

# **Delivering an SDI – Northern Ireland’s Real Life Experiences**

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**Key words:** spatial data infrastructures, portals

## **SUMMARY**

Northern Ireland is recognised as one of the leading areas in Europe in developing a spatial data infrastructure with a clear focus on the benefits it will deliver. The paper explores the work completed to date in terms of the following elements:

- Vision;
- Governance;
- Data;
- Funding;
- Systems; and
- Skills

and bring out the lessons learned.

A key milestone for the project was the launch in the spring of 2008 of GeoHub NI™, a portal, repository and GI analysis tool. This removes many of the technological barriers to the wide use of GI to support business and public services, building on a centrally-funded mapping agreement delivering mapping data free at the point of use to all public servants, and a cross-sectoral steering group to oversee the implementation of the Northern Ireland GI Strategy.

There are many lessons that can be learned from Northern Ireland’s work to date, not least in the context of the INSPIRE Directive requirements in Europe.

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## 1. INTRODUCTION

Many countries throughout the world are embarked on the work of specifying and delivering a Spatial Data Infrastructure (SDI). Some of these initiatives are being driven top-down; others are being developed bottom-up. Most are highlighting questions about what constitutes an SDI and how success in creating an SDI can be defined. Indeed, the term SDI is in danger of becoming a cliché, a ‘catch phrase’ for describing all manner of systems and processes. It might therefore be useful to reproduce some definitions of an SDI, as a reminder of what the term is intended to cover:

*‘the technology, policies, standards, human resources, and related activities necessary to acquire, process, distribute, use, maintain, and preserve spatial data’ (OMB, 2002)*

*‘the means to assemble geographic information that describes the arrangement and attributes of features and phenomena on the Earth. The infrastructure includes the materials, technology, and people necessary to acquire, process and distribute such information to meet a wide variety of needs.’ (NRC, 1993)*

*An SDI ‘assures that spatial data from multiple sources (federal, state, local, and tribal governments, academia, and the private sector) are available and easily integrated to enhance the understanding of our physical and cultural world’ (OMB, 2002).*

*‘an SDI must be more than a single data set or database; an SDI hosts geographic data and attributes, sufficient documentation (metadata), means to discover, visualise and evaluate the data (catalogues and web mapping), and some method to provide access to the geographic data.... To make an SDI functional, it must also include the organisational agreements needed to coordinate and administer it on a local, regional, national or trans-national scale. Although the core SDI concept includes within its scope neither base data collection activities or myriad applications built upon it, the infrastructure provides the ideal environment to connect applications to data.’ (Nebert, 2004)*

All of these definitions emphasise that SDIs bring data together, but that they consist of much more than data.

This paper reviews the work to date in Northern Ireland to make geographic information widely accessible and usable, such that its use becomes akin to using Microsoft Office for creating a document or spreadsheet. The authors’ work to date has led them to the conclusion that there are six key components which must all be delivered if an SDI is to be implemented in a sustainable manner. This paper considers progress on each of these components in Northern Ireland, sharing lessons learned in a manner which will be of assistance to other countries and regions.

## 2. CONTEXT

### 2.1 Northern Ireland

Northern Ireland is a self-governing region of the United Kingdom, consisting of six counties at the north of the landmass of the island of Ireland. It has a population of about 1.5 million and a geographic area of approximately 20,000 square kilometres. This small size has perhaps been helpful in ensuring that a range of initiatives – including that to build an SDI – have been joined up across departments and sectors. In the Northern Ireland Civil Service, for instance, there are about 250 Senior Civil Servants, who can therefore deal with each other on something approaching a personal basis.

Coupled with this, the political history of Northern Ireland has led to a strong central government structure and very limited devolution to local government, reducing another complexity in many SDIs – the Northern Ireland work of gathering and combining datasets has been able to work predominantly with a single tier of government. The political situation in Northern Ireland over the last 30 years may also have generated a more positive central view of the benefits of sharing data between government organisations than has perhaps developed in other parts of the world.

Recent political developments in Northern Ireland have seen the implementation of devolved government in May 2007, with the focus in the Programme for Government (Northern Ireland, 2008) being on economic development. The private sector in the province has been limited by comparison with other jurisdictions, with 69% of GDP generated and spent in the public sector (compared with 42% in the UK as a whole, and 24% in the Republic of Ireland).

