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## **Are core data providers ready for the SDI?**

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## Abstract

The question in the title of this paper can be rephrased to read: “Are core data providers ready to develop coherent strategies for the provision and financing of Spatial Data Infrastructures (SDIs)?” SDIs are often compared to hard infrastructures, such as highways, telecommunications and utilities, when the SDI concept needs to be explained to the *non-technical* community. Unfortunately, the likeness is rarely pursued much further.

In this paper, we suggest that core data providers (such as national surveys and national mapping agencies), and the *technical* community in general, may learn useful lessons by studying the innovative provision and financing strategies of providers of (hard) infrastructure services. In many nations in the developing world, the need for massive hard infrastructure development *is now felt to be immediate and critical not only to the nation’s development but also to poverty reduction*. Limited government budgets and a trend in donor preference for other priority sectors, such as education and health, are forcing traditional (hard) infrastructure providers to engage the private sector as a key partner in providing investment resources and know-how to get the job done. At the same time, governments and donors are focusing on developing enabling environments for productive investment, from a policy and legal standpoint.

In other words, the (hard) infrastructure sectors are now getting “ready” to build or rehabilitate (hard) infrastructure assets: highways, rails, ports & airports, water & sanitation facilities, telecommunications and electricity grids. In Kenya and India for example, these sectors appear to be “ready”, because they have taken action to (i) evaluate the current condition of the asset, (ii) assess existing regulatory, policy and institutional arrangements, (iii) estimate the rehabilitation cost of the asset, (iv) study and evaluate Private Sector Participation models (PSP) and (v) establish the conditions for successful PSP in infrastructure provision and financing.

Hard & Spatial Data Infrastructures have important differences, but they also share a number of attributes, such as ubiquity, interdependence, accessibility and economic benefit. Therefore, instead of tackling the question in the title directly, we suggest that outlining how (hard) infrastructure sectors in Kenya and India are now gearing up to rehabilitate and finance the provision of their assets may offer useful “readiness” lessons for core data providers gearing up for SDI. Moreover, if major hard infrastructure rehabilitation programs can be persuaded to include a small line item in their budgets for core data production, that would not only provide the much needed flow of resources towards SDI initiatives, but would also guarantee the development of a sound (hard) infrastructure.

## Introduction

Spatial Data Infrastructures (SDIs) are a particular case of Information Infrastructures specifically geared towards spatial data/geographic information. National Information Infrastructures are a blend of two distinct variations of the “information highway” metaphor. See Table 1. These two variations draw attention to the ‘connectivity in space’ and ‘connectivity in time’ aspect of information infrastructure. In the “connectivity in space” metaphor for a SDI, professional GIS users “travel” in (cyber) space towards destinations that are “information supply sites”.

In the “connectivity in time” metaphor for a SDI, citizens and communities “travel” in *time* towards a (geo) information nirvana, at which point we will be able to concentrate on real issues – food security, water supply, environmental regulations, law enforcement, national security etc – without worrying about the availability of data and information. In this future vision, (geo) information will be available to people who need it, when they need it and in a form that they can use in order to make decisions with minimal pre-processing<sup>1</sup>.

<b>Interstate Highway US</b> ( <i>source domain</i> )	<b>SDI Metaphor I: Connectivity in space</b> ( <i>target domain I</i> )	<b>SDI Metaphor II: Connectivity in time</b> ( <i>target domain II</i> )
Highway	Highway into cyberspace (cables, wireless comm. etc)	Highway into a future of public participation
Goods transported	Information	Citizens & communities
Fuel	Electricity	Information
Drivers	Professional GIS Users	Geo-ICT experts Citizens & communities
Physical destinations	Information supply sites (portals)	Geo information nirvana
Impediments to motion (roadblocks, road bumps)	Technological glitches & lack of interoperability	Government regulations, intellectual property laws

Table 1: Two SDI metaphors adapted from Tim Rohrer (1995)

