REPORT

CENTRE FOR
INTERNATIONAL
ECONOMICS

Scoping the business case for SDI development

Prepared for

GSDI Steering Committee

Centre for International Economics
Canberra & Sydney

March 2000

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Foreword

On behalf of the GSDI Steering Committee I am pleased to present this report titled "Scoping the Business Case for SDI Development" by the Centre for International Economics (CIE).

The report is a result of a decision taken at the 3rd GSDI conference in Canberra, Australia, November 1998 to produce a business case for SDI development. Conference participants envisaged the business case would identify the economic, social, environmental and disaster management benefits that could be achieved through development of national and regional SDI's and the global SDI.

The report is the first stage in the development of the business case. It examines the feasibility and methodology of the business case and identifies critical success factors for the business case. The report makes recommendations on:

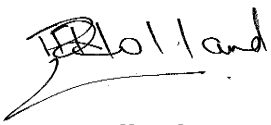
- What the business case will need to show;
- The scope and methodology for undertaking the business case;
- Identification of key areas of risk for SDI; and
- The terms of reference, timetable for completion, and a suggested budget for the business case.

A joint Australia/USA/France taskforce, reporting to the GSDI Steering Committee, managed CIE in the production of this report. Day to day administrative support was provided by the GSDI Secretariat. The report was funded jointly by the Australian Surveying and Land Information Group and the USA Federal Geographic Data Committee.

"Scoping the Business Case for SDI Development" is a useful contribution to the debate on the role and challenges facing the GSDI initiative. The recommendations presented by CIE in the report will be considered at the 4th GSDI conference in Capetown, South Africa, March 2000.

I encourage those with an interest in the GSDI and associated initiatives to continue the debate and ensure that our joint vision of a sustainable future is achieved in a cooperative and complementary way.

Copies of this report are available at the GSDI web site www.gsdi.org .



Peter Holland
Chairman, GSDI Steering Committee
March 2000

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This report

This report presents a scoping study for a major study designed to prepare a business case for SDI. It is designed to advise the GSDI Steering Committee on the feasibility and content of the major study. The major study is designed to secure political and financial support from governments, business and international organisations for development of GSDI.

A business case

The role of a business case is to establish the magnitude, nature and likely influences on the demand for the product to be developed. It must also establish that this demand can be satisfied cost effectively and providing an appropriate rate of return on funds invested — or, in the case of government investment, *generating net public benefits*.

In the case of GSDI, it will be particularly important to identify the exact nature of the GSDI product and to analyse the demand for that product.

What must the major study do?

In order to satisfy this role for a business case, the major study must:

- identify the stakeholders in GSDI;
- clearly define the GSDI product, including how it relates to other developments already taking place;
- clearly identify the demand or market niche for that product, including the decision processes that lead to a need for geographic information and in turn GSDI;
- delineate the roles of the private and public sector in establishing the GSDI and identifying the need for government funding of the product;

- estimate the costs of the product including any particular difficulties involved in international cooperation;
- justify to investors that there is a case for investment; and
- set out a concrete plan for GSDI development including a model for international cooperation.

Defining the GSDI product and identifying the demand for that product are crucial. Without these two steps, the business case will not be established.

Feasibility

We consider that the major study is worth doing, and that it is likely to generate significant benefits. While no single study can ever ensure the future of something as complex as GSDI, we consider that the business case will be an essential first step. Our recommendations below will help improve the feasibility of the project.

Recommendations

Our key findings presented throughout the report can be summarised as follows.

- The major initial focus for the major study will need to be on the demand side — evaluating the need for GSDI. Following this, significant effort will need to be devoted to clarifying the exact nature of the GSDI product.
- The major study should be undertaken in phases, allowing time for feedback between phases. While this may involve some cost duplication, it will help minimise the risks of the study not resulting in a good outcome. The phases could include the following.
  - *Phase I*. Analyse the demand side for GSDI including identifying the major decision processes that lead to demand for GSDI. Refine the definition of GSDI.
  - *Phase II*. Undertake case studies of successful and unsuccessful GSDI development. Target case studies to particular end users. Be careful to quantify benefits and costs for each case study.
  - *Phase III*. Develop targets and strategies for GSDI development.
- The task of quantifying benefits should be seriously attempted. While recognising that this is a difficult task, and that a precise estimate is not possible, we consider that the framework of quantification provides an essential discipline to the analytical process.

- The major elements of the study should proceed from case studies.
- The resulting final report should be modular, allowing different version to be targeted to the situation of particular potential investors.
- The GIS community should see the study as not only being essential for them to sell their case, but also for them to better understand it themselves.

1 Introduction

The issue

Spatial data infrastructure (SDI) and geographic information systems (GIS) are the information age in action. For those promoting SDI development, this is both an opportunity and a threat.

The capabilities of modern GIS flow from the techniques of digitising data, and the enhanced capabilities to store and process data in this form. At the same time, the speed and efficiency of data collection and transmission has increased considerably through other technical advances (including a range of communications technologies and imaging techniques). Together these advances now make it possible to assemble and process sophisticated spatial data sets. This is the opportunity.

But relatively cheap data collection, manipulation and transmission is only one aspect of the information age. Data will continue to be expensive to turn into information — to organise, interpret and use in real decisions[1]. With more data flying more quickly around the world, its organisation and interpretation will increasingly become a binding constraint. Information (or the ability to do something useful with data), will never be free.

All this is true for spatial data. Collecting and organising it, turning it into information and using that information requires real resources and real effort. These resources have alternate uses. People, firms and government agencies will not invest in data for its own sake. They need to be convinced that the enhanced access to data will be of value to them.

[1] The distinction between data and information depends, of course, on the context. 'Data' could refer, for example, to the stream of digits sent down by an imaging satellite. 'Information' refers to what those digits mean — are they rivers or roads, rocks or trees? The interpretation of these digits takes effort (although this effort may be embedded in software). Here we imagine a simple two level hierarchy: from data to information. Some authors further distinguish between information and knowledge. Whatever the terminology, the point is that work must be done before data or 'raw' information can be used in human action.

Several factors combined mean that this will not be easy in the case of GSDI. It is an abstract product based around a lot of complex technical requirements and it requires funding at a time when government budgets are under continual strain and governments are seeking to divest themselves of traditional 'infrastructure' activities. The information activities that get funded are increasingly those best able to grab the attention of those controlling resources[2]. This is the threat.

The decision to fund SDI (or not) will be made many times and in many places by many potential users — both public and private. Because governments are some of the biggest users of spatial information, they will inevitably be the biggest source of demand. The proponents of SDI must convince governments that more SDI is a legitimate use of taxpayer funds — that without government action, the identified benefits will not be achieved.

The essence of the task facing those raising funds for further SDI development is that they must sell an abstract information product. They must demonstrate how the data supported by the infrastructure they propose can effectively be turned into information and how that information can be used to solve useful problems. They must do this in the context of many other claims (bogus and genuine) on information budgets.

This report

This report presents a scoping study for a business case for SDI development. It examines the feasibility of the major study into the business case for SDI development and is designed to advise the GSDI Steering Committee on what the major study will need to demonstrate to be successful. In particular, this scoping study makes recommendations on:

- what the major study will need to show;
- the scope and methodology for undertaking the major study;
- identification of key areas of risk for the SDI; and
- the terms of reference, a timetable for completion, and a suggested budget for the major study.

[2] Witness the sums of money devoted to 'solving' the Y2K 'problem'. Though the technical inputs were beyond the comprehension of most 'buyers' (it was, after all, a subtle programming issue) the final product — a working operating system on January 1 2000 — was clear, and highly desirable. Cascading concerns about 'Y2K compliance' made this all the more so.