In the Northern Ireland public sector, a wide-ranging reform programme has been underway in recent years, with the creation of a number of shared service centres (for ICT support, financial transaction processing, personnel management, etc) recently implemented. This has provided a context for showing the benefits of joining up geography, and the Northern Ireland Geographic Information Strategy is now recognised as a key component of the reform agenda. Another focus of reform has been the reducing of the number of public sector bodies. One component of this was the merger, on 1 April 2008, of the Valuation and Lands Agency, Rate Collection Agency, Land Registers of Northern Ireland and Ordnance Survey of Northern Ireland (OSNI) into a single organisation, Land and Property Services (LPS).

## 2.2 The History of GI in Northern Ireland

Mapping of Northern Ireland began in the 1830s for taxation and land valuation purposes. This was for many years under the control of the military, with control passing to civilians in the latter part of the twentieth century. Digital mapping began in the 1980s, with digital conversion being completed in the mid-1990s. The power of digital mapping beyond automating map production was recognised at an early stage, with a former Chief Executive of OSNI, Michael Brand, being a founding member of both the European and Global spatial data organisations.

Figure 1 below shows a timeline of key developments towards a GI Strategy for Northern Ireland. A key message from the diagram is that such development takes decades rather than years fully to evolve.

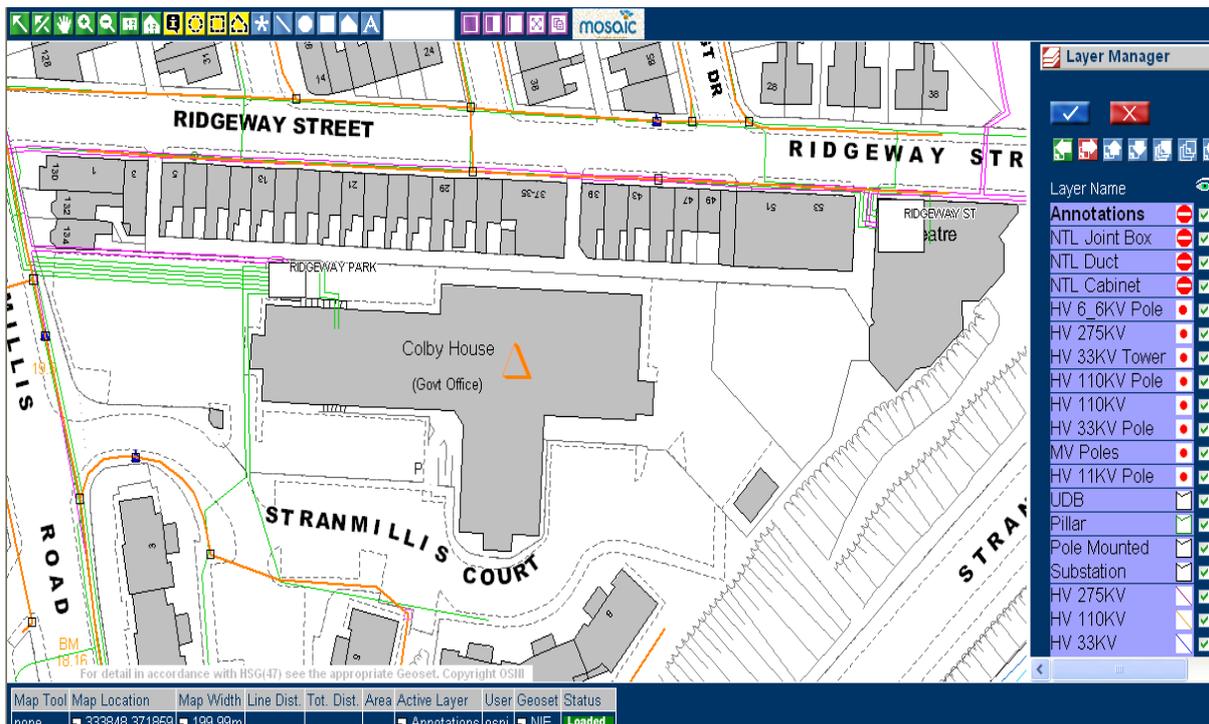


**Figure 1:** the evolution of an SDI in Northern Ireland

Some of the key elements of the journey in Northern Ireland are as follows:

- The (comparatively) very early (1983) work on the NIGIS project to realise the power of joining geographic information. This foundered, as did many other early initiatives, on the requirements of users not being able to be realised by the technology available at the time.

