

Is Public Private Partnership an Effective Instrument to Implement SDIs?

Asmat Ali, Pakistan

Key words: Public Private Partnership, Spatial Data Infrastructure Implementation

SUMMARY

Public-Private Partnership (PPP) approach has been instrumental to implement infrastructures such as transportation networks, health facilities, education, and communication networks in many developed as well as developing countries such as Pakistan. This scenario poses the question, is public private partnership an effective instrument to implement Spatial Data Infrastructures (SDIs), too?

The purpose of this paper is to explore rationale for PPP as part of SDI implementation strategies. Therefore, added value of PPP as part of SDI implementation strategies serve as conceptual framework of this research paper.

The results drawn from study carried out in this research reveal, existence of PPP has added value for SDI implementation. The research identifies that PPP can support substantially to implement SDIs. This paper raises awareness about PPP to academics and professionals involved in studying or developing and implementing SDIs.

Is Public Private Partnership an Effective Instrument to Implement SDIs?

Asmat Ali, Pakistan

1. INTRODUCTION

We are living in an era of down economy. Therefore, governments all over the world seem reluctant to implement development projects not only due to economic reasons but also due to growing pressure to deliver innovative and quality services as a global trend. The development of Spatial Data Infrastructures (SDIs) is no exception in this scenario as finds Crompvoets et al. (2008).

The significant developments in geospatial technologies have geared up spatial data production. As such, spatial data is being produced and maintained as public initiatives such as Spatial Data Infrastructures (SDIs), private projects such as Google Earth and volunteered Geographic Information (GI) activities such as Wikimapia. Instead of arguing that which one i.e. public, private or volunteered approach is better, collaboration of public and private sectors generally known as Public-Private Partnership (PPP) is embarked on exclusively, as PPP has been instrumental to develop and implement infrastructures such as transportation networks, health facilities, education, communication networks and particularly addressing disaster management issues in many developed as well as developing countries such as Pakistan. This scenario yet poses the question, is public private partnership an effective instrument to implement SDIs, too? This key question is therefore answered in this paper. The added value of PPP over individual arrangements such as public and private for SDI implementation is presented.

The paper begins with a discussion of Public-Private Partnership (PPP) and Spatial Data Infrastructure (SDI), which is followed by a presentation of relevant examples in the context of the paper. The paper ends with the argument that PPP has a major role to play in SDIs implementation.

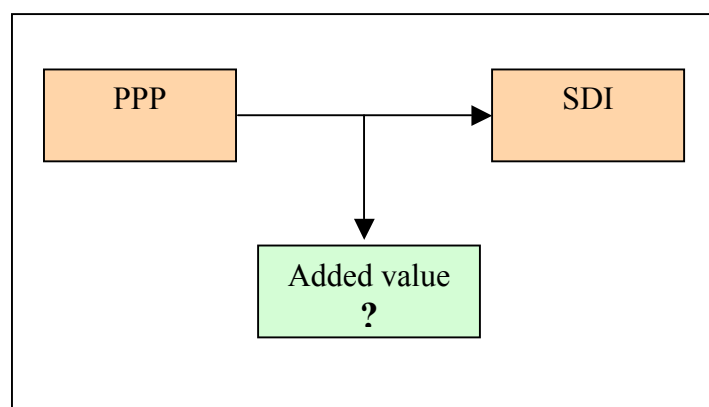


Figure 1: Main Research Question

2. PUBLIC PRIVATE PARTNERSHIP (PPP)

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 Spatial Data Infrastructure (SDI). Therefore, definition of PPP, its purpose and nature is presented to enrich understanding about PPP.

