhanced implementation, local participation, data democratization, involvement of key stakeholder groups, efficient service delivery and reduction of bureaucratic hierarchies etc.
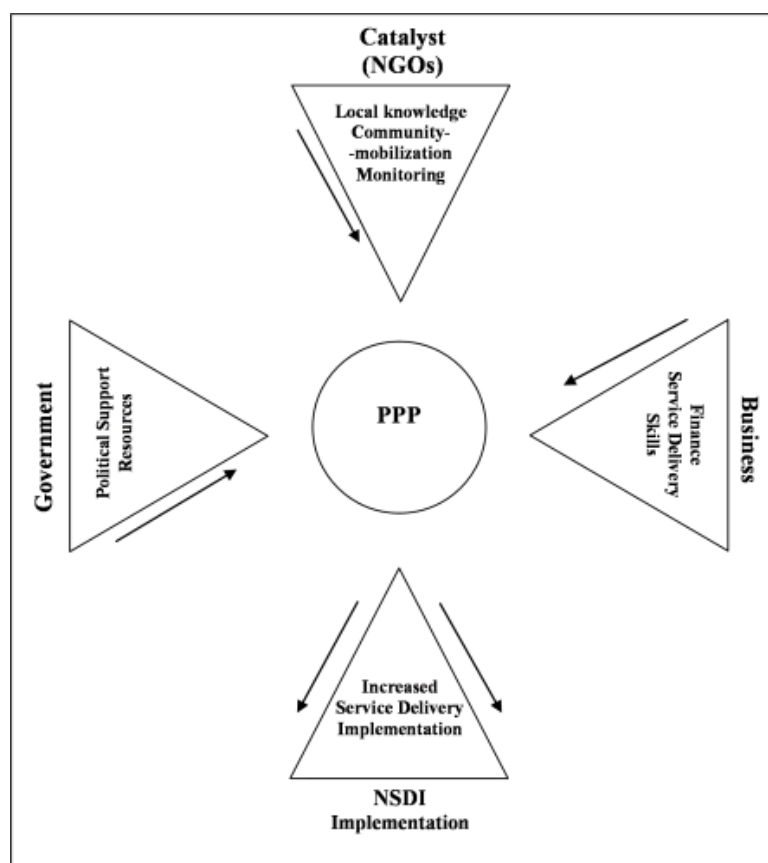
Figure 2.4: PPP as mechanism of NSDI implementation

2.6.   Other Mechanisms to Implement NSDI

This section describes some of the NSDI implementation mechanisms other than PPP.

E-Government and NSDI Implementation

There is a general tendency to integrate national SDIs in e-Government programmes (SDI-Latin America and Caribbean Newsletter, December 2007, p.11). Therefore, another approach or

mechanism of NSDI implementation can be e-government (hereafter referred to as eGov). Walter T. de Vries a researcher at ITC explored commonalities between SDI and eGov in his research titled, "eGov and SDI: The common grounds and missing links". He reviewed 857 papers and abstracts and then did text analysis using latent semantic analysis (LSA). He finds, "This initial survey on eGov in the relation with the SDI field suggests that there is still a clear gap between the two fields of research, despite similar themes and objectives", (de Vries 2005, p.270).
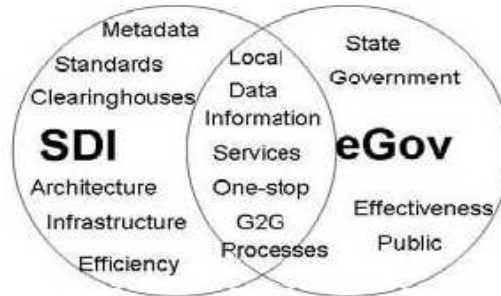
Figure 2.5: Relation between SDI and eGov (adopted from de Vries 2007)

de Vries (2007) emphasizes that SDI development should be within eGov framework. This idea is very important because it would help to achieve interoperability between SDI and eGov in first place. Moreover, it would promote the service delivery concept of SDI and would add spatial value to eGov. Duplication of efforts in terms of access network establishment for SDI can also be rooted out with this approach. But this approach demands for eGov which may not be possible for all countries especially in the developing world. Therefore, this aspect limits the scope of this approach. However, advancing his work figure 2.6 has been prepared that can be seen as preliminary model.
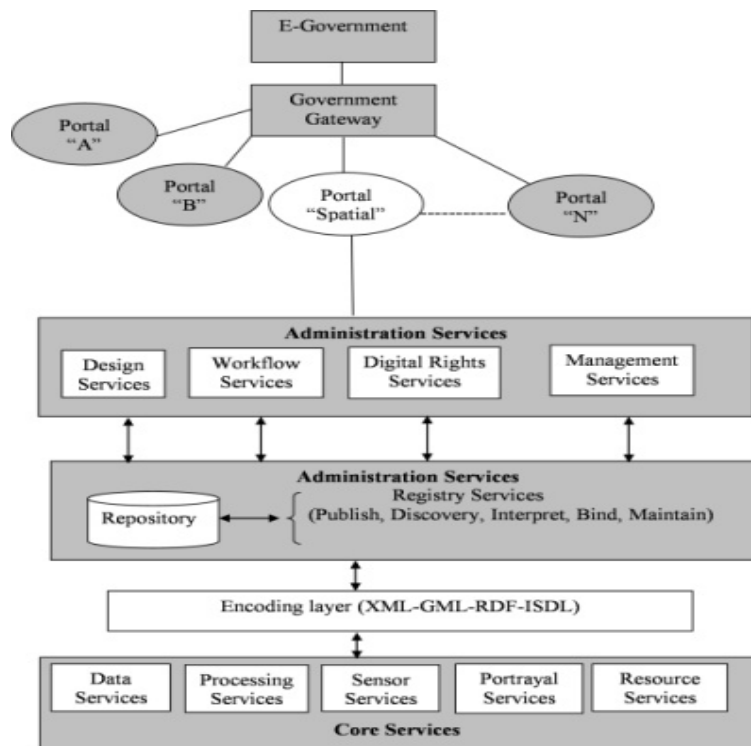
Figure 2.6: Service-Oriented Architecture of NSDI within E-Government (after Morales 2006)

Cultivation approach to implement NSDI

NSDI is not implemented on a virgin and barren ground. The available GI, ICT infrastructure, capacity building and awareness, funding, policy framework, stakeholders support and involvement, a well thought plan and strategy are some of the necessary elements that should be present in the ground to support implementation efforts. Simply said, cultivation approach can also be seen as NSDI implementation mechanism or instrument as argues Georgiadou (2006, p.60).

In addition to these mechanisms, the most recently approved NSDI Act of Japan (2008, p. 3) envisions NSDI implementation instruments which include policies relating to accurate and proper development and distribution of digital geospatial information, promotion of technologies such as GIS and Space-Based Positioning, Navigation and Timing (PNT), capacity building, enhancement of coordination among State and local governments and related institutions. It seems that all NSDI components are being envisioned as implementation mechanisms.

2.7. Examples of Successful PPPs

This section gives brief description of some of the examples of successful PPPs to date internationally.

World Health Organization (WHO)

The World Health Organization (WHO) is the directing and coordinating authority on international health within the United Nations' system, (An Introduction to the World Health Organization, p.4). It is among those international organizations which are providing health services around the globe to mankind irrespective of region, race and religion. It was established on 7th April 1948, and has headquarters in Geneva, Switzerland.

Partners of WHO include UN agencies, donors, nongovernmental organizations, WHO collaborating centres and the private sector. A publication of WHO "Basis Documents" in its 46th edition (http://www.who.int/gb/bd/PDF/bd46/e-bd46_p2.pdf) has mentioned about its objectives and other necessary information. Summary of some important points is as follows:

Objective: The objective of WHO is the attainment of highest possible health by all peoples.
Roles and Responsibilities of WHO:
- To play role as a directing and coordinating agency to establish and maintain effective collaboration with the United Nations, specialized agencies, governmental health administrations and professional groups etc.
- To propose conventions, agreements and regulations, and make recommendations with respect to international health matters
- To promote and conduct research in the field
- To promote improved standards of teaching and training in the related disciplines
- To provide information, counsel and assistance
- To develop, establish and promote international standards
- To take all necessary actions to attain the objective of the Organization.

PSMA Australia

PSMA Australia (http://www.psma.com.au/) is Australia's self-funded company dealing with GI. Summary of some important information about this organization is as follows:

Objective: To provide spatial information and digital mapping datasets.

Roles and Responsibilities of PSMA Australia:

PSMA Australia's main role is to combine reliable spatial data from Australia's governments with leading-edge technology to create national spatial information datasets. Therefore, it collects spatial information from the government and consolidates, organize and present that in a series of datasets. The organization licenses these datasets to value added resellers (VARs) – who combine their expertise and knowledge of the market to create value added end products.

VARs sell their value added end products to private sector and government consumers. In addition to the licensing agreements, VARs pay an annual access fee and royalties based on sales of their products that use PSMA Australia data. Then, PSMA Australia returns license fees to its shareholders – the governments of Australia that provide the data.

It was revealed during study of PSMA Australia that other private sector companies joined this organization when it started making good business.

2.8.   Summary and Conclusions

- PPP is not static but flexible, cyclic and dynamic in nature based on the needs of the partners. PPP does not offer 'one size fit for all' situation and it needs to be realized and devised from case to case basis. It integrates accountability strength of public sector and service delivery expertise of private sector in a single place. Risks and rewards are shared by partners.

- PPP is a multipurpose approach. The purpose PPP serves depends largely on the needs and objectives of the partners. Being largely an instrument to implement polices, some of the purposes it is used for include: political support, (better) service delivery, resource management, funding, reduction of bureaucratic inertia, projection of professionalism, achievement of collective goals, innovative solutions and accountability.

- In the tradition forms of collaboration such as procurements (tenders), the government bears the entire risk e.g. cost of product or service to be acquired, cost of new technologies, delays and cost of adding new features etc for the contemplated work to have the functionality truly intended. PPP offers incentives such as flexibility, shared costs, risks and rewards to both partners in a project for innovative and improved outcomes, while being assured that their risks and rewards of innovation will be shared with each other. This is how PPP is different from traditional forms of collaborations.

.
- NSDI implementation is a complex task which requires data produced by public and private sector organizations, technology, and innovative solutions mostly from private sector. Also, finance is needed which comes from private sector, and knowledge about local communities which comes from NGOs so that social benefits to the local communities can be made visible to make NSDI implementation possible.

- Reasons for PPP as part of NSDI implementation strategy are many because it is the heart of SDI. Some of the reasons for PPP as NSDI implementation mechanism can include: political support, funding, enhanced implementation, local participation, data democratization, involvement of key stakeholder groups, efficient service delivery and reduction of bureaucratic hierarchies etc.

- E-government, Cultivation approach, policies relating to accurate and proper development and distribution of digital geospatial information, promotion of technologies as well as capacity building can be seen as mechanisms other than PPP to implement NSDI.

- Examples of successful PPP can include World Health Organization (WHO) and PSMA Australia.

3.   Lessons From Indian NSDI

3.1.   Introduction

In the previous chapter relationship between PPP and NSDI was explored. This chapter discusses the effects of PPP on NSDI implementation by looking at Indian NSDI initiative.

The chapter answers research question 3, 4 and 5. It first gives the reason of selecting Indian NSDI and then explores that why Indian NSDI suffered from significant delay in making it a success and what lessons as an example can be learnt from it. Summary of lessons learnt is presented at the end of the chapter.

3.2.   Why Indian NSDI?

Research on spatial data infrastructures (SDIs) is not well grounded in theory and SDI practice is often negligent of previous experiences, (Budhathoki et al. 2006). Therefore, to inform current research efforts, experience of NSDI development of other countries will be explored as a benchmarking approach. But there are certainly social, political, and economic differences between the regions such as Asia and America. It means every NSDI will be different, depending on the local ground realities such as social evolution, economic conditions, political system and national ambitions.

Therefore, countries which have developed or are in the process of NSDI development are appropriate to their needs and objectives, Pakistan would have to undertake such a process looking at its own national context (social, political and economic etc). There are already several models to learn from other's experiences which can inform the development of NSDI efforts. However for Pakistan the Indian NSDI experience is definitely the most appropriate and conformable because both countries in a particular domain share many commonalities though some differences also "But despite their differences, in actual fact Pakistan and India have a great deal in common. They are both currently not only experiencing a significant economic boom, but also a strengthening of civil society and democratic institutions" and "60 years after independence, social questions continue to plague both countries" (dw-world , Aug 17, 2007). India emerged as a separate entity from Pakistan in 1947, as the subcontinent was ruled by England before partition.

It is argued that looking from availability of NSDI related information on internet, legal, and cultural aspects (e.g. languages) can also help to understand the reason of making Indian NSDI as choice to learn lessons.

Pakistan is surrounded by four countries as shown in figure 3.1. In its north is China, it was not considered due to unavailability of sufficient material in English language where as in south of Pakistan is Arabian Sea. In south west of Pakistan is Iran. A clear status whether failure or success of Iranian NSDI did not come up sharply during exploring it on a very few websites. In the west of Pakistan is Afghanistan. Afghanistan is at the SDI proposal preparation stage yet (http://www.aims.org.af/services/mapping/gis_users_community/asdi_workshop/asdi_workshop.doc). India is located on the east of Pakistan, it was considered due to availability of lot of material on internet and websites about Indian NSDI and rest of the detailed reasons are mentioned below:

Legal System

Legal system of both countries is "based on English common law **…………..**" (Source: CIA-The World Factbook, website accessed on 20th December 2007).

Figure 3.1: Countries adjacent to Pakistan

Government Type

Both countries are "Federal Republic" (Source: CIA-The World Factbook, website accessed on 20th December 2007).

Languages

In case of Pakistan, English is most frequently used in government ministries where as in Indian case website of CIA-The World Factbook says, "English enjoys associate status but is the most important language for national, political, and commercial communication………" (Website accessed on 20th December 2007).

It is also important to look around on the neighbouring countries before initiating huge undertaking such as NSDI in bigger picture of regional SDI, which may come across in future.

Therefore, after looking at the common grounds between both countries, Indian NSDI looks a more realistic and relevant choice rather than looking at America or Australia, to learn about NSDI experience.

3.3.   Indian NSDI

The Indian NSDI was initiated in 2000 jointly by the Department of Science and Technology (DST) and the Indian Space Research Organization (ISRO) through the establishment of a national task force to prepare an action plan under the aegis of DST.

3.3.1. How Indian NSDI was conceptualized?

It is important to know how Indian NSDI was actually conceptualized by the think tank. Starting from vision statement in 2001 to last NSDI workshop held at Goa in 2007, marks the trajectory of Indian NSDI. Strategy and action plan for Indian NSDI was launched at a workshop held in New Delhi from 5th to 6th February 2001 which briefly explained vision of Indian NSDI.The task force which envisioned NSDI was composed of geographers, scientists, GIS experts, administrators, mainly drawn from survey, mapping, remote sensing, and the Indian space organizations (ibid., p. Tf.1).

Statement of 'The NSDI Vision' is, "*National infrastructure for the availability of and access to organised spatial data use of the infrastructure at community, local, state, regional and national levels for sustained economic growth*", (NSDI-Strategy and Action Plan 2001, p.6).

A letter to NSDI Task Force from Department of Space describes, "…..technical agreements, standards, metadata definitions, network and access protocols will it be easily possible for the NSDI to come into existence", (NSDI-Strategy and Action Plan 2001, p.4). Similarly in another letter, it is stated that, "There is a widespread consensus, internationally, that spatial data sets need to be integrated to create what is called a geo-spatial data infrastructure. Such infrastructures have been linked to information high-ways, linking a variety of databases and providing for the flow of information from local to national levels and eventually to the global community" (DST 2001, p. 5, foreword by Secretary, DST). Also in another letter market place is the focus of potential NSDI, "In the emerging market-place, geographic or geo-spatial information occupies a preeminent position", (DST 2001, p. 5, foreword by Secretary, DST). Puri, Sahay and Georgiadou in a paper presented in GSDI-9 conference at Santiago, Chile in 2006 take note of this borrowed concept and say, "…….*the approach adopted to the setting up of the NSDI in India, focusing particularly on how it has been inspired by the "superhighway' and "marketplace" metaphors*".

The following table (Table 3.1) summarizes the important points and some of the recommendations of Indian NSDI workshops held so far in order to have a brief view of Indian NSDI initiative as perceived by the NSDI coordinating body.

Table 3.1: **Trajectory of Indian NSDI in brief**

NSDI Workshop	Important Points/ Recommendations
1st Workshop at New Delhi (February 5-6 2001)	• Standards are the crux of the NSDI............ • Academia and research community, providing the research and *technology* development backbone for NSDI *Source: NSDI-Strategy and Action Plan 2001, pp.20-21*
2nd Workshop at Tamil Nadu (July 29-31,2002)	• All organisations, institutions and persons in the public or *private sector* having spatial data assets which can conform to NSDI standards must be encouraged to participate in NSDI. • The *private sector* is seen as a partner in the NSDI initiative and its role is envisaged as providing IT solutions, services, human resources development and infrastructure, as also for committing its own data assets to such an infrastructure. *Source: http://www.mycoordinates.org/nsdi-india1.php*
3rd Workshop at Agra (November 12-14 2003)	• The *National Map Policy* must be formalized at the earliest and its operational implementation taken up. • An assessment of any consequential impact of the *National Map Policy* on NSDI and its activities must be made and solutions enabled by the NSDI Task Force. *Source: http://www.mycoordinates.org/nsdi-india2.php*
4th Workshop at Lucknow (November 17- 19 2004)	• Agencies from the government, private and *non-government sector* - who have spatial data assets and solutions are urged to integrate their efforts and participate in NSDI. • It is recognized that private sector would be the main source for SDI technology, solutions and services - which would be the backbone for NSDI. Source: http://www.mycoordinates.org/nsdi-india3.php
5th Workshop at Hyderabad (December 18 – 20 2005)	• The workshop mainly stressed upon the policy and technical issues*.* • The private industry should quickly come forward to populate the metadata as per the standard of NSDI which will reduce duplication of efforts. • Position policies and structures for NSDI to evolve a systematic *public-private partnership*. The possibility of NSDI as autonomous independent agency from the government stake holder agencies which can independently evolve a business model for NSDI needs to be explored *Source: http://www.mycoordinates.org/conference-nsdi-feb-06.php*
6th Workshop at Goa (June 28-29 2007)	• Director General of Forest Survey of India, Dr Devendra Pandey said that, our technology is our biggest strength and specially our remote sensing capabilities are one of the best in the world. • The delegates note that all elements (technical and agency-level efforts) for the NSDI......... • *The ultimate-success of NSDI will be when citizens and Society will benefit from the usage of NSDI Services.* *Source: http://www.mycoordinates.org/need_magic_wand.php*

A research was carried out in 2004 by Georgiadou, Puri and Sahay, "To understand the perspectives of stakeholders involved in the planning, implementation, and eventual end use of the proposed NSDI", (Georgiadou et al. 2005,p.1117). They note that "*The key elements identified for development*

of NSDI were: standards (to allow interoperability; standards for networks, gateways, protocols, software, etc.), evolving metadata, nodes (GIS-based spatial database servers), search and access protocols, electronic clearing house, creating user interfaces, and initiating an NSDI outreach and awareness programme", (Georgiadou et al. 2005,p.1118). Looking at the elements, one can find that except "an NSDI outreach and awareness programme" rest of the ingredients of Indian NSDI were purely technology biased. More over, partnership element is missing. According to Katleen et al. (2006, p. 1) , "The development of a spatial data infrastructure (SDI) not only comprises technical aspects, but also is supported by economic, social, organizational and legal measures", (Katleen 2006). Keeping in view the aspects defined by Katleen et al. following elements appear missing or were not in place, i.e. economic, social, organizational and legal. Puri et al. (2006, p. 6) quotes statement of a senior executive working in large private sector organization who expressed his disenchantment in the following words: "*NSDI was conceptualized and is being implemented by the government, for the government, within the bureaucratic framework of the government... We would not participate in NSDI unless it is established outside the pale of the government, and functions as an enlightened, independent body*". This and other statements quoted above speak of lack of private sector participation in Indian NSDI. Realizing the power and usefulness of innovative approach i.e. Public-Private Partnership (PPP), Indian Union Minister for Science and Technology Kapil Sibal in his statement published on the website of a magazine, GIS Development on 20th February 2007, said that there will be just a few restrictions on the use of data. And "*This (the project) will be rolled out through public-private partnerships (PPPs)*", he added. http://www.gisdevelopment.net/news/viewn.asp?id=GIS:N_npqesowhvy).

Puri, Sahay and Georgiadou conclude, "*...... in a state controlled domain where the private sector has literally had no role to play until recently, and where the use of maps is not historically evident (Sahay & Walsham 1997), the assumptions of a marketplace approach remain in contradiction with the historical realities on the ground*", (Puri et al. 2006, p. 6). This supports the fact that users and private sector were not considered in Indian NSDI. Simply saying it was not based on PPP because in PPP, public organizations, private organizations, NGOs, academia, and citizens all are included. Masser also showed concerns about Indian NSDI in an article published on website (http://www.gisdevelopment.net/policy/gii/gii0009pf.htm) of GIS Development, a magazine from India. He doubts inclusion of all stakeholders saying, "*The proposed National Geospatial Data Infrastructure is a major step forward for India. Its implementation will require the active involvement of all the geographic information stakeholders*", (Masser 2004). Recommendations made by the delegates during the NSDI-VI workshop held at Goa during 28-29 June, 2007 clearly reflects exclusion of private sector in Indian NSDI as published on website (http://www.mycoordinates.org/) of a monthly magazine "Coordinates" in its July 2007 issue. One of the recommendations was to "Recognize that the datasets generated in the private sector have got potential for many applications and thus be made part of NSDI metadata. The private industry should quickly come forward to populate the metadata as per the standard of NSDI which will reduce duplication of efforts*".
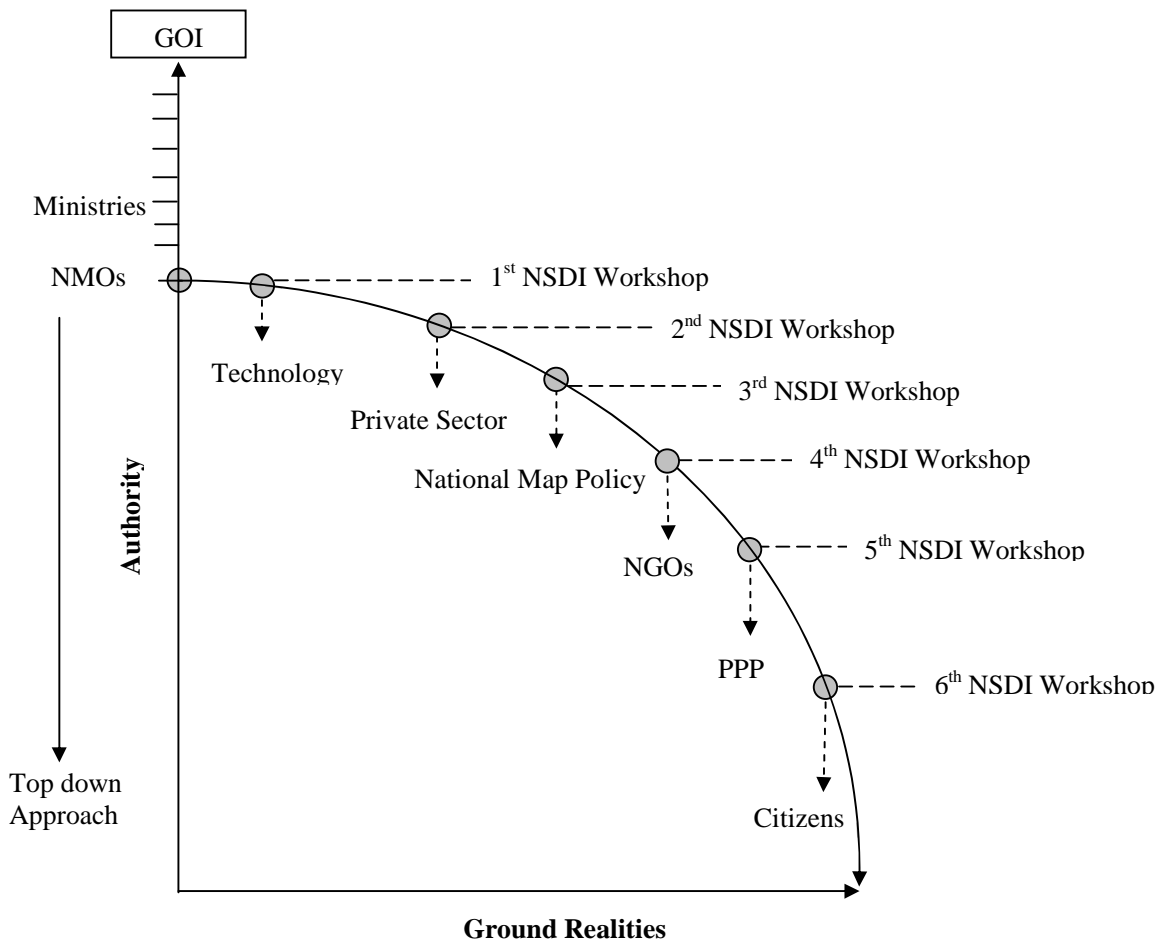
Figure 3.2: Trajectory of Indian NSDI

From above figure it is concluded that the overall trajectory of Indian NSDI development has been: initial focus on technology instead of beneficiaries of this technology such as citizens, non-involvement of private sector, outdated national map policy, neglecting role of NGOs, lack of partnerships such as PPP and top down approach.

3.4.   Stakeholders

It is also important at the outset to identify some of the most important players or stakeholders with interests in geographic information and spatial data infrastructure matters (Masser, 2005). These most important stakeholders are: central government organizations, local government organizations, commercial sector (such as data producers, brokers who add value to core datasets, publishers, hardware and software vendors etc), NGOs, academia and citizens.