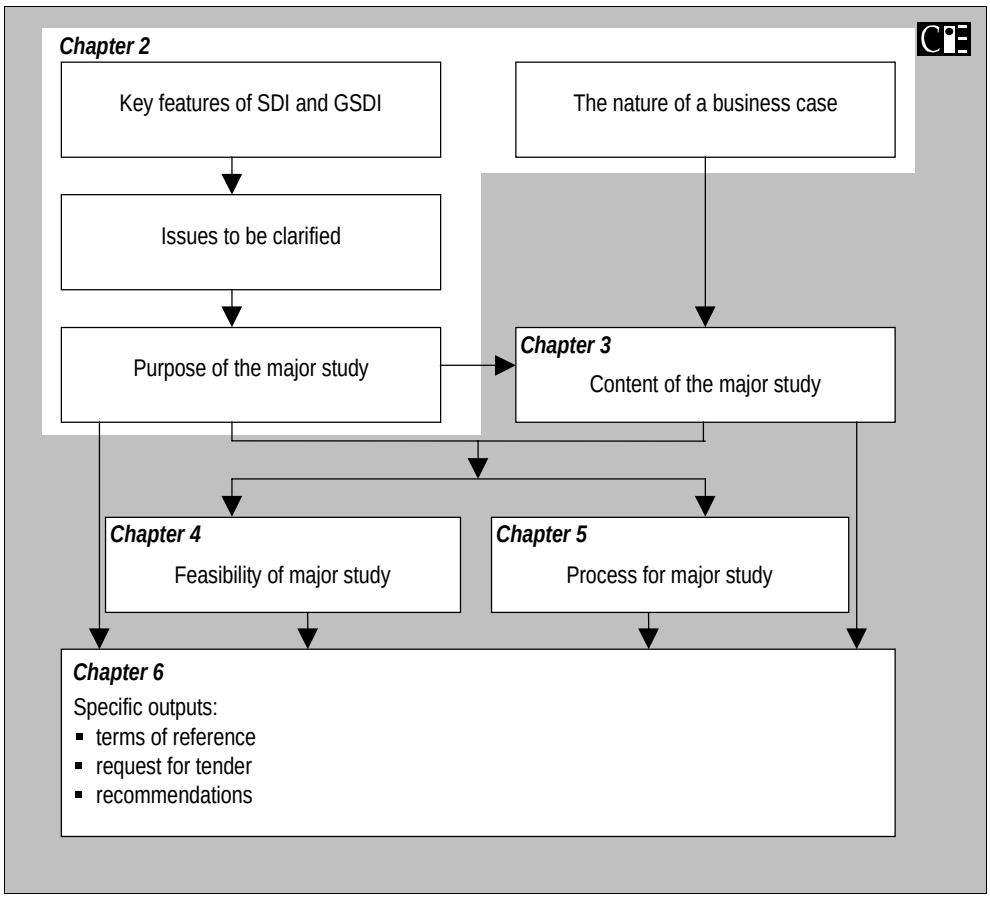
The material presented in this report is based on:

- interviews with stakeholders (in the United States, Canada, Europe, South America, Africa and the Pacific);
- an examination of the available SDI literature; and
- our own desk research and analysis.

It is worth noting that our perspective in undertaking this task is not that of GIS practitioners but that of economic analysts accustomed to analysing the costs and benefits of various institutional structures and decision making processes. It turns out that this perspective is highly appropriate to the current state of GSDI development.

The broad structure of the report is shown in chart 1.1. Starting by examining the meaning of SDI and of a business plan, we derive what the major study will need to contain, how it will need to proceed and how it should be managed and funded.

1.1 **Structure of this report**



2 *Purpose of the major study*

THE OBJECTIVE of the major study is to secure political and financial support from government(s), business and international organisations for development of GSDI. To do this, it needs to set out a GSDI business case that can comprehensively demonstrate *net public benefits* from government expenditure on GSDI, or healthy returns from private expenditure.

To examine this purpose further, we consider in more detail the nature of a business case, as well as some of the GSDI specific issues that the business case will need to clarify.

What is a business case?

Typically, a business case establishes the magnitude, nature and likely influences on the demand for the product to be developed. It then establishes that this demand can be satisfied cost effectively, allowing for an appropriate rate of return to the capital invested in supplying the product[3]. Usually, a business case will identify risks and uncertainties and suggest a strategy for managing these risks.

While both government agencies and private investors will judge a business case in terms of returns from the investment, the nature of the returns and therefore the nature of the business case will depend on whether the potential investor is public or private.

If governments are asked to fund GSDI development, then the business case must demonstrate *net public benefits* from the expenditure on SDI. The major study will need to identify nature and magnitude of the public benefits and costs, and establish that any risks associated with SDI development can be managed.

[3] Not all business cases need to establish demand. The business case for a particular gold mine, for example, does not need to demonstrate a demand for gold — it only needs to assume a reasonable price for gold. This is not the case for GSDI. It is akin to a new product, so determining that it has a market niche is fundamental.

These elements of a business case put bounds around the content of the major study. It will involve demonstrating that:

- there is demand, or a clearly identified need for GSDI;
- GSDI can be established at a cost sufficient to generate returns (or net benefits) without discouraging demand;
- the various risks — factors reducing the likelihood of need benefits — can be identified and managed; and
- there is a clear path from now ('without GSDI') to the situation in which GSDI is provided — including, for example, marketing and business development plans.

Demand and cost estimates are the fundamental core of a business case. Demand estimates amount to a demonstration to investors (whether they be national governments, international agencies or private firms) that there is a niche for the product, that consumer (government departments etc) will indeed want to purchase the product. Estimating costs shows that filling this niche is an effective use of resources.

For GSDI, establishing demand amounts to estimating the need for a *new* product. It is akin to estimating the demand for a new kind of online service, or a new household appliance[4]. Demand cannot be established by examining consumption of existing goods, rather it must be inferred from the purchasing and decision making behaviour of the relevant buyers. This makes it particularly important to understand precisely the nature of GSDI, and the behaviour of its main potential users. This includes understanding the alternative sources of information available to users and their ability to substitute between these sources.

Generating cost estimates means being able to estimate the nature of the financial commitment that customers must make. This must then be assessed against the expected benefits. If the benefits are greater than the costs, then it is feasible to establish the new product in the market. If not, then either the product is not feasible, or considerable marketing must be done to convince customers that they need the product.

The cost estimates need to include a variety of intangible costs that may arise in the case of GSDI. For example, as it will involve international

[4] Of course, GSDI is not'new' in all senses. Some of its elements have been in place for many years, and its ideas have been presented on many occasions. In the context of the proposed business case however, a case must be made for new funding, so from the perspective of the purchasers it is a new product.

cooperation, are there particular costs that arise because of the need to coordinate the activities of diverse governments in many locations?

These elements of the content of the major study are discussed further in chapter 3.

What is GSDI?

There is a relatively large literature discussing the various notions of NSDI, GSDI and so on. Many of the papers clearly articulate a vision of what can be achieved with spatial data and how it can be organised and used on a national, regional and global level. Much of this discussion comes from a technical or supply side viewpoint. The various visions do not always appear to be talking about the same product. This makes it difficult to determine exactly what 'GSDI' refers to. The following briefly discusses some of the issues.

Infrastructure

While there is broad agreement about what constitutes *spatial data* (or geospatial data), there is more scope for misunderstanding what the *infrastructure* refers to.

