

# Costs-benefits analysis INSPIRE

Final report



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# Management Summary

## *Picture of costs and benefits of the INSPIRE Directive for the Netherlands*

In 2001, the Directorate General of the Environment (DG-ENV), the Eurostat and the Joint Research Center (JRC) of the EC decided to set up a European Geo-information Infrastructure for the environment, namely, the Infrastructure for Spatial Information in Europe (INSPIRE). On 15 May 2007, the eponymously-named European Directive came into force. This Directive now forms the legal basis for the common provision of geo-information throughout the European Union.

With the introduction of INSPIRE at European level we are working on the availability of geo-information and how well it can be exchanged. The European Directive INSPIRE has to produce a European geo-information infrastructure which will contribute to an improved provision of information at, among others, international policy level and for service providing processes. In order to achieve this, a number of implementation routes have been initiated at national level. These are:

- Setting up provisions to make geo-information available with metadata, including a national INSPIRE portal;
- Describing, harmonising and making geo-information available with metadata via a national INSPIRE portal;
- Promotion of the use of the geo-information that is available via the INSPIRE portal.

To make these implementation routes successful, it is necessary for the parties involved to be familiar with INSPIRE and to have insight into the impact, costs and benefits of the Directive. The Ministry of Housing, Spatial Planning and the Environment has given Geonovum the task of executing strategic impact and costs-benefits analyses. The primary concern of these analyses is to show the costs and benefits to the data providers and the direct users of the data. We will, therefore, focus on showing the level of efficiency of the implementation of INSPIRE in the Netherlands.

This management summary brings together the most important results and conclusions that have been discovered. In the costs-benefits analysis we looked at the differences between the project alternative (the introduction of INSPIRE) and the zero alternative (the situation as it would be without the introduction of INSPIRE). The point of departure for the zero alternative is that the goal of harmonising GIDEON would not have been achieved without INSPIRE. This does not mean that nothing has been happening in the field of geo-information. Clearly there are already developments going on that are independent on the INSPIRE Directive and there is good level of cooperation already in existence between member states for some themes. We also assume that without INSPIRE, the National Geo Register (NGR) would have been developed in the longer term. The results have been obtained based on the information provided by various relevant parties (both data providers and users) in a number of (theoretical) use cases. The use cases play a role in giving us an insight into the costs and benefits that can be derived by implementing INSPIRE. In Chapter 6 the use cases are described in more detail.

*Introduction of INSPIRE via the basis model is efficient, via the collective model significantly less*

Two models have been developed to unlock and harmonise geo-information conform to INSPIRE:

1. Basis model. The government converts the Directive into national legislation and tries to minimize the impact on organisations that manage information for which INSPIRE is mandatory. Only the most suitable datasets are unlocked and harmonised.
2. Collective model. The government converts the Directive into national legislation, but each organisation that manages geo-information, for which INSPIRE is mandatory, has to harmonise the metadata, data and services and unlock it in a standard way.

These two models have been worked out in the cost-benefit analysis as variations of the project alternatives.

The balance of the costs and benefits of the introduction of INSPIRE according to the basis model shows (across the entire time horizon of the CBA) that the benefits exceed the costs by 34.0 million euro (net cash value). The costs are 32.1 million euro and the benefits total 66.1 million euro. This means that the introduction of INSPIRE according to the basis model leads to an advantage for society and that it is attractive to invest in INSPIRE.

In the following table, the most important outcomes of the costs-benefit analysis are listed for the whole of society for both models.

Table S.1 Overview of social costs and benefits INSPIRE basis model, collective model and difference (Netto value, in mln. euro)

Costs and benefits	Basis model	Collective model	Difference
Costs	32.1	40.9	8.8
Benefits	66.1 + PM (+)	63.7 + PM (+)	-/- 2.4
<b>Balance (benefits -/- costs)</b>	<b>34.0 + PM (+)</b>	<b>22.8 + PM (+)</b>	<b>-/- 11.2</b>

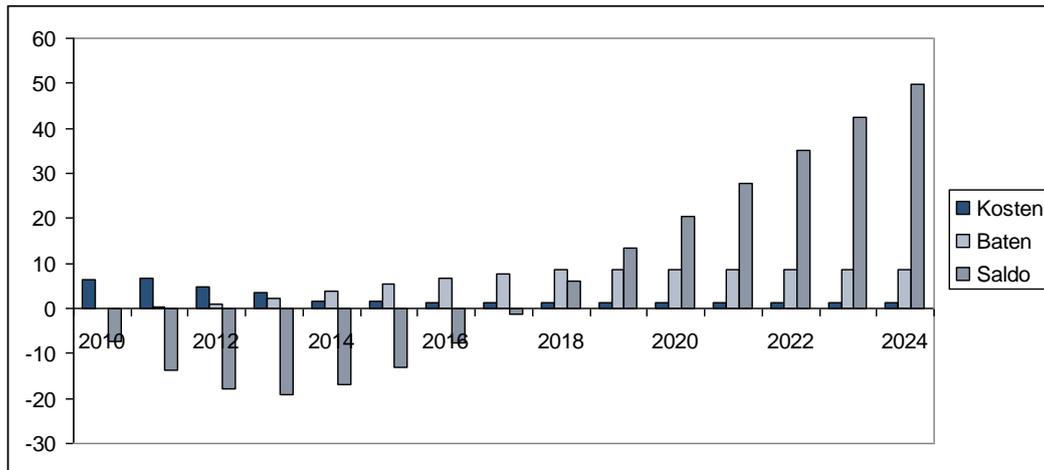
PM represents the (as yet unquantifiable) benefits that will come from the strategic effects