The “information highway” metaphor was developed during the Clinton-Gore administration. It has guided National Information Infrastructure policy in the US ever since. The Clinton-Gore Administration argued that the economic boom of the 1950s and 1960s was fuelled by the federal commitment to plan and build the interstate highway system, and that a similar economic boom would result from a federal commitment and involvement to plan and build the National Information Infrastructure<sup>2</sup>. The source domain of the metaphor was the successful interstate highway system built after World War II<sup>3</sup>. Ironically, the “information highway” metaphor has inspired similar initiatives in countries, where:

- (1) hard infrastructures (roads / rail / ports & airports / water & sanitation / telecommunications / electricity etc) are *in dire need of rehabilitation*; while the

<sup>1</sup> Ezigbalike, D. (2003): “SDI Overview”, Ethiopian SDI Stakeholders Workshop, May 16, 2003, Addis Abeba, Ethiopia

<sup>2</sup> Rother T. (1995): Conceptual blending on the Information Highway: How metaphorical inferences work, Philosophy Department, University of Oregon Eugene Oregon 97403, <http://philosophy.uoregon.edu/metaphor/iclacf4.htm>

<sup>3</sup> Building the highways that changed a nation:  
[http://www.usnews.com/usnews/biz/e\\_friend.php3?goto=%2Fusnews%2Fissue%2F030630%2Fusnews%2F30interstate.htm](http://www.usnews.com/usnews/biz/e_friend.php3?goto=%2Fusnews%2Fissue%2F030630%2Fusnews%2F30interstate.htm)

- (ii) providers of hard infrastructure services are now developing *innovative* mechanisms for (hard) infrastructure provision and financing

It seems natural to pursue a course of study to understand the relationships between (hard) infrastructure and SDI, while keeping in mind that hard & Spatial Data Infrastructures share a number of common attributes and some differences, shown in Table 2. In this paper, we shall highlight recent developments with *vignettes* from the hard infrastructure sectors in Kenya and India in order to gain insights on SDI development.

Hard Infrastructures	Spatial Data Infrastructures
Tangible	Fuzzy
Benefits to the masses visible	Benefits to the masses less concrete
More straight-forward in terms of plans, deadlines, and funding requirements	Lesser straight-forward
“Engineering oriented”	“Science IT oriented”
More or less refined methods, benchmarks	Still in the development and debate phase
More saleable concept to the highest level of decision makers in the government	Less saleable, benefits yet to be concretely measured
Projected as a public good	Not necessarily projected (or visualised) as a public good

Table 2: Differences between hard and data infrastructures

## Gearing up for the rehabilitation of (hard) infrastructure services in Kenya and India

### Infrastructure services and poverty reduction

There is renewed attention of multilateral agencies to infrastructure services for poverty reduction<sup>4</sup>. In Africa, bridging the infrastructure gap (all forms of infrastructure, regional and continental, and communication technologies, energy, transport, water and sanitation) is a key NEPAD initiative<sup>5</sup>.

“Infrastructure services constitute a central element of strategies for achieving the Millennium Development Goals. But they will be far more effective in helping to eradicate poverty if two previously distinct agendas are brought together. One of these agendas focuses primarily on the importance of major national infrastructure – the ‘hardware’ of transport, telecommunications, energy, water etc – as a driver of economic growth. The other is more concerned with the provision of local services for poor people, in which physical capital is just one part of the framework for improving outcomes and supporting sustainable livelihoods<sup>6</sup>”.

Given that geographic information provides a basis for spatial analysis, local planning, and resource allocation, it should be viewed an ‘intermediate’ means for the provision of local services and for design and monitoring of poverty reduction strategies. In theory, spatial data

<sup>4</sup> Infrastructure and the Challenges of Development Finance [http://www.worldbank.org/jp/02event/01seminar/pdf\\_ss/ss3\\_frannie.pdf](http://www.worldbank.org/jp/02event/01seminar/pdf_ss/ss3_frannie.pdf)

<sup>5</sup> <http://www.nepad.org>

<sup>6</sup> [http://62.189.42.51/DFIDstage/Pubs/files/making\\_connections\\_consult.pdf](http://62.189.42.51/DFIDstage/Pubs/files/making_connections_consult.pdf)  
Making Connections\_infrastructure for poverty reduction DFID perspective

infrastructure, as the framework for geographic information management, should be viewed as an embedded necessity for improving the efficiency of infrastructure services.