According to the Merriam-Webster Collegiate Dictionary, infrastructure is *the underlying foundation or basic framework (as of a system or organization)* and *the resources (as personnel, buildings, or equipment) required for an activity*. According to the Australian Concise Oxford Dictionary, infrastructure is the *subordinate parts of an undertaking*.

In both these cases, infrastructure is something that lies behind and supports other activities — which themselves will be unrelated to the nature of the infrastructure. People using telephone infrastructure use it to talk about anything, not just telephones. Road infrastructure can serve any of a broad number of purposes. These definitions also make it clear that infrastructure includes not just hardware, but also personnel and systems.

These broad definitions of infrastructure have been applied in a variety of contexts. *Information infrastructure* is used to describe the many frameworks underlying information technologies and their use. *Social infrastructure* is used to refer to the explicit and tacit rules of conduct that lie behind social interaction. Various forms of infrastructure are recognised as valuable national assets.

Public versus private provision of infrastructure

For much of the twentieth century is was widely held that infrastructure is something that needs to be funded and operated by government. Traditionally viewed as a 'public good' or a 'natural monopoly' it was argued that public provision is essential to ensure that the infrastructure is indeed provided.

In these circumstances, the main problem was not *whether* infrastructure should be publicly provided but was determining the appropriate *level* of provision of infrastructure. Providing too much could be as serious as not providing enough because the resources used could have been used elsewhere. Defining something as infrastructure was not sufficient to ensure funding. It was crucial to first determine that this funding was valuable.

Over the past 20 years or so, governments have increasingly found that private firms are well able to fund and operate many kinds of infrastructure. With rapid technical change, things previously believed to be natural monopolies have turned out not to be so. In many cases, the role of government has come to be more about providing an appropriate regulatory environment.

This means that the major study will need to be able to clearly delineate the roles of the private and public sector in establishing GSDI. In particular, it will need to identify whether the appropriate role for government involves direct provision or the establishment of appropriate operating codes and conventions. This is closely related to the issue of the nature of the GSDI 'product' discussed below.

Infrastructure and development

Economic development theory and practice has increasingly recognised that infrastructure is a national asset, and an essential condition for sustained economic growth. In countries where governments have traditionally undertaken inappropriate activities (such as controlling markets or running state owned businesses) development policy has encouraged government to focus on more fruitful areas of government activity, including the development and maintenance of key infrastructures and the establishment of an appropriate regulatory environment.

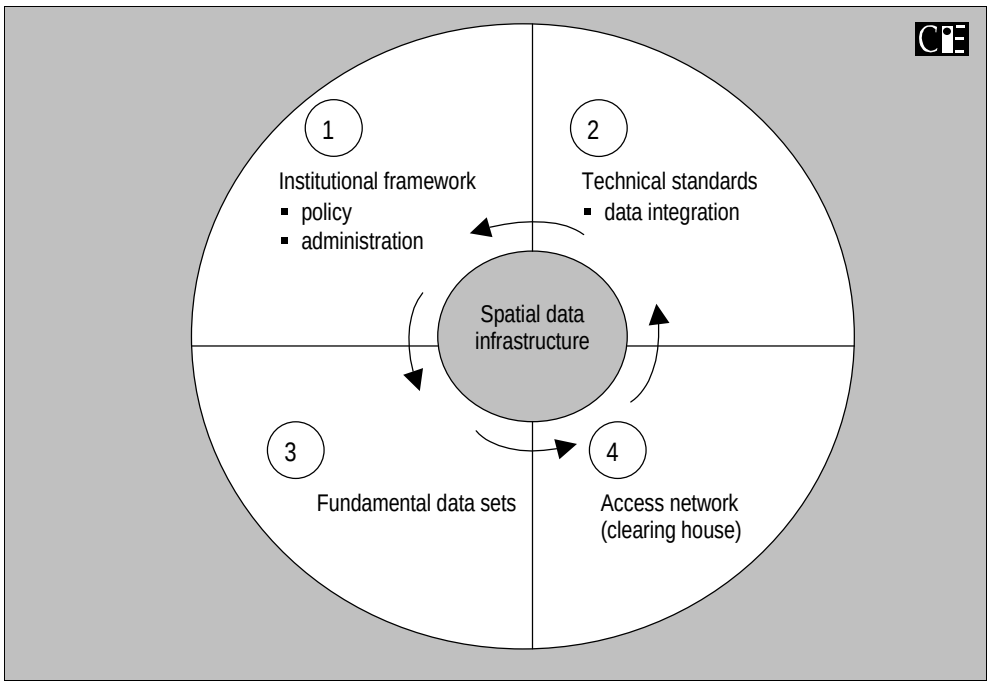
The major study will need to be able to distinguish the infrastructure needs of developing and developed countries and set out how the need for GSDI relates to the stage of development.

Global and national SDI

The broad definitions of infrastructure are consistent with the definition of GSDI adopted by the GSDI Steering Committee as *the broad policy, organisational, technical and financial arrangements necessary to support global access to geographic information*.

It is also consistent with the four component model of a regional SDI adopted by PCGIAP (chart 2.1).

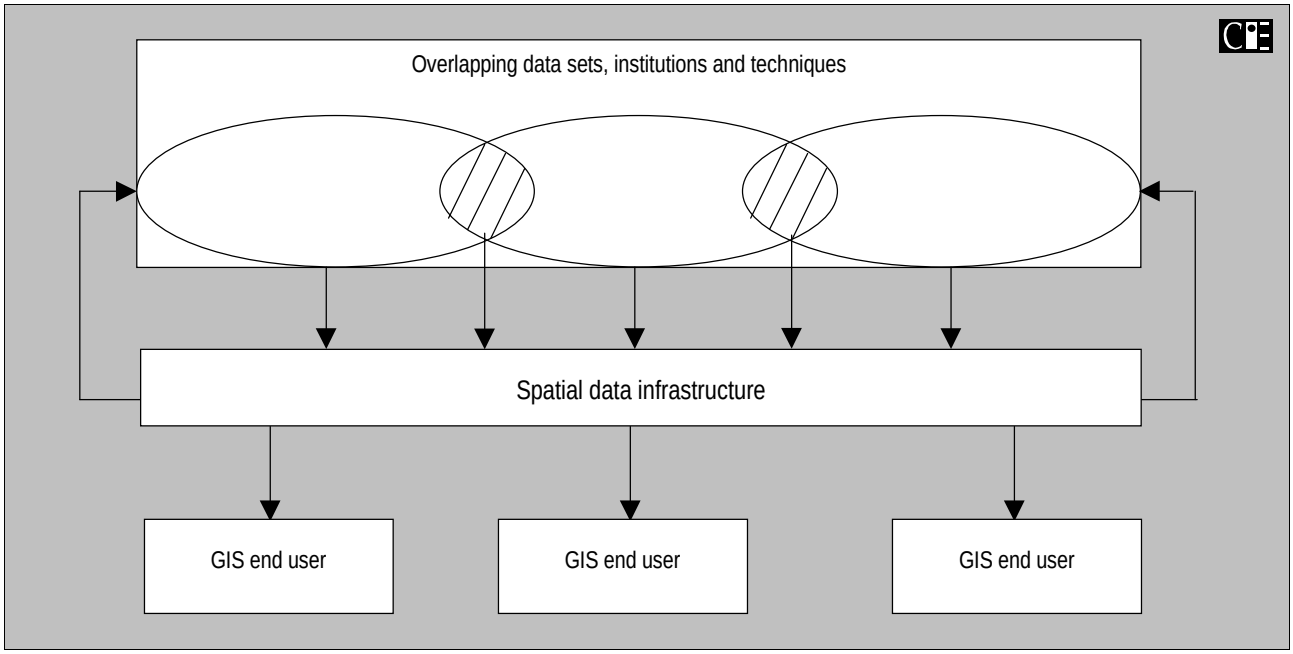
2.1 **A model of spatial data infrastructure**



SDI in this sense gives a picture of a variety of end uses, all mediated by a common infrastructure or approach. Chart 2.2 illustrates, for example, how various geographic information systems can use different (but possibly overlapping) data sets if there is a common infrastructure (as defined in chart 2.1, for example) that mediates between them. Users with a particular need are not hindered in their ability to access spatial information because the 'infrastructure' has done the work of organising it for them.