If the collective model is taken as the point of departure, then the balance of the costs and benefits decreases to 22.8 million euro (net cash value), a decrease of 11.2 million euro. The costs increase to 40.9 million euro (cash value), an increase of 8.8 million euro (cash value). The benefits decrease to 63.7 million euro, when compared to the basis model, a decrease of 2.4 million euro.

*In the basis model this investment is retrieved after eight years.*

Until 2013, the annual costs will exceed the benefits and increase the negative cumulative balance of both. From 2014 onwards, the benefits will be higher and the negative cumulative balance decreases. This is shown in the figure below.

Figure S.1 Phasing of the costs and benefits over time in the basis model (contribution in mln. euro)<sup>a)</sup>



<sup>a)</sup> This figure shows the values for the costs and benefits and also the **cumulative balance** of costs and benefits. These values concern the costs, benefits and balances for the relevant years and differences in the cash value

From 2018 onwards, the cumulative difference of costs and benefits is positive and the costs that have been incurred because of INSPIRE are retrieved. INSPIRE has a 'cost recovery' time of eight years. In the collective model the time to recover the costs is nine years.

#### *Major part of the costs until 2015*

Most of the costs will be incurred until 2015, with a peak in 2013. Until 2015 we will invest in implementing INSPIRE in all three Annexes, after that investment will be made mostly in the Annexes II and III. The costs of PDOK (the 25% attributed to INSPIRE) will run until 2013. After 2015 only structural costs (management and maintenance, costs for the program) will exist and will remain constant at around 1.3 million euro.

#### *Results of the speed of response analysis*

From the speed of response analysis it becomes clear that the costs-benefits analysis is reasonably firm. Only the assumptions associated with the effects on users (the efficiency benefits) exert a decisive influence on the outcomes of the costs benefits analysis. The number of international projects with geo-information and time savings for the user which will be achieved by implementing INSPIRE appear to be of crucial importance.

#### *Most important conclusions*

In summary the most important conclusions are:

- in the basis model, the benefits of introducing INSPIRE vastly outweigh the costs;
- in the collective model, the benefits only just outweigh the costs;
- the costs in the basis model will be retrieved after eight years;
- introduction via the basis model is definitely more efficient than via the collective model, as fewer costs have to be made and more benefits are generated;
- the major part of the benefit gained is for the users.

#### *Strategic impact large as well*

The strategic impact of INSPIRE is mainly caused by making E-government policy and geo-information (GIDEON) stronger. The principles of the E-government and INSPIRE are in tune with each other (single storage, plural use and management at the resource). The Directive is introduced by means of an act; this causes projects to be prioritised. The Directive also provides

standards and put national developments in policy about geo-information in a much broader international context.

INSPIRE dovetails with the philosophy of ‘the Netherlands Open And Connected’ (Nederland Open In Verbinding). Choosing Open Source and open standards enhances the performance of a government and allows it to provide a maximum level of service.

For a data provider INSPIRE leads to the development of a more open service. It is not only chain partners who are being served, but parties who are interested both here and abroad as well. This may lead to modifications in information policy being made or the creation of policy concerning publications. The increased requirements that INSPIRE has for data to be available and provided (7/24) could be a stimulus for new agreements to be made about increasing services and tasks. For data providers INSPIRE will lead to better services, a better profiling provision and a larger network.

From a predominantly users point of view, the INSPIRE Directive should lead to a more efficient making of policy and projects, mainly in cross-border fields. INSPIRE may also lead to tighter cohesion between policies.

INSPIRE influences the release policy that software providers operate. These providers can opt to include INSPIRE software in the standard software provided or they can offer separate extensions for this. Providers of services will focus on implementation routes, the execution of an architecture scan for INSPIRE and knowledge sharing sessions.

Finally, INSPIRE offers new possibilities for organisations to build their own field-specific data portals which are linked to INSPIRE portals. Private parties can also offer data via an INSPIRE portal.

The relationship between the costs and benefits (including the non-monetary benefits) could turn out to be even more positive. This means that the social advantage may possibly be even higher than is shown in the balance of the monetary benefits and costs.