### **Innovations in the provision of hard infrastructures**

“New institutional alternatives to the traditional public sector infrastructure monopoly include private provision (across the full spectrum of agencies from multinational companies to street-level water vendors), commercially operated public sector provision, and user partnerships. All of these should provide an element of competition. In these circumstances, the government’s role is to concentrate on effective delivery of the many services that it alone can provide, and to ensure pro-poor regulation of private, commercial and community delivery of the other services<sup>7</sup>”.

The Water Development Minister said Kenya will separate water resources management from water services provision in order to improve the sector's performance. This, she said, has been occasioned by the inability of urban water utility managers to deliver and maintain basic infrastructure services for their growing populations. "The traditional supply orientation of water sector managers in this country tends to produce an over-emphasis on construction of facilities rather than on effective operations and maintenance," she said. She further announced that an autonomous Water Service Regulatory Board has been formed to regulate matters of water supply and sewerage services<sup>8</sup>.

Similar innovations can be envisioned for spatial data infrastructure development – e.g. private sector provision of data and information. An inter-sectoral ‘information board’ perhaps has similarities to existing geoinformation councils. Furthermore, the SDI community is exploring means to finance and maintain information, which may be different than the means to finance and maintain information services.

### **Innovations in the financing of hard infrastructures<sup>9</sup>**

Governments in most Sub-Saharan Africa countries have introduced or indicated interest in restructuring financing arrangements for road maintenance through the establishment of road funds based on dedicated revenues from user charges. This begs the question whether a ‘(geo) information fund’ is a realistic pursuit. If one looks at the types of questions that have been raised in the WB/ECA paper ‘African Road Funds’, one can envision similar questions being asked about how or whether an information fund might work.

- Where do the revenues come from for the road fund, and which expenditures does the road fund finance?
- What revenue-raising mechanisms are used, how is the tariff adjusted, what sort of tariff structure is used, are there any exemptions, and how is the revenue collected?
- How is the road fund managed, what is the structure of the road fund board, and how are funds divided between main, urban and rural roads?
- What kind of financial accounting systems are used, how are funds withdrawn from the road fund, how are revenues disbursed to end users, and what kind of auditing is carried out<sup>10</sup>?

<sup>7</sup> Ibid.

<sup>8</sup> <http://allafrica.com/stories/200306170124.html>

Water Sector Set for Reforms, The East African Standard (Nairobi) Posted to the web June 17, 2003

<sup>9</sup> Infrastructure and the Challenges of Development Finance

[http://www.worldbank.or.jp/02event/01seminar/pdf\\_ss/ss3\\_frannie.pdf](http://www.worldbank.or.jp/02event/01seminar/pdf_ss/ss3_frannie.pdf)

<sup>10</sup> African Road Funds: GAT works and why? SSA Africa Transport Policy Program, The WB and ECA

## Tucking SDI in utilities and other infrastructure development

In India, the Country Framework Report 2000<sup>11</sup> is the first in a series of country reviews aimed at improving the environment for private sector involvement in infrastructure. The Country Framework Report has three main objectives:

- To describe and assess the current status and performance of key infrastructure sectors (telecommunications, power, urban water & municipal services, roads, ports, airports).
- To describe and assess the policy, regulatory, and institutional environment for involving the private sector in those sectors.
- Through the above, to assist policymakers in framing future reform and development strategies and to assist potential private sector investors in assessing investment opportunities.