But what are the needs, and what is the value of the infrastructure?

2.2 **Many uses for overlapping data**



What is the 'product' for the business case?

While the above comments raise some general issues about the nature of GSDI, they have not addressed a more fundamental question for the business case: what exactly is the product that governments and other agencies will be asked to fund? The broad definitions of GSDI are not sufficiently operational (or practical) to build a clear business case around.

Global SDI versus national or regional SDI

Is GSDI a simple linking of national SDIs? Is it ensuring that national SDIs are compatible? In this case, perhaps the GSDI product is something like a WTO (or a UN) for spatial data — a forum where nations come together to compare notes and give each other assistance.

To a degree the European stakeholders we spoke to saw GSDI as a coordination issues, ensuring the compatibility and consistency of various SDI efforts in different countries.

Encouraging developing countries

Perhaps GSDI is a matter of encouraging countries that do not currently place emphasis on geospatial data to do so. In this case, the product may be

a suite of policy recommendations and technical assistance approaches that development agencies can apply in their client countries.

It is interesting to note that many of the policy programs and development assistance packages of the past have failed (import protection and replacement, large white elephant industrial plants, and so on). How do we ensure that the GSDI product does not fall into the same category? This relates closely to questions of demand discussed further below.

A number of the developing country stakeholders we spoke with identified GSDI with good governance in general — having information and management systems in place allowing governments to better and more efficiently undertake their roles.

SDI versus GIS

Discussions of SDI often do not distinguish between the infrastructure itself and the more specific notion of a particular GIS. The exact relationship between SDI and particular GIS products needs to be clarified if the GSDI product is to be clearly defined.

Is GSDI a process, a general framework, or is it a particular product such as a world map or a comprehensive database? To a degree, some of the North American stakeholders saw GSDI as a particular product or a particular instance of different regional data coming together.

Do more and do it faster

While the exact nature of the product is not clear, it is likely to involve some increase in action relative to what is happening already. What is the baseline against which this speeding up is to be evaluated, that is what is the rate of development in the absence of the 'GSDI product'?

Who are the stakeholders?

An element of pinning down the product is identifying the key stakeholders in the provision and use of spatial data. This includes both private and public sector organisations.

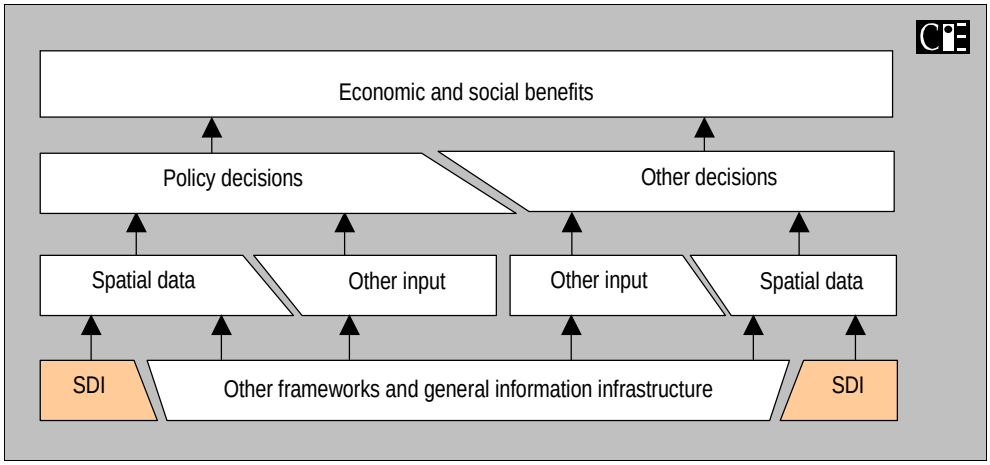
The business case will need to identify stakeholders in order to understand the decision processes that lead to a demand for GSDI (see below) an also to identify key sources of information to undertake the research for the business case. Identifying the stakeholders will also be crucial for working out the business development process that arises from the business case.

What about the demand side of GSDI?

The area that raises the most questions is the exact nature of potential demand for GSDI. What exactly are the products that users want and need (and how does this relate to what can be supplied)? Further, how does the demand for GSDI relate to developments that are taking place already?

Analysis of demand is inevitably difficult, because the demand for infrastructure indirectly derived from the decision-making processes. As chart 2.3 illustrates, policy decisions are one element of economic benefits. Spatial data is one element of policy decisions, and SDI is one element of spatial data.

2.3 **Demand for SDI is indirectly derived from decision making**



Demand for GSDI is a derived (or indirect) demand. It depends first on the need for good decisions, second on the need for spatial data to assist those decisions and third on the need for an infrastructure to support that spatial data.

Analysis of the demand side will involve a clear understanding of the decision-making processes that use spatial information. But what must be established on the demand side is not the need for spatial data itself (it is clear that basic and thematic maps, for example, are important in many policy contexts), but the need for extra effort to speed the rate of development of the product called GSDI.

People (governments) are making decisions now based on patchy and incomplete, but steadily developing data sets — data sets that exist now without the benefit of a comprehensive GSDI. What is the need to speed things up? How will decisions be improved?

Clarifying the demand side will be a crucial element of the business case. Investors will only be willing to part with funds to the extent that they are convinced there is a real need for the product and that the need cannot be satisfied in any other way. Government investors will need to be convinced first that there is a real need for the product and second that the elements of the 'GSDI product' are not already, or could not easily be, provided by the private sector.

It is unlikely that the demand question can be addressed on a comprehensive general basis. Success is more likely if it is addressed on a case by case basis. Cases which will be relevant to public investors include:

- environmental management;
- emergency services;
- land use and planning; and
- major project planning.

All this needs to be addressed in the context of demand for *global* infrastructure. The case is easier to make on a national basis, why global?

What does the major study need to achieve?

With the discussion above in mind, we can set out what the major study must achieve. The purpose of the major study is to establish a business case for SDI development by:

- identifying the stakeholders in GSDI;
- clearly defining the GSDI product, including how it relates to various developments already taking place;
- clearly identifying the demand or market niche for that product, including the decision processes that lead to a need for GIS and in turn GSDI;
- delineating the roles of the private and public sector in establishing the GSDI and identifying the need for government funding of the product;
- estimating the costs of the product including any particular difficulties involved in international cooperation;
- justifying to investors that there is a case for investment; and
- setting out a concrete plan for GSDI development including a model for international cooperation.

3 *Approach and content of the major study*

Having discussed issues that the major study must address, we turn now to questions of how it should address them.

Broad structural questions

Is it one document or more?

GSDI will potentially be funded by a number of governments and agencies. This raises a question as to whether a single business case document is likely to be able to 'convince' these various bodies.

In our view, it is unlikely that a single document will be able to make an appropriate case in a variety of fora. An alternative is to construct a case that is 'modular' — effectively a series of documents with a common core but with modules that can be inserted as appropriate.

The core document would include the key definitions of GSDI and the main elements of the business case. The modules would include particular examples or case studies relevant to different stakeholders.

The identification of modules would flow naturally from the identification of key stakeholders in the business case as well as from the case studies.