#### *What else might be interesting for you to read?*

- For the reader who wants to get a more extensive picture with headlines, than this summary offers, we suggest reading **Chapter 1** (Introduction), **Chapter 2** (Project and Zero Alternative) and **Chapter 3** (Final results).
- We advise the reader who wants to gain a more detailed insight into the specifics to read **Chapters 4 and 5** as well.
- In **Chapter 6** the user cases are described. The description of the user cases gives more insight into how INSPIRE can generate effects on practise for various users throughout society.
- The meeting participants, the interview partners and those who attended the expert meetings are listed in the Appendix.

# 1. Introduction

## 1.1 Background

The role of geo-information in the information regime of the government and private parties is large and is becoming recognised more and more frequently. Spatial data plays an important part in policy-making, service provision and business processes. To achieve their goals, organisations co-operate much better in chains and the exchange geo-information is an important part of that cooperation.

To make this exchange of information run smoothly, data has to be made available in a clear, accessible and simple way. The standardisation and harmonisation of data and the setting up of infrastructures are important steps that have to be taken if this is to be realised.

Since the early nineties, Government institutions and universities all over the world have been working together, via the Open Geospatial Consortium of companies, setting up standards to increase the ease of use of GEO. Managers of spatial data and providers of applications in the field of geo-information have all conformed to these standards since their inception. Despite this, geo-information is still quite fragmented and not easily accessible.

With the arrival of the ‘Infrastructure for Spatial Information in the European Community’ (INSPIRE) we are now working at pan-European level to enhance the availability and ease of exchange of geo-information. The European Directive INSPIRE has to lead to a European geo-information infrastructure that contributes to, amongst other things, the improved provision of information and cross-border processes related to policy and services.

In 15 May 2007, the European Directive INSPIRE formally came into force. This Directive has led to the development of an infrastructure for the exchange of European geo-information which will ensure that an integrated approach towards devising European policy for the environment is possible. The introduction of INSPIRE was secured in Dutch legislation via an implementation act. The starting date of this implementation act was confirmed on 1 September 2009 by Royal Decree.

To ensure that implementation of INSPIRE in the Netherlands develops correctly, the Ministry of Housing, Spatial Planning and the Environment has given Geonovum the task of guiding its introduction. A number of implementation routes have been initiated at national level to ensure this. These are:

- Setting up provisions to make geo-information available with metadata, including a national INSPIRE portal;

- Describing, harmonising and making geo-information available with metadata via a national INSPIRE portal;
- Promoting the use of the geo-information that is available via the INSPIRE portal.

## 1.2 Definition of the problem and its focus

Costs and benefits analyses of INSPIRE have been made on two previous occasions: in 2004 by the European Union and, in 2005, by Royal Haskoning. Now INSPIRE is going to be worked out in even greater detail as Geonovum has commissioned ECORYS and Grontmij to complete a new costs and benefits analysis. To make a thorough analysis of costs and benefits they will have to look at the impact that INSPIRE has on the primary processes that the parties involved carry out.

The aim of the research, therefore, is:

To give an insight into the costs and benefits related to the introduction of INSPIRE in the Netherlands

The primary concern of this analysis is to illustrate what costs and benefits there will be for the data providers and the direct users of the data. We will focus, therefore, on showing the level of efficiency that the implementation of INSPIRE in the Netherlands brings. In the project alternative we make a distinction between two variations, namely the basis model and the alternative collective model (see Chapter2).

The results of the costs and benefits analysis of INSPIRE will be presented to the House of Representatives by the Minister of Housing, Spatial Planning and the Environment.

## 1.3 Conceptual framework: the OEI methodology

In the Netherlands the OEI methodology is a useful guide for the execution of costs and benefits analyses<sup>1</sup>. The OEI methodology was initially meant for use in infrastructural projects.

In the past ECORYS has executed a number of costs and benefits analyses using this method for ICT projects which have had a national impact and which also appeared suitable for a costs and benefits analysis of this sort<sup>2</sup>. Recently, ECORYS, in co-operation with CONICT, wrote the guide *Costs and Benefits Analyses for ICT projects*. In this guide, the insights gained by using the OEI methodology are applied to ICT projects.

As this methodology is sound, is usable in practise and is generally accepted, (by the CPB, the Netherlands Bureau for Economic Analysis, amongst others), we also want to use it for this costs and benefits analysis.

According to the OEI Directive the following steps should be taken to map out the costs and benefits:

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<sup>1</sup> According to a cabinet-decision for projects with national importance a social costs-benefits analysis CBA has to be made. This should be executed conform the Evaluation which was written for OEI of infrastructure project. Guide for costs and benefits analysis CPBNEI 2000.  
OEI means Overview Effects Infrastructure.