Indian NSDI has sixteen stakeholders and they are all national agencies according to the website (http://gisserver.nic.in/nsdiportal/gotogos.jsp). Puri et al. (2006) finds that the users have been almost totally neglected during the NSDI design. The attitude of public sector organizations is stated in an article published on 19th Feb 2007 in The Times of India in these words, "Getting information out of government is a bit like getting blood from a stone". Private sector also suffered

the same as they were also not involved in NSDI development. Where as a strong private GIS market exists in India mentioned by science and technology minister Kapil Sibal in a statement published by The Times of India on 19th February, 2007. The minister said in his statement, "*in any case, there are already 200 firms in the GIS business in India*". As a result later on Indian NSDI faced serious difficulties at implementation stage which caused significant delay in getting tangible benefits from it. Establishment of National Spatial Data Committee (NSDC) in 2006 further strengthened grip of Indian bureaucrats instead of social sector, end users and private GI sector organizations over Indian NSDI. The role of NSDC as stated by Coordinates in its July 2006 issue is, "*The NSDC shall be the apex national authority for formulating and implementing appropriate policies, strategies and programmes for the establishment, operation, management of the NSDI and utilistation and any other activities related to spatial data in the country*". The committee is totally void of private sector membership. The National Spatial Data Committee (NSDC) constituted with the members all belonging to public sector organizations as reports the website *http://www.mycoordinates.org/indias-nsdi-july06-1.php.*

The exclusion of end users also made it impossible to bring social aspects of NSDI in the terminology of Georgiadou 'Social SDI' and it became a 'technical SDI'. About the exclusion of state governments, the then Surveyor General of India in the July 2006 issue of Coordinates (http://www.mycoordinates.org/indias-nsdi-july06.php) said, "*The other area of concern is to involve state governments. We need to think how to get them on board through state level SDI*". And "*Although major data producing agencies are at central level but at micro level most of the datasets are with the state governments*" he further added. He also realized the difficulties of implementation saying that, "*The challenge as Member Secretary is the implementation of an action plan within a given timeframe*". In the February 2006 issue of GIM International (http://www.gim-international.com/issues/articles/id614-Multilevel_Implementation_of_SDIs.html), Masser writes, "*Many national SDI documents seem to abide by the principle of 'one size fits all'; they suggest that the outcome of SDI implementation will lead to a relatively uniform product…… National SDI strategies drive state-wide SDI strategies and state-wide SDI strategies drive local-level SDI strategies*".

Therefore, participation of local stakeholders i.e. states, end users, private sector GI organizations, academia and NGOs is very crucial for implementation of an NSDI. As most detailed database maintenance and updating tasks are carried out at local level, the input of local government has a considerable impact on SDI implementation at state and national levels, (Masser 2005). In the August 2007 issue of Coordinates (http://www.mycoordinates.org/nsdi_august2007.php) Mukund Rao former president GSDI also showed his concerns about participation of few stakeholders in Indian NSDI in these words, "….but was driven by a few individuals for success and benefit in the country".

3.5.   Partnerships

Masser (2004) in a GSDI conference at Bangalore, India underpins the importance of partnership for NSDI development "………*NSDI development must seek to create partnerships of stakeholders that promote interoperability. Partnership would help to control heterogeneity and promote interoperability*". It seems that it was a clue given to think tank of Indian NSDI by Masser but it was not considered seriously then.

In June 2004, the Federal Geographic Data Committee published a report "NSDI Future Directions Initiative: Towards a National Geospatial Strategy and Implementation Plan" (http://www.fgdc.gov/policyandplanning/future-directions/reports/FD_Final_Report.pdf).This document sets goals such as achieving a greater degree of partnership with all geospatial data stakeholders, including private industry, states and tribes, making the "framework data real" and communicating the importance of NSDI as "the primary mechanism for assuring access to reliable geospatial data" to "government, business and academia". The rationale of having partnerships for an NSDI is obvious though USA established NSDI more than a decade ago but yet it is striving for partnerships after recognizing its importance for NSDI.

According to this document, "The NSDI cannot be maintained and enhanced by a single organization". But in case of Indian NSDI, partnership can't be well grounded though it exists on paper documents such as recommendations of NSDI workshops. Concerns about non involvement of private sector in Indian NSDI was shown but no arrangements in practical sense were made as is clear from the statement of K M Jagadeesh who is from private sector, "Private sector should also be involved in development of NSDI and operational utilisation of NSDI", (http://www.mycoordinates.org/indias-nsdi-july06-2-.php). It means private sector was not involved in Indian NSDI development.

Georgiadou et al (2005) take note of elements of Indian NSDI, "The key elements identified for development of NSDI were: standards (to allow interoperability; standards for networks, gateways, protocols, software, etc.), evolving metadata, nodes (GIS-based spatial database servers), search and access protocols, electronic clearing house, creating user interfaces, and initiating an NSDI outreach and awareness programme", (Georgiadou et al. 2005, p.1118). The elements do not include partnership but the focus is on technical aspects which reflect its purely technical nature.

Puri et al. (2006, p. 6) quotes statement of a senior executive working in large private sector organization who expressed his disenchantment in the following words: "NSDI was conceptualized and is being implemented by the government, for the government, within the bureaucratic framework of the government… We would not participate in NSDI unless it is established outside the pale of the government, and functions as an enlightened, independent body". The statements quoted by senior executives working in large public , private sector organizations speak of lack of public sector and of end users participation in Indian NSDI. Realizing the power and usefulness of innovative approach i.e. Public-Private Partnership (PPP), Indian Union Minister for Science and Technology Kapil Sibal in his statement published on the website of a magazine, GIS Development on 20th February 2007, said that there will be just a few restrictions on the use of data. And "This (the project) will be rolled out   through   public-private   partnerships   (PPPs)",   he   added.

http://www.gisdevelopment.net/news/viewn.asp?id=GIS:N_npqesowhvy). Former president GSDI, Mukund Rao in the August 2007 issue of Coordinates (http://www.mycoordinates.org/nsdi_august2007.php) underscores the need of PPP for NSDI in these words, "*Another major amalgam for NSDI is Public-Private partnerships – it would be just impossible for a single entity (even government) to fully establish the NSDI on its own. Partnerships will have to be the core mechanism to make NSDI successful.* "

Table 3.2: Key features of the Indian NSDI (Source: Georgiadou et al. 2005, p.1124)

Learning from the domain of information infrastructure	As applied to the Indian NSDI
Installed base and lock-in effect	Installed base recognized, but no clear strategy exists of how it would form the basis of the NSDI. Lock-in created by diversity of maps, other spatial sources, and institutional issues not addressed.
Reflexive standardization	Standardization process mired in scientific thinking. Developing a 'hierarchy' of standards reflexively and as a negotiated process not in evidence.
Cultivation approach to design	Top-down, 'constructionist' approach evident at present, data-centric focus, **end users not involved** in determining their perceived needs, inculcation of bottom-up approaches also not considered; visions of 'grand' design.

3.6.   Implementation

NSDI implementation is a complex process. In addition too many stakeholders in the game as is the case of Indian NSDI make it more complex. The gravity of the situation increases further when major players are not included such as private sector and end user groups which is true also in Indian case as Georgiadou et al. (2005) also finds, "*The Indian NSDI shows little evidence of systematic interaction between its developers (the scientific institutions) and potential end users (for example, district administration) to understand their information needs*", (p.1123). There is no much evidence of any partnership arrangements including PPP though "PPP" is there on papers of Indian NSDI workshops and in the statements given by Indian ministers to the print media. To quote an example, science and technology minister Kapil Sibal said in a statement published by The Times of India on 19th February, 2007, "*The government proposes to make all this information available through public-private partnerships*"**.** Indian NSDI followed top-down approach termed as "construction approach" by Georgiadou giving it bit mechanical meaning. According to her, "The top-down approach is required to specify a strategic goal and vision, prioritize plans, arrange core funding, contribute to the definition of fundamental datasets, build a clearing house, develop metadata standards, and resolve information policy issues", (Georgiadou et al. 2005, p.1123). Simply said it revolves around planning and lacks in implementation terms as implementation is more encouraged by bottom-up approach because implementation requires local participation which is present in bottom-up approach according to Georgiadou et al, "*The bottom-up approach aim to promote various local initiatives*"….., (Georgiadou et al. 2005, p.1123). An ideal situation was to have a mixed approach combing top-down and bottom-up but it was not considered then and even not yet due to bureaucratic inertia present in Indian NSDI. Therefore, lack of PPP and adoption of top-down approach made implementation of Indian NSDI to get tangible benefits a dream instead of reality.

3.7.   Conclusions and Lessons Learned

- Learning from others experience in NSDI development would inform such efforts but choice of Indian NSDI is more suitable for Pakistan because both countries have been parts of the same whole i.e. Subcontinent and share many commonalities though some differences also. They are both currently not only experiencing a significant economic boom, but also a strengthening of civil society and democratic institutions" and "60 years after independence, social questions continue to plague both countries.

- The overall trajectory of Indian NSDI development has been: initial focus on technology instead of beneficiaries of this technology such as citizens, non-involvement of private sector, outdated national map policy, neglecting role of NGOs, lack of partnerships such as PPP and top down approach.

- Private sector, social organizations end user groups were not included. Only public sector organizations participated.

- No evidence of any partnerships arrangements were found from the literature studied and websites explored. Recommendations made during Indian NSDI conferences reflect that PPP would be established but it is suspected, that was established in papers only.

- Due to lack of PPP, Indian NSDI failed to bridge the gap between public and private sectors, to reduce bureaucratic inertia and monopoly of public sector and to promote data democratization. Consequently, it faced severe difficulties at implementation stage and suffered from significant delay.

4. Field data collection, analysis and findings

4.1. Introduction

After exploring Indian NSDI in the previous chapter, this chapter is dedicated to 'NSDI like' activities in Pakistan. In this chapter, design and preparation of questionnaire, methodology for data collection, distribution of questionnaire, interviews and discussions with various experts from public and private GI sector organizations, academia and NGOs are described in detail. The chapter unbundles research questions 6, 7 and 8 by describing the current situation of Public and Private GI sector organizations visited and opinions about PPP approach for NSDI development in Pakistan. Further PPP project in Pakistan are outlined. Last section of the chapter bundles discussion into conclusions.

4.2. Study Area

The field study was conducted in Pakistan that is fairly large but low earning country with a population of 160 million people. However, the economy has been growing according to 'Economic Survey of Pakistan 2006-07' report published on website of Accountancy (www.accountancy.com.pk). According to the report, "Economic growth accelerates to 7.0 percent in 2006-07 at the back of robust growth in agriculture, manufacturing and services". From the economic point of view, **service sector** is one of the largest sectors in the economy and has been contributing a lot in the economic growth. One of the areas that have experienced the optimal growth is mobile telecom sector, where there are approximately 41 million mobile phone subscribers which are increasing 750,000 annually.

Table 4.1: Some facts and figures-Pakistan

Area	803,940 sq km
Population	164.741924 million
Government Type	Federal Republic
Provinces	4
GDP	110.7 billion (USD)
GDP Growth	7.8%
Literacy	50%
Mobile phone subs	41.2 million
Mobile phone add	750k / month
E-Gov. Readiness	0.49 vs 0.12

Source: World Bank, CIA-The World Factbook
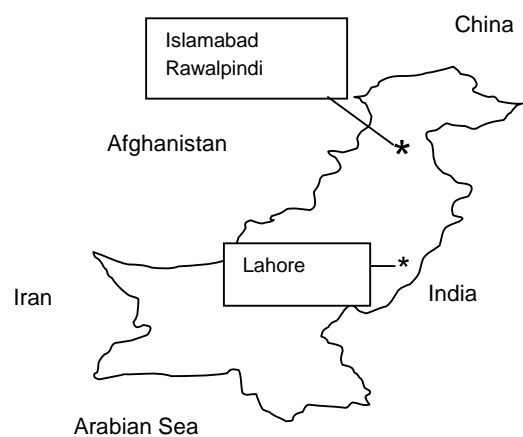
Figure 4.1: Study area

4.3.   Data Collection

There are two major approaches to gather information about a situation, person, problem or phenomenon (Kumar 2006, p.118). These are:

- *Primary data*: Data collected through sources such as questionnaire and interview etc.
- *Secondary data*: Collected through sources such as documents which already exist. It includes earlier researches, government publications and minutes of meetings etc.

Both approaches have been adopted in this research. To maximize these efforts field study was extended to three main cities of Pakistan i.e. Islamabad, Rawalpindi and Lahore as shown in figure 4.1 under section 4.2.

4.3.1.   Preparation

Before proceeding on field work, questionnaires and a list with contact details of organizations dealing with GI related activities were prepared.

4.3.1.1. Questionnaire design

We simply can't think of things that we haven't got some model for already in our head (Georgiadou 2003, p.2). Therefore, before designing questionnaires following documents were benefited from:

- Survey of National Spatial Data Infrastructures by Onsurd , 1998
- Reflections on the Indian NSDI by Georgiadou, 2003
- Are core data providers ready for the SDI? by Georgiadou et al. 2003
- A Metaphor-based Socio-technical Perspective of SDI Implementations:
     Some Lessons from India, by Puri et al. 2006
- Towards strategy of spatial data infrastructure development with focus on the private sector involvement: A case study in Uganda, ITC MSc thesis of Susan Nasirumbi,2006
- SDI ontology and implications for research in the developing world, by Georgiadou, 2006
- National Spatial Data Clearinghouses: Worldwide development and impact, by Crompvoets, 2006
- Assessing SDI Initiatives: A Ten Year Retrospective by Onsurd ,2007

After critical review of above mentioned documents in the context of this research a template was designed (Appendix-1). Based on the template, two questionnaires (Appendix 2 and 3) were designed differently for private and public sectors with a certain degree of overlap. Later on some more questions were added to questionnaires which are not shown in the template. The questionnaire for private sector organizations was prepared to understand the nature of the sector and to the extents to which private sector can build NSDI technical components in the country. Where as questionnaire for GI public sector was prepared to know its attitude towards PPP approach for NSDI implementation.

There were 40 questions for GI public sector and 45 for GI private sector organizations that contained both multiple choice and open type of questions. The questionnaires were designed targeting the respondents familiar with GI and its use. In the case of a questionnaire, as there is no one to explain the meaning of questions to respondents, it is important that questions are clear and easy to

understand (Kumar 2006, p.126). Therefore, efforts were made to set clear and easy to understand questions. In addition to this, a glossary of related terms was added in the beginning of the questionnaires to help understanding of the respondents. More over, to facilitate real time and interactive communication with respondents incase of any ambiguity, efforts were also made to get a 'Toll-free' number as it allows callers to make phone calls without being charged for the calls but the efforts did not succeed because the facility was available for land line phones only where as the field work spread over three cities did not allow me to have a fixed land line phone. Therefore, mobility was preferred to fixed land phone and in the end of questionnaires mobile number as well as e-mail was mentioned.

Table 4.2: Sections of questionnaires

Organization Type	Total Sections in the questionnaires	Section heading
Public Sector	08	i) Organization, ii) Resources, iii) Delivery Mechanism, iv) Services, v) Standards, vi) Policy and Legal Framework, vii) Public-Private Partnership, viii) Education and Training
Private Sector	06	i) Company (Human Resources, ICT Resources) , ii) Technical Expertise (Data/Services, Database, Delivery Mechanism, Standards, Communication Network) iii) Public-Private Partnership, iv) Finance, v) Legal Framework, vi) Education and Training

The Web is an excellent means by which to gather the needed information quickly (Crompvoets 2006, p.11). Therefore, a version of the questionnaire was published on web (http://asmatali.brinkster.net/) to get input through web-based survey.

4.4. Primary Data Collection

4.4.1. Questionnaires

After reaching Pakistan questionnaires were sent to three private companies and three public sector departments as a test case but none of them replied. Phone calls were also made to these organizations to motivate for the response but all was in vain. After this total failure, change in the strategy was made. In the letter addressed to private companies, identification of my official status in Survey of Pakistan was removed which was included in previous letters and surprisingly it started giving results though slowly. In all 48 questionnaires were sent to public sector organizations, Academic, NGO and private companies. Out of which 19 questionnaires were received back with information representing 40% return rate.
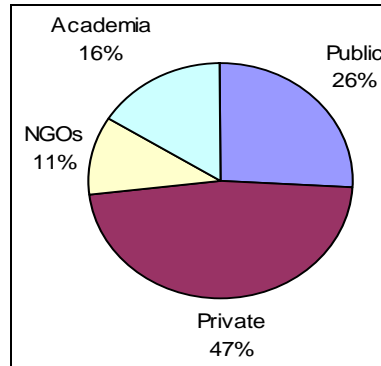
Figure 4.2: Questionnaire response rate

4.4.2. Interviews

One to one contact plays significant role for information exchange. Therefore, GI stakeholders from private and public sector organisations were interviewed to know their opinion towards PPP for NSDI development. As capacity building is an important part of NSDI development therefore, in this context employees of academia engaged in GI related teaching were also interviewed. A total of **five interviews** were recorded the type of organizations and sectors interviewed are displayed in Table 4.3. Later on, these were transcribed. Both types of interview were conducted i.e. structured and semi structured. For structured interviews a list of questions was given in advance to have an idea of what the interview would be like. This mainly was to have an early preparation and focus for the interviewee. Anyhow, few questions were asked which were not included in the questionnaire but emerged from replies to the questionnaire given.

Table 4.3: Organizations interviewed

Public sector	Private sector	Other
Survey of Pakistan (SoP)	Geomatics & Engineering Services	Institute of Geographical Information Systems (IGIS)
	MYCO	
	NESPAK	

Some of the main points of interviews are summarised as follows:

- ❖ Not all data is open to public yet due to map policy (SoP)
- ❖ Old recruitment policy needs to be revised so that IT personnel may be recruited to cope up with the fast changing world (SoP)
- ❖ Survey of Pakistan can serve as umbrella organization for such initiative (NSDI) by providing guide lines and coordinating with other organizations (SoP)
- ❖ Survey of Pakistan can help to define standards for geographic data (SoP)
- ❖ (About PPP) This is a good idea but it needs legal framework to establish such partnership approach. (SoP)

- ❖ We started back in 2003 and got overwhelming response from all over the country and especially from the government organizations (IGIS)

- ❖ Short courses and tailor made courses for various organizations(IGIS)

- ❖ Now we have converted our existing MS program leading to PhD program (IGIS)

- ❖ Now good awareness can be seen among people and relevant professionals (IGIS)

- ❖ Same data is being prepared by many organizations (NESPAK)

- ❖ There is no data sharing and the cost of mapping a city is huge (NESPAK)

- ❖ When you pay for some thing then you mean you are very serious about that (NESPAK)

- ❖ Earlier there was no source except Survey of Pakistan. Now situation is not like that (NESPAK)

- ❖ In Pakistan, surveying and mapping was a very neglected field but today the conditions are better due to the foreign consultants (MYCO)

- ❖ SoP has old policy not to issue data but every body can get satellite imagery (MYCO)

- ❖ SoP is not updating maps (MYCO)

- ❖ Ever since, the arrival of satellite imagery, the world is like an open book (Geomatics & Engineering Services)

- ❖ There is need to educate people who have put restrictions on the issuance of geoinformation to the general public (Geomatics & Engineering Services)

4.4.3. Organizations visited

Due to the prevailing worst law and order situation in the country visits were made to some private companies and government offices to get input through questionnaires distributed via e-mail as well as through courier. This provided an opportunity to have a direct observation of organizations visited and to request them for interviews. Normal post was not considered suitable for distribution of questionnaires due to daily clashes in the various parts of the country which effects communication and could have caused significant delay in communication.

The methodology of questionnaire distribution via e-mail and courier and confirmed by phone calls produced results in Islamabad and Rawalpindi. Hence, the same was practiced in Lahore and a better response was received in Lahore, also due to one of the reasons of having benefit of knowing the local language which was practised frequently during visits to various organizations. The following organizations were visited:

Public Sector Organizations

Three public sector organizations operating in geospatial domain were visited i.e. Survey of Pakistan (SoP) at Rawalpindi, Soil Survey of Pakistan (SSP) at Lahore and Geological Survey of Pakistan (GSP) also at Lahore. All these organizations are on the supply side producing and providing GI within their mandated role. As being funded by the government no user oriented products are being considered. No PPP project exists in the departments however, GSP is outsourcing part of its job due

to deficiency of human resources. When asked about PPP in the department during interview with The Deputy Surveyor General of Pakistan, he spontaneously appreciated PPP approach saying, "This is a good idea but it needs legal framework to establish such partnership approach". This reflects willingness and positive attitude of NMO conducive towards PPP. SoP is rich in human and technical resources and is presently a member of the most renowned international mapping project 'Global Mapping' a UN project funded and supervised by International Steering Committee for Global mapping (ISCGM). The project has almost been completed and the data is going to be handed over to ISCGM shortly as told by Mr. Ghulam Sarwar, Deputy Director, incharge of the program in SoP.

The visit to these organizations was very fruitful as it provided an opportunity to directly observe their activities, working style and to collect documents e.g. Map Policy and project report etc.

Private Sector Organizations

Two GI private sector organizations were visited. National Engineering Services Pakistan (Pvt.) Limited (NESPAK) located in Islamabad and MYCO Surveys (Pvt.) Limited in Lahore. NESPAK is a consultancy organization and provides services in the fields of GIS and IT in addition to other infrastructure development project services. NESPAK is involved in many PPP projects, list of which is attached as Appendix-5. One of the GIS expert of the organization during interview criticized Survey of Pakistan for not giving access to data which is no doubt a common complaint by the users. MYCO provides services for topographic and engineering surveys and also take part in capacity building programs. During visit, it was revealed that a GIS project related with route planning for bullet train was under process.

Academia, Research Institutes and NGOs

To explore the role being played by academia, research institutes and non-governmental organizations (NGOs) one organization from each domain was directly observed through visits. In the category of academia and research institutes, Institute of Geographical Information Systems (IGIS) located in Islamabad was visited. The institute offers a number of programs from basic short courses to degree level such as MS and PhD in GIS and Remote Sensing. The institute organizes seminars, workshops and symposiums regularly to create awareness about spatial sciences and technologies among people of the country. For example in 2006, an International Conference on Advances in Space Technologies i.e. "ICAST 2006 "was arranged by the institute and now a days, 2nd International Conference on Advances in Space Technologies i.e. "ICAST 2008" is being announced which is likely to be held on October 25-26, 2008 at Islamabad, Pakistan (http://www.icast2008.com). A workshop on "National Spatial Data Infrastructure (NSDI) in Pakistan" (Annexure-4) was arranged by IGIS to provide me a unified platform to present my research idea and to get input from public and private sector but due to sudden call of strike announced on September 26 and to be observed on September 27, holding of the workshop which was scheduled on September 27 (http://www.igis.edu.pk/index.htm) could not be made possible, as all the routes to Islamabad were blocked by law enforcement agencies on that day.
During interview Mr. Mubushar Hussain, Assistant Professor, also representative of ITC Alumni Association in Pakistan informed that GI awareness in Pakistan is increasing especially after earth quake of 2005.

One of the winners of **GSDI 2007 Small Grants** (http://www.gsdi.org/proj+progr.asp), World Wildlife Fund-Pakistan (WWF-P) is a non governmental organization. WWF-P is one component of the WWF international family and is playing its role for conservation of nature in Pakistan. The NGO is **establishing a Spatial Data Infrastructure** (SDI), previously know as data clearinghouse, for sharing conservation information, data and expertise, (GSDI Small Grant Summaries 2006-2007 Funding Cycle, p.9). During discussion, it was revealed that a survey was conducted titled "SWOT analysis of partners and stakeholders to assess their GIS/RS capabilities/resources" the summary of which was collected (Appendix-6). The analysis shows that there is need of capacity building in GIS and RS in Pakistan. Some projects have been completed by the organization through PPP. The detail of which is given as Appendix-7.

4.5.   Secondary Data Collection

Secondary data was also collected during field work to validate the primary data. It included institutional policies, project reports, list of projects, website addresses and other documents with relevant information of the organizations. The following table displays detail of the documents collected:

Table 4.4: Documents collected during filed work

Organization	Organization Type	Document Collected
1. Survey of Pakistan	Public	Map Policy
2. Soil Survey of Pakistan	Public	'Strengthening Soil Survey of Pakistan' project report
3. World Wildlife Fund-Pakistan	NGO	SWOT analysis (summary), Questionnaire
4. Geomatics & Engineering Services	Private	Company Profile
5. MYCO	Private	List of projects completed
6. NESPAK	Private	Brochure
7. Institute of Geographical Information Systems	Academia & Research Institute	Profile of the institute ,List of projects completed, Newsletter
8. Lead Pakistan	NGO	Governance of Fragile Ecosystems: Conserving Wild Natural Resources in Pakistan
9. WiNTrace	Private	Brochure
10. EUROGI	NGO	Brochure, Draft Cape Town Declaration approved on 30th Nov, 2007. Part of (page 18) Final Report-DIGIT.

Documents Review

To supplement data collected through questionnaires and interviews, some important points of the documents collected during filed work are presented here:

Map Policy
Collected form Survey of Pakistan, Map Policy (Appendix –8) can be seen as a framework in which Survey of Pakistan operates. Some of its important points are:

- …it is necessary to afford all legitimate facilities to Government department, private agencies etc entrusted with national development works/projects, to **safeguard national security** and to prevent classified material from finding its way to unauthorised persons or potential enemies…(p.1).

- Publication or use of Restricted / Secret Maps by the private agencies without the approval of the Surveyor General of Pakistan/……… will be liable to be dealt with under the provisions of the Map Official Secret Act, 1923 (p.1).

- '**Government' means the Federal Government** (p.1).

- Guide maps of important cities of Pakistan and large scale special project maps although in the RESTRICTED scale may be treated as 'UNRESTRICTED', But the **Surveyor General will refer cases falling in Restricted Belt to …………….. for guidance** on information to be excluded/included (p.2).

- 'Public Maps'. All maps other than those classified above. All secret and restricted maps can have public Editions after deletion of the items mentioned ………….except in the border and coastal areas as marked on………..(p.2).

- **Reproduction of maps** or a part thereof, except for public maps, should **be done after obtaining permission** from…………(p.2).