2.1 Definition

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 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 policies, 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 SDI as confirms SDI Africa: An Implementation Guide (Chapter 2, p.6) therefore, PPP is an instrument for SDI 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 from 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 2.1. 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 policies, 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

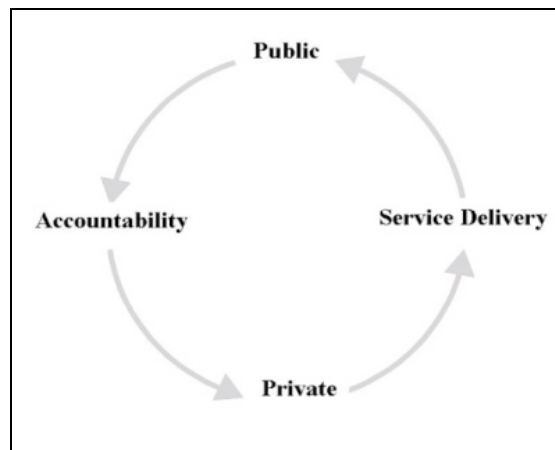


Figure 2: Cyclic nature of PPP

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 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 (<http://www.ncppp.org/>). The interpreted summary of the components is as follows:

Statutory and Political Environment: 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's Organized Structure: 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.

Detailed Business Plan (Contract): For the success of PPP, a well thought-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.

Guaranteed Revenue 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.

Stakeholder Support: 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.

Pick Your Partner Carefully: 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.

3. SPATIAL DATA INFRASTRUCTURE (SDI)

3.1 Definition

After critical study of literature (e.g. SDI Africa: An Implementation Guide, GSIDI Cookbook Version 2.0, Creating Spatial Data Infrastructures, FGDC documents and research papers etc) it is revealed that no agreed definition of Spatial Data Infrastructure (SDI) exists as finds Crompvoets et al. (2008), too. Due to its multifaceted character (de Man 2007), in literature SDI is described in various ways. For example Williamson view SDI 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 (N)SDI 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).

3.2 Components of SDI

The Federal Geographic Data Committee (FGDC) highlights components of (N)SDI 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 (N)SDI.

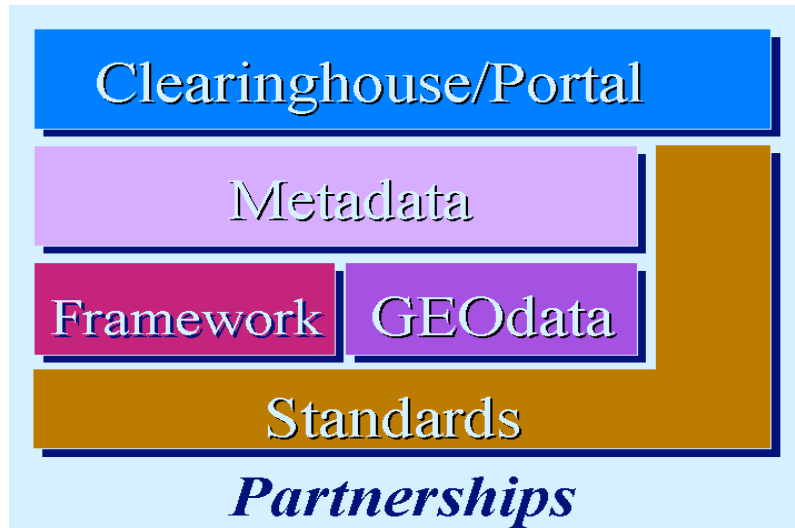


Figure 3: Components of NSDI (Source: <http://www.fgdc.gov/>)

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 SDIs are victims of central/ federal governments/ and NMOs.

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.

Though Chan argues that because of internal and external dynamics, it will never be possible to specify the ideal SDI (Chan et al., 2001) and its components. However, it reveals from most part of the above discussion that partnership is a component of SDI. PPP is a partnership so it is the first reason to have PPP as part of SDI implementation strategy.

4. Rationale for PPP as part of SDI implementation strategy

The needs to have PPP as SDI implementation instrument are 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 SDI 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 project 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 SDI 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 SDI implementation.

Data Democratization

Data democratization can be seen and envisioned as one of the ultimate goal of SDI. 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, SDI 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 SDI – in Brief

Importance of having PPP approach and its perceived value for SDI development is structured in tabular form in Table 1.