- A report in 1987 of a UK Government Committee on Geographic Information, known as the Chorley Report (Department of the Environment, 1987) which highlighted the power of joining up geographic information with remarkable prescience, given that the work predated many developments, not least the Internet;
- The launch in 2001 of the first joined up dataset – Pointer, a definitive address dataset for Northern Ireland. This was a joint activity by OSNI, Royal Mail (the postal delivery authority), local authorities and the Valuation & Lands Agency and showed in practice the improvements that could be delivered by bringing data together.
- Also in 2001, the process of developing a GI Strategy for Northern Ireland commenced, with a 3-day workshop held in February 2002 on Lusty Beg, an island in County Fermanagh, with more than 100 people (from Northern Ireland and beyond) present. This led, using a mind mapping process, to the publication of a GI Strategy in 2003 (OSNI, 2003). The strategy gave examples of the benefits of bringing geographic information together, and proposed the development of a number of pilot projects to show the power of joining up data about place in different sectors. It also set out a vision and a governance structure for implementing the Strategy.
- Development of the pilot projects commenced in a number of sectors, but made most headway in the utilities sector, where different organisations had a requirement to know where other organisations’ cables and pipelines ran. All therefore agreed to pool this information in a single system, reducing the time taken to learn of the location of others’ assets ‘from 6 weeks to 6 minutes’. This pilot was driven by the business needs of the commercial organisations involved. An extract from the system is shown in Figure 2.



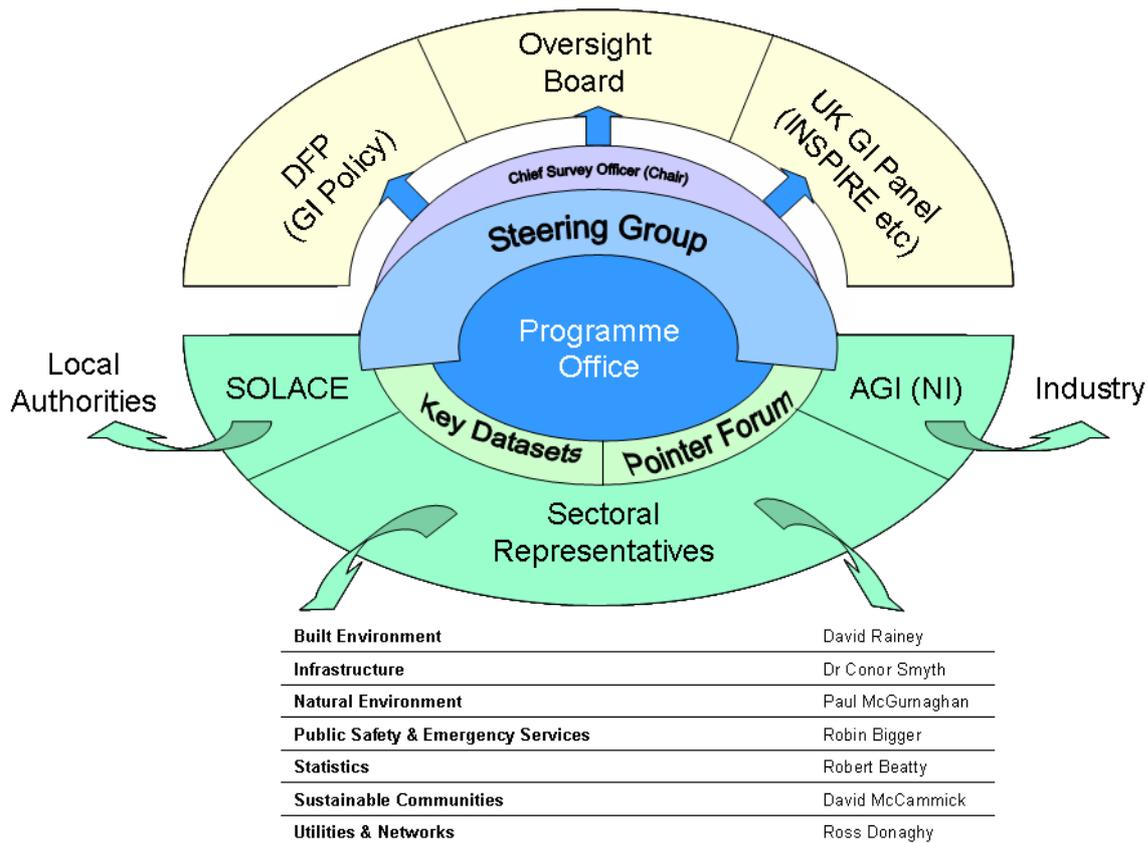
**Figure 2:** an extract from the utilities pilot