Due to easy access to high resolution satellite imagery in the market and commercial spatial engines such as Google Earth, the department has already taken an **initiative for reclassification of maps** (Appendix- 9) which would result in making more maps publicly accessible by the user community.

'Strengthening Soil Survey of Pakistan' **Project Report**

The above mentioned report (Appendix-10) is about a project **financed by the Government of the Netherlands** in 1996. The purpose of the project was to develop a **database and GIS facility** at the department. A number of GI organizations were visited by three project team members in the context of the project. Some of the main findings of the report are:

- There are a number of small GIS facilities in public and private institutes in Pakistan engaged in a variety of ad hoc projects.
- There are **restrictions on the supply of information** from sensitive areas and on data about sensitive parameters e.g. relief. These restrictions are severely hindering progress.
- **There is a willingness to share data** and prepare proposals for collaborative projects with SSP.
- **Training is perceived as extremely important** by all the groups visited. It is considered by some to be more important in the first instance than provision of the latest hardware and software.
- Soil data are perceived as an important input to natural resources information systems.

- The use of Remote Sensing (RS) by the GIS groups visited is very limited and there is almost no fundamental analysis of RS data where they are used.

- ……there is a **need to generate external income** from project work and foster a more commercial approach.

SWOT Analysis

Pakistan's Ministry of Environment conducted a survey under Pakistan Wetlands Programme (http://www.pakistanwetlands.org/) in 2006. The title was "SWOT analysis of partners and stakeholders to assess their GIS/RS capabilities/resources" summary and questionnaire of which is attached as Appendix-6. It "… was designed to carry out SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis of partners and stakeholders. The SWOT also includes the questions on the **available spatial datasets and databases** with the respective organization and the **mechanism for sharing these resources"**, (Pakistan Wetlands GIS Implementation Strategy, p.8). Some of the results from page 63 of the document are:

- Survey results show that **42% of the respondent organisations have GIS staff** whereas only 14% have remote sensing staff.

- **64% of the organizations have information technology (IT) related staff**

- Most of the professional staff of the partner organizations working as GIS professional has either **masters or bachelor degrees**.

- Regarding data sharing mechanisms, survey data reveals that there is no **established mechanism of data sharing** among the data custodians

- **Seventy nine percent of the respondents are in view of data sharing**

- ….**lack of coordination** among stakeholders, **no proper data sharing policy**, sensitivity of data, **lack of sufficient funds** and misuse of data are the major concerns in this regard.

- **Most** of the **respondents** have shown **interest in sharing** human and hardware resources.

- Survey has revealed that **most of the respondent** organizations **have hardware facilities**

Governance of Fragile Ecosystems: Conserving Wild Natural Resources in Pakistan

The above mentioned paper written by Dr. Amin U. Khan was published by NGO LEAD Pakistan (http://www.lead.org.pk/) in 2003. The focus of the paper is conservation of natural resources through local participation. The main points of the paper are:

- Present public policies on environmental resources are based on short term gains and do not take into account scientific considerations

- Presently, the funds available are scare and projects often fail to mobilize available local resources

- The existing and proposed forest regulations in this country are designed to maintain and strengthen economic rather than ecological role of the forests

- Specific land-use planning, crucial to the landscape, should be in the hands of the local agencies

- The analysis ………..shows that interdependence among people, nation and the fragile environment is much greater than commonly imagined

Cape Town Declaration

The above mentioned document (Appendix-11) was collected during seminar titled "Public-Private Partnerships for Spatial Data Infrastructure in the Context of E-Government (PPP4SDI)" organized by EUROGI in 1st week of December 2007 at University Roma–La Sapienza, Rome, Italy. The participants of the Group on Earth Observations (GEO) approved this text of the declaration after Ministerial Summit in Cape Town, South Africa, on 3oth November 2007. Some of the points of the declaration are:

- *Recalling* that the 2002 **World Summit** on Sustainable Development (WSSD) **stressed** the **importance of Earth observation systems for** advancing **sustainable development,** particularly in **developing countries**

- *Recalling* that the Group on Earth Observations was founded **on the principle of using coordinated, comprehensive and sustained Earth observations** to enhance human health, safety and welfare, alleviate human suffering including poverty, protect the global environment and achieve sustainable development

- *Recognizing* the importance of providing stable, reliable and long-term operations of Earth observation networks and systems **within the framework of national policies** and international obligations

- **Coordination** at national, regional and global levels, continued investments, scientific and technological advances and **innovative approaches to financing** will be vital for upgrading and expanding Earth observations and building the capacity of individuals, institutions and systems, **particularly in developing countries**

Final Report-DIGIT

This one page document (Appendix-12) collected during seminar titled "Public-Private Partnerships for Spatial Data Infrastructure in the Context of E-Government (PPP4SDI)" organized by EUROGI in 1st week of December 2007 at University Roma–La Sapienza, Rome, Italy portrays very useful information about European region. It exclusively highlights the result of 26 interviews with persons involved in e-government/interoperability initiatives by Gartner, Inc a leading information technology research and advisory company in IT. According to the report published in 2007, page 18:

- Several DGs have the same objectives but are not cooperating.
- ….the majority of projects is neither guided nor monitored from a higher level within the EC.
- EC projects tend to focus on **technical solutions first** instead of aligning business processes and semantics.

The above quoted lines complement the observations (e.g. on going technological focus of SDI in Europe) made during the PPP4SDI seminar described under additional field work section.

4.6.   Additional Field Work

A seminar titled "Public-Private Partnerships for Spatial Data Infrastructure in the Context of E-Government (PPP4SDI) was organized by EUROGI in 1st week of December 2007 at University Roma–La Sapienza, Rome, Italy.

One of the reasons to attend the seminar, was to supplement my understanding of SDI to enrich this research with practical examples as was advertised by EUROGI (Appendix-13) "To explore ways in which Private-Public Partnerships (PPP) can assist in building the Spatial Data Infrastructure (SDI) across Europe. A number of practical examples of PPPs in the spatial data and services fields will be highlighted".

Almost 43 participants from various countries of the European Union (EU) were present in the seminar (Appendix-14). It was a two days seminar. The first day was devoted to *SETTING THE SCENE* by invited speakers on their experience in building SDI's related projects through PPP. Mauro Salvemini president of EUROGI & AM-FM Italia from Italy gave a snapshot of EUROGI and its current activities in EU. He stressed digital data while arguing the challenge of next few years faced by SDI, and underscored it also a challenge for SDI Europe. The paradox exposed by him "GI demand is highly increasing" was termed as the first paradox while "**Europe not developing integration solutions**" was termed as the second paradox by him. Generally speaking his presentation was revolving in an orbit of digital data, technology, market driven supply and demand theory neglecting the social aspect of SDI which was my first disappointment. Because technology alone does not work, it needs humans and humans prompt to socially valuable aspects rather than just technological innovations. Eva Pauknerova from Spatial Data Infrastructures Unit of INSPIRE kept the ball rolling towards "technical SDI" (Georgiadou et al. 2006) arguing "What is the Spatial Data Infrastructure?" and envisioned following four components of SDI:

- Institutional Framework
- Fundamental Data Sets
- Technical Standards
- Information Services

Michael Nicholson of Intelligent Addressing Ltd from UK proved to be a break through when he revealed "**The UK currently has no nationally accepted SDI".** One of the reasons he pointed out during informal talk, has been the sixty pages license offered by Ordnance Survey to private sector for data exchange. "**No examples of PPP in the SDI area in Italy are known to AM/FM**" one of the presenter mentioned. The audience was not informed about the reasons of having no PPP in SDI in Italy. At the end of first day, in concluding remarks one of the dignitary speakers underpinned the data part of SDIs.

In the second day of the seminar, slide show continued before and after coffee and lunch till round table discussion. Luigi Zanella of a private sector organization named Core Soluzioni Informatiche which develops software and services from Italy, in his presentation said "**Core do not have strictly speaking PPP experience**…….". Presenters continued declaring their developed product based projects as successful examples without mentioning the success criteria. Yves Riallant from France gave following examples of PPP4SDI in France:

- MAPEOS : Web map services for municipalities
- TERIA : French network for centimeter accurate positioning in real-time

MAPEOS is not vendor neutral application as it is using ESRI which is not open source software. Later in the seminar, conclusion wrapped up the forum. The summary of the conclusion is:
- PPP is an option for SDI development. It helps to quantify risk but it takes long time for establishment which is a problem of PPP.
- For SDI, data and information policy must be formed with giving public sector priority
- Service is in fact remote service and it is part of e-Gov
- Simplification is needed at public/private level to enhance efficiency and reduce cost
- Public tendering includes PPP
- PPP promotes professionalism
- External Data infrastructure (DI) is due to private` sector
- Cultural issues are important and need to be realized

Findings: There is a wide gap between theory and practices in the SDI domain.

4.7.   Results of Data Analysis

This section presents summary results of field data analysis. GI related activities such as GIS, in Pakistan is not new as says United Nations Development Programme report, "…..in Pakistan although varieties of independent GIS/mapping exercises are occurring throughout the country at the project level (United Nations Development Programme: Strengthening The Geo-Information And Digital Mapping Capacity of Survey of Pakistan, 1998). Both sectors i.e. public and private are contributing towards geo-related activities but in isolation. A quantitative and comparative view after data analysis of both the sectors is given below:

Public Sector

Both sectors i.e. private and public are contributing towards developments in the domain of GI in Pakistan. Public sector is more on the supply side producing and providing GI which is indeed very important in itself because GI is like blood in human body which keeps alive the body to make decisions necessary for survival. But mandates differ from organization to organization as a result the type of data or GI collected and produced varies, too. The different type of GI collected and maintained by some of the public sector organizations, its form (e.g. analogue or digital) and its dissemination mode as found after processing empirical data is summarised in table below.

Table 4.5: Public sector organizations producing spatial data

Data Type	Responsible Organization	Responsible Ministry	Analogue Data	Digital Data	Website	Use of web site for data dissemination
Topographic	Survey of Pakistan	Defence	Yes	Yes	No	No
Soil	Soil Survey of Pakistan	Food and Agriculture	No	Yes	No	No
Geological	Geological Survey of Pakistan	Petroleum and Natural Resources	Yes	Yes	Yes	No
Remote Sensing	SUPARCO	Scientific and Technological Research	No	Yes	Yes	No
Landuse	Pakistan Agricultural Research Council	Food, Agriculture and Livestock	No	Yes	Yes	No

Data produced by the public sector organizations is lot but only 40% organizations included in the survey permit citizens to access entire data sets the main reason for this partial access is outdated map policy that hampers the full exploitation and utilization of available GI. The outdated nature of map policy was mentioned during interviews and informal talks with the officials of some of the public sector organizations and also by the GI private sector experts. Table 4.5 reflects present data access to citizens.

Table 4.6: Data access to citizens

Public Organization	Entire Data Accessible by Citizens
Survey of Pakistan	No
Soil Survey of Pakistan	No
Geological Survey of Pakistan	Yes
SUPARCO	Yes
Pakistan Agricultural Research Council	No

GI public sector is willing to join PPP projects related with GI activities such as NSDI development as observed from empirical findings and validated through interviews for example, The Deputy Surveyor General of Pakistan appreciated PPP approach saying, "This is a good idea but it needs legal framework to establish such partnership approach". It is interesting to see that NGOs graded potential of PPP for NSDI development in Pakistan 100% as "Good" followed by 80% from public sector and 71% from private sector. This reflects the **positive attitude of public**, private and NGOs towards PPP in Pakistan.
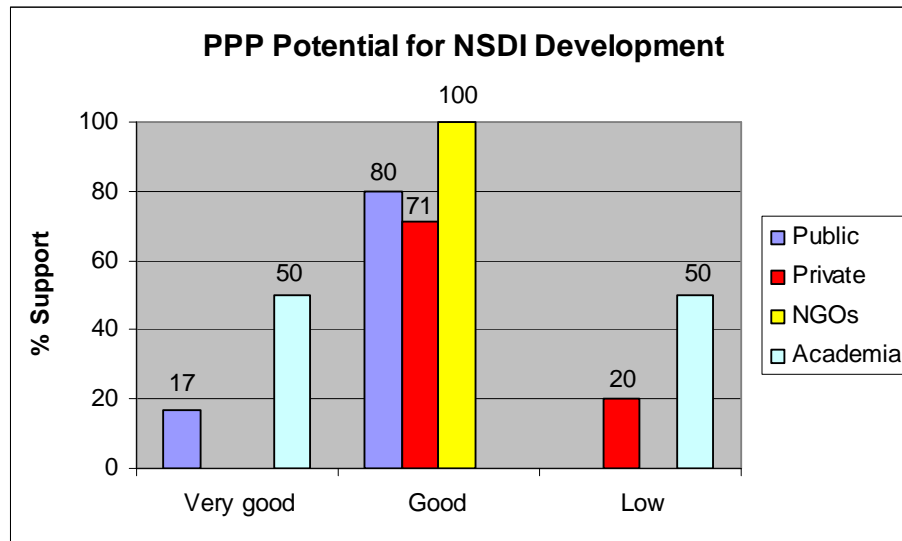
Figure 4.3: Potential of PPP for NSDI in Pakistan

Private Sector

GI private sector does not include only data producers but it includes brokers who add value to these datasets for the provision of value added services (e.g. vehicle tracking system), hardware and software vendors who provide data collection, storage (e.g. GPS, data backup tapes) and GIS software (e.g. ESRI). GI private sector also includes people who build access network (e.g. Intranet and Internet) to establish communication links between data or service providers and the end users. This list further includes training institutes in the private sector that are providing training facilities to the citizens in discipline such as GIS, Remote Sensing and IT etc.

In Pakistan there are many consulting firms, construction, surveying and mapping companies spread throughout the country. There are some GIS companies, too. According to Pakistan Engineering Council (http://www.pec.org.pk/) database, there are about 400 such companies which are registered but it does not imply the actual figures because companies have to pay a reasonable amount to get registered with the council so possibly some companies may have not registered themselves due to the registration fee. It means actual figure may be higher than 400. The services offered by these companies range from surveying, designing, mapping , construction of water reservoirs (e.g. dams, canals), coal mining, forestry and urban development tasks such as planning and development of new housing schemes, roads and other infrastructure. From the IT sector side, there are 1082 registered companies as reveals the record of Pakistan Software Export Board (http://www.pseb.org.pk/page.php?pid=2). Main hub of these private companies are provincial headquarters i.e. Lahore, Karachi, Peshawar, Quetta, Rawalpindi and federal capital Islamabad. In addition to this, are NGOs that are working in nature conservation programs such as World Wildlife Fund Pakistan and Leads Pakistan in remote areas of the country. Most of the companies treat GIS development as IT project. Some of the major private companies in Rawalpindi and Islamabad dealing with GI are summarized in Table 4.7.

Table 4.7: Some major GI companies in Rawalpindi/Islamabad

Sl. No.	Name of Company	Website	Main GI Services Provided
1.	R2V Services	http://www.r2v.com/	-GIS -3D Modeling -Engineering Design -Desktop Publishing
2.	TopGIS Consultants	http://topgis.com/	-GIS Applications design -Geodatabase -Spatial Analysis -Web Based GIS
3.	SAKURA GIS	http://www.sakuragis.com/	-GIS -Remote Sensing -GPS Technology -Natural Resource Management
4.	Winson	http://www.winson.com.pk/	- Vehicle tracking - Software / System's Development
5.	LMRK	http://www.lmkr.com/	-GIS -(Geo)Software applications
6.	Pakistan Resources Development Services (Pvt) Limited (PRDS)	http://prds.com.pk/	- ESRI distributor in Pakistan - Training in GIS
7.	ECIL	http://www.ecil.com/	-GIS -Survey & Mapping -Irrigation
8.	Shahzad International	http://www.shahzadintl.com.pk/	-Geological Survey -Automatic Mapping Facility Management Systems -GIS
9.	NetSol Technologies	http://www.netsoltek.com/	-IT solutions and services
10.	Hagler Bailly Pakistan	http://haglerbailly.com.pk/	-Environment - Natural Resource Planning and Utilization

There are many more companies which have not been included as the purpose is to map the trend and nature not the exact figures. Therefore, above table gives a snapshot of GI private sector in Rawalpindi and Islamabad. The sector consists of developers such as NetSol Technologies which is developing most of E-Services (e.g. Land Record Management Information System) in Pakistan. Some are providing value added services such as R2V Services, some are taking care of environment related projects, geological surveying and mapping etc. Their services range from GI production to provision of innovative value added services based on GI.

Therefore, GI private sector covers the extent of the country for the provision of GI services (e.g. data and value added services etc). More detailed view is presented in next paragraphs.

The market may be segmented by distinguishing among provider types, i.e. (commercial) data producers, data value-adders, software developers and service providers, (Georgiadou2003). Therefore, to understand the **nature of GI** private sector it is important to answer the following questions:

- Who are serving in the sector in terms of their academic levels and professional backgrounds i.e. **Human Resources**
- What kind of **data** is being produced? Is it prepared on certain **standards** and to make this data discoverable **metadata** is developed or not?
- How GI is being managed i.e. in a **database**?
- What is the data/information **delivery mode**?
- What kind of **Geo-ICT** facilities are present?
- Are **value added service** being provide?
- Is the sector aware of latest trends in spatial technologies such as **OGC service specifications**?
- To what extent can private sector build NSDI technical components

These questions are answered with the results of empirical findings.

Human Resources

Technology does not work alone, it needs humans to operate and manage. Well educated and professionally skilled personals can perform better than the ones who are not properly educated and lack in professional expertise no matter they are technicians or managers of GI. Especially it is important in the domain of spatial knowledge as spatial technology is very fragile in the sense that it keeps on changing due to generation of new spatial knowledge as envisions website, "At the International Institute for Geo-Information Science and Earth Observation (ITC), knowledge of geo-information management is plenty available and is continually being developed and extended", (http://www.itc.nl/about_itc/default.asp).

Therefore, it becomes essential, "……to assess the existing educational capacity for SDI in a country", (SDI-Africa: An Implementation Guide, Chapter 3, p.20). This aspect was included in questionnaire for private sector.

Academic Qualification and Professional Background
It has been observed that 62% personnel working in GI private sector organizations are graduates followed by 30% post graduates. It indicates that staff working in the sector has sufficient academic level.

GI private sector organizations are dominated by GIS and IT professionals which is healthy sign in a country such as Pakistan. Professionals from both disciplines are 78% followed by civil engineers which are 67% due to lot of construction work for the development of physical

infrastructure being the priority of GOP. SWOT analysis (Appendix-6) carried out by Pakistan's Ministry of Environment under Pakistan Wetlands Programme confirms to the recent research as well.

Main Professionals in Private GI Sector
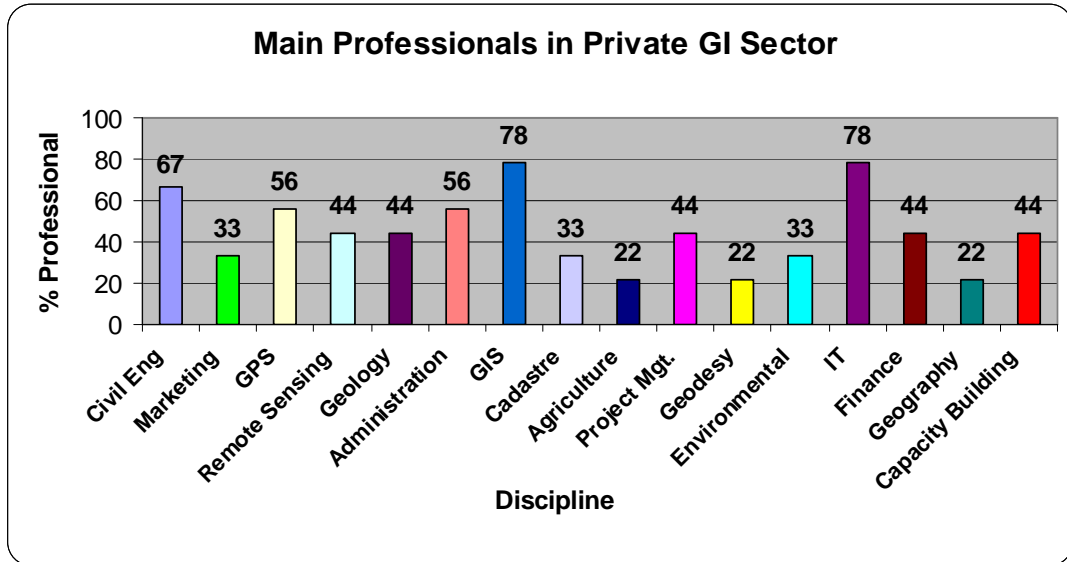
Figure 4.4: Professional background of staff working in GI private sector

Data Types Produced

Topographic data serves as a base for most GIS and RS applications it is also evident from the filed observations. In private sector, 78% organizations are producing topographic data, 56% collecting transportation data followed by 44% cadastre and administrative boundary data.

Data carrying no geographical coordinates and attributes is of no use in GIS as this kind of data can't be processed by computers for GIS analysis e.g. spatial analysis as argues the most recently approved NSDI Act of Japan, "Geographic Information System (GIS)" refers to an information system that processes geospatial information, recorded in digital form, on a digital / electronic map (a map recorded in an electromagnetic method) with computers to enable geographic understanding and analyses of geospatial information (NSDI Act of Japan, 2008, p.2). 67% private sector organizations are producing data with geographical coordinates while 78% are producing attributed data as well. This makes data integration and spatial data analysis feasible. Public sector organizations are leading in the production of georeferenced and attributed data.
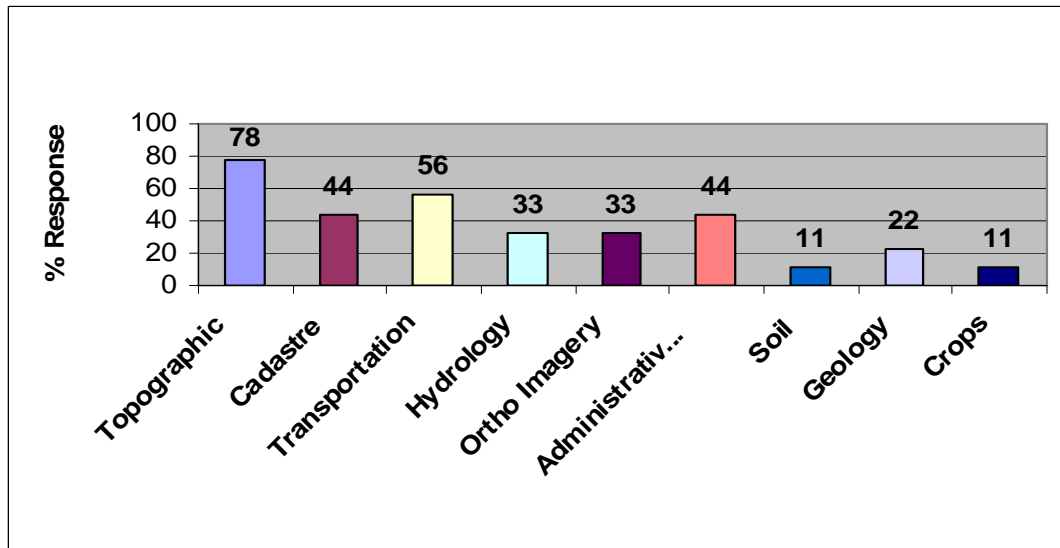
Figure 4.5: Data types produced by private sector

Standards, Metadata and Database

Standards play a significant role to reuse and share data. These also help to overcome heterogeneity problems. 56% private sector organizations while 60% public sector organizations are producing data on various standards. In private sector 44% organizations are creating metadata.

60% GI private sector organizations have managed half of their data in a database, 40% organizations have quarter of their data in a database.
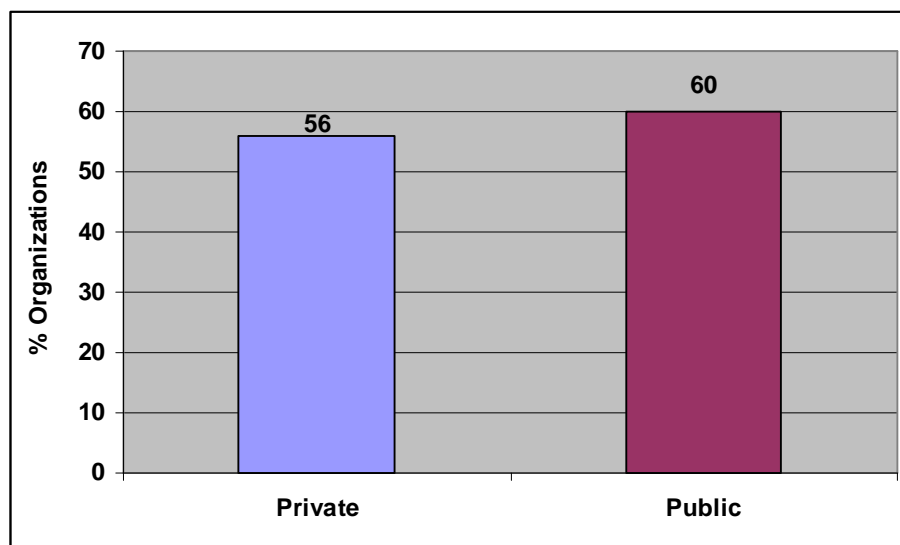
Figure 4.6: Percentage of organizations in private and public sector following standards

Mode of Data / Information Delivery

Data delivery mechanism such as World Wide Web (WWW) which makes use of internet plays significant role to serve user needs in real time. Where as data sent through post may take significant time to reach customers living especially far away from the data serving organizations. The importance of web based data delivery system was well realized during 2005 earth quake in Pakistan. ITC launched maps of the effected areas on internet which were freely downloadable to help teams engaged in rescue operations in the areas where as a very few customers purchased maps from Survey of Pakistan (SoP). Therefore, in a practical sense ITC served more than SoP in that critical time.