<sup>2</sup> See for example ECORYS & Dialogic (2002), exploration costs and benefits RYX or ECORYS costs-benefits analysis of a system of basis registrations

1. *Defining the project alternative*: this is a description of developments that would come occur if INSPIRE came into force.
2. *Defining the zero alternative*: this is a statement of developments if INSPIRE was not introduced.
3. *Specifying the costs and benefits*: a social costs and benefit analysis (CBA) which illustrates all the relevant effects that a project has on social welfare. The effects in question are found in the differences between the project and the zero alternatives.
4. *The costs and benefits expanded over time*. By expanding the costs and benefits over time, it is possible to determine financial indicators which in turn can be used to describe how attractive the investment is.

In a costs-benefits analysis which is made following OEI Directive, there are primarily three kinds of effects to be considered:

- *Direct effects*: these are the pro and cons of the project alternative compared to the zero alternative for the source keepers and the users of the data (all government institutions, citizens and businesses).
- *Indirect effects*: these are the effects that are created by the direct effects of the project, more precisely: the result of direct effects via transactions etc. on other actors and the economy (these are the providers of the data [businesses] and the final users of the data [government, citizens and businesses]).
- *External effects*: these are the effects that are hard to express in terms of money, as there are no markets – and therefore no costs. For many projects these are the consequences that a project has on the environment, nature and security. For this particular project, the external effects are those which cannot be expressed in costs and money, such as the effect that INSPIRE has on the quality of the services of the government. The external effects could reach the providers of the data, the managers of the data and data users (government, citizens, and businesses).

## 1.4 Research method

In short, this paragraph describes the research method and the process that was followed to make the costs and benefits analysis. The most important points of departure when using this method are:

- The costs and benefits analysis focuses mainly on the costs and the direct effects, i.e. the efficiencies;
- For the analysis of users and data providers, time and means were only available on a limited basis;
- The costs-benefit analysis is illustrated with a number of use cases;
- A very usable method of making an impact analysis of INSPIRE is available;
- The costs-benefit analysis is drawn up in such a way as to make annual updating possible.

From this point of departure, it has been decided to make the use cases leading for specifying costs and benefits. As there was no opportunity to specifically illustrate the costs and benefits for all data providers and users, process analyses are used for a restricted number of source keepers and users, and these are scaled up later and then added to the total. This is why there are four use cases selected, one for each group of data providers linked to the three Annexes and one for the users. These have been worked out with providers and users in separate sessions.

The use cases are the thread which runs through the project's approach; however they were not the only source of information. Apart from the use cases which already exist in literature, a number of interviews and a meeting of experts were also used. The names of discussion partners and the participants of the meetings are listed in the Appendix.

## 1.5 Book References

After this introductory **Chapter 1** with the questions and the conceptual framework of the research **Chapter 2** follows by describing the project and zero alternatives which are used to specify the costs and benefits. **Chapter 3** presents the most important results of the analysis of the costs and benefits. **Chapters 4 and 5** offer a detailed explanation of the costs and the benefits respectively. **Chapter 6** describes the use cases which form the basis of the analysis. The most important results and the conclusions can be found in the Management Summary which this report opens with.

### *What might be interesting to you?*

- Readers who are only interested in the final outcomes, or who have little time, will find that reading the Management Summary will furnish them with enough information.
- Readers who wish to have a good understanding of the main principles and findings should read **Chapter 2** (Project and Zero alternatives) and **Chapter 3** (Final results).
- Readers who want to have a deeper insight into how everything was worked out should read **Chapters 4, 5 and 6** as well.

## 2. Project and zero alternatives - INSPIRE

### 2.1 Introduction

In this chapter we will explain the project and zero alternatives for the making of a cost-benefit analysis (CBA) for INSPIRE. The project and zero alternatives are used as the base scenarios for the CBA and we specifically describe the CBA both with and without the introduction of the INSPIRE Directive. In the CBA, the costs and benefits of the project alternative are specifically compared to those of the zero alternative. In this way, the project and the zero alternatives are described. Two variations of the project alternative have also been worked out: these are the basis model and the collective model.

### 2.2 Project alternative: introduction of the INSPIRE Directive

Problems about the availability and exchange of geo-information have recently been discovered within the European Union. For this reason, the European Commission, the Directorate General of the Environment (DG-ENV), Eurostat and the Joint Research Centre (JRC) have drawn up a Directive for the development of an infrastructure to support the exchange of geo-information across the EU. This Directive, the INSPIRE Directive, should promote the harmonisation and exchange of this type of information. They came into force formally on 15 May 2007 and represent the legal base for the common provision of geo-information within the European Union. INSPIRE ensures that good quality geo-information is available, accessible and usable, and that it can be exchanged in an integrated manner. Geo-information is thus made available, accessible and usable right across the EU in a very clear way.

INSPIRE uses the following basic principles for setting up the European geo-information infrastructure:

Geo-information is stored, managed and made available at one suitable level;

- Geo-information from various sources in the European Union can be combined and exchanged between various users and applications by employing one consistent method;
- Geo-information that has been collected at one particular level of government, can be exchanged with other government levels;
- Geo-information is made available under such conditions that large scale use of it is not unnecessarily hampered;
- Available geo-information can be found easily and the suitability and user conditions can be traced.