- In 2004, work towards a European SDI, INSPIRE, began, a process which brought the Directive into law in May 2007. Work in the UK to develop a Location Strategy began a little later and the Strategy is, at the time of writing, with UK Ministers for approval. Northern Ireland has therefore moved ahead of developments at both the European and UK levels and can, in that sense, be seen as a bottom-up initiative in response to local needs.

## 2.3 Where Are We Now?

March 2008 saw the go live of GeoHub NI™, a technological solution designed to show users the power of joining up data about place. This has been developed under contract by Fujitsu, with ISpatial and ESRI as subcontractors. The project was conceived in 2005 as a second phase to OSNI's e-delivery system and was somewhat vaguely specified. More detailed specifications were developed in 2006 and then delivered from a range of off-the-shelf components, with rights management and security elements being the largest bespoke modules which had to be developed. GeoHub provides a system to which a wide range of datasets from a wide range of organisations can be loaded (more than 100 datasets have at the time of writing been supplied, along with some of the necessary metadata, and some Memoranda of Understanding and Service Level Agreements have been signed between GeoHub and the supplying organisations to cover what can (and cannot) be done with the data, how often it will be updated, and so on). The system also enables users to interrogate data (subject to the access rights that their login gives them), and to download datasets to their own GIS (again, subject to access rights). Many organisations will therefore begin to use GeoHub as a data supply system, whilst others will find that its display and analysis tools will be all that they require – for the time being at least.

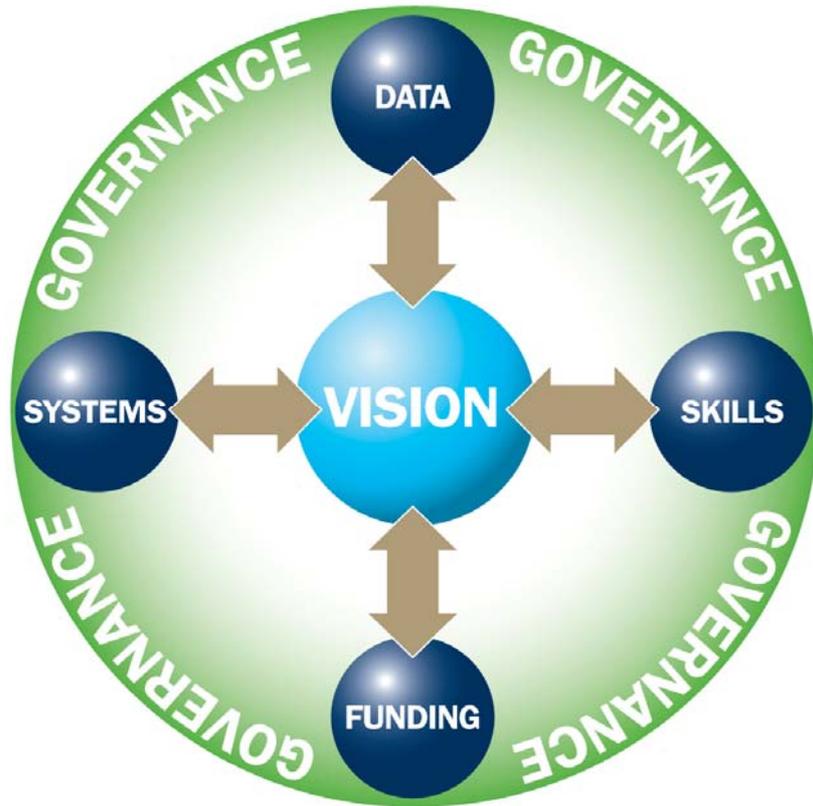
The project has been managed within the GI Strategy programme which has been managed by a multi-sectoral steering group. Figure 3 below shows in schematic the composition and linkages of the steering group.