Data collected from filed shows that:

- ➢ All private sector organizations deliver data through internet and have websites
- ➢ All public sector organizations deliver data through post and few have websites

Geo-ICT

Geo-ICT is ICT with a flavour (de By et al. 2007, p.2) of GI. Recent developments in Geo-ICT have now important roles for the development of cadastral systems and GSDI surrounding cadastral systems. The developments in ICT in general, and specifically the Geo-ICT can improve the quality, cost effectiveness, performance……(van Oosterom et al. 2002,p.3). This important aspect was also covered in questionnaires.

Software

Almost all organizations in public and private sector are well equipped with GIS software. ESRI is doing good business in the country as 83% organizations in public sector have ArcGIS, as compared to private sector where 67% organizations are using this software. 56% organizations in private sector have Erdas Imagine as image processing software. Anyhow for spatial database, Oracle Spatial is in use of 33% public sector organizations. Where no private sector organization possesses this software due to its higher cost as well as complexity of its modules as mentioned by private sector organizations visited.

Hardware

Hardware is compliment to software. In private sector 81% organizations have server, to **manage PCs** and **users** on workgroup **networking** which has been established by 78% organizations to accelerate data exchange within their respective domains.

Websites

It has been observed that 100% academia and NGOs have their websites followed by 67% private and 60% public sector organizations.
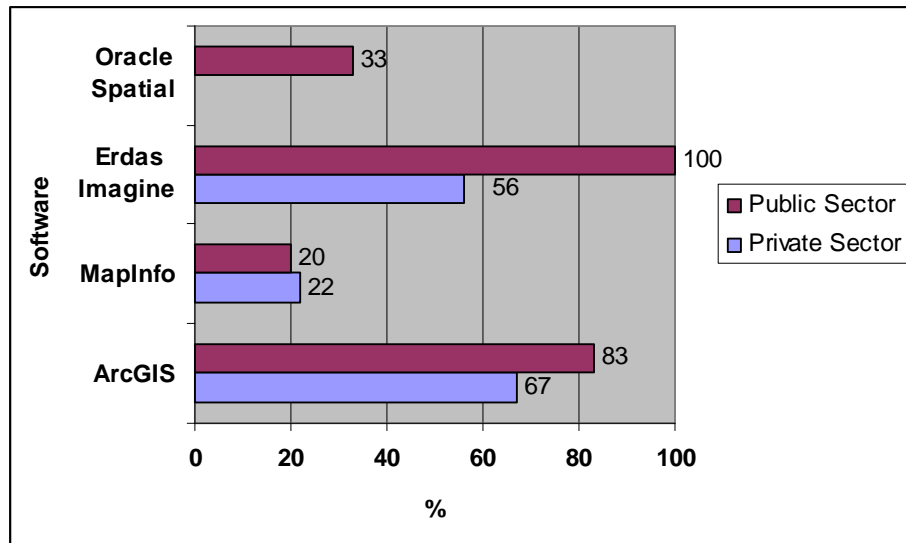
Figure 4.7: GI related software in use

Communication Network

Communication is the backbone of every infrastructure. To get information about communication network, questionnaire for private sector organizations was populated with this theme also. Internet as communication tool is being used by 23% organizations in the private sector followed by intranet which is in use by 22% organizations. New approaches in communication network such as Global System for Mobile communications (GSM) and General Packet Radio Service (GPRS) is relatively low and is in use by few private sector organizations which provide Location Based Services (LBS) such as vehicle tracking system. 11% organizations are equipped with GSM and GPRS communication tools.
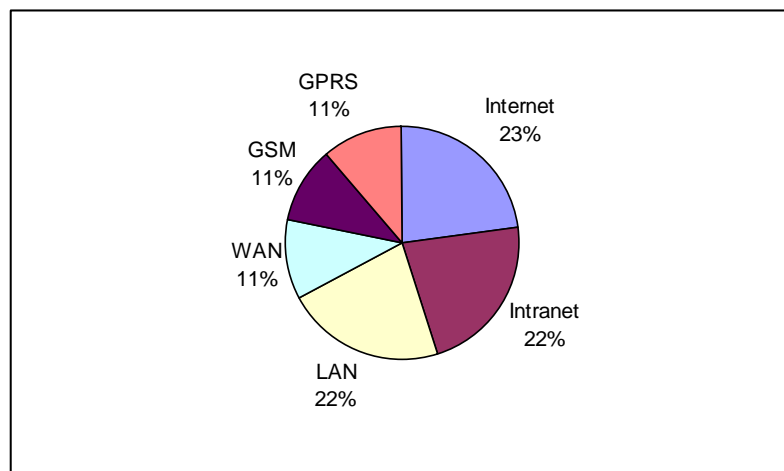
Figure 4.8: Communication network in use by private sector

Value Added Services and OGC Specifications

56% private sector organizations are providing value added services which are basically Location Based Services (LBS) such as vehicle tracking system. Web Map Server (WMS) service specifications have been implemented by 22% organizations as OGC specifications.
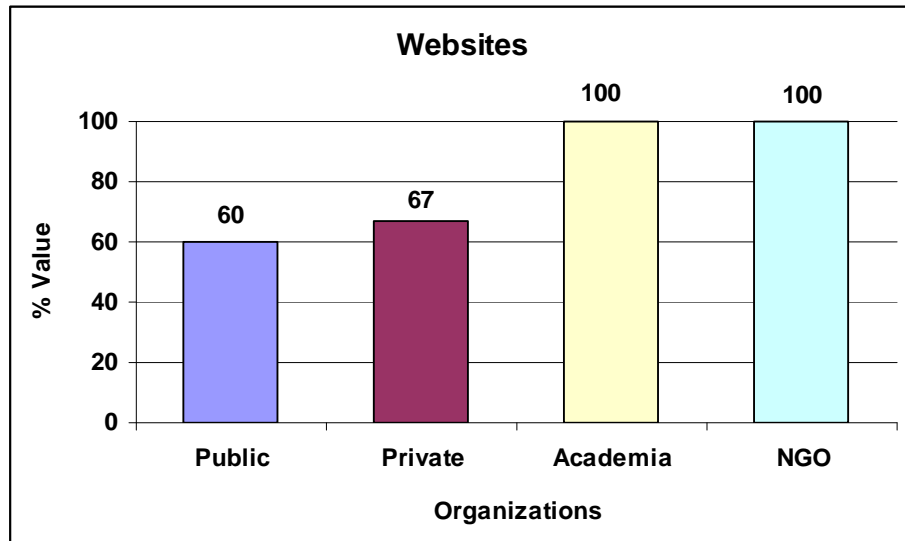
Figure 4.9: Websites owned by organizations

Private Sector's Capacity for Development of Technical Components of NSDI

It is observed that 67% organizations responded to GIS Portal development with interface in English language where as 47% organizations responded to the development of GIS portal in national language.

A GIS portal offers metadata to extract data from databases which need not only database development capability but also expertise to develop data extraction tools. 44% organizations responded to metadata creation capability, 56% organizations responded to develop databases and 44% organizations responded to development of data extraction tools. A GIS portal by National Disaster Management Authority (NDMA, http://ndma.gov.pk/) Pakistan has been developed. The portal was developed and is maintained by a consortium of experts drawn from the World Bank, American and Pakistani universities and the private sector, with support from the government of Pakistan according to the website of GSDI (http://lists.gsdi.org/pipermail/sdi-asiapacific/2005-November/000075.html).

Capacity for Development
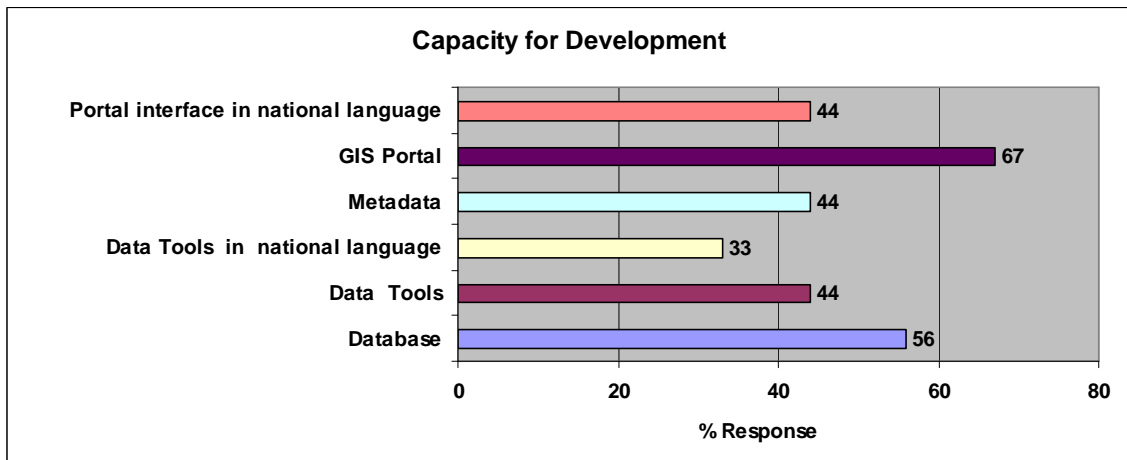
Figure 4.10: Private sector's capacity to develop NSDI technical components

It can be concluded that nature of GI private sector is diverse and rich in service provision as it is well balanced with data producers, GIS application developers, value added service providers, training providers and software/system developers etc. The sector have good human resources and is capable of developing technical components of NSDI such as GIS portal, metadata, databases and data extraction tools etc not only in English language but also in national language because every one in the country does not understand English. The GI private sector is in favour of PPP approach.

Public Private Partnership-Pakistani Scenario

During the survey work on any development in PPP in Pakistan, it was found that recognizing the strengths of Public-Private Partnership (PPP), Government of Pakistan (GOP) structured a PPP program that included the establishment of a PPP Task Force in December 2005. **The purpose of the Task Force is to formulate a policy, regulatory and legislation structure, conducive to undertaking PPPs** as notes report of a Pakistani newspaper, "Daily Times" of November 26, 2006. It also includes the establishment of the Infrastructure Project Development Facility (IPDF) in May 2006, that serves as the Secretariat to the Task Force, **provide 'hands-on' technical assistance** to the implementing agencies (federal, provincial and local government), build implementation capacity, provide inputs on the need for government support (financing, guarantees, subsidies etc.) **and drafting of a Business Plan** ……, the report further noted. It is a signal that PPP concept in Pakistan is now beyond conceptual discussion and in the fast track implementation phase. The focal point for implementation of the Government's PPP program is IPDF, (IPDF Newsletter Oct-Dec 2007). IPDF has an independent Board of Directors consisting of a chairman and six directors, three each from the public and private sectors. According to the IPDF newsletter presently there are 21 active projects which are summarised in Table 4.8.

In chapter 2 the six critical components of a successful PPP defined by The National Council for Public-Private Partnerships (NCPPP) were summarised. These components are explored in the GI context of Pakistan now.

Political Leadership: Since the early 1990s, Pakistan has established a policy and regulatory framework for Public Private Partnership (PPP) in the telecom and energy sectors, (Pakistan Draft Policy on Public Private Partnerships 2007, p.2). This traces back the importance of PPP recognised by political leadership about 17 years ago. But Mr. Shaukat Aziz's Government from 2004 to 2007 added a new chapter in the history of PPP in Pakistan. Being a banker by profession and ex-finance minister of the country he especially focused PPP approach for infrastructure development. While addressing '2006 PPP Forum' he pointed out that, "better infrastructure is not only crucial for business but is critical for human development (Public Private Partnership Forum Report 2006, p.19). "PPPs can play a key role in increasing resources and improving efficiencies by not only accessing finance, but also by bringing in needed expertise, skills, technology, tools, and designs and, implementation, accountability, and monitoring mechanisms" he further added. In another statement published by a Pakistani newspaper he attributed development of the country to PPP approach, "He said Pakistan was promoting development through public-private partnership…." (The News-International , December 15, 2006).

Therefore, political leadership element is present in Pakistan.

Public Sector Involvement: Public sector active involvement is evident from Table 4.8. More projects are also being developed through PPP approach outside IPDF domain. Some of these include:

- Destination Pakistan between Ministry of Tourism and Mobillink (A mobile phone company)
  Source: Associated Press of Pakistan, Feb 6, 2007.

- The Competitiveness Support Fund (CSF) …..approved **four** innovative **projects** for Pakistan aimed at supporting cutlery, medicinal fruits, engineering and dairy clusters to improve their export potential. Minister of State for Finance and Chairman of CSF for **reviewing the progress** of the Fund's activities approved these projects. All approved projects will support **public-private partnerships** to link ……. private sector, academia and government.
  Source: The News-International, Oct 10, 2007.

- The governments' decision to construct mega dams through public-private partnership for power generation and irrigation…….
  The advisor to the prime Minister on Finance Dr Salman Shah has announced that future mega dams would be built under public-private partnership. **Public Sector department involved in this project is WAPDA** (Water And Power Development Authority).
  Source: The News-International, July 31, 2007.

Therefore, 'Public Sector Involvement' component can be seen as 'partially exists' specifically in GI domain in Pakistan.

A Well Thought-Out Plan: According to NCPPP, "A carefully developed plan (often done **with the assistance of an outside expert** in this field) will substantially increase the probability of success of the partnership". IPDF in Pakistan is this '**outside expert**'. IPDF will play a key role in ensuring that

projects are structured in a manner…….(Pakistan Draft Policy on Public Private Partnerships 2007, p.5). Public Private Partnership Forum Report (2006) highlights, "IPDF has been set-up for meeting the purpose of bringing the public and private sector players together to address the infrastructure needs of Pakistan. Its' **mandate is** to help public sector agencies, at all tiers of the Government, **to improve infrastructure development proposals** and……….."

At the moment no plan dealing with NSDI is present though GOP has started a number of PPP projects in the domain of GI and IT etc. Therefore, this component can be seen as partially existing in Pakistan.

A Dedicated Income Stream: This factor was well realized in Pakistan as notes Public Private Partnership Forum Report 2006, "In order to structure a comprehensive PPP program for Pakistan………. it was assessed that the country needs:

- availability of long term fixed rate financing in local currency

Therefore, to overcome this aspect of PPP, "Establishment of the IPDF that will serve as the Secretariat to the PPP Task Force, provide 'hands-on' technical assistance to implementing agencies at all tiers of government, build their implementation capacity, and **provide** inputs, **financing, guarantees**, **subsidies** etc, (Public Private Partnership Forum Report 2006, p.3)

Therefore, this component can be seen as 'partially exists' in Pakistan in the context of NSDI.

Communications with Stakeholders: Public sector organizations in Pakistan usually lack this component. Though once again this responsibility institutionally lies with IPDF to bring all stockholders together and get feedback. Stakeholders are involved especially the end user group but they are not given power to play a significant role. It was determined during field work as well that communications with stakeholders especially end user group, in public sector had not been considered seriously yet. Therefore, this component exists but partially.

Selecting the Right Partner: Selection of right partner is only possible if objectives of a task (partnership) are well known and understood. Therefore, this component demands not only technical knowledge but also administrative knowledge. This is a sphere of capacity building in a practical sense. It has been covered in draft policy on public private partnership, "In order to deliver on its mission statement, **IPDF will act as the principal facilitator and coordinator for** PPPs in Pakistan, with focus on the following 'pillar' functions:

Pillar I**:** Provide transaction support to implementing agencies to structure viable PPP Projects that provide good value for money. This also entails (i) building public and private stakeholder awareness and skills, and (ii) feedback and assistance to the TF as its secretariat to create a suitable policy, legal and regulatory framework for PPPs.

Therefore, this component is present in Pakistan but partially because selection of partner requires close contact among potential partners and that is not being fully exercised in GI domain of Pakistan.

Public-private partnership policy approved in principle as reported by Associated Press of Pakistan (APP) in its edition of 8th November, 2007 where as Prime Minister of Pakistan in a statement published in the same edition said that a **strong economy** has created an ideal climate for investment in Pakistan. The **Cabinet approved** an **Amendment** in Seed **Act**, 1976, as the present Act

did not provide for involvement of the private sector. The amendment in the Act would now allow a major role to the private sector adding to the productivity and availability …….. (Associated Press of Pakistan, Aug 1, 2007). These are some of the few moves (policy frame work, political, and economic environment) which can be seen as practical measures towards strengthening **institutional environment** for PPP in Pakistan. Institutional environment plays an important role in PPPs as Hammami et.al (2006) finds, "Countries with weak institutions and low-quality bureaucracies are more likely to display high country risk and are therefore less likely to foster PPPs" (p8). Pakistan was the top reformer in the region and the number 10 reformer globally—making it easier to start a business……….(World Bank Country Classification Groups, July 2006 data).

Hence institutional soil of Pakistan for seeds of PPP is quite fertile. The issue of security is not discussed here due to the prevailing law and order situation in the specific region.

PPP Projects

The pipeline of infrastructure projects continues to grow. IPDF, presently, has 44 projects in its pipeline, out of which 21 are on the active list......." (IPDF Newsletter Oct-Dec 2007, p.5). A number of PPP projects have been developed and are being development in sectors such as infrastructure, health, education, energy, Information Technology (IT) and GIS etc. These projects (Appendix-15) are being implemented by E-Gov, IPDF, local governments, private companies and NGOs. But in the research projects related with IT and GIS will be addressed. Some of these projects are based on Build Operate Transfer (BOT) form of PPP where as in some projects form of PPP is not mentioned. Table 4.8 summarizes these projects.

Table 4.8: PPP projects in GIS and IT sector in Pakistan

Implemented By	GIS	IT	Form of PPP
E-Gov Source: http://www.pak.gov.pk/e_government.aspx	05	29	Not mentioned
IPDF Source: IPDF Newsletter Oct-Dec 2007	00	02	BOT
Local Govt. of Punjab Source: http://www.pitb.gov.pk/current_projects.aspx	03	28	BOT
Local Govt. of NWFP Source: http://www.nwfp.gov.pk/ST_IT/Department/index.php	02	29	BOT
Local Govt. of Sind Source: http://www.karachicity.gov.pk/	00	06	Not mentioned
Local Govt. of Baluchistan Source: http://www.balochistan.gov.pk/New%20Folder/it.htm	00	14	Not mentioned
Private Company (NESPAK) http://www.nespak.com.pk/projects/major.asp?Ar=2&sector=9	13	50	Not mentioned
NGOs (WWF-P) Source: http://www.wwfpak.org/projects.php	34	00	Not mentioned
Total	**57**	**158**	

It is interesting to see from above table that most of GIS projects are being developed by private sector. The number of PPP projects both in GIS and IT sectors will boom with the passage of time because Government of Pakistan (GOP) **has offered investment opportunities in IT, GIS** and **mapping** in the investment policy (Investment Policy p.24, http://www.pakboi.gov.pk/pdf/IT%20&%20Telecom.pdf). This reflects the encouraging attitude of both the partners i.e. government and private sector towards PPP.

Effects of PPP on Project Implementation

It is not easy to conclude the effects of PPP on the projects implemented through this approach. First of all such projects take a longer time to implement due to PPP approach which is problem of PPP as mentioned earlier after under section 4.6. Therefore, it would be bit early to evaluate PPP projects implemented which actually started in 2003 or even later. Second, it needs to be explored in a broader context and perspective. For example from the perspective of public sector which always present a rosy picture, from the perspective of private sector which look at money generated and from the perspective of citizens in terms of services and quality of services they got.

It is argued that it is better to look at it from citizen's perspective because the ultimate goal of PPP is, "Improving quality and service coverage…………..…...for the future and livelihood of its **people**", Prime Minister of Pakistan (Public Private Partnership Forum Report 2006, p.17).

In 2007, World Bank and the E-Government Directorate of Pakistan jointly worked to determine the "20 Most important Services" in Pakistan. The purpose was to identify and prioritize the most important services to the citizen (http://go.worldbank.org/N36SGR8RA0). According to the information available in presentation slides on the website, percentage of satisfied citizens and level of satisfaction is illustrated in figure below:
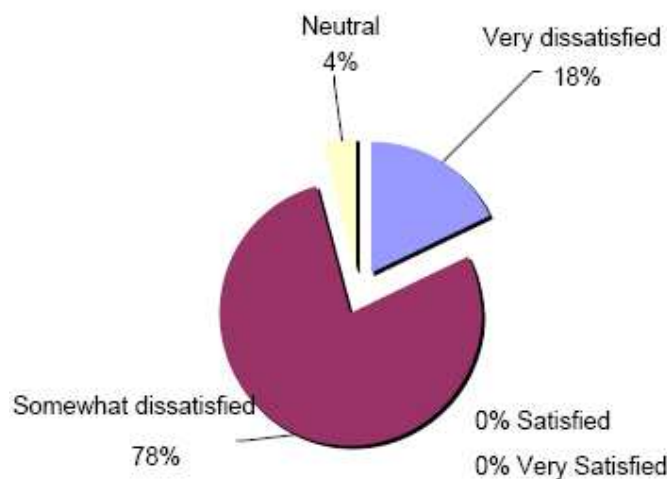
Figure 4.11: Citizens satisfaction with E- services in Pakistan
(Source: http://go.worldbank.org/N36SGR8RA0)

It can be aggregated that from citizen's perspective most of the people are satisfied. Moreover, according to report of Global E-Government published in 2007, Pakistan ranks higher than some countries of the region such as Bangladesh, Sri Lanka and also some countries in the European Union (EU) such as Italy and Greece for provision of online services (Global E-Government, 2007.p.14). In short, projects implemented through PPP show healthy and encouraging results.

PPP Policy Framework in Pakistan

Successful implementation of a plan needs ingredients such as consistent political support which comes from government, local knowledge and community mobilization through NGOs, finance, skills, assets and service delivery from private sector. During field work most of the representatives of public and private sector organizations complained about lack of PPP policy framework which is no more an issue. Because, "The Economic Coordination Committee (ECC) of the Cabinet, in its meeting held on 13th November, 2007, under the chairmanship of the then Prime Minister approved the Policy Framework for Public Private Partnerships for the development of infrastructure projects in the country", (IPDF Newsletter Jan-Mar, 2008). Important points of this policy are as under:

Objectives and Focus:
The Government's objectives in promoting PPPs are to provide:

• **More services:** As there is a huge backlog in basic services such as water and sanitation, solid waste management, transport and rural electricity. Not only do we need to catch up with the backlog, we need to start building infrastructure for future needs as well.

• **Better services:** The quality of existing services is deteriorating due to lack of incentives and funding for infrastructure maintenance and upgradation. The result is unclean water, unhygienic living conditions and inability to provide proper health care and education.

• **Affordable services:** As certain segments of the population cannot pay cost recovery tariffs, whereas the private service provider needs to recover costs in order to sustain operations. In such cases the Government will provide targeted (to low income consumers), explicit (not hidden as budget support) performance based (only provided once the service - such as 24 hour clean drinking water to the consumer's dwelling - is actually delivered).

• **Timely services**: The Government does not have the capacity or the fiscal space to meet the immediate service demands of its citizens.

Public Private Partnership project evaluations will focus on, **but will not be limited** to, the following sectors:

(i)   Transport and logistics, including provincial and municipal roads, rail, seaports, airports, fishing harbours as well as warehousing, wholesale markets and cold storages.

(ii)   Mass Urban Public Transport, including buses and intra and inter-city rail.

(iii) Municipal Services, including water supply and sanitation, solid waste management, low cost housing, and health/education

(iv)   Small Scale Energy Projects (hydroelectric and captive power generation projects) - other than those being facilitated by the Private Power Infrastructure Board (PPIB) and the Alternative Energy Development Board (AEDB).

The PPP policy framework though focuses presently more on physical infrastructures but the potential usage of GI can be sighted for planning purposes to make better and sound decisions for these intended physical infrastructures.
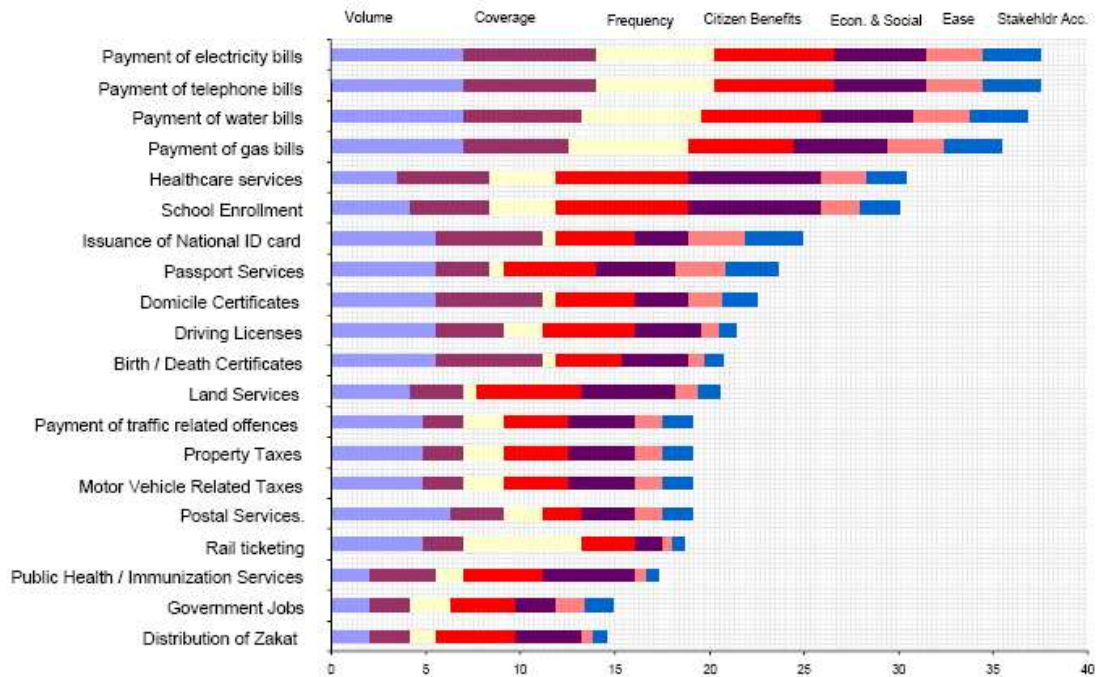
Figure 4.12: 20 Most important E-services in Pakistan
(Source: http://go.worldbank.org/N36SGR8RA0)

4.8.   Summary and Conclusions

- There are a number of small GIS facilities in private sector of Pakistan engaged in a variety of ad hoc projects. The GI private sector is spread all over big cities in Pakistan and is providing diverse services to the society as it consists of data producers, GIS application developers, value added service providers, training providers and software/system developers etc.