Table 1: Summary of importance of PPP for SDI

PPP	Value for SDI
Why PPP?	The development of SDIs involves a wide cross section of partners from government, industry and academia. (Onsrud,2008)
Funding	SDI can't be developed and kept running without a dedicated income stream. Where as “ <i>Public infrastructure and service needs far exceed the capability of government budgets to meet them</i> ”. (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 SDI.
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. SDIs need lots of personnel but who have expertise.
Political support	SDI is not getting as much political support as other infrastructures such as telecom, road, and health. Therefore, “ <i>the need for sustained political support</i> ” Georgiadou <i>et al.</i> (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 SDI because benefits of SDI 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, SDIs are supposed to provide news and innovative value added services because days of first generation of SDIs are gone now.
Quality services	SDIs 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 SDI. 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 SDI stakeholder groups and promote team work spirit enabling better working environment which is essential for any service providing organization. <i>"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"</i> . Geoweb. Visited on 12 th Nov2007. (http://www.galdosinc.com/technology/geoweb/)
More focus on infrastructure	SDI is also infrastructure.
Sharing	Sharing of resources in terms of data, expertise and finance are just one aspect of PPP that is essential for SDI. 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., <i>"They are shared, as they seek to make available expensive, geo-referenced spatial data</i>

	<i>digitally to a variety of users for diverse application needs..... ”, (Georgiadou et al. 2005, p.1115)</i>
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 SDI 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).

5. PPP’s Existence in World’s Effectively Implemented SDIs

According to Cromptoets et al. (2008) Canadian, Colombian and Mexican SDI rank relatively higher in terms of implementation than the other National SDIs. Francisco Hansen Albites (2009) finds PPP in Mexican SDI. Iván-Darío GÓMEZ and Lilia-Patricia ARIAS (2009) find PPP in Colombian SDI. Similar evidence is found about Canadian SDI from website of GeoConnections (<http://www.geoconnexions.org/en/aboutGeo.html>).

6. CONCLUSION

The implementation of SDIs is a complex task that needs joint efforts of public and private sectors may it be in the form of PPP. Public-Private Partnership as SDIs implement approach has been underscored by many researchers such as; Asmat (2008), Arie Duindam, Grontmij, Ron Bloksma, Hennie Genee, Jeroen van der Veen (2009) , Dan Paull (2009), Olav Eggers (2009) and Jesper Jarmbaek (2009). Therefore, it is concluded that reasons for PPP as part of SDI 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.

REFERENCES

- Arie Duindam, Ron Bloksma, Hennie Genee, Jeroen van der Veen (2009).** State of Play of the Operational and Legally Bound Spatial Planning SDI in The Netherlands
- Asmat Ali (2008).** Is Indian NSDI an example to follow? Available at: <http://mycoordinates.org/indian-nsdi-april08.php>
- Basic Documents (2007).** World Health Organization. Available at: http://www.who.int/gb/bd/PDF/bd46/e-bd46_p1.pdf
- Chan, T.O., Feeney, M.-E.F., Rajabifard, A. and I. Williamson (2001).** The Dynamic Nature of Spatial Data Infrastructures: A Method of Descriptive Classification, *GEOMATICA*, 55(1): 65-72.
- Crompvoets, J., A. Rajabifard, B. van Loenen, T. Delgado (2008).** A Multi-View Framework to Assess SDI. Space for Geo-Information (RGI), Wageningen University and Centre for SDIs and Land Administration, Department of Geomatics, The University of Melbourne, Melbourne, Australia.
- Dan Paul (2009).** The Information Infrastructure Facilitating Collaboration and Delivering Capability Cross the Governments of Australia
- de Man, W. H. E. (2007).** In: Research and theory in advancing spatial data infrastructures concepts / H.J. Onsrud. Redlands : ESRI, 2007. ISBN 978-1-58948-162-6. p. 42.
- FGDC (2005).** The National Spatial Data Infrastructure. Washington DC, Federal Geographic Data Committee. Available at: <http://www.fgdc.gov>
- Francisco Hansen Albites (2009).** Towards the Mexican National Spatial Data Infrastructure
- Georgiadou, P. Y. (2003).** Reflections on the Indian NSDI National Spatial Data Infrastructure. *Geospatial today : strategic renewal to geospatial world*.
- Georgiadou, P. Y., S. K. Puri, et al. (2005).** Towards a potential research agenda to guide the implementation of spatial data infrastructures : a case study from India. *International Journal of Geographical Information Science*, 19(10), pp.1113-1130.
- Georgiadou, P. Y., S. K. Puri, et al. (2006).** "rainbow metaphor : spatial data infrastructure organization and implementation in India." In: *International studies of management and organization*, 35(2006)4, pp. 48-71.
- Guiding principles for public - private partnerships PPP, in land administration.** United Nations, Economic and Social Council. 2005. Publication Number: HBP/WP.7/2005/8