**Figure 3:** The NI GI Strategy Steering Group and its linkages

### 3. THE COMPONENTS OF SUCCESS

The authors have recently had the chance to review progress on the NI GI Strategy implementation, and to reflect on developments elsewhere (see, for instance, Masser, 2007). As a result of this reflection, the authors have concluded that there are six elements which must all be in place if the effective, joined up use of geographic information is to be sustainably embedded in a country or region. The elements are depicted diagrammatically below, and each element is explored further in the following sections.



**Figure 4:** the necessary elements for a sustainable SDI

### 3.1 Vision

Academics have long stated that function must be agreed before form; that strategy and vision must be agreed before an organisational structure is put in place. The authors believe that the same applies for the development of an SDI. The vision also needs to be sufficiently compelling to gain wide acceptance, and to gain willingness from people to change their approach so as to enable the successful development and implementation of an SDI.

The vision agreed in the NI GI Strategy (OSNI, 2003) is as follows:

- Every Public Servant can access the appropriate (geographic) information in order to facilitate policy development and evaluation, administration and service delivery, at the desktop, in a seamless way; and
- The public can view Government held information in easy to understand ways.

The vision states that use of GI in the working life of public servants in Northern Ireland should be as natural as the use of Microsoft Office when writing a document. The broader use of GI beyond the public sector is referenced in the vision but is secondary to gaining wide use

in the public sector. This clear prioritising has proved valuable to guide the activities of the organisations involved with delivering the GI Strategy.

It is also important that a vision focuses on outcomes, or at least outputs, not just on inputs, and that it is set out in practical terms, not in a purely theoretical way. The NI vision does that – it is about getting the spatial data and information in a form and at a place where it can be used by public servants to deliver better outcomes. The vision for the UK Location Strategy (yet to be published) is effectively summarised in the first paragraph of the Strategy: ‘Place matters. Everything happens somewhere. If we can understand more about the nature of place, where events happen and the impacts on people and assets at the location, we can plan better, manage risk better and use our resources better. This will increase the success rate for new initiatives, assist in the reduction of the potential for future problems and give tangible financial benefits.’ This vision, as can be seen, focuses clearly on outcomes and therefore communicates the benefits of an SDI to stakeholders well beyond the GI community.

### **3.2 Governance**

Many projects fail because of a lack of effective governance. This is a particular risk for projects such as SDIs which involve very many stakeholders in many different sectors and with many different priorities. It is therefore crucial that the governance of an SDI initiative includes all of the key stakeholders, and brings them together in a way which allows issues to be debated and decided.

Clear leadership of the project, within the governance structure, is also vital. That leadership may be political – as has been a key component in German SDI work, for instance; could be by technical experts (although there are dangers, in this approach, that the focus is on technical matters only and not on strategy, vision and use – this was the learning from many SDI initiatives in the 1990s); or public service led. The NI GI Strategy has adopted this last approach, as is shown in Figure 3. The diagram shows the key upwards linkages within government regarding policy matters (to the parent Department) and programme governance (the Oversight Board oversees all major reform projects in the Northern Ireland Civil Service). There are also links to UK Government, with the UK GI Panel responsible for delivering the UK Location Strategy. The Steering Group is at the heart of the structure and comprises representatives of a range of sectoral groups. These were deliberately designed to follow usage sectors (built environment, natural environment, etc), rather than machinery of government structures. The broader GI community is represented through the Association of Geographic Information, and local government through the Society of Local Authority Chief Executives (SOLACE). This model has worked well in driving the work forward, with attendance at Steering Group meetings by senior people from all sectors. Many of the sectors also have active Sectoral Groups guiding the development of the use of GI in their sectors.

A good example of the power of this broad stakeholder engagement has been in recent developments in Pointer, the definitive address dataset for Northern Ireland. As mentioned in section 2.2, this was a joint venture of a number of data supply organisations, with funding from the eGovernment Fund. A Project Board was formed but a number of the members did

not have sufficiently strong links into the communities that they were representing, meaning that stakeholder engagement was not secured. The early development of Pointer was therefore not driven by stakeholders and, in practice, it stalled for a number of years, despite a general recognition of the importance of using common addresses. More recently, Pointer has been brought under the aegis of the GI Strategy Steering Group, and a much broader Stakeholder Forum has been establishing (including, for instance, representatives of the Planning Service, the Statistics and Research Agency, local government, utility companies and the Fire and Rescue Service). In the last 12 months, this Forum has driven the specification of Pointer forward and overseen significant data cleansing. It is a powerful example of how the effective coordination of stakeholder input can make very significant developments occur in a short time period.