- The GI private sector have good human resources and is capable of developing basic technical components of NSDI such as GIS portal, metadata, databases and data extraction tools etc not only in English language but also in national language because every body does not understand English as a matter of fact. The GI private sector is in favour of PPP approach.

- A small number of GI, ICT and eGOV-related projects exist which have PPP as GOP provided investment opportunities in these areas to the investors recently. The impact of PPP in various domains has been positive and healthy on the implementation of these projects as citizens being the end users are generally satisfied with the services being provided which is a real scale to measure success of implementation also third party reports such as Global E-Government reports rate these services better than the services provided by some of the countries in Asia and Europe. This is no doubt a healthy sign for implementation of PPP in NSDI development in Pakistan as a future project.

- It has so far been realized that the attitude of government and private sector towards PPP for the projects of public interest is favourable and encouraging. Both sectors have shown willing to support PPP which is already in fact being practiced in many projects and more are in the pipe line. The policy framework towards PPP is conducive as it underscores the need of having PPP in all sectors and its importance has never been denied.

- There is a wide gap between theory and practices in SDI domain.

5. PPP-based NSDI Implementation Strategy

5.1. Introduction

Up till now this research has explored PPP as mechanism of NSDI implementation in chapter 2, to what extent the current state of Indian NSDI is due to lack of PPP as an implementation mechanism in chapter 3 as well as to what extent Pakistan's socio-administrative culture and state of GI private sector is conducive to PPP in chapter 4.

This chapter synthesizes the outcome of all previous chapters in order to spell out elements of PPP-based NSDI implementation strategy in Pakistan. The chapter answers research question 9. It starts with determining status of GI and PPP related activities in Pakistan. Then these findings are compared with Indian NSDI scenario. The parameters used to evaluate are outcome of chapter 2. Combination of Gap and SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis is applied to spell out elements of PPP-based NSDI implementation strategy at the end of the chapter.

5.2. Assessing the Current Status

Two tables have been prepared to understand current status of GI and PPP related activities in Pakistan. Table 5.1 critically analyse GI related activities where as Table 5.2 displays PPP status in the context of GI in the country. The parameters used in the upcoming tables are outcome of chapter 2. The decision level i.e. High, Moderate, Low and Nil are based on the following criteria:

Measured value if >=70% Then High

>=60% Then Moderate

<=40% Then Low

=0% Then Nil

Table 5.1: Current status of GI activities in Pakistan

SDI Component	Parameter	Measured Value	Value Measuring and Validating Method
Geographic data	Georeferenced		
	Attributed	High	• Field Work Questionnaire
	Availability	Moderate	• Interviews
	Accessibility	Low	• Site Visits
	Updation		
Spatial databases	Availability	Low	
	Accessibility		
Metadata	Availability	Low	
	Accessibility		
Standards	Uniformity	Low	

Services	OGC service specifications	Low	• Field Work Questionnaire • Personal observation
	Value added Services		
Policies	Data sharing policy	Nil	• Field Work Questionnaire • Interviews

	E-government	Moderate	• Websites e.g.
			Global E-Government
			   (http://www.insidepolitics.org/)
			• World Bank
			   (http://go.worldbank.org/N36SGR8RA0)

	Map policy	Low	• Field Work Questionnaire • Interviews • Documents collected e.g. Map policy (SoP) • Personal observation

	Environment protection policy	Moderate	• Policy documents e.g. National Environment Protection Policy of Pakistan
			   http://www.environment.gov.pk/nep/policy.pdf
			• Websites e.g. Cleaner Production Program
			   http://www.cpp.org.pk/index.shtml

	PPP policy	Moderate	• Websites e.g. http://ipdf.gov.pk/tmpnew/index.php • Newspapers e.g. http://www.thenews.com.pk/print1.asp?id=93072
Capacity Building	Academic Education Level	Moderate	• Field Work Questionnaire • Websites e.g. • Sustainable Development Policy Institute, Pakistan (http://www.sdpi.org/)
	Professional Education Level		
	Courses	Moderate	Field Work Questionnaire • Interviews • Websites e.g. -Pakistan Society of Geographic Information Systems (http://www.psgis.org/) -Higher Education Commission, Pakistan (http://www.hec.gov.pk/new/index.htm) -Centre for Geographic Information System (GIS), Pakistan (http://www.pu.edu.pk/departments/default.asp?deptid=65)
	Awareness	Low	• Interviews • Personal observation

Access Network	Mode of delivery	Low	• Field Work Questionnaire • Websites e.g. GSP (http://www.gsp.gov.pk/)
Partnerships	Willingness	High	• Field Work Questionnaire • Interviews e.g. (SoP)
	PPP	Low	• Field Work Questionnaire • Websites e.g. http://www.pak.gov.pk/e_government.aspx
ICT	Hardware Software	High	• Field Work Questionnaire • Documents collected e.g. summary of SWOT Analysis 2006 by World Wildlife Fund-Pakistan • Websites e.g. Pakistan Software Export Board http://www.pseb.org.pk/page.php?pid=1
Social component	Community protection initiative	Moderate	• Websites e.g.(http://ndma.gov.pk/) • Online documents (e.g. http://books.icimod.org/)
	Involvement of NGOs	Low	• Field Work Questionnaire • Documents collected (e.g. project list) • Websites (e.g http://www.cpp.org.pk/index.shtml)
Capacity for development	GIS portal/tools	Moderate	• Field Work Questionnaire • Personal observations

After assessing GI related activities now status of PPP is summarised in form of six critical elements of a successful PPP as defined by The National Council of Public-Private Partnership (NCPPP). This is outcome of the detailed and critical discussion made in Chapter 4.

Table 5.2: Status of PPP components in GI context of Pakistan

PPP Component	Status in Pakistan
Political Support	Exists
Public Sector	Partially Exists
Well thought Plan	Partially Exists
Dedicated Income Stream	Partially exists
Communication with stakeholders	Partially exists
Selecting the right partner	Partially exists

The above two tables emerge to the following strengths, weaknesses, opportunities and threats.

Strengths, weaknesses, opportunities and threats faced by GI Sector in Pakistan

Internal Factors (IFAS) / External Factors (EFAS)	Strengths	Weaknesses
	❖ Georeferenced/Attributed data ❖ E-government ❖ Involvement of NGOs ❖ PPP projects ❖ Availability of GI ❖ Availability of hard/software ❖ Capacity for development ❖ Supportive policies	❖ No strategic plan ❖ No data sharing policy ❖ Outdated Map Policy ❖ No uniformity in standardization ❖ Outdated GI ❖ Slow service delivery ❖ Partial accessibility to GI ❖ Lack of spatial databases ❖ Unavailability of metadata
	Opportunity GOP's interest /offer in • PPPs • Outsourcing (E-government Strategy 2005, p.20) • Standardization • Land Record Management Information System • Agency specific GIS Applications • Offer to private sector for investment in GIS (http://www.pakboi.gov.pk/pdf/IT%20&%20Telecom.pdf) • Efficient service delivery • Private sector involvement • Support for ICT usage (e.g. websites) • Availability of latest technology • Conducive IT policy towards PPP	**Threats** • Lack of coordinating body • Dissatisfaction of user community • Competitors e.g. Google Earth • Availability of cheaper and diverse GI products from International market • Data security

5.3. Setting the Priorities

It is essential to set priorities in order to give recommendations for PPP-based NSDI implementation strategy. SDI parameters those are measured 'Nil' or 'Low' in Table 5.1 are given weight score of 1 and those appeared in 'Lessons From Indian NSDI' i.e. chapter 3 are also given weight score of 1. Therefore, score ranges from 1-2 where; 1= 2nd priority, and 2=1st priority. The higher the weight, higher the priority of the parameter is, for NSDI implementation in Pakistan.

Table 5.3: Setting priorities

SDI Component	Parameter	Pakistan	Lessons from Indian NSDI	Total Weight
Geographic data	Accessibility	1	1	2
	Updation	1	Not assessed	1
Spatial databases	Available/accessible	1	Not assessed	1
Metadata	Available/accessible	1	Not assessed	1
Standards	Uniformity	1	Not assessed	1
Services	OGC service specifications	1	Not assessed	1
	Value added Services	1	Not assessed	1
Policies	Data sharing policy	1	1	2
	Map policy	1	1	2
Capacity Building	Awareness	1	1	2
Access Network	Mode of delivery	1	Not assessed	1
Partnership	PPP	1	1	2
Social component	NGOs	1	1	2

Therefore, above table assists to set priorities as follows:

1st Priority	Accessibility of Geographic data, Data sharing policies, Map policy, Awareness creating programs ,PPP and involvement of NGOs.
2nd Priority	Data updation, Availability and accessibility of spatial databases and metadata, Uniform standards, Provision of services, Mode of data/information delivery.
3rd Priority	Availability of Geographic data , E-government, Environment protection policy, PPP policy, Capacity building (educational and professional), community protection initiatives and Private sector's capacity for development of technical component of NSDI.
4th Priority	Georeferenced/attributed data, willingness of partners, hardware and software etc.

5.4.   Recommendations for PPP-based NSDI Implementation Strategy

The momentum of the work such as NSDI implementation needs to be split up in phases for better understanding. It would help to take small but stable steps and to sense the reaction of the stakeholders. In the light of the priorities identified, the following recommendations are made:

Phase-0: Administrative Tier
To successfully implement NSDI, it is important to have a dedicated institution that can play role as a directing and coordinating agency to establish and maintain effective collaboration with all key stakeholders operating in GI sector of Pakistan. Decisions such as core datasets, standards and policy matters etc require a multiple-stakeholder team. And the team needs a team leader that can unite all players to put their brains together. The coordinating body will serve as a team leader. It will help to shape a consensus based vision, mission and strategic plan as well its implementation. The

coordinating body is required to be comprised of representatives from the federal, provincial, and district levels. The coordinating body shall be instrumental in the smooth coordination of and consensus based decision making with respect to NSDI implementation.

Recommendations: A coordinating body is required.

Phase-I: Policy Tier

This phase covers aspects of 1st priority i.e. accessibility of Geographic data, data sharing policies, map policy, awareness building programs, PPP and involvement of NGOs.

Most of the contents of this phase are related with policy matters. For example, available Geographic data in public sector can only be accessed fully if consensus based map policy and data sharing policy exist. But policies are approved by governments and governments are led by politicians. Therefore, political support is needed not only to improve existing policies like map policy as well as framing of new policies like data sharing policy but the same should also be user friendly. As PPP can serve the purpose to get political support therefore, in the context of PPP, arrangements can be made to achieve this objective i.e. policy formulation and revision. Revised map and data sharing policies should address matters relating to ownership, pricing, copy rights and liability etc. once these policies are in place, private sector can also play its role to develop new and innovative solutions as partners of public sector. A spatial data policy i.e. combination of revised map policy and data sharing policy is needed.

*Recommendations***:** A comprehensive spatial data policy is required.

NGOs can play a vital role for awareness building programs and also as a mediator (catalyst) between public and private sector for PPP. The involvement of NGOs can bring multiple benefits such as awareness building programs, social benefits, local knowledge, and community mobilization as well as monitoring because they operate and can operate far from big cities where public sector organizations can't. These benefits are backbone for implementation of strategies such as NSDI.

*Recommendations***:** Involvement of NGOs is required.

Phase-II: Technology Tier

2nd priority area includes aspects such as uniform standards, metadata, services, mode of data/information delivery, data updation and spatial databases.

Once policy hurdles to access and share data are removed and more helping hands such as private sector and NGOs are available, it is then the time to explore for innovative technical solution for better management and delivery of services.

Comprehensive set of uniform standards (e.g. metadata standards and data exchange standards) is essential to harmonize present and future GI collections in order to build spatial databases without facing problems of interoperability. But it requires input from major GI stakeholder groups to reach an agreement for uniform standards. PPP involves two major GI stakeholders i.e. public and private. Therefore, in the context of PPP, consensus can be achieved for uniform set of standards.

Recommendations: A set of uniform standard is required to be decided and implemented.

The updating cycle of data collected by public sector organizations is fairly rough which ranges from five to ten years. Updating is done with traditional survey methods i.e. field surveys. But faster and better output oriented solutions such as use of RS and GPS can be applied for this task. Private sector is leading in this field therefore, this sector may be involved to share knowledge and expertise on modern data collection/ updating techniques.

*Recommendations***:** Updated data is required.

Once data is standardized and updated then it should be managed into databases to respond quickly to service demands. It would facilitate to overcome 'duplication of efforts' while saving time and money but providing efficient services. Public sector organizations lack database development concept whereas private sector is capable of doing the job. Therefore, the job of database development can be given to private sector that is possible in PPP.

*Recommendations***:** Spatial databases are required.

To explore and exploit available data in a spatial database demands interface mechanisms such as OGC Web Catalogue Services (WC-S), Web Map Services (WMS) and Web Feature Services (WFS). This being relatively new area is not offered by most of the public sector organizations. However, private sector is taking a lead in this direction. As PPP brings innovative and new solutions for public sector organizations therefore, development of such service and their facility mechanisms can be given to private sector partner.

 *Recommendations***:** OGC and value added services are required.

The era of M-Governance (Mobile-Governance) is approaching fast. Data/ information that is not remotely accessible and efficiently deliverable may lose its importance for customers. In the context of PPP, service delivery via electronic media that comes from private sector basically offers many chances for providing such services through PPP arrangements. As an example a website (http://itcnt07/~ali00490/research/) has been developed. The website (Appendix-16) gives access to about 0.14 million records of geographical names database of Pakistan, prepared during study and the website also serves as GI dissemination system.

Recommendations: Efficient service delivery is required.

Phase-III: Socio-Technical Tier
This phase caters the aspects relating to availability of Geographic data, E-government, environment protection policy, PPP policy, capacity building (educational and professional), community protection initiatives and private sector's capacity for development of technical component of NSDI.

All GI is not in digital format yet in Pakistan. The level of expertise and resources differs from federal to local governments. In PPP, arrangement can be made to involve private sector to do this task e.g. outsourcing.

*Recommendations***:** All Geographic data in digital format is required.

Current E-government policy includes programs such as development of GIS and Land Records Management Information System by involving private sector but GIS or spatial portal is not part of the E-government portal. In PPP context, arrangements can be made to involve private sector to do this job as found during empirical work in Pakistan. Private sector is capable of developing GIS

portal, and necessary tools to extract data. Every GI organization can develop its portal and then link it to main GIS portal present in E-government web pages.

*Recommendations***:** GIS portal is required to be part of E-government portal.

Pakistan needs a comprehensive capacity building (educational and professional) program because it has been observed that GI organizations lack GI management concepts. GI managers need to focus on GI management rather than its production. The specific knowledge being innovative and relatively new exists in private sector. In PPP, arrangement can be made to involve private sector in these kinds of capacity building programs.

*Recommendations***:** Capacity building programs focused on GI management are required.

Presently, environment protection, community protection (e.g. disaster management) and PPP policy are individually focusing on different aspects e.g. nature conservation, social benefits to communities and physical infrastructure development programs in a fragmented and isolated manner. Public and private sector organizations and NGOs are operating in a haphazard manner in these programs. As GI is common denominator to all these programs, they are required to be integrated in a bigger approach such as National Spatial Data Infrastructure (NSDI).

*Recommendations***:** National Spatial Data Infrastructure (NSDI) development is required to address diverse social-technical needs.

Private sector has capacity to build technical components of NSDI in Pakistan. Therefore, private sector as a partner is required in NSDI implementation in Pakistan.

*Recommendations***:** Private sector as NSDI partner is required.

Phase-IV: Supportive Tier

NSDI development and implementation is not an end in itself. It requires continuous maintenance and support. It may take off with existing resources but gradually it needs to be widened in terms of stakeholders, data, services and policies etc. Therefore, this tier can be seen as supportive to all above tiers. Georeferenced, attributed data, hard/Software and willingness to share fall in the domain of this phase. Though all these elements are measured as 'high' but still not entire data is georeferenced and attributed. In PPP environment, arrangements can be made to involve private sector to prepare tabular (attribute) data that can be linked to data prepared by public sector.

*Recommendations***:** Entire data is required to be georeferenced and attributed.

Open source software developed in local languages can contribute a lot towards speeding up existing 'NSDI like' activities within PPP context.

Recommendations: Open source software with interface in local language is required.

Willingness has been shown by both public and private sectors. It needs to be transformed into trust and actions. PPP can help to serve this purpose.

*Recommendations***:** Willingness of partners towards PPP needs to be converted into PPP projects.

5.5.   Summary and Conclusions

Elements of PPP-based NSDI implementation strategy in Pakistan include:

1) Implementation phases. 2) A coordinating body. 3) Involvement of key stakeholder groups 4) Spatial data policy. 5) Capacity building. 6) Updated GI. 7) Uniform standards 8) Spatial databases. 9) Efficient service delivery. 10) OGC/value added services. 11) Spatial Portal. 12) High speed internet connectivity. 13) Entire data in digital form. 14) NSDI development as priority. 15) Entire data Georeferenced/attributed. 16) Open source software 17) PPP and 18) Team spirit

6. Conclusions and Recommendations

6.1. Introduction

This chapter summarizes over all conclusions of the research to address objectives of the research. The next section 6.2 presents conclusions that are drawn from the previous chapters. Then the recommendations for further research are given in section 6.3.

6.2. Conclusions

This research has been made on the most current, realistic, demanding and significant, but very difficult issue. It integrates knowledge and expertise from three major disciplines that include SDI, Public Administration and Economics. This research reveals that there is disparity in views of 'Gurus' on specific issues related with the research. The research has proved to be a huge undertaking with four objectives and nine research questions.

Sub objective I: To explore Public-Private Partnership (PPP) as a mechanism of NSDI implementation.

There is a relationship between PPP and NSDI. A close study reveals that without PPP, NSDI implementation will be meaningless and facile. PPP brings political support and funding, promotes sharing culture such as risks and rewards among partners, reduces gap between public and private sector, promotes bottom up approach, promote data democratization, and integrates accountability and service delivery to facilitate NSDI implementation.

Sub objective II: To understand to what extent the current state of Indian NSDI is due to lack of PPP as an implementation mechanism.

Findings of chapter 3 reveal that due to lack of PPP as an implementation mechanism, Indian NSDI failed to bridge the gap between public and private sectors, to reduce bureaucratic inertia and monopoly of public sector as well as to promote data democratization. Consequently, it faced severe difficulties at implementation stage and suffered from significant delay.

Sub objective III: To determine to what extent Pakistan's socio-administrative culture and the state of GI private sector is conducive to PPP.

A close examination of findings of chapter 4 reveals that the attitude of government and private sector towards PPP for the projects of public interest is favorable and encouraging. Both sectors have shown willing to support PPP which is already in fact being practiced in many projects and more are in the pipe line. The policy framework towards PPP in Pakistan is conducive as it underscores the need of having PPP in all sectors and its importance has never been denied.

Sub objective IV: To spell out elements for a PPP-based NSDI strategy in Pakistan.

Elements of PPP-based NSDI implementation strategy in Pakistan include:
1) Implementation phases. 2) A coordinating body. 3) Involvement of key stakeholder groups 4) Spatial data policy. 5) Capacity building. 6) Updated GI. 7) Uniform standards 8) Spatial databases. 9) Efficient service delivery. 10) OGC/value added services. 11) Spatial Portal. 12) High speed internet connectivity. 13) Entire data in digital form. 14) NSDI development as priority. 15) Entire data Georeferenced/attributed. 16) Open source software 17) PPP and 8) Team spirit

6.3.   Recommendations for Further Research

Michael Wegener once wrote that "Everything that happens, happens somewhere in space and time".
Because of limited 'time and space' this research work is focused on exploring the potential of PPP for NSDI implementation in Pakistan. The research highlights needs, potentials and added value of PPP for NSDI implementation from technical, financial and implementation aspects. NSDI implementation is a huge undertaking and many more aspects are related to it. The research in this domain is therefore a continuous process. The recommendations for further research are:

- Legal aspects such as ownership and liability, needs attention in NSDI because many players are involved in its development and implementation. Therefore, how PPP can help to overcome these issues is recommended for further research.

- Almost no social components of NSDI and their parameters exist in literature studied during this research. Therefore, further research is recommended in this direction, too.

- As explored during the research operation, things on ground sometimes do not conform to educational talks which means that SDI developments may not be matching to what is being written and taught. A gap therefore exists between theory and practices in SDI domain even in the 'developed' world. This is a dilemma and therefore, future research is required to be orientated in this important direction that why this gap exists.

Concluding Remarks

Pakistan is already in an advantageous position to implement NSDI through PPP, because a) it has political support b) it has institution such as IPDF that is dedicated to support PPP projects c) GI private sector is fully convinced with the idea of NSDI development and is capable of developing basic technical components of NSDI d) It has e-government to support PPP and accommodate NSDI and d) it has culture and national character characterized by volunteerism, endowment and sacrifice for nation building tasks. Keeping in view the current national scenario, regional and international support it can rightly be stated that there is vehement potential of PPP for NSDI implementation in Pakistan.

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Appendices

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Appendix-1
</div>

Questionnaire Design Template: Pub: Stands for Public sector, and Pri stands for Private sector   **Page 1 of 5**

SDI Component	Parameter	Question Asked (From)
Geospatial Data	Availability of spatial data	Please give details of geographic data produced by your organization (Pub) Format of the table provided *[table: Sl No. | Product | Scale | Format (Analogue | Digital) | Updating Frequency | Contents]* Which of the following data is provided by your company? (Pri) 14 choices were given, including Others (Please specify)…….
	Georeferenced	Digital data produced is: (Pub and Pri)
	Attributed	☐ Georeferenced ☐ Not Georeferenced ☐ With attributes ☐ Without attributes
Databases	status	What % of digital data is in a database? (Pub and Pri) ☐ 100% ☐ 50% ☐ 25% ☐ Less than 25% ☐ Not in database
	Online Database	Is data in database accessible through internet/intranet? (Pub and Pri) (　　) Yes　　　　　　　　　　　　　　(　　) No
Standards	Adoption of Standards	Is data of the organization prepared on certain standards? (Pub and Pri) (　) Yes　　　　　　　(　) No If Yes, then please specify which standards are being used?
Metadata	Adoption of Standards	Which editor is being used? ……………………………….. (Pub and Pri)

Geo-ICT	Communication	Website of the organization? (Pub)
		Does your company have website? (Pri) ( ) Yes ( ) No If yes please give website address of your company? http://-- Which of the following is available in your organization? (Pub) ☐ Internet ☐ Intranet ☐ None Which of the following communication networks are you using? (Pri) ☐ Intranet ☐ Internet ☐ GSM Network ☐ GPRS Network ☐ WLAN ☐ LAN ☐ WAN
	Hardware	Which hardware exists in the organization? (Pub) ☐ PC Stand alone= ☐ PC Networked= ☐ Server= ☐ Scanner= ☐ Plotter= ☐ GPS= ☐ Total Station=
	Software	Which GIS software are you using? (Pub) ☐ ArcGIS ☐ GeoMedia ☐ MapInfo ☐ uDig ☐ Other (Please specify)---------- Which database management system (DBMS) are you using? (Pub)

		☐ Oracle Spatial ☐ ArcSDE ☐ PostgreSQL ☐ MySQL ☐ Other (Please specify)---------- Which Image processing software are you using? (Pub) ☐ Erdas Imagine ☐ ER Mapper ☐ ILWIS ☐ IDRISI ☐ Other (Please specify)---------- Do you use any open source software? (Pub) ( ) Yes ( ) No Which of the following ICT facility do you use currently? Tick appropriate boxes, please. (Pri) PC Server GIS Software Image Processing Software ☐ Stand alone ☐ IBM ☐ ESRI ArcGIS ☐ Erdas Imagine ☐ Work group ☐ Dell ☐ GeoMedia ☐ ILWIS ☐ Domain networked ☐ Sun ☐ MapInfo ☐ ER Mapper ☐ Others ☐ Others ☐ Others ☐ Others
Delivery Mechanism	Mode	What is your mode of data delivery? (Pub and Pri) ▪ Post ▪ Website ▪ Other (please specify)**…………………**.

Questionnaire Design Template   **Page 4 of 5**

Services	Value Added Services	Do you provide value added services (such as mobile mapping, tracking services, spatial analysis and image processing etc) to your customers? (Pub and Pri)
	OGC	Which of the following OGC specifications have you implemented? (Pub and Pri) Choices Given: Catalogue Service , Web Map Service (WMS), Web Feature Service (WFS)
Data Policies and Legislation	Accessibility	Is all data produced by the organization, available for every one? (Pub)
	Data sharing	Does any policy or legal framework exist for geographic data sharing? (Pub) Are government policies limiting your organization in providing data to every one? (Pub) Existing rules and regulations support public private partnership in Pakistan? (Pri) Choices Given: Strongly Agree, Agree, Neither Agree Nor disagree, Disagree, Strongly disagree
Capacity Building and Awareness programs	Training	Education and training is important for public private partnership management at different levels, for both public and private sectors to implement NSDI in Pakistan. (Pub and Pri) Choices Given: Strongly Agree, Agree, Neither Agree Nor disagree, Disagree, Strongly
Partnerships	Role	Which role your organization can play for establishing PPP in Pakistan?
	Resources	What resources are needed to help you establish public private partnership?
	Outsourcing	Does your organization outsource part of your work to private sector? (Pub) ( ) Yes ( ) No
	Previous Partnership Experience	Have you been engaged in any public private partnership (Pub and Pri)? ( ) Yes ( ) No if Yes then Which **ONE** benefit is the most important to your organization?
	Willingness/support	What is the potential of public private partnership for NSDI in Pakistan? Choices Give: Very Good, Good, Low, Very Low, No

Questionnaire Design Template   **Page 5 of 5**

Development Capacity of Private Sector	Data Tools	Can you help to develop tools to discover, access, extract, and process etc data present in databases? ( ) Yes ( ) No If yes can you develop these tools in national language? ( ) Yes ( ) No
		Can you help to develop tools to resolve heterogeneity problem of different databases? ( ) Yes ( ) No
	Databases	Can you help to develop databases? ( ) Yes ( ) No If yes please explain how? ---
	Metadata development	Can you help to create metadata? ( ) Yes ( ) No If yes, can you develop metadata in national language? ( ) Yes ( ) No
	Portal	Can you help to develop GIS portal? ( ) Yes ( ) No If yes, can you please develop its interface in national language?
	Access Network	Which networks can you help to establish? Given Choice: Intranet, Internet, GSM, GPRS, LAN, WAN

Appendix-2

Public Private Partnership (PPP) Questionnaire
(Private GI Sector)

Identification

.
Name of Respondent:……………………………………………………………………

Name of company:...