Hyman, G., and k.Lance (2000). Encuesta sobre infraestructuras nacionales de datos espaciales en las Americas

Iván-Darío GÓMEZ and Lilia-Patricia ARIAS (2009). The evolution of the National Spatial Data Infrastructure in Colombia: a high level strategy to support policy formulation and spatial information management in the context of the Colombian Space Commission

Olav Eggers (2009). Implementation of Inspire in Denmark - How we do the job!

Masser, I. (2005). GIS worlds : creating spatial data infrastructures. Redlands, ESRI.

Pakistan's National Environmental Policy (2005-15). Available at http://www.pakistan.gov.pk/ministries/ContentInfo.jsp?MinID=5&cPath=42_438&ContentID=5038.

Pakistan Investment Policy. Available at <http://www.pakboi.gov.pk/pdf/IT%20&%20Telecom.pdf>.

Pakistan IT Policy. Available at <http://www.pakistan.gov.pk/e-government-directorate/>

Radwan, M. M., M. H. Nasr, et al. (2005). Egyptian survey authority business model to strengthen public private partnership in the real estate industry. In: Proceedings of the FIG Working Week and GSDI 8 : From Pharaohs to Geinformatics, Cairo, 16-21 April 2005. Frederiksberg, FIG, 2005. ISBN 87-90907-43-4. 13 p.

SDI Africa: An Implementation Guide (2004). Publisher: UN Economic Commission for Africa. Available at: <http://geoinfo.uneca.org/sdiafrica/>

Stephen P. Osborne (2000). Public-Private Partnerships: Theory and Practice in International Perspective

Uta Wehn de Montalvo (2001). Strategies for SDI implementation: A survey of national experiences. In: Proceedings of 5th Global Spatial Data Infrastructure Conference: Cartagena de Indias, Colombia, 21-25 May 2001.

van der Molen, P.(2002). Partnerships for better service : public - private and public - public partnerships to achieve better service to customers in the Netherlands.

Williamson, I., Rajabifard, A. and F.Feeney, M.-E., (2004). Developing spatial data infrastructures From concept to reality, 316 pp.

BIOGRAPHICAL NOTES

Asmat Ali is Assistant Director at Survey of Pakistan. In 1991 he got post graduate diploma in Land Survey from Survey Training Institute Islamabad Pakistan as well as Professional Master Degree in Geoinformatics in 1998 from ITC, The Netherlands. Then after spending about ten years in Geo-information production discipline at Survey of Pakistan he switched over from Geo-information production to Geo-information management and in 2008 earned Master of Science Degree in Geo-information Management from ITC, The Netherlands. Presently he is working as Central Database Administrator in Survey of Pakistan. He has been identified by SDI-Asia and Pacific as focal point for SDI in Pakistan. He is contributing towards geospatial knowledge and technologies as developer, researcher and author.

CONTACTS

Asmat Ali
Survey of Pakistan
Murree Road
Rawalpindi
PAKISTAN
Tel. +923335101578
Email: asmatali@yahoo.com
Web site: www.asmatali.webs.com