### **3.3 Data**

The key questions around data for an SDI flow from the vision for the SDI: what datasets are required to deliver the vision of the SDI? What are the priorities on providing and improving the datasets? Another key question is the quality required, which will determine whether existing data needs to be improved or not to meet the needs of the SDI.

In Northern Ireland, in line with the vision centred on the public sector, the key focus has been on ensuring that key datasets used by the public sector will ‘fit together’ effectively to meet user needs (this will often require combinations of datasets). A number of joint activities have taken place over recent years, including the commissioning of orthophotography coverage for Northern Ireland by a consortium including OSNI, the Department of Agriculture and Rural Development and others. Another example has been the development of a Roads Network from OSNI data, incorporating definitive information including road segment ID number from the Roads Service.

One core of an SDI is, of course, the data from the national mapping agency. But this is but the core – most users will want to overlay other data such as flood data, planning applications and the like. The pilot project on utility data (as described in section 2.2) is a striking example of this. A key component in developing an SDI, therefore, is to bring together a wide range of data (with its associated metadata) for access by users. This process also requires agreements to be in place as to what can (and cannot) be done with each dataset, the frequency with which it will be updated, and so on. These agreements, in the authors’ experience, can take considerably longer to put in place than the supply of the data itself.

It is important, before making data combinations available, to consider the extent to which data will need to ‘fit together’ – to what extent can inconsistencies in coordinate base be allowed to exist within the different datasets – what is ‘fit for purpose’? Recent developments such as Google Earth have allowed users to begin to understand that ‘good enough is good enough’, rather than unnecessarily striving for high accuracy at all times.

### 3.4 Funding

The cost of spatial data has long been perceived by many as a key impediment to the development of an SDI in many jurisdictions, and these issues were one of the last resolved matters in the agreement of the INSPIRE Directive. Again, vision is important. OSNI had for a number of years positioned itself as a deliverer of public good, whilst recognising that funding was required to enable it to complete its public good role (for further detail, see Greenway, 2007). A key development in Northern Ireland therefore was the agreement of a Northern Ireland Mapping Agreement (NIMA), which provides access to all OSNI data, free at the point of use, by all public servants. Funding is provided in a central financial transfer, thereby removing funding as an impediment to the wide use of spatial data. In the private sector, OSNI had taken an indirect approach, stating that it will not compete directly with partner organisations in the supply of digital data to private sector customers. This recognises that most private sector customers will require mapping data embedded in an application.

The NIMA arrangement has, the authors believe, been vital in enabling the wider use of spatial data, which is an essential component of securing the vision in the GI Strategy. It may also provide ‘a third way’ between the direct application of user pays, and mapping being ‘free’ (with the difficulties that this can provide in terms of securing medium term investment in the mapping data).

### 3.5 Systems

Another key component in delivering a sustainable SDI is the systems and technology to underpin it. It is reassuring that some of the main GIS vendors have now put a key focus on SDI delivery within their systems and applications. This will provide a broader range of options for larger GI users to specify and purchase a system that meets their needs.

There are, however, a large number of organisations which have not yet proven a business case for investment in a large GIS platform. Some of these may never be able to make that business case; others need time and further development to put such a case together. A key component of the NI GI Strategy has therefore been the delivery of GeoHub-NI, a thin client application that will enable all public sector users to access mapping and other spatial data, and perform a range of analysis queries on combinations of data. In short, it will show what is possible. The system was signed as ready for go live in March 2008, at which time more than 100 datasets had been supplied for load to it. A key lesson learned was that almost all of the datasets supplied did not have ISO-compliant metadata with them; the importance of metadata when using others’ data seems not generally to have been recognised by data suppliers.

One of the GI vendors had also put a free map viewer in place to support spatial data usage. This has proved popular and has, for instance, been provided free of charge to every Member of the Northern Ireland Legislative Assembly.

Another example, predating the GeoHub, shows what can be achieved with simple GI tools. The Northern Ireland Ambulance Service approached the Strategic Investment Board (SIB)

for funding to purchase 30 additional ambulances, to allow them to meet a target of response to 75% of Category A (life threatening) calls within 8 minutes. A member of staff of the SIB had some GIS experience and, using Microsoft MapPoint, analysed the location of ambulances. He found that, by moving the location of the ambulances from ambulance stations, and by adjusting the locations so that they were different in working hours and outside working hours (to allow for the movement of the population), the target could be met without additional ambulances. This showed to many people in Northern Ireland the ability of spatial data to support effective use of funds.