Does it do original research?

To what extent should the business case draw in existing (published and unpublished) studies, and to what extent should it undertake original research?

We think it is unlikely that any existing studies will analyse the costs and benefits of GSDI at a level sufficient for a business case. While existing studies will provide essential background, and will point to research

strategies that are more or less fruitful, the business case will need to undertake independent research.

How important is quantification?

Quantifying the value and cost of abstract items such as GSDI is inevitably extremely difficult. While the returns from a mine or other economic activity that involves a well defined product can easily be evaluated, this is not so for GSDI. One key reason is that GSDI has the possibility both to change decision making behaviour and to allow new kinds of activities to take place.

Despite these difficulties, we consider it is important (and will be beneficial) if the business case devotes a significant amount of attention to quantification.

First, a business case needs to be able to show that there is a reasonable expectation that the benefits of GSDI will exceed the costs. It is very difficult to do this without an approach that takes the task of quantification seriously. Governments are likely to be skeptical of untested claims of benefits and will certainly require a clear estimate of the costs they are expected to bear in establishing GSDI.

Second, quantification provides a natural process or framework within which to construct a business case. Methodologies for quantifying benefits and costs (see below) when followed properly can generate fruitful questions and insights, even when the final numbers are very imprecise. In the process of trying to get a number — collecting and evaluating data and so on — the researcher learns a great deal about the product and its limitations, and this knowledge can be gainfully applied to the general business case[5].

Further, the process of quantification can help in identifying relative orders of magnitude. It can therefore help in setting priorities.

[5] The advantages of taking a quantitative view can be seen in Australia's 'National Competition Policy' (NCP) review process which requires that all Australian regulations affecting competition must be subject to a net public benefits test. Under NCP, regulations that do not provide public benefits clearly greater than costs must be removed. Even in cases where costs and benefits cannot be accurately estimated, this new requirement to explicitly compare them has forced both proponents and opponents of regulations to clearly identify the costs and benefits. Whereas once both sides produced vague and unsubstantiated arguments, this is now considerably less likely.

It is of course important that quantification not be viewed as an end in itself (just for the sake of a number) but as an approach or mindset that applies to the general task of constructing a business case.

We therefore recommend that the business case does attempt quantification, not to producing a single correct number, but for the reasons above and to provide some feasible orders of magnitude.

An action plan

If it succeeds in clarifying the issues summarised in the previous chapter, and once it has undertaken quantification, the business case will need to provide a clear 'action plan' for further development of GSDI. This includes relating actions to particular stakeholders and particular members of the GSDI steering committee.

Methodology

Broad approach

The business case will need to use a broad research arsenal that will include:

- a literature review (a broad starting point for this is provided in the reference list to this document);
- analysis of past attempts to establish global geographic information;
- interviews with stakeholders; and
- the possibility of a survey of major potential users.

Research strategy

As a broad research strategy, we consider that the work for the business case should initially focus on demand issues before going on to clarify the nature of the product. This will provide a more concrete motivation for understanding the relevance of various issues and definitions on the supply side.

Quantification

As with the evaluation of any policy, regulation or new product, quantification will involve two key components:

- the identification of a baseline of business as usual scenario; and
- overlaying a 'with GSDI' scenario on top of the baseline.

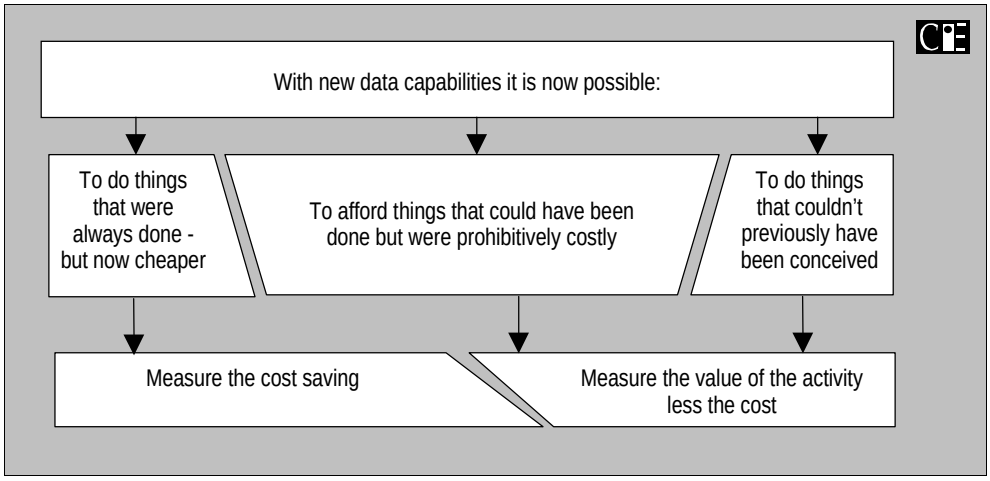
The baseline identifies the state of the world without the extra expenditure on GSDI. What will decisions systems and the use of GIS be like without the extra spending on GSDI.

The 'with GSDI' scenario tests for the difference that GSDI makes.

It is extremely important to clearly identify the 'with' and 'without' scenarios. This is the only way to identify the benefits that come from the GSDI spending itself, rather than from other aspects of GIS in general.

The 'with' scenario is constructed by understanding the channel of costs and benefits for GSDI. This will be a major task for the business case. At this stage many of these benefits are not clear. The broad possibilities, however, are illustrated in chart 3.1.

3.1 **Continuum of benefits**



Case studies

Case studies will be an important element of both the research methodology and the presentation of an argument in the business case. General propositions about the nature of demand can be tested and illustrated using careful analysis of particular examples.

Case studies will need to be carefully chosen to reflect both aspects of the issues involved and guidance provided by stakeholders. The exact number of case studies will need to be flexible, but around five is probably appropriate.

Not all the case studies have to be 'positive'. It will be useful and informative to include a case study of the failure of a particular approach to GSDI. Indeed, failures often provide more lessons and guidance than do successes.

Structure of the report

The overall structure of the report (and its possible modules) will in part be determined by the findings of the research. A possible base structure is outlined in table 3.2.

Within this base structure, the 'modules' could be constructed by combining particular demand elements with particular case studies. Thus, a module targeted for development agencies would use development case studies along with analysis of demand for development purposes.

3.2 **Outline of the report**

Chapter	***Contents***
Executive Summary	Overview of the study and summary of key results
1. Introduction	General introductory comments
2. The need for SDI	Begin with a discussion of the demand side, identifying the need for SDI. Rather than starting with a definition of SDI, this provides a motivation for readers by showing readers that there really is a problem to be solved. This includes a discussion of the decision making processes that lead to the need for spatial data and hence SDI.
3. SDI concepts	Discuss the 'GSDI product' as it relates to the needs identified in chapter 2. Refer to the historical emergence of SDI and its state of development in a range of countries. This includes identifying government and private initiatives.
4. Case studies/quantification of benefits.	This part of the report could be 'modular'. It focuses on demonstrating both the need for, and the advantages of GSDI (or national and regional SDIs) in a mix of regions and applications. The case studies should be chosen to target particular potential end users. The core chapter would also include an identification of the ways in which decision making could be improved through SDI. The case studies should also include examples of where SDI has *not* been successful.
5. Costs of GSDI	This would identify the financial resources likely to be required to establish GSDI in the way outlined in the previous chapters.
6. The role for public/development agency action.	This chapter would justify the need for public, as opposed to private, funding. It would also justify the need for development agency support.
7. An action plan	Set objectives for SDI (in 2010 or some appropriate target year) and present a plan for achieving those objectives.
8. Recommendations	Summarise specific recommendations derived from previous chapters.