In Kenya, a key component of the new government's program for national development is to restore investment in water & sanitation, transport, telecommunications and energy infrastructures as quickly as possible. The government recognizes that rehabilitation of this infrastructure is a critical step towards re-establishing Kenya in its position as the region's economic hub.

In Kenya, as in many other countries in Africa and the developing world, the need for infrastructure investment is massive and immediate; as such, it is beyond the limited investment budget of the government, and although donors can certainly help, their resources are in equally high demand in other priority sectors, such as education and health, which are of less potential attractiveness to the private sector. For infrastructure, there is a high potential for the private sector to play a key role in providing the investment resources and the know-how to get the job done, while the government and the donors focus on getting the enabling environment for productive investment right<sup>12</sup>.

"It is estimated that more than US\$1.5 billion is needed to rehabilitate and expand the national electricity grid, US\$ 3.3 billion is needed to rehabilitate and expand water supply and sanitation systems in Kenya, and more than US\$ 1 billion is needed for rehabilitation of the roads network throughout the country. The Government of Kenya cannot afford the above investment needs in the electricity, water and roads sectors and needs to revert to the private sector<sup>13</sup>. The providers of infrastructures services in Kenya and India have taken action to:

- evaluate the current condition of the asset
- assess existing regulatory, policy and institutional arrangements
- estimate the rehabilitation cost of the asset
- study and evaluate Private Sector Participation models (PSP)
- establish the conditions for successful PSP in infrastructure provision and financing.

A quick calculation reveals that the cost of "wall to wall" 1:10 000 orthophoto and line mapping for the entire territory of Kenya would cost around US\$ 50 million, a fraction of the estimated US\$ 6 billion for the electricity grid, road network and water supply system. Thus, if the major hard infrastructure rehabilitation programs included a small line item in their budgets for geographic information production, then that would provide a flow of resources

<sup>11</sup> India: Country framework report for private participation in infrastructure, 2000 – World Bank and PPIAF

<sup>12</sup> Government of Kenya: Building Kenya together, Conference on private sector participation in Kenya's infrastructure <http://www.buildkenyatogether.com/pages/faqs.htm>

<sup>13</sup> Government of Kenya: Building Kenya together, Conference on private sector participation in Kenya's infrastructure <http://www.buildkenyatogether.com/pages/faqs.htm>

towards the country's SDI initiative, and guarantee the development of a sound (hard) infrastructure

## **Hard infrastructure and spatial data infrastructures: where do they meet?**

### **Spatial Data Infrastructures are key to development of hard infrastructures**

The National Highway Development Project (NHDP), a visionary scheme of Prime Minister Atal Bihari Vajpayee, is changing the face of Indian roads and highways, kilometre by kilometre. Under this ambitious project, work is proceeding apace on four-laning of approximately 14,850 km of road network through the length and breadth of the country. Minister of Road Transport and Highways B.C. Khanduri is upbeat about the project that, he says, will result in colossal economic and social gains. To the question: "What kind of difficulties you faced or are facing in the construction process?" he answered "There are some difficulties that we had not expected to become so big. These are basically problems related to land acquisition, which normally should not have taken more than a year. It has taken as much as three years. Even today we have not got all land on the Golden Quadrilateral"<sup>14</sup>.

The cost of core data (in this case land records) may be meagre compared to the investments necessary for (hard) infrastructures but the cost of not having a proper land record system works out to be much more that cost of developing one.

### **New Hard infrastructure providers are the new spatial data producers too!**

In many countries like India, the new infrastructure developers (e.g. in telecom, broadband etc.) are large private companies. As in the Kenyan road sector the investments by these companies in building up geographic databases for supporting large telecom related infrastructures is meagre. Three to four large mobile phone providers in India have ended up investing at least 3 times the annual budget of the national mapping agency of India to develop the large-scale geographic databases of around 100 Indian cities<sup>15</sup>. As the private sector participation in the hard infrastructure development in India increases in other sectors like power, pipelines, gas etc. we will see investments in geo-information database development from the hard infrastructure companies increasing.