So, in short, INSPIRE focuses on three goals:

- Availability of metadata according to a uniform standard;

- Harmonisation of geo-information; and
- Efficient unlocking of geo-information.

This is briefly explained below. INSPIRE has no further impact on the quality of the data. The data and the way it is obtained do not change because of INSPIRE and so are not within the scope of the costs-benefit analysis.

#### *Modifying or developing metadata in the project alternative*

According to the INSPIRE Directive, in the project alternative, the metadata associated with each file that falls under the INSPIRE Directive, is modified or developed according to a standard that is prescribed by INSPIRE. As a result of this, the metadata of this geo-information becomes much clearer and the user friendliness of the data is increased (mainly for other organisations who want to use this geo-information). Apart from this, other organisations can find the geo-information faster and easier as well.

#### *Harmonisation of geo-information in the project alternative*

The harmonisation of geo-information is an important goal of the INSPIRE Directive and thus is also included in the project alternative. The costs and benefits of this harmonisation should, therefore, be included in the CBA. The strategy behind the INSPIRE Directive is to achieve a basic provision of geo-information in the Netherlands, (GIDEON). Harmonisation is also an important goal here. In many cases it will not be easy to make a clear distinction between the harmonisation that is created via the introduction of the INSPIRE Directive and that which can be ascribed to GIDEON. As GIDEON is clearly being positioned in the context of the INSPIRE Directive<sup>3</sup> in the CBA harmonisation, it is included as a fully fledged part of the project alternative.

#### *Unlocking data in the project alternative*

In the project alternative, we adopt the position that the search service which was developed within the National Geo Register (NGR) can be used to unlock geo-information under INSPIRE. The NGR collates all the existing information about geo-information and makes it available via one integrated portal. People who are looking for specific information can quickly filter it via the published metadata. In many cases geo-information can be directly consulted and downloaded via the register. Development of the NGR is not part of the introduction of the INSPIRE Directive in the Netherlands. The NGR is only part of the project alternative as it is used for the INSPIRE searching service. The costs and benefits of the NGR are, therefore, not accredited to INSPIRE, (except for the costs of the INSPIRE searching service; this is the national INSPIRE web service for finding national INSPIRE data linked to the EU INSPIRE portal).

The National Geo Register (NGR) will be the interface for the PDOK provision (Public Services on the Map). The organisations in PDOK want to create an operational provision available on a government-wide basis which can be used to offer information from just one place. Geo datasets will be unlocked via PDOK.

The development of PDOK is an initiative which has a direct relationship with INSPIRE. Using PDOK, the Ministry of Housing, Spatial Planning and the Environment, the Government Service for Sustainable Rural Development, the National Service of the Implementation of the Regulations of the Ministry of Agriculture, Nature and Food Quality, the Dutch Organisation

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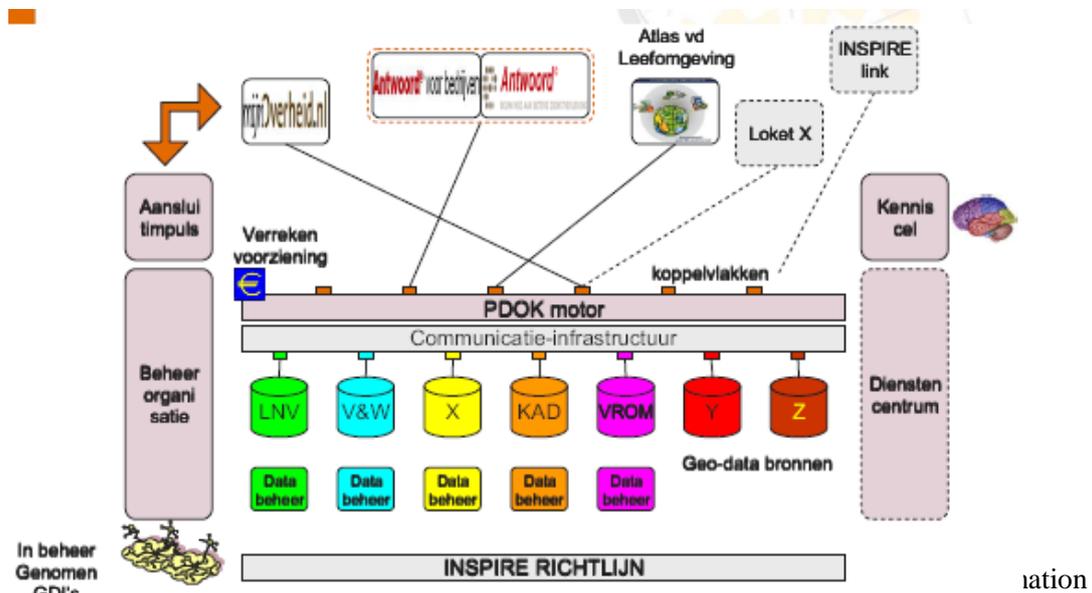
<sup>3</sup> See: GIDEON – Basic Services Geo-information The Netherlands; Vision and implementation strategy (2008-2011); VROM 8187 / APRIL 2008

for Applied Scientific Research and Geonovum will co-operate over the next four years in organising an operational, government-wide provision for offering geo-information. An important part of the geo-information falls under the INSPIRE themes.