Traps to avoid

It is important that the business case avoids making extravagant, untested, abstract or utopian claims. Such things are too easy to dismiss. Rather the study needs to make specific claims about particular uses or outcomes.

The study should also avoid a spurious precision. These claims are also easy to dismiss.

4 Feasibility of the major study

A broad view

In chapter 2, we summarised the objective of the major study as *securing political and financial support from government(s), business and international organisations for development of GSDI.* In light of the subsequent discussion in chapter 2, and the need to more clearly define both the demand and supply sides of GSDI, this is a very ambitious objective.

If feasibility is judged in terms of the study itself actually achieving financial support, then feasibility is extremely low. This is partly because we do not know in advance what the major study will actually find. It may not be able to identify a demand for GSDI, or it may find that the costs of setting it up are greater than the benefits. Feasibility in this strong sense is also low because the objective is a big task for any one document or study.

If however, feasibility is judged in terms of laying a sound foundation for continued development of GSDI, then the prospects are good. Further, it is unlikely that the idea of GSDI will get much further without a major study that clarifies the various issues identified in the previous chapters. While the GIS community is perfectly capable of addressing these issues itself, a major study with outside consultants will provide an excellent catalyst for further developing ideas.

Is there a case to be made?

To date the case for GSDI does not seem to have been significantly tested outside of the GIS community. From outside this community, the idea of GSDI remains very abstract and unclear.

However the importance of various kinds of spatial data is clear, and if the business case can relate GSDI to the use of spatial data, then there is likely to be a good case to be made. In particular, there is highly likely to be a good case to put for SDI development in developing countries. The precise nature of this case, however, is yet to be determined.

Can governments and agencies be convinced?

The answer to this depends entirely on the government or agency under consideration. Most governments (except in the developing world) devote significant resources to various forms of spatial data — although in many cases this funding has declined over time. There are also regional initiatives currently underway with mixed success.

In general, and over the long term, governments are responsive to sound arguments for measures that enhance good governance. Measures which are legitimately in the government's domain and which are clearly costed and specified generally have a good chance of success.

International agencies, such as the World Bank, also devote resources to spatial data issues (particularly in relation to the environment). These agencies are also likely to support GSDI initiatives if they are clearly costed and if they are clearly related to the agency's existing work program.

Improving feasibility

There are a number of ways to improve the likelihood of a useful outcome.

Undertake the major report in phases

The business case depends on a number of elements, some of which build on earlier ones. The clear definition of the GSDI product depends, for example, on identifying the demand for GSDI and cost estimates in turn depend on a clear product definition.

In order to ensure that later elements are not undermined by problems in the earlier elements, it may be appropriate to conduct the major study in two or three phases, allowing for careful evaluation and feedback at each phase. One possibility for these stages is as follows.

- **Phase I**. Analyse the demand side for GSDI including identifying the major decision processes that lead to demand for GSDI. Refine the definition of GSDI.
- **Phase II**. Undertake case studies of successful and unsuccessful GSDI development. Target case studies to particular end users. Be careful to quantify benefits and costs for each case study.
- **Phase III**. Develop targets and strategies for GSDI development.

The kinds of results emerging could be reviewed after each phase before proceeding with the next phase.

Get broad feedback at each phase

If a phased approach is adopted, it will be important to get broad feedback (from a full range of stakeholders) after each phase.

Take quantification seriously

As noted in chapter 3, quantification of costs and benefits can have distinct advantages even if the quantification is not precise. It is generally easier to sell results if a serious attempt at quantification has been made. This, of course, does not imply that quantification guarantees success, only that a clear, transparent attempt to measure benefits is one way of removing skepticism and uncertainty about results. We would recommend taking the task of quantification very seriously.

Identify roles and responsibilities

It will be important for the business case to clearly identify who is to make the next step in the process and who then has the responsibility to respond and take the process forward.

Make good use of case studies

Case studies are a vehicle both for undertaking research and for the presentation of a sound argument. The abstract nature of GSDI means that case studies will be essential to get particular points across.

5 *Undertaking the major study*

THERE ARE A NUMBER of practical considerations to be resolved in getting the major study underway and in choosing the team to undertake the study. We consider each of these in turn.

Project management

A successful consultancy project requires clearly defined:

- tasks;
- milestones;
- reporting requirements; and
- feedback mechanisms.

In principle, each of these could be achieved either under the current *ad hoc* GSDI steering committee arrangements or under GSDI as a permanent organisation. As either organisation will have an international focus, it will be necessary to define a single point of contact for the consultant which acts as conduit for information flowing in any direction.

Difficulties often arise in large projects where the communications channels are not clear, or are not open. A member of the GSDI steering committee (or of the permanent GSDI organisation) will need to take responsibility for the management of the project. The location of this responsibility could either be determined in advance, or once the nationality and location of the consultants has been determined.

Contracts

If the *ad hoc* GSDI arrangements remain, then the consultant's contract will need to be between the chosen consultant and the appropriate member of the GSDI committee. Other members of the committee who provide funds to the project may need to have associated contracts with the member of the GSDI committee that is managing the project.

Assessment of milestones

Payment to the consultants should be conditional on achieving defined milestones. Achievement of the milestones could either be assessed by the GSDI committee member (or the GSDI organisation) or by a panel constituted from the GSDI steering committee.

Feedback

Feedback to consultants should be sought as widely as possible, but channeled through a single point to avoid duplication and confusion.

Decision to proceed in the case of a phased study

If the option for a phased study is adopted, it will be important to have clear decisions about whether to proceed to the next phase.

What funding will be required?

Table 5.1 provides an indicative budget for the study. The professional fees are based on an estimate of the professional time that would be required to complete each of the tasks (falling within three phases). This timing is then costed by assuming a monthly fees of between US$20 000 and US$25 000. These are based on typical rates for international consultants that would be paid by organisations such as the World Bank.

Travel costs will depend on the location of the selected consultant. The estimates in table 5.1 are based on 4 or 5 trips at US$5000 each. This estimated is very rough but is designed to reflect the fact that it will be important for the consultants to visit a number of agencies in Europe, the United States and selected developing countries. The exact choice of the countries to visit should be an outcome of phase I.

Disbursements and publication are estimates designed simply to flag these cost items.

These cost estimates suggest a budget of between US$255 000 and US$335 000. Allowing for a 20 per cent margin of error, this suggests that the planning for the major project should expect consultants costs of between US$200 000 and US$400 000.

5.1 **Indicative budget — consultant costs**

Item	*Person months to complete*	*Cost (lower)*	*Cost (upper)*
		US$	US$
Professional fees			
Phase I			
Demand side analysis	1	20 000	25 000
GSDI definition and concepts	1	20 000	25 000
Identify stakeholders	0.5	10 000	12 500
Total	**2.5**	**50 000**	**62 500**
Phase II			
Case studies	3	60 000	75 000
Quantification of benefits	2	40 000	50 000
Quantification of costs	1	20 000	25 000
Total	**6**	**120 000**	**150 000**
Phase III			
Public versus private provisions	0.5	10 000	12 500
Targets	0.5	10 000	12 500
Action plan	1	20 000	25 000
Recommendation	0.5	10 000	12 500
Total	**2.5**	**50 000**	**62 500**
Other costs			
Travel and accommodation		20 000	30 000
Disbursements		5 000	10 000
Report publication and distribution		10 000	20 000
Total other costs		**35 000**	**60 000**
Grand total		***255 000***	***335 000***

Source: CIE estimates

The major project will also involve costs from the point of view of the agency or agencies responsible for managing the project and the agencies providing feedback after each phase. The managing agency should account for costs of around 1 to 2 person months. Other agencies could be involved in feedback processes totaling 0.5 to 1 person months.