Postal Address of company: …………………………………………………………………

……………………………………………………………………………………………….

For how long are you working in this company?...

E-mail:…………………………………………

Telephone Number: ……………………   Fax Number……………………………..

Date:……………………

Glossary:

Partnership: A formal or informal arrangement between two or more partners for the common benefit of each. In this questionnaire a partnership refers to an arrangement for sharing spatial data or resources.

Public Private Partnership (PPP): It is a system in which a government service or private business venture is funded and operated through a partnership of government and one or more private sector companies.

Information Technology (IT): As defined by the Information Technology Association of America (ITAA), is "the study, design, development, implementation, support or management of computer-based information systems, particularly software applications and computer hardware." In short, IT deals with the use of electronic computers and computer software to convert, store, protect, process, transmit and retrieve information, securely. Recently it has become popular to broaden the term to explicitly include the field of electronic communication so that people tend to use the abbreviation ICT (Information and Communications Technology).

National Spatial Data Infrastructure (NSDI): The NSDI will provide a base or structure of relationships among data producers and users that will facilitate data sharing. The increased ability to share data through common standards and networks will, in turn, serve as a stimulus for growth, and sustainable national development.

E-Government: It refers to government's use of information technology to exchange information and services with citizens, businesses, and other arms of government.

GI: Geoinformation. Geoinformation is an abbreviation of geographic information. Geographic information is created by manipulating geographic (or spatial) data generally known by the abbreviation geodata in a computerized system.

GIS: Geographic Information System. A term used to describe the digital mapping and information system used by many local governments.

Metadata: Metadata is the term used to describe the summary information or characteristics of a set of data.

Open Geospatial Consortium (**OGC**)**:** It is an international voluntary consensus standards organization. It supports the development and implementation of standards for geospatial content and services, GIS data processing and exchange. It was previously known as **Open GIS Consortium**.

OGC Catalogue Services: Catalogue Services Specification defines common interfaces to discover, browse, and query metadata about data, services, and other potential resources.

OGC Web Map Service (WMS): WMS produces maps of spatially referenced data dynamically from geographic information.

OGC Web Feature Service: It provides an interface allowing requests for geographical features across the web using platform-independent calls.

Open Source Software: Source code of such software is available under a license (or arrangement such as the public domain) that permits users to use, change, and improve the software, and to redistribute it in modified or unmodified form.

Part 1-Company

1. In which year was your company established?..

2. Does your company have website?
    (   ) Yes   (   ) No

    If yes please give website address of your company?
    http://...

3. At which level your company serves? Tick the most appropriate, please.
    .
    - International
    - National
    - Provincial
    - District
    - Others (please specify)…………………………

1.1 Business Goals

4. What is the core business of your company?

    ……………………………………………………………………………………………
    ……………………………………………………………………………………………
    ……………………………………………………………………………………………
    ……………………………………………………………………………………………

5. What are the business goals of the company?
    ……………………………………………………………………………………………
    ……………………………………………………………………………………………
    ……………………………………………………………………………………………
    ……………………………………………………………………………………………

1.2 Human Resources

6. What is the total number of staff employed within the company? ……………..

7. How many of them are technical? ………………………….

8. What is their professional background? Tick the most appropriate, please.

☐ Civil Engineering   ☐ Marketing   ☐ GPS   ☐ Remote Sensing

☐ Geological Engineering ☐ Administration   ☐ GIS   ☐ Cadastre

☐ Agricultural Engineering ☐ Project Management ☐ Geodesy   ☐ Environmental Science

☐ Information Technology ☐ Finance   ☐ Geography ☐ Capacity Building

☐ Others (Please specify)…………………………………

9. What is their professional qualification?

    Example:

    | ☐ Master of Science= 3 | ☐ Graduates=20 |

    ☐ Doctorate=   ☐ Master of Science=   ☐ Engineering=   ☐ Graduate=

    ☐ Diploma=   ☐ Certificate=

    ☐ Others (Please specify)…………………………………

1.3 ICT Resources

Which of the following ICT facility do you use currently? Tick appropriate boxes, please.

PC	*Server*	*GIS software*	*Image processing software*
☐ Stand alone	☐ IBM	☐ ESRI ArcGIS	☐ Erdas Imagine
☐ Work group networked	☐ Dell	☐ GeoMedia	☐ ILWIS
☐ Domain networked	☐ Sun	☐ MapInfo	☐ ER Mapper
☐ Others	☐ Others	☐ Others	☐ Others

Part 2- Technical Expertise

2.1 Data, Databases, and Services

10. Which of the following data is provided by your company?

☐ Topographic	☐ Cadastre	☐ Transportation	☐ Elevation
☐ Hydrology	☐ Ortho Imagery	☐ Administrative units	☐ Property Tax
☐ Income Tax	☐ Soil	☐ Geology	☐ Crops

☐ Others (Please specify)…………………………………….

11. What % of data is in digital format?

( ) 100%   ( ) more than 50%   ( ) less than 50%   ( ) 0%

12. Digital data produced is:

☐ Georeferenced   ☐ Not Georeferenced   ☐ With attributes   ☐ Without attributes

☐ None of these

13. What % of digital data is in a database?

☐ 100%   ☐ 50%   ☐ 25%   ☐ Less than 25%

☐ Not in database

14. Is data in database accessible through internet/intranet? Please skip if no database exists

    (   ) Yes   (   ) No

15. Can you help to develop databases?   (   ) Yes   (   ) No

16. If yes please explain how?
    ……
    ……
    ……

17. Can you help to develop tools to discover, access, extract, and process etc data present in databases?

    (   ) Yes   (   ) No

18. If yes can you develop these tools in national language?   (   ) Yes   (   ) No

19. Can you help to develop tools to resolve heterogeneity problem of different databases?

    ☐ Yes   ☐ No

20. Which of the following OGC specifications have you implemented?
    • Catalogue Service
    • Web Map Service (WMS)
    • Web Feature Service (WFS)
    • None of these

21. Do you provide value added services (such as mobile mapping, tracking services, spatial analysis and image processing etc) to your customers?

☐ Yes   ☐ Not right now but plan to provide   ☐ No

22. If yes, then please specify which value added services you are providing

23. If No, What are the main difficulties faced by your company to provide value added service?
    ▪ Lack of required data
    ▪ Lack of necessary technology

- Lack of skills
- Lack of customers
- Others (please specify)…………………………………………………..

24. Are you looking for support from public organizations that can help you to add value to your business?

( ) Yes   ( ) No

2.2 Delivery Mechanism

25. What is mode of delivery for data/services?
    - Post
    - Internet
    - Other (please specify)**…………………**.

26. Can you help to develop GIS portal?   ( ) Yes   ( ) No

27. If yes, can you please develop its interface in national language?

    ☐ Yes   ☐ No

2.3 Standards

28. Does your company create data on certain standards?

    ( ) Yes   ( ) No

    If **yes**, then please specify

    Which standards are being used?.....................................

    Which editor is being used? ………………………………..

29. Can you help to create metadata?   ☐ Yes   ☐ No
30. If yes, can you develop metadata in national language?

    ☐ Yes   ☐ No

2.3 Communication Network

31. Which of the following communication networks are you using?

    ☐ Intranet   ☐ Internet   ☐ GSM Network   ☐ GPRS Network

    ☐ WLAN   ☐ LAN   ☐ WAN

32. Which networks (mentioned above) can you help to establish?

    ……

………

………

33. How many servers or websites of your company are directly accessible by external users/customers?

…………………………………………………………………………………………….

Part 3 – Public Private Partnership (PPP)

34.   Have you been engaged in any partnership with government?

(   ) Yes   (   ) No

1. If **Yes**, please give following details:

Project Name	
Name of Partner(s)	
Purpose of Project	
Location (Province name only, please)	
Duration	

Project Name	
Name of Partner(s)	
Purpose of Project	
Location (Province name only, please)	
Duration	

Project Name	
Name of Partner(s)	
Purpose of Project	
Location (Province name only, please)	
Duration	

Project Name	
Name of Partner(s)	
Purpose of Project	
Location (Province name only, please)	
Duration	

Project Name	
Name of Partner(s)	
Purpose of Project	
Location (Province name only, please)	
Duration	

*Please feel free to use additional page(s) incase of more partnership projects.

2. Please list major benefits that your organization have received from this partnership?
   ……………………………………………………………………………………………………
   ……………………………………………………………………………………………………
   ……………………………………………………………………………………………………
   ……………………………………………………………………………………………………
3. Which **ONE** benefit is the most important to your organization?
   ……………………………………………………………………………………………………

35. Do you know some where else any public private partnership in GI or ICT or E-Government related projects, being practiced?

(   ) Yes   (   ) No

1. If yes please give the details below:

Project Name	
Name of Partner(s)	
Purpose of Project	
Location (Province name only, please)	
Duration	

Project Name	
Name of Partner(s)	
Purpose of Project	
Location (Province name only, please)	
Duration	

Project Name	
Name of Partner(s)	
Purpose of Project	
Location (Province name only, please)	
Duration	

Project Name	
Name of Partner(s)	
Purpose of Project	
Location (Province name only, please)	
Duration	

Note: Please feel free to use additional page(s) if needed.

36. What benefits do you expect from public private partnership? Please specify briefly.

………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………

37. What resources are needed to help you establish public private partnership?

………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………

38. What are the main problems related to public private partnership?

………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………

39. Which role your organization can play for establishing public private partnership?
………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………

40. What is the potential of public private partnership for NSDI in Pakistan?

☐ Very good   ☐ Good   ☐ Low   ☐ Very Low

☐ No

Part 4-Finance

41. Can you provide some or all finance to support public private partnership for NSDI in Pakistan?

☐ Yes, some finance   ☐ Yes, all finance   ☐ No

42. If yes, what do you expect from public organizations?

Part 5-Legal Frame Work

43. Existing rules and regulations support public private partnership in Pakistan? Please tick the appropriate

☐ Strongly Agree   ☐ Agree   ☐ Neither agree nor disagree   ☐ Disagree

☐ Strongly disagree

44. If you do not agree, then what do you suggest, please?

…………………………………………………………………………………..

…………………………………………………………………………………..

Part 6-Education and Training

45. Education and training is important for public private partnership management at different levels, for both public and private sectors to implement NSDI in Pakistan.

☐ Strongly Agree   ☐ Agree   ☐ Neither agree nor disagree   ☐ Disagree

☐ Strongly disagree

Thank you for your kind cooperation in completing this questionnaire. For any further reference, please contact:

Asmat Ali

ali00490@itc.nl

Mobile: 03335101578

<u>**Appendix-3**</u>

Public Private Partnership (PPP) Questionnaire
(GI Public Sector)

Identification

.

Name of Respondent: …………………………………………………………………………..

Designation: ………………………………………………………………………………….

Name of Organization: …………………………………………………………………………

Website of organization: http://..

Postal Address: …………………………………………………………………………………

…………………………………………………………………………………………………..

E-mail: ……………………………………………………

Telephone Number: ……………………………………………………………………………

Fax Number: ……………………………………………………………………………………

For how long are you working in this organization? ....

Date:………………………………………………………………………………………….

Glossary:

Partnership: A formal or informal arrangement between two or more partners for the common benefit of each. In this questionnaire a partnership refers to an arrangement for sharing spatial data or resources.

Public Private Partnership (PPP): It is a system in which a government service or private business venture is funded and operated through a partnership of government and one or more private sector companies.

Information Technology (IT): As defined by the Information Technology Association of America (ITAA), is "the study, design, development, implementation, support or management of computer-based information systems, particularly software applications and computer hardware." In short, IT deals with the use of electronic computers and computer software to convert, store, protect, process, transmit and retrieve information, securely. Recently it has become popular to broaden the term to explicitly include the field of electronic communication so that people tend to use the abbreviation ICT (Information and Communications Technology).

National Spatial Data Infrastructure (NSDI): The NSDI will provide a base or structure of relationships among data producers and users that will facilitate data sharing. The increased ability to share data through common standards and networks will, in turn, serve as a stimulus for growth, and sustainable national development.

E-Government: It refers to government's use of information technology to exchange information and services with citizens, businesses, and other arms of government.

GI: Geoinformation. Geoinformation is an abbreviation of geographic information. Geographic information is created by manipulating geographic (or spatial) data generally known by the abbreviation geodata in a computerized system.

GIS: Geographic Information System. A term used to describe the digital mapping and information system used by many local governments.

Metadata: Metadata is the term used to describe the summary information or characteristics of a set of data.

Value Added Services: The services which are different from core or standard services such as to provide a map or data is a core service where as to provide map or data which shows shortest path to nearest facility is a value added service. Core data is required to build value added services on it.

Open Geospatial Consortium (**OGC):** It is an international voluntary consensus standards organization. It supports the development and implementation of standards for geospatial content and services, GIS data processing and exchange. It was previously known as **Open GIS Consortium**.

OGC Catalogue Services: Catalogue Services Specification defines common interfaces to discover, browse, and query metadata about data, services, and other potential resources.

OGC Web Map Service (WMS): WMS produces maps of spatially referenced data dynamically from geographic information.

OGC Web Feature Service: It provides an interface allowing requests for geographical features across the web using platform-independent calls.

Open Source Software: Source code of such software is available under a license (or arrangement such as the public domain) that permits users to use, change, and improve the software, and to redistribute it in modified or unmodified form.

Part 1-Organization

1. Which organization are you representing in response to this questionnaire? Tick the appropriate, please.
    - ▪ Federal Government
    - ▪ Provincial government
    - ▪ Local (e.g. district, city government etc)
    - ▪ Academia & Research
    - ▪ Non government organization (NGO)
    - ▪ Other (please specify)………………………

2. What is the mandate of your organization? Please describe briefly.
    …………………………………………………………………………………………………
    …………………………………………………………………………………………………
    …………………………………………………………………………………………………

3. What are the goals of the organization? Please describe briefly.
    …………………………………………………………………………………………………
    …………………………………………………………………………………………………
    …………………………………………………………………………………………………

4. Which of the following is available in your organization?
    ☐ Internet   ☐ Intranet   ☐ None

Part 2-Resources

2.1 Data

5. Please give details of geographic data produced by your organization.

Sl No.	Product	Scale	Format		Updating Frequency	Contents
			Digital	Analogue		
Example	Topographic map	1:50,000	✓	✓	5 years	Admin boundary, water bodies, transportation network, contours etc
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

Note: Please feel free to use additional / separate page if you like.

6. Digital data produced is:

☐ Georeferenced   ☐ Not Georeferenced   ☐ With attributes   ☐ Without attributes

☐ None of these

7. What % of digital data is in a database?

☐ 100%   ☐ 50%   ☐ 25%   ☐ Less than 25%

☐ Not in database

8. Is data in database accessible through internet/intranet ? Please skip if no database exists

    (   ) Yes   (   ) No

2.2 Software

9. Which GIS software are you using?

☐ ArcGIS   ☐ GeoMedia   ☐ MapInfo   ☐ uDig

☐ Others (please specify)…………………..

10. Which database management system (DBMS) are you using? Please skip if you don't have database.

☐ Oracle Spatial   ☐ ArcSDE   ☐ PostgreSQL   ☐ MySQL

☐ Others (Please specify) …………………..

11. Which Image processing software are you using? Please skip if you don't use remote sensing

☐ Erdas Imagine   ☐ ER Mapper   ☐ ILWIS   ☐ IDRISI

☐ Others (Please specify) …………

12. Do you use any application software (Such as Tools to access and deliver data etc) which has interface in national or local language?

    (   ) Yes   (   ) No

13. If yes, by which sector it was developed:

- Public Sector
- Private Sector
- Joint effort

14. Do you use any open source software?   (   ) Yes   (   ) No

2.3 Hardware

15. Which hardware exists in the organization?

| Example: | PC Stand alone=10 | PC Networked=40 | Server=05 |

☐ PC Stand alone=   ☐ PC Networked=   ☐ Server=   ☐ Scanner=

☐ Plotter=   ☐ GPS=   ☐ Total Station=

16. For repairing of hardware (after expiry of warranty period) what do you do?

(   ) Get it fixed by employee of the organization

(   ) Get it fixed by some company

2.4 Human

17. Does your organization recruit IT people? (   ) Yes   (   ) No

If No, then please specify that from where you get IT support:

(   ) Ask some other government organization

(   ) Ask private sector to support

(   ) Others (please specify)……………………………………………………

2.5 Financial

18. How is your organization funded?

(   ) Fully funded by the government

(   ) Partially funded by the government and partially by recovery of costs through sales

(   ) Others (Please specify)……………………………………………………..

19. How does the budget change every year?
(   ) Increasing   (   ) Decreasing   (   ) No change
(   ) Others (Please specify)…………………………………………………..

20. If decreasing, then do you plan to collaborate with private sector to launch new products/services
(   ) Yes   (   ) No

Part 3-Delivery Mechanism

21. What is your mode of data delivery?
    ▪ Post
    ▪ Website
    ▪ Other (please specify)**………………**.

Part 4-Services

22. Which of the following OGC specifications have you implemented?
    • Catalogue Service
    • Web Map Service (WMS)
    • Web Feature Service (WFS)

23. Do you provide value added services (such as mobile mapping, tracking services, spatial analysis and image processing etc) to your customers?

☐ Yes   ☐ Not right now but plan to provide   ☐ No

24. If yes, then please specify which value added services are you providing to private sector, and citizens.

Service	Customer

25. If No, What are the main difficulties faced by your organization to provide such service?
    ……………………………………………………………………………………………
    ……………………………………………………………………………………………
    ……………………………………………………………………………………………

26. Is your organization looking for solution partner from private sector for delivery of such value added services?

☐ Yes   ☐ No

Part 5-Standards

27. Is data of the organization prepared on certain standards?

 ( ) Yes   ( ) No

28.   If **yes**, then please specify

       Which standards are being used? ……………………………..

       Which metadata editor is being used?..

Part 6–Policy and Legal Framework

29. Is all data produced by the organization, available for every one?

   ( ) Yes   ( ) No, for internal use only

   ( ) For government organizations only   ( ) others (Please specify below)

   ……………………………………………………………………………………………
   ……………………………………………………………………………………………
   ………………………………………………………………………………………

30. Are government policies limiting your organization in providing data to every one?

   (   ) Yes   (   ) No

  If yes, please specify which
  policies?………………………………………………………………………………………
  ……………………………………………………………………………………………
  ……………………………………………………………………………………………

31. Does your organization outsource part of your work to private sector?

   (   ) Yes   (   ) No

    If No, please specify the
  reasons:………………………………………………………………………………………
  ……………………………………………………………………………………………
  …………………………………………………………………………………

32. Does any policy or legal framework exist for geographic data sharing?

   (   ) Yes   (   ) No

Part 7 – Public Private Partnership (PPP)

Public Private Partnership (PPP): It is a system in which a government service or private business venture is funded and operated through a partnership of government and one or more private sector companies.

33. Have you been engaged in any public private partnership (PPP)?

    (   ) Yes   (   ) No

    1. If **Yes**, please give following details:

Project Name	
Name of Partner(s)	
Purpose of PPP	
Location (Province name only, please)	
Duration	

    *Please feel free to use additional page(s) incase of more partnership projects.

    2. Please list major benefits that your organization have received from this partnership?

    ………………………………………………………………………………………………
    ………………………………………………………………………………………………
    ………………………………………………………………………………………………

    3. Which ONE benefit is the most important to your organization?

    ………………………………………………………………………………………………

34. Do you know some where else PPP in GI or ICT or E-Government related projects, being practiced?

    (   ) Yes   (   ) No

    2. If yes please give the details below:

Project Name	
Name of Partner(s)	
Purpose of PPP	
Location (Province name only, please)	
Duration	

35. What benefits do you expect from PPP? Please specify briefly

    …………………………………………………………………………………………………
    …………………………………………………………………………………………………
    …………………………………………………………………………………………………

36. What resources are needed to help you establish PPP?

    …………………………………………………………………………………………………
    …………………………………………………………………………………………………
    …………………………………………………………………………………………………

37. What are the most important difficulties related to PPP?

    …………………………………………………………………………………………………
    …………………………………………………………………………………………………
    …………………………………………………………………………………………………

38. Which role your organization can play for establishing PPP in Pakistan?

    …………………………………………………………………………………………………
    …………………………………………………………………………………………………

39. What is the potential of PPP in GI domain of Pakistan?

    ☐ Very good   ☐ Good   ☐ Poor   ☐ No

Part 8-Education and Training

40. Education and training is important for public private partnership management at different levels, for both public and private sectors to implement NSDI in Pakistan.

    ☐ Strongly Agree   ☐ Agree   ☐ Neither agree nor disagree   ☐ Disagree

    ☐ Strongly disagree

Thank you for your kind cooperation in completing this questionnaire. For any further reference, please contact:

Asmat Ali
ali00490@itc.nl
Mobile: 03335101578

Appendix-4

WORKSHOP

National Spatial Data Infrastructure (NSDI) in Pakistan
27th September 2007, IGIS – NUST, Islamabad, Pakistan

Organized By
- **Institute of Geographical Information Systems**
  National University of Sciences & Technology (NUST), Islamabad
- **IEEE/GRSS/AESS Chapter, Islamabad Section**

In collaboration with
ITC Alumni Association, Pakistan

Resource Person

Mr. Asmat Ali
Department of Geoinformation Management
International Institute for Geo-Information Science and Earth Observation (ITC), The Netherlands

Mr. Zahir Ali
Researcher at the Department of Urban and Regional Planning and Geo-information Management
International Institute for Geo-Information Science and Earth Observation (ITC), The Netherlands

Programme

Time HRS	Activity
1000 – 1010	**Workshop Opening and Welcome Words** **Dr. M. Umar Khattak** Director, IGIS-NUST, Chairman, IEEE/GRSS/AESS Chapter, Islamabad Section
1010 – 1020	**Experience as Pioneer Director General of IGIS** **Engr. Mansoor Malik** DG, Marketing and Industrial Relations, NUST/ Chairman, IEEE Islamabad Section
1020 – 1120	**Needs for National Spatial Data Infrastructure (NSDI) in Pakistan** **Mr. Asmat Ali** **Q/A Session**
1120 – 1200	**Data Collection from the Participants through Questionnaire**
1200 – 1230	**Role of Cadastre in NSDI** **Mr. Zahir Ali** **Q/A Session**
1230 – 1300	**Role of Capacity Building in NSDI** **Dr. M. Umar Khattak** Director, IGIS-NUST, Chairman, IEEE/GRSS/AESS Chapter, Islamabad Section **Q/A Session**
1300 – 1305	**Closing Remarks** **Dr. M. Umar Khattak**

Participants
Academicians, professionals, researchers, government officials, mapping companies, telecommunication service providers, NGOs and other geoinformation stakeholders.

Contact Person
Mubushar Hussain
Assistant Professor
Institute of Geographical Information Systems
National University of Sciences and Technology
112, Street 37, Sector F-10/1, Islamabad-Pakistan
Tel: + 92 51 926 7241- 44 (Four Lines), Fax: + 92 51 9267245, Cell: 0300 9425447
Email: info@igis.edu.pk, mubushar@igis.edu.pk

<u>**Appendix-5**</u>

NESPAK (IT Projects)

(Source: http://www.nespak.com.pk/projects/major.asp?Ar=1&sector=9)

Page 1 of 2

- Automation of QAL

- Computerisation of Registration Deeds

- Punjab Portal

- Basic & Advance Training

- Office Automation

- Computerization of Arms Licenses

- Sialkot Portal Model IT City

- Motor Transport MIS

- Automation of Agriculture Dept.

- Networking of Benches

- Computerization of sub-ordinate judiciary

- Electronic Document Management System

- Prison Management System

- Computerization of 34 Social Welfare Deptt.

- Automation of Live Stock Dept

- Punjab Intranet

- Punjab Public Service Commission

- Computerization of Food Department

- Computerization of Law & Parliamentary Affairs Deptt.

- Lahore WAN

- Computerization of Religious Affairs and Auqaf Deptt.

- Computerization of Lahore General Hospital

- CID Police

- Computerization of Punjab Provencial Cooperative Bank Ltd.

- Computerization of Excise and Taxation Lahore

- Development of FS for Online Recruitment System for FPSC

- Provision of E-Services of Capital Development Authority (CDA)

- E-Enable Solution of Islamabad Police, Islamabad

- Office Automation System for Health Care Development Project

- Computerization of the Land Records

- Billing Software - WASA

- Billing system

- Billing Software

- Development of Management Information System

- E-Services at Commissioner / Deputy Commissioner Offices Project

- Consultancy service for Punjab Municipal Development Fund Company (PMDFC)

- IT Related Services for Capital Development Authority Islamabad Police & Chief Commissioner Office

NESPAK (GIS Projects)

(Source:http://www.nespak.com.pk/projects/major.asp?Ar=2&sector=9)

- Services to PMDFC for 9 Towns

- Conservation and Development of Land and Water Resources of Upper Kaha Hill Torrent Watershed

- Integrated Master Plan for Lahore

- Satellite Image for Model Study on River Ravi

- Satellite Imageries of 42 Cantonments of Pakistan

- Urban Land Availability Information System

- Establishment of Geographical Information System

- GIS based Punjab Roads Information System

- Development of Parcel Database for Karachi Cable Project

- Digital Terrain Model for Ghazi-Barotha Project

- High Resolution Satellite Imageries for Lahore

- Digitized Satellite Mapping of Walton Cantonment, Lahore

- Alborz Integrated Land & Water Management Project

Appendix-6

SWOT Analysis (Pakistan Wetlands GIS Implementation Strategy)

Appendix 7: Summarised results of SWOT assessment

Based on the initial survey, results synthesised from the received responses regarding the various issues are presented collectively below.