This PDOK provision facilitates co-operation in the mutual unlocking of geo-information between (internal) partners and out to (external) social parties. PDOK is thus a response to the increased importance that geo-information has in society and connects the government-wide GIDEON vision with the cabinet’s view of how e-services should be provided.

By making all the PDOK partners’ geo datasets available online, the principle of a single method of obtaining information and multiple use, comes into shape and an important contribution is made towards increasing efficiency within the government. One of the goals of PDOK is to link INSPIRE as a client of the provision of information (view figure).

Figure 0.1 Relationship between INSPIRE and PDOK in the geo domain



“reference mapping”) can also be included in the PDOK engine<sup>4</sup>.

However, at this point in time, the NGR and PDOK are just being developed. In the project alternative, therefore, it is assumed that the data providers themselves, over the next five years, will ensure that data of theirs which fall under the INSPIRE Directive can be unlocked. One of PDOK’s goals is that all the participating parties should develop and manage a mutual organisational and technical provision and that they are able to unlock any datasets that fall under INSPIRE. Circa 50% of the PDOK budget is reserved for the unlocking of information. In this CBA we assume that PDOK unlocks 50% of the datasets for INSPIRE. This means that 25% of the PDOK budget is allocated to INSPIRE.

*INSPIRE themes*

INSPIRE is related to 34 themes within the geo-information. The themes are included in the Directive in three appendices (Annexes) and are displayed in the table below. The themes are grouped in the Annexes according to the time that the metadata and the geo-information have to be available and the level at which the geo-information has to be harmonised respectively. The metadata for Appendices I and II have to be made available in 2010, for the themes in Appendix

<sup>4</sup> Source: Global impact analysis 'Organising information services INSPIRE', Land Registry, 2009

III this must be accomplished in 2013. The availability of geo-information also follows in phases, namely 2011 for Appendix I and 2014 for Appendices II and III.

Table 0.1 INSPIRE Themes

Appendix I Metadata 2010, harmonisation 2011	Appendix III Metadata 2013, harmonisation 2014
1. Coordinate reference systems 2. Geographical grid systems 3. Geographical names 4. Administrative units 5. Addresses 6. Cadastral parcels 7. Transport networks 8. Hydrography 9. Protected sites	1. Statistical units 2. Buildings 3. Soil 4. Land use 5. Human health and safety 6. Utility and governmental services 7. Environmental monitoring facilities 8. Production and industrial facilities 9. Agriculture and aquaculture facilities 10. Population distribution - demography 11. Area management/restrictions/regulation zones and reporting units 12. Natural risk zones 13. Atmospheric conditions 14. Meteorological geographical features 15. Oceanographic geographical features 16. Sea regions 17. Bio-geographical regions 18. Habitats and biotopes 19. Species distribution 20. Energy resources 21. Mineral resources
Appendix II Metadata 2010, harmonisation 2014	
1. Elevation 2. Land cover 3. Ortho-imagery 4. Geology	

Harmonisation means that data providers `translate` the content of their geo-information into the specifications that INSPIRE draws up for each theme. INSPIRE does not make it mandatory for data providers to modify their source data.

*INSPIRE in the Netherlands*

The Netherlands have decided to follow the INSPIRE Directive. The principles underpinning the contents of the Directive in the Netherlands are that:

- The work involved in INSPIRE should be minimal;
- INSPIRE uses basis registrations as much as possible and their national provisions, and
- Certain information may not be explicitly present in existing datasets; however this information can be implicitly derived. In the framework of INSPIRE, information is considered to be ‘present’ if the required piece of information can automatically be derived from available datasets. If human intervention (interpretation or addition) is needed, then the information is considered to be ‘non-present’ (and, therefore, not able to be provided).