It may be worthwhile for the SDI development agencies to engage the private (and public) hard infrastructure providers to get them in the SDI loop as these fragmented efforts of the hard infrastructure companies, if well linked up, could become important feeders in the spatial information highway of the future in developing countries.

### **Land records as infrastructure?**

A decade ago, India and China had roughly the same gross domestic product per capita. But at \$440, India's current GDP per capita is only about half of China's, and India's GDP is growing at a rate of only 6 percent a year, compared with China's 10 percent. That 6 percent is no mean feat, but could India grow faster?

<sup>14</sup> Excerpts from an exclusive interview of India Digest with Minister of Road Transport and Highways B.C. Khanduri, Date of the article <http://www.hcilondon.net/indiadigest/Issue-11/Page2.pdf>, July 1, 2003

<sup>15</sup> Story of a private sector mobile phone provider in India which is changing the face of GIS in India too: <http://gisdevelopment.net/magazine/gisdev/2003/jan/findiaa.shtml>  
<http://www.esri.com/news/arcnews/fall02/articles/reliance-infocom.html>

The McKinsey Global Institute (MGI)<sup>16</sup> has studied the country's economy to see what is holding it back and which policy changes would accelerate its growth. MGI studied 13 sectors in detail—two in agriculture, five in manufacturing, and six in services. Together, they account for 26 percent of India's GDP and 24 percent of its employment.

The MGI study found three main barriers to faster growth: the multiplicity of regulations governing product markets, distortions in the market for land, and widespread government ownership of businesses. These three barriers together inhibit GDP growth by more than 4 percent a year. Removing them would free India's economy to grow as fast as China's, at 10 percent a year. Some 75 million new jobs would be created outside agriculture—enough not only to absorb the rapidly growing workforce but also to reabsorb the majority of workers displaced by productivity improvements. Removing the distortion in land markets is estimated to contribute 1.3% to economic growth in India.

Title to most land parcels in India—90 percent by one estimate—is unclear, and the problem might take Indian courts a century to resolve at their current rate of progress. This lack of clarity about who owns what makes it immensely difficult to buy land for retail and housing development. Property developers and individual landowners also have trouble raising financing, since they can't offer as collateral for loans any land to which they don't have clear title. Not surprisingly, most new housing developments are constructed on land already owned by the developers or the few insiders who know how to speed up the bureaucratic title-clearing process. Streamlining this process and revising the laws on land ownership would boost competition in construction. Competitive builders would improve their productivity and offer houses at lower prices. The sluggish Indian construction market would expand dramatically.

This study proves that countries *do* get economically affected by not having an organised land record management system. This argument could be effectively used by the SDI development agencies to lobby for getting 'infrastructure' status for the SDI development programs (in terms of funding, tax concessions etc.) from the government since development of local level spatial database increases the GDP growth of a country.

## Conclusion

Infrastructure sectors in Kenya and India are now getting ready to rehabilitate their hard assets using provision and financing mechanisms, that are different from those employed for the 1950s and 1960s for the interstate highway system in the US, the source domain of the "information highway" metaphor. Highways, telecommunications and utilities sectors in these countries evaluate the current condition of their assets, assess existing regulatory, policy & institutional arrangements, estimate the rehabilitation cost of the assets and study & evaluate private sector participation models for their provision & financing.

SDI champions in developing countries, who are 'conversant' in the mechanisms for public financial management and infrastructure budgeting, may learn valuable lessons from these sectors. Moreover, if they can persuade major hard infrastructure rehabilitation programs to include a small line item in their budgets for core data production, that would not only provide the much needed flow of resources towards SDI initiatives, but would also guarantee the development of a sound (hard) infrastructure.

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<sup>16</sup> Unlocking Potential: Remove Barriers to India's Growth, [http://www.mckinsey.com/knowledge/articles/Unlocking\\_India.asp](http://www.mckinsey.com/knowledge/articles/Unlocking_India.asp)