Where do the funds come from?

Some broad options for funding the major study are as follows.

- Each agency within the GSDI steering committee contributing a proportion of the funds from their own budget.
- Agencies within the GSDI steering committee seeking special purpose funding from national governments.
- Seeking special purpose funding from a combination of private and public sector agencies. This will involved demonstrating to the private sector that there will be significant spin-offs from the major study for private sector activtity.

What is the time frame?

The professional time for all phases (as set out in table 5.1) comes to a total of 11 person months. This suggests elapsed time for all phases of the major study of 6 to 12 months, depending on the exact nature of the consultant team and the time taken for feedback.

What are the selection criteria for the consultant?

The nature of the task suggests a consultant team with a variety of skills, but an emphasis on the ability to undertake evaluation and analysis in abstract areas and a good understanding of policy and decision processes. Some important selection criteria are as follows.

- Broad familiarity with GIS and their uses.
- Understanding of information infrastructure — that is, understanding the broad technical and organisational requirements that underpin information exchange.
- Ability to undertake economic evaluation in a variety of areas — especially infrastructure and information services.
- Experience in quantitative evaluation.
- Demonstrated ability to provide a sound framework for dealing with abstract evaluation issues.
- Communication skills.
- Experience in dealing with government, private sector and development agencies.
- Understanding of government and business decision processes.
- Experience in managing large projects extending up to a year.

A less formal selection criterion is that ideally the consultant should come from outside the GIS community. While this may conflict with the first criterion above, and while it may mean the consultant spends more time getting up to speed, it has the advantage of providing an independent and fresh view on the issues.

6 *Outcomes and findings*

Terms of reference and request for proposal

These are set out in appendixes A and B respectively. Each draw on the material presented in the previous chapters of this scoping study.

Key recommendations

We can summarise our key findings presented throughout this report as follows.

- Major initial focus needs to be on the demand side, evaluating the need for GSDI. Following this, significant effort needs to be devoted to clarifying the nature of the GSDI product.
- The major study should be undertaken in phases, allowing time for feedback between phases. While this may involve some cost duplication, it will help minimise the risks of the study not resulting in a good outcome.
- The task of quantifying benefits should be seriously attempted. While recognising that this is a difficult task, and that a precise estimate is not possible, we consider that the framework of quantification provides an essential discipline to the analytical process.
- The major elements of the study should proceed from case studies.
- The resulting final report should be modular, allowing different version to be targeted to the situation of particular potential investors.
- The GIS community should see the study as not only being essential for them to sell their case, but also for them to better understand it themselves.

References

To undertake this study we have referred to a large amount of literature on SDI concepts and GSDI in particular.

GSDI website

One of the most comprehensive sources is the GSDI web page (www.gsdi.org) which contains the text of most papers presented at various GSDI conferences over the past few years. A useful survey can be found in:

- Masser, I., 1998, *The First generation of National Geographic Information Systems*, International Institute for Aerospace Survey and Earth Sciences, Netherlands, http://www.gsdi.org/canberra/masser.html, accessed 2nd February 2000; and

National and regional SDI organisations

Useful national and regional sites include:

The Australia and New Zealand Land Information Council (www.anzlic.org.au) and in particular:

- ANZLIC (Australia New Zealand Land Information Council) 1998, *Spatial data Infrastructure for Australia and New Zealand*, ANZLIC Spatial Information Council, Canberra, May 1998, www.anzlic.org.au/anzdiscu.htm, accessed 2nd February 2000;
- Price Waterhouse 1995, *Australian Land and Geographic Data Infrastructure Benefits Study*, Report prepared for ANZLIC, February 1995.

The United Kingdom Ordinance Survey (www.ordsvy.gov.uk) and in particluar:

- Oxera 1999, *The economic contribution of the Ordinance Survey*, Oxford Economic Research Associates, Oxford (www.ordsvy.gov.uk/literatu/external/oxera99)

European Umbrella Organisation for Geographic information at (www.eurogi.org).

Canadian Spatial Data Infrastructure at (www.cgdi.gc.ca).

Australian Spatial Data Infrastructure at (www.auslig.gov.au/index_sdi.htm).

Other sites

The Open GIS Consortium at (www.opengis.org).

The Digital Earth program at (www.digitalearth.gsfc.nasa.gov).

Appendixes

A Terms of reference for the major study

***Note**: the items in square brackets are to be completed as appropriate by the GSDI Steering Committee or the organisation commissioning the major study.*

The issue

Background

For the past *[X]* years, geographic information system (GIS) practitioners around the world have been developing the notion of *spatial data infrastructure* (SDI). This concept has been applied in a number of national contexts [references], and there are proposals to develop it in a regional context [reference]. More recently, a group of practitioners has met in a series of conferences to develop the idea of global spatial data infrastructure (GSDI).

GSDI has been generally defined as *the broad policy, organisational, technical and financial arrangements necessary to support global access to geographic information*. Within the context of this broad definition, individual writers in the field have developed particular notions of exactly what GSDI means.

The GSDI steering committee *[define]* considers that it is now an appropriate time to further develop the various notions of GSDI and crystallise them into a concrete business case.

The business case

The objective of the business case is to secure political and financial support from government(s), business and international organisations for development of GSDI. To do this, it must comprehensively demonstrate *net public benefits* from government expenditure on GSDI, or healthy returns from private expenditure.

The task

The task for the consultant will be to prepare a comprehensive business case setting out in detail the costs and benefits of GSDI. In particular, the business case will need to:

- identify the main GSDI stakeholders;
- clearly define the nature of GSDI in a manner suitable for a business case;
- clearly identify the demand or market niche for that product, including the decision processes that lead to a need for GIS and in turn GSDI;
- delineate the roles of the private and public sector in establishing the GSDI and identifying the need for government funding of the product;
- estimate the costs of the product including any particular difficulties involved in international cooperation;
- justify to investors that there is a case for investment; and
- setting out a concrete plan for GSDI development including a model for international cooperation.

In addition, it is intended that the business case quantify the costs and benefits of GSDI investment.

[Include as appropriate discussion of the need to complete the study in separate phases]

Selection criteria

Consultants or the consulting team will be selected on the basis of the following selection criteria.

- A demonstrated understanding of the task.
- Broad familiarity with GIS and their uses.
- Understanding of information infrastructure — that is, understanding the broad technical and organisational requirements that underpin information exchange.
- Ability to undertake economic evaluation in a variety of areas — especially infrastructure and information services.
- Experience in quantitative evaluation.
- Demonstrated ability to provide a sound framework for dealing with abstract evaluation issues.

- Communication skills.
- Experience in dealing with government, private sector and development agencies.
- Understanding of government and business decision processes.
- Experience in managing large projects extending up to a year.

Timing

[Insert timing details as appropriate]

Budget

[Insert budget details as appropriate]

The proposal

Interested consultants are asked to submit a proposal detailing their suitability for the task by setting out:

- a proposed methodology for the study;
- a detailed work plan for completing the task;
- a complete set of cost estimates for undertaking the study, including details of professional fees for each consultant and other costs;
- details of how the consulting team meets each of the selection criteria;
- examples of previous work in related areas;
- demonstration of quantitative evaluation skills;
- *curricula vitae* and other relevant details of each team member.

Contact details

Further details , including a copy of the scoping study for this task can be obtained from

[contact]

or by visiting *[website]*.

Other matters

[Include more on organisational arrangements and contractual details as appropriate.]