### *Project alternative with two variations*

For the unlocking and harmonisation of geo-information which conforms to INSPIRE, two models have been developed:

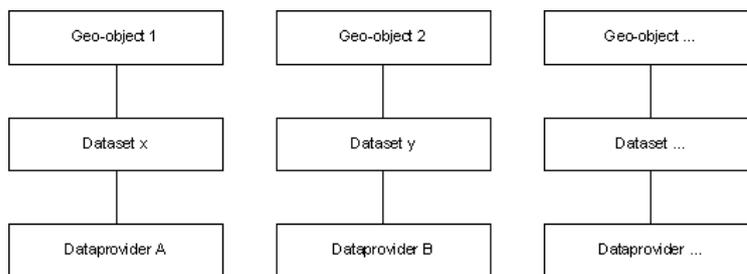
1. Basis model. The government converts the Directive into national legislation and tries to minimize the impact on the organisations that manage the information for which INSPIRE is mandatory. Only the most suitable datasets are unlocked and harmonised.
2. Collective model. The government converts the Directive into national legislation, but each organisation that manages the geo-information, for which INSPIRE is mandatory, has to harmonise the metadata, data and services and unlock it in a standard way.

These two models are worked out as variations within the project alternative.

### *Basis model*

In the basis model, for each geo-object (feature type) within an INSPIRE theme, only one Dutch dataset with only one data provider, is taken as an INSPIRE dataset. A dataset can be designated as an INSPIRE dataset if there is more than one geo-object. The condition for being designated an INSPIRE dataset is that the dataset meets the data specifications for the relevant INSPIRE theme. If a geo-object is included in multiple datasets each having various attributes, then only one of these datasets is taken to be an INSPIRE dataset. The figure below illustrates the basis model.

Figure 0.2 Basis model



The basis model is used for the introduction of INSPIRE. The plan is to develop this model further in the future. Another (more developed) model may be used for a specific INSPIRE dataset. The application of the model depends on the distribution of the INSPIRE datasets and will be specified for each dataset.

The number of data providers in the basis model is 22. This numbering is based on the schemes that were drawn up by Geonovum for Annexes I, II and III. Each Annex has a number of data providers, varying from 10 to 16. A number of other organisations may probably act as data providers in more Annexes, so some overlap exists. After making adjustments for this overlap, it is highly likely that 22 data providers will remain.

Table 0.2 Numbers of data providers and datasets in the basis model

	Number data providers	Number datasets
Annex I	16	40
Annex II	13	4
Annex III	10	28
<b>Total (Adjusted for overlap)</b>	<b>22</b>	<b>72</b>

The number of datasets in the basis model is 72. This is also based on the schemes per Annex. It should be noted that the schemes are not definite yet because, to date, no formal decision-making has taken place.

*Basis model as principle*

Because of the impact that data providers would suffer if they used the above models, Geonovum has advised the INSPIRE steering group to choose the basis model. This model most closely reflects the principles adopted by the Dutch government: that the lowest possible amount of work should be necessary and that basis registrations and their national provisions should be used wherever possible.

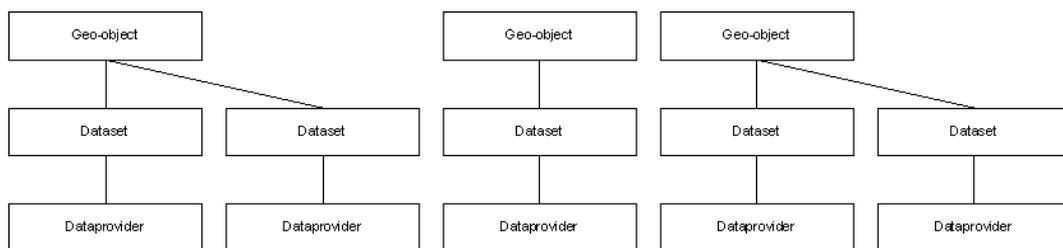
*Collective model as a variation within the project alternative included in the CBA*

An alternative to the basis model is the collective model; in this model every organisation which has a dataset that falls under INSPIRE is registered as a data provider. The collective model is included in the CBA as a variation of the project alternative.

*Collective model*

All the datasets under the 34 themes that meet the INSPIRE data specifications form part of the collective model under INSPIRE. This means that, for one INSPIRE geo-object, a lot more Dutch datasets will become available and will be provided by more organisations via the INSPIRE portal. The figure below illustrates the collective model.

Figure 0.3 Collective model



The total number of data providers increases in the collective model to about 26, an increase of four (taking the overlap between the Annexes into account, in the same way as was done with the basis model). The number of datasets in the collective model becomes/remains at the level of 165.

Table 0.3 Numbers of data providers and datasets in the collective model

	Number of data providers	Number of datasets
Annex I	16	83
Annex II	14	16
Annex III	17	66
<b>Total (Adjusted for overlap)</b>	<b>26</b>	<b>165</b>

The difference in the number of datasets between the collective model and the basis model is 93.

## 2.3 Zero alternative: INSPIRE not introduced

The zero alternative in the MCBA is related to a hypothetical situation, i.e. the situation which would exist if INSPIRE was not introduced in the Netherlands. In this scenario the Dutch government decides to ignore the Directive and not to make a (co-ordinated) effort to harmonise geo-information. To describe the effects that the introduction of INSPIRE may have, it is important to have a good insight into the developments that would have taken place had it not been introduced. Effects that would have occurred without the introduction of INSPIRE should not be ascribed to the introduction of INSPIRE.