### **3.6 Skills**

Once a clear vision is in place, data and technology is available and funding arrangements are agreed, a final element remains necessary for the sustainability of an SDI. This is the availability of skilled staff to ensure that data is used and developed effectively to meet user requirements now and in the future. These skills are needed both to assist staff in using (and not abusing) spatial data, and also to ensure that data is brought together effectively within organisations (and then made available to others through platforms such as GeoHub NI™).

This is perhaps the area that is least fully developed to date in Northern Ireland. There are a number of very capable small teams of staff in different government organisations, but each of these is vulnerable to staff loss, and many organisations have no such capability. Land and Property Services has therefore recently established a small GI Consultancy Team to address this gap. The team, for example, is providing a member of staff two days a week to the NI Assembly, to allow staff and Members effectively to use the free map viewers provided to them. The team is primarily in place to allow users to see the power of geographic information, at which stage they can make a convincing case for investment in the necessary systems and skills to allow them to deliver further benefits from the data.

Another approach being explored in Northern Ireland is whether the model used for statisticians might be appropriate for GI specialists. Statisticians in the Northern Ireland Civil Service are employed by the Statistics and Research Agency, and are seconded out to organisations as required. This ensures the development of a sustainable statistician cadre, and removes the vulnerability of an organisation if it was itself employing a small number of statisticians. The exploration with the Statistics and Research Agency is exploring two options – use of the secondment model for GI specialists; and the addition of GI specialists to the statistics units in organisations. The work of the GI Consultancy Team will, in parallel, show organisations the power of spatial data to deliver better services and develop more evidence-based policy.

#### **4. THE NEXT CHAPTER**

Northern Ireland might be said, at present, to be ‘at the end of the beginning’ of implementing an SDI. The province is ahead of other parts of the British Isles, but fully recognises that it has further to go before spatial data is seen as an essential component of almost every public sector decision concerning service delivery and policy development.

A central part of the next chapter is the consolidation of Land and Property Services, to provide a ‘one stop shop’ for all public sector activity related to such matters. Within LPS, a data spine will be at its heart, bringing together mapping, land registration, valuation and rating data within the organisation, and linking to planning, local authority and a wide range of other data. Already in the Belfast area, local authority building control staff collect data on property changes which is used to update the valuation list. This is in the process of being rolled out to other local authority areas. Planning Service data overlaps with land register data – LPS will be working to ensure that these overlaps are removed. The data spine itself, therefore, will be a powerful example of what can be achieved by joining data together. Clear data sharing protocols will also be required, to ensure that data is shared in accordance with Data Protection and other legislative provisions.

All of this re-emphasises that an SDI is much broader than any one organisation and that strong, cross-organisational governance is required if an SDI is to become a key element of policy development and service delivery. This is much bigger than any one organisation, and it is therefore important that delivery of an SDI is not tied too closely to any one organisation, remembering that any organisation can be subject to government reorganisations.

#### **5. CONCLUSIONS**

Northern Ireland has, as shown in this paper, made good progress towards making an SDI a reality in the province. The SDI comprises, as set out in the definitions in section 1 of this paper, far more than geographic data – human and system processes and applications are equally vital components of Northern Ireland’s success.

Reflecting on this work, the authors of this paper have come to the conclusion that there are six essential components to sustainable embedding an SDI, as set out in this paper – vision, governance, data, funding, systems and skills. All of these are necessary – but are they, taken together, sufficient to achieve the aim? They are, the authors believe, as long as there is a key coalition of people to make sure that plans are converted into reality and that things happen on the ground. The authors believe that the experiences of Northern Ireland are transferable to other provinces and countries, particularly when taken in conjunction with the model set out in this paper.

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## BIOGRAPHICAL NOTES

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Iain is a Chartered Surveyor (MRICS), a Fellow of the Irish Institution of Surveyors (FIS) and a member of the Chartered Institute of Marketing (MCIM). Between 1998 and 2006 he was the head of the RICS delegation to the International Federation of Surveyors (FIG). He is Chair of the FIG Standards Network and of the FIG Task Force on Institutional and Organisation Development. He is also a member of the Management and Editorial Boards of the journal Survey Review. He has published a range of articles and papers on geodetic surveys, business and management practices, sales and marketing, and standardisation.

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