Existing GIS/Mapping human resources and their training requirements:
Survey results show that 42% of the respondent organisations have GIS staff whereas only 14% have remote sensing staff. However, 64% of the organisations have information technology (IT) related staff who's skills in GIS/RS techniques could be improved to deal with geo-information and data.

Initial findings show that qualification and skill levels of partner organisations vary a lot. Most of the professional staff of the partner organisations working as GIS professional has either masters or bachelor degrees. Most of them, engaged in GIS/RS applications, have graduated in disciplines other than GIS/RS. Very few people have received proper education and possess skills of GIS and Remote Sensing techniques. Most of the staff has received local level training and field experience in GIS/RS applications.

Most of the organisations informed that beyond technical skills, managers and other professionals dealing with GIS activities need training and greater understanding of the subject matter so that more human resources are produced in this sector. Findings show that 64% of the stakeholder organisations are interested in the basic and mid level GIS/RS training for their staff whereas 36% have asked for advanced level training in the subject matter. For further details see Table 29 and Table30.

Available GIS/RS data with stakeholders and data sharing mechanisms:
Overall findings of consultations relating to geo-information and data are summarised in Table 31. According to the survey 36% stakeholder organisations have vector data layers at various scales for their project areas, whereas same number of organisations have satellite remote sensing data from low to medium resolutions for various applications in their project sites.

Regarding data sharing mechanisms, survey data reveals that there is no established mechanism of data sharing among the data custodians. Seventy nine percent of the respondents are in view of data sharing, however, lack of coordination among stakeholders, no proper data sharing policy, sensitivity of data, lack of sufficient funds and misuse of data are the major concerns in this regard. Most of the respondents have shown interest in sharing human and hardware resources.

Technical infrastructure for GIS data management (hardware and software):
Survey has revealed that most of the respondent organisations have hardware facilities but very limited number of them has GIS/RS facility. Results show that 42% of the respondents have GIS/RS licences of different versions. There are total 18 licences of different GIS softwares and 9 licences of RS software (ERDAS Imagine). Requirement analysis shows there is still lack of such softwares in the government and private sector without which development of spatial datasets is quite impossible (See Table 32).

Appendix-7

WWF – Pakistan Projects

(Source: http://www.wwfpak.org/projects.php)

- Chitral Gol National Park
- Machiara National Park
- Implementation of management plan of Khunjerab National Park.
- Promote Sustainable Harvest of Medicinal plants of Miandam Valley
- Promotion of Medicinal Herbs in Collaboration with Private Sector, Swat
- Boundary Demarcation and Renotification of Protected Areas
- Pakistan Sustainable Cotton Initiative
- Indus for All Programme
- Conservation of High Altitude Wetlands In Northern Pakistan.
- Protection and Management of Pakistan Wetlands Programme
- Environmental Baseline Surveys and Monitoring of Taunsa Barrage Emergency
- Better Management Practices for Water Thirsty Crops Ensuring Sustainable Sources of
- Integrating poverty environmental concerns into the freshwater policy framework of Pakistan.
- Conservation of Indus River Dolphin by improving agriculture resources use in the Lower Indus Basin in Pakistan.
- Indus Basin Water Security
- Saving Wetlands SKY-HIGH
- Joint Implementation of the Karakuram Trust Project Activities in Central Karakuram National Park
- Assessment of Environmental Impacts of implementation of Better Management Practices in Cotton Crop
- Pakistan Indus River Dolphin
- Conservation of Snow Leopard in Pakistan
- Pakistan *Gyps* Vulture Restoration Project
- Conservation of Indus River Dolphin by enhancing rescues from the irrigation canals and raising awareness
- Darwin Initiative Project on Conservation of Pakistan's Marine Cetacean Biodiversity and pelagic environment
- Conservation of Marine Turtles at Sandspit
- Environmental Impact Analysis Study of PET/PETE bottles in Pak
- Clean and Green Lahore Project

Appendix-8

Map Policy (Survey of Pakistan)   **Page 1 of 3**

CONFIDENTIAL

GOVERNMENT OF PAKISTAN
MINISTRY OF DEFENCE

RULES FOR THE PUBLICATION, CLASSIFICATION, ISSUE
AND CUSTODY OF MAPS — 1981.

PART-A/GENERAL

    Whereas it is necessary to afford all legitimate facilities to Government department, private agencies etc entrusted with national development works/projects, to safeguard national security and to prevent classified material from finding its way to unauthorised persons or potential enemies; rules and procedures governing the Publication, Classification, Issue and Custody of Maps as contained in the following paragraphs are issued for compliance by all concerned.

    Note:-   Publication or use of Restricted/Secret Maps by the private agencies without the approval of the Surveyor General of Pakistan/Director Military Intelligence will be liable to be dealt with under the provisions of the Official Secrets Act., 1923.

2. DEFINITIONS. In these rules, unless there is anything repugnant in the subject or context:—

    a) 'Annexure' means an annexure to these rules;

    b) 'Director Military Intelligence' means the Director Military Intelligence (D.M.I)General Headquarters.

    c) 'Government' means the Federal Government;

    d) 'Maps' include charts, plans, prints and reproductions;

    e) 'Top Secret Maps' are those which contain informations of all important munitions of war, the unauthorised disclosure of which would cause grave damage to the state and would jeopardize its security. See list 'A' to Annexure 'A';

    f) 'Secret Maps'

      i) Any information of the nature specified in list 'B' of Annexure 'A';or.

      ii) Information or material which is not of TOP SECRET nature but the disclosure of which to persons other than those whose duty it is to have knowledge of it, would endanger national security and cause serious injury to the interests or prestige of the state, cause serious administrative embarrassment or difficulty, or would be of great advantage to a foreign nation.

      iii) Information or material, the unauthorised disclosure of which, while not endangering national security, would be prejudicial to the interest or prestige of the state, any governmental activity or an individual or would cause administrative embarrassment or difficulty, or be of advantage to a foreign nation.

    g) 'Restricted Maps'

      i) Maps showing information of the nature indicated in list 'C' of annexure 'A' and /or

      ii) Maps on scale larger than 1/M of countries other than Pakistan Printed by Pakistan Government agencies.

      iii) For Pakistan

      All maps or re-issues of old maps of Pakistan on scale ½ inch to one mile or 1/250,000 and larger showing information or the nature in list 'C' of Annexure 'A' and of border areas of Pakistan, including coastal areas, as marked on the index attached as Annexure 'C' subject to sub rule (v) below.

      iv) Sketch index maps showing the progress of Surveys in areas outside Pakistan or in areas containing works of defence or any map giving information concerning the publication of top secret, secret or transfrontier restricted maps.

Contd....P/2.

: - 2 - :

v) Guide maps of important cities of Pakistan and larger scale special project maps although in the RESTRICTED scale may be treated as 'UNRESTRICTED', But the Surveyor General will refer cases falling in Restricted Belt to the Director Military Intelligence for guidance on information to be excluded/included.

h) 'Public Maps'. All maps other than those classified above. All secret and restricted maps can have public Editions after deletion of the items mentioned in lists B&C in Annexure A except in the border and coastal areas as marked on index map attached as Annexure 'C'.

3. Survey of Pakistan is primarily responsible for surveying and mapping in the country but the following agencies may also publish special maps for their own use subject to the security clearance/their publications from Director Military Intelligence before final printing. All such maps will be classified as laid down in para 7 below:

a) Provincial Governments or Administrations.

b) Private firms, Newspaper agencies, other than foreign firms and newspaper agencies.

c) Geological Survey of Pakistan, Meteorological Services, Soil Survey of Pakistan, Pakistan Army, Pakistan Navy and Pakistan Air Force.

d) Autonomous Bodies under Provincial and Federal Governments.

4. All such authorised agencies will get themselves registered with Survey of Pakistan. Survey of Pakistan will allot them a code (Single or a combination of alphabetical letter). All agencies will print this code letter prominently in RED ink. A list of all registered publishing agencies alongwith allotted codes will be forwarded to Director Military Intelligence for security clearance. Subsequent registration will also be intimated by Survey of Pakistan. Private Firms and Newspaper agencies will also require clearance from the Director Military Intelligence before they are registered as agencies for publication of maps provided such agencies do not publish maps of any part of Pakistan on a scale larger than 1/M or maps containing information of the nature specified in Annexure A. Before any maps are published by any registered agency their proofs will be submitted to Survey of Pakistan. Survey of Pakistan will submit all proofs as defined in these rules, to MI Dte for scrutiny. Copyright act will, however, be followed where applicable.

5. Reproduction of maps or a part thereof, except for public maps, should be done after obtaining permission from Director Military Intelligence or all reproductions should confirm to the security classification of the originals. Public editions of secret/restricted maps except areas (Annexure 'C') can also be published after clearance from Director Military Intelligence through Survey of Pakistan. Survey of Pakistan can also scrutinize/clear such editions if specific instructions by Chief of the General Staff, Army is available to them regarding the concerned area.

6. Procedure for security classification of maps:—

a) The security classification of maps produced under the authority of a Provincial Government should remain the responsibility of the Provincial Government, in consultation with the Director Military Intelligence and Director Intelligence Bureau through Survey of Pakistan provided such maps do not give information of the nature specified in Annexure 'A'.

b) Similarly the security classification of maps produced by a private agency will be the responsibility of the Federal or Provincial Government or Administration, in whose jurisdiction the private agency lies, in consultation with the Director Military Intelligence and Director Intelligence Bureau through Survey of Pakistan provided that such agencies do not publish maps of any part of PAKISTAN on a scale larger than 1/M or maps containing information of the nature specified in Annexure 'A'.

An Officer of the States and Frontier Regions Division, not below the rank of a Deputy Secretary.

ISSUE OF CLASSIFIED AIR PHOTOGRAPHS TO CIVIL DEPARTMENTS AND NON-OFFICIAL AGENCIES/INDIVIDUALS. 　　　　　APPENDIX 'R'

1.　　SECRET

The following officers in person, are authorised to countersign indent for the issue of air photographs required for official use or in respect of Semi Government organisation, non-official individual, agencies entrusted with or ong in national development works sponsored by their respective Ministries/departme

(a) Federal Government

(1) Secretaries, Addl. Secretaries and Joint Secretaries to the Govt of Pakistan - including cases of non-official agencies.

(2) All Heads of Departments (for official use only).

(3) Chairman of all Autonomous/Semi-Autonomous Bodies under the Federal Government/Chairman of Corporations/Agencies/Authoriti Geological Survey of Pakistan/Resident Director OGDC, Chairma Director General, Soil Survey, Atomic Energy Commission/Infras Highway Board under the Federal Government in respect of proje being executed under their own respective organization.

(×) Director General Petroleum concession vide sl. 10

(b) Provincial Government

(1) Secretaries to the Provincial Governments

(2) Chairman WAPDA, Chairman PIDC, Chairman KDA, Chairman, Baluch Development Authority, Chairman, Sarhad Development Authority, Chairman, Punjab Mineral Development Corporation.

2.　　RESTRICTED/PUBLIC

The following officers, in person, are authorised to countersign indent for the issue of air photographs required for official use or in respect of Semi Government organisations, non-official individuals/agencies entrusted with or en in national development works sponsored by their respective Ministries/departmen

(a) Federal Government

✓(1) Secretaries, Addl. Secretaries, Joint Secretaries and Deputy Secretaries to the Government of Pakistan.

(2) Heads of Departments (for official use only)

(3) Chairman/Secretary CDA; Director General/Deputy Director Genera Geological Survey of Pakistan, Resident Director/Director OGDC.

(b) Provincial Government

✓(i) Secretaries to the Provincial Govts. and Commissioners Division

(ii) Heads of Departments (for official use only)

(iii) Chairman/Member/General Manager/Chief Engineer WAPDA, Chairman/ Director PIDC, Chief Engineer/Secretary Small Dams Organizat: Chairman/Secretary K.D.A., Sarhad Development Authority, Baluch: Development Authority.

3.　　Photomosaics/air photographs will not be made available by the Oil and Development Corporation for use by Russian members of the Corporation unless they are cleared by ISI Dte. to whom the demands will be referred for prior scrutiny/ examination.

<u>Appendix-9</u>

Change in Policy (Survey of Pakistan)   **Page 1 of 2**

SURVEY OF PAKISTAN
DIRECTORATE OF PHOTOGRAMMETRY

Annex-H

No. 3336 /14-C-Rule   Date : 17 -09-2004.

To,

     Mr. Asmat Ali A/D   DBA (DMB)
     Mr. Muhammad Rafique A/D No.3 PHO
     Mr. Aftab Nazir S.O   No.1 PHO

Subject: RULES FOR SUPPLY OF CLASSIFIED DIGITAL DAT

      A draft document about subject matter must
be submitted to this office by 18-09-2004 duly signed
by all the board members, please.

(KHALID TUFAIL)
Survey Officer
T.O to D.P

(GHULAM SARWAR)
Deputy Director
O.C. No. 1 C.O.
Survey of Pakistan
Rawalpindi

SURVEY OF PAKISTAN
MAP PUBLICATION OFFICE
RAWALPINDI

Annex-K

No. 2437/40-0-DBase

Dated 06/9/2002

From,

The Director Map Publication,
Survey of Pakistan, Rawalpindi.

To,

Mr. Asmat Ali,
Assistant Director,
D.B.A

Sub: POLICY OF DIGITAL DATABASE MANAGEMENT :

Draft policy on the subject matter as already
submitted to DSG-I/SGO for approval shall be implemented when
approval of the same is received. However copy rights of
Survey of Pakistan should be protected and you shall work
under the over all supervision of DMP. Meanwhile Digital
data shall be supplied to inentors, both departmental and
extra departmental after approval of SG/DSG-1.

(NASRATULLAH)
DIRECTOR MAP PUBLICATION
SURVEY OF PAKISTAN
RAWALPINDI

Copy to:-

DSG-I for kind information and necessary action
regarding approval of the policy on digital data
already submitted vide our letter No. 1859/40-0-DBASE
dated 01-07-2002, please.

Strengthening Soil Survey of Pakistan

Inventory of databases and GIS activities

at Natural Resources Institutes in Pakistan

Dr Bob J A Jones
Senior DB/GIS Specialist

Arthur Ph Neher
GIS/RS Specialist

Muhammad Nawaz Syal
GIS and Satellite Remote Sensing Consultant

August 1996

Summary

During the past 25 years a vast amount of information about the soils of Pakistan has been collected by the Soil Survey of Pakistan (SSP). The SSP has its headquarters in Lahore and field offices elsewhere in the country. Under the framework of the Government of the Netherlands financed project 'Strengthening Soil Survey of Pakistan' a database and Geographical Information System (GIS) facility will be developed to facilitate a better use of the data already collected. A three man team from the project made visits to a number of natural resources research institutes in Lahore, Islamabad and Peshawar to establish the extent of computerised database and GIS activities in areas relating to soils. An inventory has been made and the information collected is presented in this report. The team found that computerisation of land resources data is not widespread but there are a number of small groups pioneering the development of GIS. These groups are sponsored by various government and international donor organisations but there is a lack of co-ordination. There is a good opportunity for SSP to link in with some of the project work currently going on in these organisations.

Introduction

The Soil Survey of Pakistan is a partly decentralised organisation with its headquarters in Lahore and field offices in Sind, North West Frontier and Baluchistan Provinces.

A Plan of Operation has been drafted by the project team lead by Mr Reitse Koopmans, the Project Manager. Presentation of this has highlighted the need for a more detailed Plan of Implementation to provide a better structured and justified strategy for the introduction and development of the Database and GIS laid down in the Plan of Operation.

Under the overall guidance of the Project Manager, options for co-operation and networking with other organisations have been considered by a three-person team comprising: Dr Bob J A Jones, Senior Database Management/GIS Expert and short term advisor to the project; Arthur Ph. Neher, Geographical Information Systems and Remote Sensing Specialist and long term expert on the project; and Mohammed Nawaz Syal, GIS and Satellite Remote Sensing Consultant who has had 25 years experience on the staff of the Soil Survey of Pakistan. This team undertook an inventory of database and GIS activities at Natural Resources Institutes in Pakistan. This report contains the findings of the team and will form an annex to the Plan of Implementation, particularly with respect to the introduction of a centralised or partly decentralized information system.

Lahore
24 August 1996

IX

Overall Findings

1. There are a number of small GIS facilities in natural resources institutes in Pakistan engaged in a variety of ad hoc projects.
2. Most of these GIS activities have been established recently and are at the basic level with little or no spatial analysis. There are few examples of linking attribute to spatial data.
3. GIS in Pakistan is, therefore, regarded as being in a very early stage of development.
4. There is little contact or collaboration between the groups of GIS experts.
5. The GIS facilities are not generally integrated with the mainstream activities of the organisations which foster them, for example the SCARP Monitoring Organisation of WAPDA which uses largely paper based data handling systems but has a small GIS facility in Hyderabad.
6. All systems that the team came into contact with are PC based. The most widely used geo-software packages are: PC ARC/INFO, IDRISI and ILWIS, whereas dBASE served as the main DBMS software.
7. Systems management was generally regarded by the team as inadequate and is very much *ad hoc*.
8. Virtually no resources are set aside in projects planned for the maintenance and upgrading of hardware and software.
9. As far as the team could judge, no national databases of any significance are being compiled for natural resources data other than the database proposed by the Geological Survey of Pakistan (GSP).
10. Training is perceived as extremely important by all the groups visited. It is considered by some to be more important in the first instance than provision of the latest hardware and software.
11. Retaining staff is becoming increasingly difficult in the Government research sector, but capable well-trained experts in database management systems (DBMS) and GIS are critical to the future success of these ventures.
12. There is a willingness to share data and prepare proposals for collaborative projects with SSP.
13. Soil data are perceived as an important input to natural resources information systems.
14. Quality of data is suspect and the validation techniques and 'cleaning' operations were not clear.
15. There are restrictions on the supply of information from sensitive areas and on data about sensitive parameters e.g. relief. These restrictions are severely hindering progress.
16. The use of Remote Sensing (RS) by the GIS groups visited is very limited and there is almost no fundamental analysis of RS data where they are used.
17. There is little appreciation of the potential value of natural resources data and few obvious plans for the commercialisation of data. However, there is a need to generate external income from project work and foster a more commercial approach. The group at WRRI, NARC in Islamabad, were most aware of the need for some commercialisation of their activities.
18. There is little danger of SSP duplicating any existing GIS efforts in Pakistan.
19. The GIS facilities in Hydrabad (WAPDA South Region) and at the Geological Institute in Quetta were not visited. These are apparently important centres of GIS activities and should be visited by a project team in the near future.

qtit.doc/26-Aug-96

XI

Appendix-11

Cape Town Declaration

GROUP ON
EARTH OBSERVATIONS

N.B. This text has been approved on 30th Nov 2007 by the Summit.

RFG

GEO-IV – 28-29 November 2007

Document 5 (29 November Final draft)

[Draft Cape Town Declaration

1 We, the participants assembled at the Group on Earth Observations Ministerial Summit in Cape Town, South Africa, on 30 November 2007:

2 *Recognizing* that nations are facing major environmental, social and economic challenges as a consequence of global change;

3 *Recognizing* that sound policymaking for addressing the environment and sustainable development must be based on understanding, describing and predicting a complex and interdependent world, and therefore requires terrestrial, oceanic, air-borne, and space-based Earth observations, data assimilation techniques and Earth system modelling;

4 *Recalling* that the 2002 World Summit on Sustainable Development (WSSD) stressed the importance of Earth observation systems for advancing sustainable development, particularly in developing countries;

5 *Recalling* that the G8 Summit in Evian in 2003 committed to strengthen international cooperation on global observation and associated information systems and the G8 Summits in Gleneagles in 2005 and Heiligendamm in 2007 affirmed the role of the Global Earth Observation System of Systems (GEOSS);

6 *Recalling* that the Group on Earth Observations was founded on the principle of using coordinated, comprehensive and sustained Earth observations to enhance human health, safety and welfare, alleviate human suffering including poverty, protect the global environment and achieve sustainable development;

7 *Reaffirming* the outcomes of the Earth Observation Summits in Washington in 2003, Tokyo in 2004 and Brussels in 2005 that established the Group on Earth Observations (GEO) and endorsed the 10-Year Implementation Plan for building GEOSS;

8 *Recognizing* that GEOSS will continue to build upon the interlinking and strengthening of existing and future observation, prediction and information systems developed and operated by Members and Participating Organizations, within the scope of the 10 year Implementation Plan;

9 *Recognizing* the importance of providing stable, reliable and long-term operations of Earth observation networks and systems within the framework of national policies and international obligations.

10 *Reaffirming* that the success of GEOSS will depend on a commitment by all GEO partners to work together to ensure timely, global and open access to data and products;

11 *Recognizing* the important contribution GEOSS can make through collaboration with UN system bodies including in response to the needs of the United Nations Framework Convention on Climate Change (UNFCCC), the Convention on Biological Diversity (CBD), United Nations Convention on Combating Desertification (UNCCD), and other relevant agreements and processes, and the growing need to further enhance such contributions .

12 *Recognizing* that GEOSS can contribute to the development of the United Nations Spatial Data Infrastructure (UNSDI);

13 Recognizing the important contribution GEO can make through collaboration with the International Telecommunication Union to promote, by the appropriate alerting authorities, the implementation of the international standard for all-media public warning across all disaster and emergency situations;

14 *Reaffirming* that GEO is addressing user needs focussed on multiple societal benefit areas;

15 We note with satisfaction the numerous contributions and early achievements made by Members and Participating Organisations towards the GEOSS 10 -Year Implementation Plan, as described in the *GEO Report on Progress*. These contributions and early achievements are delivering multiple social, environmental and economic benefits such as facilitating access to observations, data and products, enhancing resilience to natural disasters, improving energy, water and resources management, improving monitoring and forecasting capabilities for climate, air quality and epidemics and facilitating the protection of ecosystems and the services they provide;

16 In evolving from concept to action and implementation, we envision GEO providing a significant international framework to increase the benefits of national and regional investments in global Earth observation, prediction and information systems;

17 We confirm our common view that:

    a) The sustained operation of terrestrial, oceanic, air-borne, and space-based observations networks is critical for informed decision making;

    b) Data interoperability is critical for the improvement and expansion of observational, modelling, data assimilation and prediction capabilities;

    c) Continued research and development activities and coherent planning are essential for future observation systems;

    d) Continued cooperation and dialogue will establish GEOSS as a powerful means to support informed decision making;

    e) Coordination at national, regional and global levels, continued investments, scientific and technological advances and innovative approaches to financing will be vital for upgrading and expanding Earth observations and building the capacity of individuals, institutions and systems, particularly in developing countries;

18. We support the establishment of a process with the objective to reach a consensus on the implementation of the Data Sharing Principles for GEOSS to be presented to the next GEO Ministerial Summit. The success of GEOSS will depend on a commitment by all GEO partners to work together to ensure timely, global and open access to data and products;

19. We commit to explore ways and means for the sustained operations of the shared architectural GEOSS components and related information infrastructure

20. We welcome the resolution of the World Radio Conference-07 on radio communication use for Earth observation applications and the support it provides for the international protection and long term availability of frequencies for terrestrial, oceanic, air-borne, and space-based observations, including passive measurements;

21. We commit ourselves to working together to improve the interoperability of and access to observation and associated prediction and information systems towards the continued strengthening of GEOSS and the full realisation of the 10 -Year Implementation Plan.

22. We thank the Government of the Republic of South Africa for organizing and hosting today's Summit and thus advancing international cooperation on Earth observation systems;

23. We resolve to meet again before the end of 2010 to review progress, conduct a mid-term assessment and give further guidance on the implementation of GEOSS.]

***

Appendix-12

DIGIT Report

- OIOISI, Service Oriented Infrastructure - This is a national web-service based infrastructure, enabling a secure and reliable exchange of business documents. Electronic invoicing is the key driver for this initiative.

2.5   Interviews

Gartner executed 26 interviews with persons involved in e-government/interoperability initiatives. The interviews confirmed that there is currently no explicit sense of urgency to deliver PEGS.

Interoperability knowledge is scattered across many projects, people and DGs. Several DGs have the same objectives but are not cooperating. Although we identified a number of centrally directed/facilitated approaches, the majority of projects is neither guided nor monitored from a higher level within the EC. This fragmentation leads to suboptimal solutions and does not contribute to the ultimate goal of EIF: "Public Services Where Needed".

The interviews showed that the EC projects tend to focus on technical solutions first instead of aligning business processes and semantics. Although some limited services exist (e.g. vehicle registration, drivers licenses, criminal information), operational PEGS are still in its infancy state.