B *Request for proposal for the major study*

***Note**: the items in square brackets are to be completed as appropriate by the GSDI Steering Committee or the organisation commissioning the major study.*

Global spatial data infrastructure: the next phase

Just like our telephone network requires a basic underlying infrastructure, so too does the information age. In particular, spatial or geographic information requires and underling infrastructure to ensure its efficient development and use.

A number of geospatial information specialists have been developing the idea of global spatial data infrastructure (GSDI) over the past several years. These specialists, represented by the GSDI Steering Committee [or appropriate organisation] wish to proceed further with the development of GSDI, taking its ideas outside of the domain of specialists and developing a business case suitable for presentation to a wide variety of stakeholders.

The GSDI Steering Committee is seeking proposals from suitably qualified consultants, or consulting teams to prepare the business case. Further details and a terms of reference can be obtained from:

[contact details]

C Job description for this scoping study

Definitions

Consultancy	The consultancy that will undertake the Scoping Study
Final Report	Final report of the Consultancy presented to the Project Manager.
Major Study	The study being commissioned by the GSDI Steering Committee into the Business Case for Spatial Data Infrastructure (SDI) Development. The study will be undertaken in two stages.
Project Manager	The Australian Surveying & Land Information Group (AUSLIG)
Scoping Study	Stage 1 of the Major Study.

Purpose

The purpose of this document is to seek a proposal from The Centre for International Economics to undertake a Scoping Study into the Business Case for Spatial Data Infrastructure (SDI) Development.

Background

The Global Spatial Data Infrastructure (GSDI) encompasses the broad policy, organisational, technical and financial arrangements necessary to support global access to geographic information.

The emergence of the GSDI concept can be traced through the mapping and land information system developments of the 1960's and 70's; the acceptance of the notion of information as a corporate resource in the 1980's; rapid improvements in computing, communications and positioning technologies through the 1980's and 90's; and finally, implementation of national SDI's in the 1990's.

An interim group, the GSDI Steering Committee, comprising representatives from all continents, has been tasked with leading the GSDI initiative until a permanent global umbrella organisation is established to take the GSDI into the future. Australia, through Mr Peter Holland, General Manager, AUSLIG currently holds the Chair of the GSDI Steering Committee. The Secretariat also resides with AUSLIG

Resolution 3 of the 3rd GSDI Conference held in Canberra, Australia in November 1998 called on the GSDI Steering Committee to commission a major independent study (Major Study) into the Business Case for SDI Development, with a draft report to be presented to the 4th Conference in Cape Town, South Africa, in March 2000.

Process

The Major Study will be undertaken in two stages:

- *Stage 1* Conduct a Scoping Study to assist the GSDI Steering Committee to refine the issues to be addressed, to agree to the methodology to be used, and to determine the budget for Stage 2.
- *Stage 2* Commission the second stage of the Major Study as determined following Stage 1.

Stage 1

The outputs from Stage 1 will examine the feasibility of the business case study and make recommendations on how it would be undertaken. A report will be provided to the GSDI Steering Committee containing an outline of the scope or contents of, and methodology for undertaking, the Major Study, terms of reference for, and a timetable for completion of, the Stage 2 consultancy, and a recommended budget. The report should provide a basis for competitive bidding for the Major Study and contain a "Request for Tender" for the consultancy for Stage 2.

The Scoping Study is to be presented to the next GSDI Conference in Cape Town, South Africa, 13 – 15 March 2000 for approval and progression into the next stage.

Expectations of Stage 2

It is anticipated that the output of Stage 2 will be a report addressing the Terms of Reference, including appropriate data, analysis, case studies, conclusions and an executive summary. The report will be required in a

form suitable for publication. An indicative outline of the Major Study is provided in the Attachment.

The Major Study

The Major Study will identify the economic, social, environmental and disaster management benefits that can be achieved through development of national and regional SDI's and the global SDI. It is envisaged that SDI development will be facilitated through:

- Financial support and capacity building, by national governments and international agencies; and
- Policy changes to enable wider access to public sector spatial data, by national governments.

The target audience for the Major Study are senior policy makers in national and international agencies, such as treasuries, national development departments, and international aid agencies. It is likely that this audience will be unfamiliar with SDI concepts, but will regularly be making decisions between competing bids for government funds, and setting government policies for information access. The Major Study must therefore be written in their language rather than that of the SDI community.

The Major Study is expected to:

- Build on existing national and other economic, social, environmental and disaster management studies, and refer to the development policies of international bodies;
- Be undertaken by independent experts, with funding from independent sources;
- Include real multi-national and/or global case studies that illustrate SDI benefits; and
- Be suitable for submission to national governments and international funding agencies.

It is anticipated that the Major Study will be used by the GSDI Steering Committee in a major campaign to secure government and funding support for national, regional and global SDI development.

Timetable

The Consultancy is expected to work to the following indicative timetable:

Proposal to undertake the scoping study submitted to the Project Manager	Mid January 2000
Draft report of the Consultancy submitted to the Project Manager	Mid to late February 2000
Final Report of the Consultancy submitted to the Project Manager	No later than 6 March 2000

Ownership of the Final Report

The Final Report and all materials produced during the consultancy will be the property of the GSDI Steering Committee. The GSDI Steering Committee may publish the report in whole or part.

Confidentiality

Some of the documents or information supplied by persons or organisations contacted during the Consultancy may be confidential. The consultant must undertake to respect confidential information, and to destroy confidential material at the completion of the Scoping Study.

Involvement in the Major Study

The Centre for International Economics will be inellegible to tender for the consultancy for the Stage 2 but may be invited to act as an "economic advisor" to the GSDI Steering Committee for the Major Study.

Submission of Proposal

The Centre for International Economics is invited to submit a proposal and costs to undertake a Scoping Study into the Business Case for SDI Development. This proposal should be submitted to:

Mr David Robertson
GSDI Secretariat
Spatial Data Infrastructure Program
Australian Surveying and Land Information Group
PO Box 2
Belconnen ACT 2616

AUSTRALIA

Ph: +61 2 6201 4382
Fax: +61 2 6201 4366
Email: DavidRobertson@auslig.gov.au

Questions regarding the Scoping Study should also be referred to Mr David Robertson.

Attachment: Draft Outline of Stage 2 Report

Executive Summary

Overview of study scope and results

Spatial Data Infrastructure Concepts

- Introduction to SDI and GSDI concepts for non-SDI people
- Reference to recent surveys on SDI activities
- Emphasise disparity between developed and developing countries
- Link to other global technological and economic developments

Selected SDI Case Studies

- Around 5 brief case studies (2 pages each) that illustrate SDI concepts
- Should be mix of countries / regions / applications (developed / developing; national / regional; resource / land / utilities etc)
- ISCGM (global mapping project) should be one of the case studies

Survey of Existing Cost/Benefit Studies

- Summary of all available SDI-related cost / benefit studies from around the world
- Analysis of the results

SDI 2010

- Define realistic goal for the state of SDI and GSDI development in 2010 (By 2010, all ...)
- Include institutional frameworks, standards, data, and data access (each at national and global levels)
- Identify roles of both public and private sectors
- Forecast the national and global benefits that would be derived, based on analysis of existing studies

- Benefits to be classified into economic, social, environmental, disaster management categories

Obstacles to SDI 2010

- Identify the obstacles to realisation of the SDI 2010 ideal
- Obstacles to include financial, skills, technical, policy, security, leadership, etc

Recommendations

- Identify actions that can be taken at national and international level to address obstacles and realise benefits
- Include budget, capacity-building and data-access policies / actions, by national governments and international agencies
- Link to national development and international aid priorities and policies