The list of interviewees is presented in appendix D.
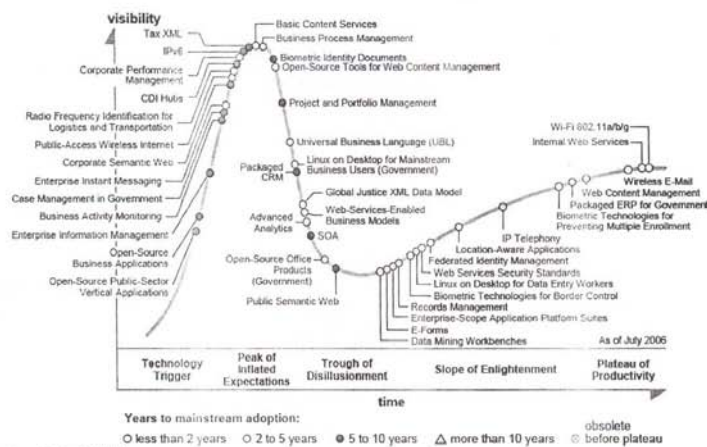
2.6   Gartner Research

Figure 3   Gartner Hype Cycle for Government (July 2006)

Figure 3 shows the most recent Gartner Hype Cycle for Government to date. The Gartner Hype Cycle methodology is explained in appendix B. The most important trends with respect to EIF are:

- *Web-service security standards* — Strong support comes from major web-services vendors and World Wide Web Consortium/Organization for the Advancement of Structured Information Standards/Web Services Interoperability Organization (W3C/OASIS/WS-I) for almost all elements. Major products include some compatibility

Appendix-13

Announcement: Seminar on Public-Private Partnership For Spatial Data Infrastructure

EUROGI
EUROPEAN UMBRELLA ORGANISATION
FOR GEOGRAPHIC INFORMATION

JRC ies
EUROPEAN COMMISSION   Institute for Environment and Sustainability

VISION

Geographic Information with all its aspects should become a fully integrated component of the European knowledge-based society

MISSION

In order to ensure good governance, economic and social development, environmental protection and sustainability, and informed public participation, the mission is to maximise the availability and effective use of GI throughout Europe

This will require EUROGI to stimulate, encourage and support the development and effective use of GI and relevant technologies, and to act as the voice for the European community

MEMBERS OF EUROGI

AESIG, Spain
AFIGEO, France
AGI, United Kingdom
AM/FM Italia, Italy
CC Belgium, Belgium
DDGI, Germany
GTIM SIG, Luxembourg
HUNAGY, Hungary
IGP, Portugal
IRLOGI, Ireland
PROGIS, Finland
GEONOVUM, The Netherlands
SOGI, Switzerland
ULI, Sweden

AGEO, Austria
CAGI, Czech Republic
LISA, Iceland

AUTODESK
ESRI
INTERGRAPH
NAVTEQ

EARSC
GI NORDEN

PPP4SDI – EU INDUSTRY DAY
PUBLIC-PRIVATE PARTNERSHIPS FOR
SPATIAL DATA INFRASTRUCTURES IN THE CONTEXT OF E-GOVERNMENT
December 6-7, 2007 – Rome, Italy
University Roma - La Sapienza, Piazza Borghese, 9

EUROGI will be holding a seminar to explore ways in which Private-Public Partnerships (PPP) can assist in building the Spatial Data Infrastructure (SDI) across Europe. The event is supported by the European Commission, Joint Research Centre (JRC) - the technical coordinator of INSPIRE. This European SDI is supporting Community environmental policies and shall be built upon SDIs established and operated by the Member States. There is a general tendency to integrate national SDIs in e-Government programmes.

The seminar programme will focus on setting the context within which PPPs can help to build SDIs. It will also provide practical examples of PPPs in the spatial data and services fields and will highlight the many new and exciting opportunities which are becoming available in both the public and private sectors.

A **Public-Private Partnership** (PPP) is a contractual agreement between a public agency (national, regional or local) and a private sector entity. Through a PPP the skills and assets of each sector (public and private) are shared with the view to delivering a service, product or facility for the use of the general public. In addition to the sharing of resources, each party shares in the risks and rewards associated with the joint project. There are critical components in any successful PPP. While there is no set formula or absolute foolproof technique in setting up or running a successful PPP, a number of 'success factors' can be identified.

- A successful partnership can result only if there is commitment from "the top".
- It is essential from the very outset that the outcomes or products must be clearly understood and defined.
- Once a partnership has been established, it is important that both parties remain actively involved throughout the project.
- In cases where the private partner provides the initial capital funds, there must be a means of repayment of this investment.
- More people will be affected by a partnership than just the public officials and the private-sector partner. Where possible the interests of these other stakeholders need to be factored into the PPP.
- Public procurement processes need to use appropriate criteria for the selection of partners.

These and other best practice PPP features will be discussed at the seminar.

The term **Spatial Data Infrastructure** (SDI) is often used to denote the relevant technologies, policies, institutional and other arrangements that facilitate the availability of and access to spatial data. A SDI provides a basis for spatial data discovery, evaluation, download and application for users and providers within all levels of government, the commercial sector, the non-profit sector, academia and the general public. The word infrastructure is used to promote the concept of a reliable, supporting environment, analogous to a road or telecommunications network. Spatial data infrastructures facilitate access to geographically related information using a set of standard practices, protocols, and specifications. SDIs are delivered electronically via the Internet. Currently over 140 countries are committed to developing SDIs.

The INSPIRE Directive entered into force in May 2007 and will be followed by implementing rules which concern the main components of INSPIRE. These include: metadata, key spatial data themes and services, network services and technologies, agreements on sharing and access, reporting and monitoring mechanisms.

As a result the SDIs created by the EU Member States shall be compatible and usable in a Community context and cross borders. The target users of INSPIRE include policy-makers, planners, managers and service delivery agencies at European, national and local level.

Autodesk   INTERGRAPH   ESRI   NAVTEQ

am/FM   SAPIENZA Università di Roma   LABSITA

WHAT DOES EUROGI ACHIEVE?

EUROGI has a unique role in representing the GI community throughout Europe.

EUROGI gives all the nations of Europe a focal point at which to share experiences and opinions in the field and to make them available to public and private organisations alike.

EUROGI is a truly European organisation. Its members come from across the whole of Europe, including the European Union (EU) and EFTA.

Through the support and involvement of its members, the role of EUROGI is exploited for their benefit.

EUROGI:

- Raises awareness of GI.

- Provides its members with accurate and timely information on European opportunities as well as consolidated views on policies affecting GI.

- Improves knowledge sharing between nations by exchanging experiences and best practices.

- Encourages greater use of GI in Europe by promoting availability, removing constraints and promoting standards.

- Supports GI standards by cooperating with international standardisation organisations in the GI field.

- Improves the exchange of views and understanding between European nations and the EC by being a recognised contact point for EC Directorates and other European and international organisations.

- Is a lobbyist. Through contacts with European officials (EC and MEP), EUROGI's lobbying has an impact on the thinking of politicians and other decision-makers.

- Participates in pan-European projects funded by the EC and other organisations, those usually requiring multinational participation. EUROGI is a valued participant of projects.

- Is an expert witness. EUROGI draws on the expertise of its members and brings together specialists.

In short, EUROGI is the:

- European Forum for GI matters
- Facilitator for GI discussions
- Lobbyist for GI
- Catalyst for relevant topics
- Supporter of national GI associations

E-government refers to governance processes in which Information and Communications Technology (ICT) play an active and significant role in the exchange of information and services with citizens, (Government-to-Citizen or G2C), businesses, (Government-to-Business or G2B) and other arms of government (Government-to-Government or G2G).

The most important anticipated benefits of e-government include an improved quality of existing government provided products and services, the provision of new services and products, enhanced and easier participation by people in the choice and provision of government products and services which more closely fit their needs.

PPP4SDI in the context of e-Government: INSPIRE will increasingly play an extremely relevant role in promoting the widespread adoption of spatial data and will become an integral part of e-government services and processes. PPPs represent new opportunities to provide both spatial data and services (viewing, delivering, manipulating and analysing spatial data) into SDIs at national, regional and local levels, and in so doing will assist in the cost effective roll out of INSPIRE.

The seminar will investigate models and possibilities for allowing PPP to effectively develop SDI either at local, regional, national, trans-national and European levels, in the context of e-government processes, specifically focusing on the economics of SDI through effective participation of private sector companies.

The **Programme** will feature presentations from EUROGI, JRC and keynote speakers, as well as the perspectives from the private sector and the national approaches to be delivered by the members of EUROGI. Some relevant cases will also be presented and a large open debate is foreseen. The outcomes of the seminar will be published on the first half of 2008.

REGISTRATION FORM

EUROGI is pleased to invite you for attending the EU Industry Day on PPP4SDI in Rome. The participation is open and free of charge.

Since the number of attendees is limited, please be so kind to fill the Registration Form below and return it to the Secretariat of EUROGI no later than November 30, 2007.

Title:		Surname:	
First Name:			
Organisation:			
Address:			
e-mail:	Tel: +		Fax: +

Secretariat of EUROGI:

Mrs. Isabel Barros,
Rua de Artilharia Um, 107
1099-052 Lisboa,
Portugal
Tel: +351-213-819-635
Fax: +351-213-819-699
E-Mail: isabel.barros@eurogi.org

Timetable:

December 6, 2007:
   14:00 – 14:30 Registration
   14:30 – 17:30 Presentations and debate
December 7, 2007:
   09:00 – 12:30 Presentations and debate
   14:00 – 16:30 Roundtable
   16:30 – 17:00 Wrap up and Closing

NOTE:

You are welcome to register by E-mail. Please send the above detailed information to the secretariat and state **[PPP4SDI Registration]** in the Subject box of your message.

Further information will soon be available at the EUROGI website: **www.eurogi.org**

ACCOMODATION:

You are kindly requested to take care of your own accommodation.

For enquiries about accommodation and reservations you are welcome to contact *Mr. Enrico Patara* by e-mail at spartacusrome@hotmail.com or by phone at +39-06-683-2542 or +39-348-073-6112.

Appendix-14

Participants: Seminar on Public-Private Partnership For Spatial Data Infrastructure

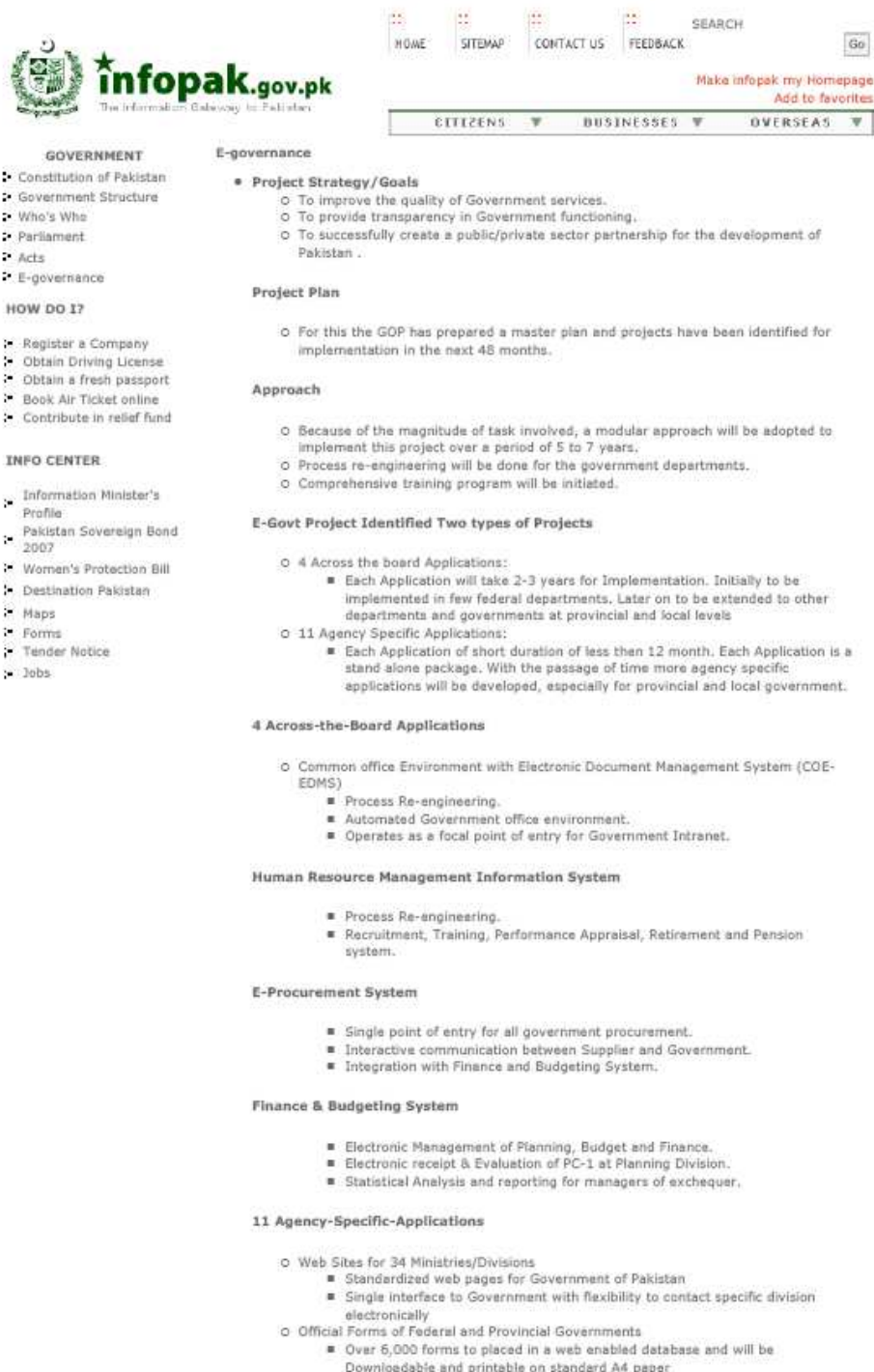|			Lista dei partecipanti	
NR	First Name	Surname	Organisation	Country
1	Ali	Asmat	ITC	Netherlands
2	Carmelo	Attardo	INTERGRAPH	EUROPE
3	Laura	Berardi	LABSITA	Italy
4	Alberto	Berli	SINERGIS	Italy
5	Zvonko	Biljecki	GEOFOTO LLC	Croatia
6	Gianni	Campanile	ESRI	Italy
7	Enrico	Cavattoni	AGSM Verona S.p.A.	Italy
8	Christopher	Corbin		UK
9	Whit	Crump	Microsoft	
10	Kornél	Czimber	DigiTerra	Hungary
11	Andrea	Deiana	GeoInfoLab	Italy
12	Luciano	De Licio	CAVEA	Italy
13	Pasquale	Di Donato	LABSITA	Italy
14	Sergio	Farruggia	AM/FM GIS	Italy
15	João	Geirinhas	EUROGI	Portugal
16	Sandro	Gizzi	AM/FM Italia	Italy
17	Pasquale	Gravante	Elasis S.C.p.A.	Italy
18	Jirí	Hiess	CAGI	Czech Republic
19	Corrado	Iannucci		Italy
20	Angela	Ionita	RACAI	Romania
21	Anisoara	Irimescu	National Meteorological Administration	Romania
22	Bela	Jarolics	Ihlet Kht.	Hungary
23	Rui Pedro	Julião	IGP	Portugal
24	Pal	Levai	FOMI	Hungary
25	Miklos	Mariafoldy	Ihlet Kht.	Hungary
26	Stefania	Mazzeo	ELSAG DATAMAT SpA	Italy
27	Valeria	Mercadante	LABSITA	Italy
28	Claudio	Mingrino	INTERGRAPH	Italy
29	Attila	Molnár	Ihlet Kht.	Hungary
30	Argentina	Nertan	National Meteorological Administration	Romania
31	Michael	Nicholson	Intelligent Addressing Ltd	UK
32	Domenico	Pannucci	ELSAG DATAMAT SpA	Italy
33	Eva	Pauknerova	JRC	EU
34	Liévin	Quoidbach	NAVTEQ	EU
35	Mladen	Rapaic	GEOFOTO LLC	Croatia
36	Gábor	Remetey-Fülöpp	HUNAGI	Hungary
37	Yves	Riallant	AFIGéO	France
38	François	Salgé	AFIGÉO	France
39	Mauro	Salvemini	EUROGI	Italy
40	Stefano	Toparini	AUTODESK	Italy
41	Marco	Virginillo	Precidency of the Council of Ministers - Dpt. Innovation	Italy
42	Wolfgang	Walcher	Microsoft	
43	Luigi	Zanella	CORE Soluzioni Informatiche	Italy
44				
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Appendix-15

PPP projects implemented by E-government

(http://www.pak.gov.pk/e_government.aspx)

E-governance   Page 1 of 2

GOVERNMENT

- Constitution of Pakistan
- Government Structure
- Who's Who
- Parliament
- Acts
- E-governance

HOW DO I?

- Register a Company
- Obtain Driving License
- Obtain a fresh passport
- Book Air Ticket online
- Contribute in relief fund

INFO CENTER

- Information Minister's Profile
- Pakistan Sovereign Bond 2007
- Women's Protection Bill
- Destination Pakistan
- Maps
- Forms
- Tender Notice
- Jobs

HOME   SITEMAP   CONTACT US   FEEDBACK   SEARCH   Go

Make infopak my Homepage
Add to favorites

CITIZENS ▼   BUSINESSES ▼   OVERSEAS ▼

E-governance

- **Project Strategy/Goals**
  - To improve the quality of Government services.
  - To provide transparency in Government functioning.
  - To successfully create a public/private sector partnership for the development of Pakistan .

Project Plan

  - For this the GOP has prepared a master plan and projects have been identified for implementation in the next 48 months.

Approach

  - Because of the magnitude of task involved, a modular approach will be adopted to implement this project over a period of 5 to 7 years.
  - Process re-engineering will be done for the government departments.
  - Comprehensive training program will be initiated.

E-Govt Project Identified Two types of Projects

  - 4 Across the board Applications:
    - Each Application will take 2-3 years for Implementation. Initially to be implemented in few federal departments. Later on to be extended to other departments and governments at provincial and local levels
  - 11 Agency Specific Applications:
    - Each Application of short duration of less then 12 month. Each Application is a stand alone package. With the passage of time more agency specific applications will be developed, especially for provincial and local government.

4 Across-the-Board Applications

  - Common office Environment with Electronic Document Management System (COE-EDMS)
    - Process Re-engineering.
    - Automated Government office environment.
    - Operates as a focal point of entry for Government Intranet.

Human Resource Management Information System

    - Process Re-engineering.
    - Recruitment, Training, Performance Appraisal, Retirement and Pension system.

E-Procurement System

    - Single point of entry for all government procurement.
    - Interactive communication between Supplier and Government.
    - Integration with Finance and Budgeting System.

Finance & Budgeting System

    - Electronic Management of Planning, Budget and Finance.
    - Electronic receipt & Evaluation of PC-1 at Planning Division.
    - Statistical Analysis and reporting for managers of exchequer.

11 Agency-Specific-Applications

  - Web Sites for 34 Ministries/Divisions
    - Standardized web pages for Government of Pakistan
    - Single interface to Government with flexibility to contact specific division electronically
  - Official Forms of Federal and Provincial Governments
    - Over 6,000 forms to placed in a web enabled database and will be Downloadable and printable on standard A4 paper

o Information on Educational Institutions of Pakistan
  ■ Admission policies and downloadable forms, Prospectus & Schedule
o Information on Pakistan Missions Abroad
  ■ Downloadable & printable visa forms
  ■ Electronic document management between Missions & Foreign Office
o Electronic Filing of Tax Returns
  ■ Rules & procedures for filing tax returns
  ■ Electronic Filing of Tax returns.
o GIS for Agriculture, Natural Resources & Urban Property of Pakistan
  ■ Mapping & database of national cartographic data
  ■ Web enabled for access to all citizens and foreign investors
o Un-repealed Statutes of Pakistan
  ■ Web enabled database of Laws and Regulations, Downloadable & Printable
    with Search & Retrieval.
o Case Laws of Supreme Court & High Courts of Pakistan
  ■ Web enable database of Case Laws since 1947
o Skill Enablement of Probationary Officers
  ■ Training of New Hires for Government Employment
  ■ Refresher training for existing government officials
o Information on Haj, Ziarah, and Zakat
  ■ Web enable database of Haj, Ziarah & Zakat applicants
  ■ Travel & logistics information for applicants
  ■ Electronic contact between citizens & government
o Application & Databases of Narcotics Division
  ■ Web enabled and workflow driven information system
  ■ Information dissemination to local & foreign agencies

PPP projects implemented by IPDF

(Source: IPDF Newsletter Oct-Dec 2007)

Project Name	Sector	Province
Charsaddah Solid Waste Management	Municipal Services	NWFP
Kalinger Water Supply	Municipal Services	NWFP
PSEB IT Park	Office/Industry infrastructure	ICT
CBR Automation Project	IT Industry	ICT
Environment Friendly Public Transport	Mass Urban Public Transport	Sindh
PTDC Office Complex	Office/Industry infrastructure	ICT
Mirpurkhas-Hyderabad Road	Transport & Logistics	Sindh
Lahore Solid Waste Management	Municipal Services	Punjab
Faisalabad Solid Waste Management	Municipal Services	Punjab
Quetta Solid Waste Management	Municipal Services	Balochistan
Lahore WASA Metering and Billing System	Municipal Services	Punjab
Faisalabad WASA Metering and Billing System	Municipal Services	Punjab
Islamabad-Rawalpindi Mass Transit	Mass Urban Public Transport	ICT
Bus Rapid Transit System	Mass Urban Public Transport	Sindh
Port Qasim Shipyard Project	Transport & Logistics	Sindh
Gwadar Shipyard Project	Transport & Logistics	Balochistan
Establishment of Cargo Terminal at Multan	Transport & Logistics	Punjab
Extension of Peshawar Airport Terminal	Transport & Logistics	NWFP
Development of Cargo City next to Karachi Airport	Transport & Logistics	Sindh
Multi-Purpose Water Reservoirs (Dams)	Energy & Water Reservoirs	ICT
Bridges over River Indus	Transport & Logistics	Sindh

PPP projects implemented by Punjab Government

(Source: http://www.pitb.gov.pk/current_projects.aspx)

PITB Current Projects
PITB Certification Program Similar to ISO 9000 for IT Industry
Punjab Complaint Line (24 Hours Call Centers for Citizens)
Punjab Health Help Line
Telemedicine for Teaching Hospitals in Punjab
Digital Library Pilot
Workflow Automations Services – Pilot
Small Level Hardware Phase IV
GIS For Urban Property – Pilot
Software Technology Park
Demand Based Training
Land Record Management Information System
Punjab Highway Patrolling Post
Hospital Management Information System
Outstanding Talent Scholarship Program Phase-II-2007
IT Workshops and Seminars
Decision Support Infrastructure System for Chief Minister Secretariat
Institutional Strengthening of Anti Corruption Establishment, Punjab through Office Automation
PITB Capacity Building
Computerization of Irrigation and Power Department
Computerization of Punjab Small Industries Corporation
Computerization of Labour department, Labour Directorate & PESSI
Capacity Building Institutional Strengthening of Chief Minister Inspection Team, Punjab
Computerization of Anti Vehicle Lifting Operation of CIA, Lahore
Computerization of Criminal Record Office (CRO) Mobile Labs
Small Level Hardware Support
Computerization of Zakat and Ushr Department
Office Automation of P&D Department
Establishment of IT Labs at 18 Middle and Primary Schools

▪ Computerization of Special Branch, Punjab Police Lahore
▪ Monitoring and Evaluation of ICS / ACS Program

PPP projects implemented by NWFP Government

(Source: http://www.nwfp.gov.pk/GoServices/IT-Conferance.php)

➤ Promote BOT business and create environment of investment for potential invest
➤ Increase liaison with educational/training institutions.
➤ Review and update market oriented curricula, on yearly basis.
➤ Introduce accreditation standards to improve quality of output of the educational
➤ Support post graduate-market oriented advance technical skill centers, through p
➤ Conduct regular software competitions at district and Provincial levels.
➤ Organize NITC type exhibitions regularly.
➤ Create an enabling environment for private sector.
➤ Give liberal support to software development & export business.
➤ Give support for venture financing and facility of working capital.
➤ Create mass scale awareness about potential of IT through seminars, worksl competitions, print and electronic media.
➤ Support establishment of Call centers, content development & medical transcripti

Automated Public Sector Processes

- NWFP budget and financial system under NAM.
- Budget system for the 24 district governments.
- Motor vehicle registration & taxation.
- Property tax.
- Land Record System in Peshawar and D.I.Khan.
- Driving Licensing
- Crime Control System (Police).
- Litigation & case tracking (Services Tribunal).
- GIS for mineral exploration and excavation.
- HR-database of Provincial Government employees and pensioners.
- Web portal of the provincial government.
- 24 district web sites.
- EMIS/Schools information system,
- Examination system Boards.
- Payrolls and Accounts System of DAOs.
- Provincial ADP.
- HMIS and website of Health Department.
- Assembly Proceedings.
- Governor's & Chief Minister's Directives system.
- Entry system to Medical and Engineering colleges.
- Statistical database of Bureau of statistics.
- Stolen vehicles tracking system in Police Department.
- Hospital Management System in Teaching Hospitals.
- DSR system in Home Department.
- Examination System (Public Service Commission).
- Virtual Teacher (interactive CDs based science subjects).
- Zakat distribution system.
- Performance Reporting system for Performance Based Budgeting.
- Establishment of IT Park
- Paperless office in major departments.
- Establishment of Computer labs in educational institutions.

PPP projects implemented by Sind Government

(Source: http://www.karachicity.gov.pk/)

- Establishment of Information Technology Center (ITC).

- E-Government Pilot Project for Government of Sindh (Phase-I).

- IT Training for Sindh Government Employees.

- Establishment of Provincial Portal and Websites for Government of Sindh.

- Introduction of it in District Administration in Sindh.

- Establishment of IT Resource Rural Community Internet Centers in Sindh.

- IT Awareness Center

- Call Center Training for Jobless Graduates/Under-Graduates

- Intranet Setup for Government of Sindh

- Establishment of Video Conferencing System in Sindh

- Karachi Internet Media City

PPP projects implemented by Baluchistan Government

(Source: http://www.balochistan.gov.pk/New%20Folder/it.htm)

- IT training to both private and public sectors.

- Establishment of Balochistan Institute of Information Technology & Management Sciences.

- Provincial Government IT Training Center

- Equipping Polytechnic Institutes with computer labs

- Provision of IT education in Deeni Madaris (religious schools) of Balochistan.

- Establishment of IT Department at district level

- Establishment of Data Centre for all the departments

- Plan to strengthen the IT department of Balochistan

- Establishment of IT labs in 95 Secondary Schools and Colleges of Balochistan

- Development of local government's web portal

- Establishment of IT departments at district

- Automation of Balochistan Board of Intermediate and Secondary Education

- On-line testing for Balochistan Public Service Commission (BPSC)

- Computerization provincial bureau of statistics

Appendix-16

Geoinformation Dissemination System

(http://itcnt07/~ali00490/research/)