### *Meta-information in the zero alternative*

In the zero alternative we assume that no specific actions were taken by data providers to develop or modify meta-information in a uniform way. Every organisation has to decide for itself the particular way in which the metadata is described and included.

### *Harmonisation of geo-information in the zero alternative*

During the description of the project alternative we already pointed out that GIDEON was clearly positioned in the context of the INSPIRE Directive. Our principle underlying the zero alternative is, therefore, that the goal of harmonising GIDEON would not have been achieved without the introduction of the INSPIRE Directive.

### *Unlocking data in the zero alternative*

This does not mean that nothing is happening to geo-information in the zero alternative. There are already developments going on which are independent of the INSPIRE Directive; within some particular themes, for example, there is already an element of collaboration between a number of member states. We can assume too, in the long term, that the national geo register (NGR) would still have come into being without the introduction of INSPIRE. In the zero alternative the unlocking of geo-information would also have been well organised in the longer term, without the catalytic effect of the PDOK engine.

Not introducing the INSPIRE Directive may lead to sanctions from the European Commission. If the Netherlands decide to not execute the INSPIRE Directive, this will have consequences; the most obvious one is that the Netherlands will be given a sanction by the European Commission. It is, however, unclear as to what kind of sanction this would be and how heavy its impact (for example how large a financial fine might be). In this cost-benefits analysis a sanction such as this is not taken into account.

## 3. Costs and benefits INSPIRE

### 3.1 Introduction

In 2001, the Directorate General of the Environment (DG-ENV), the Eurostat and the Joint Research Center (JRC) of the EC decided to set up a European Geo-information Infrastructure for the environment, namely, the Infrastructure for Spatial Information in Europe (INSPIRE). On 15 May 2007, the eponymously-named European Directive came into force. This Directive now forms the legal basis for the common provision of geo-information throughout the European Union.

With the introduction of INSPIRE at European level, we are working on the availability of geo-information and how well it can be exchanged. The European Directive INSPIRE has to produce a European geo-information infrastructure which will contribute to an improved provision of information at, among others, international policy level and for service providing processes. In order to achieve this, a number of implementation routes have been initiated at national level. These are:

- Setting up provisions to make geo-information available with metadata, including a national INSPIRE portal;
- Describing, harmonising and making geo-information available with metadata via a national INSPIRE portal;
- Promoting the use of the geo-information that is available via the INSPIRE portal.

To make these implementation routes successful, it is necessary for the parties involved to be familiar with INSPIRE and to have insight into the impact, costs and benefits of the Directive. The Ministry of Housing, Spatial Planning and the Environment has given Geonovum the task of executing strategic impact and costs-benefits analyses.

This chapter describes the most important results of the costs-benefits analyses, including the speed of response analysis. It is a chapter which can stand on its own and provides all the necessary information about the decision-making processes. However, if more insight is required into how the costs and benefits are worked out, then the additional information in Chapters 4 and 5 should be consulted.

The results which have been obtained are based on information which was provided by various involved parties (both data providers and users) from a number of (theoretical) use cases. The use cases offer an insight into the costs and benefits that result from the implementation of INSPIRE and can also be used as examples for the members of the House of Representatives. In Chapter 6 the use cases are described in detail.

## 3.2 General points of departure

For the INSPIRE costs-benefits analyses and other analyses executed for basis registrations, such as the Program Streamlining Basis Information, the Basis Company Registration, the Basis Registration Addresses and Buildings and the Starting Package GBA, a number of points of departure are used which conform to the (Guide to) Costs-Benefits Analyses for ICT-projects<sup>5</sup>.

These general points of departure are:

- the running time of the costs-benefits analysis is 15 years;
- the start year is 2009;
- the discount rate is 2.5%;
- the costs and benefits are based on 2009 price levels;
- the start year for investments is 2009;
- the prices per hour for the employment of personnel are based on the Manual of Government Salary Rates 2009, Ministry of Finance:
  - the hour price for lower functions is € 56 per hour (Scale 8);
  - the hour price for middle functions is € 64 per hour (Scale 10);
  - the hour price for higher functions is € 77 per hour (Scale 12);
  - the net number of productive hours per FTE is the equivalent of 1.370 hour;
- the costs and benefits are expressed in cash values. The balance of the costs and benefits is the net cash value;
- the costs and benefits will be presented at an aggregate level<sup>6</sup>;
- the costs and benefits will be presented in the organisations in which the costs have been made and where the benefits can be generated. So investment is not taken into account.

The cash value (CV) is the current value of an amount that will be paid in future<sup>7</sup>. The cash value is specified for both the costs and the benefits. When the attraction of an investment is evaluated we always look at the net cash value. If the net cash value is higher than 0, then the cash value of the benefits is higher than the cash value of the costs and it investment in the project becomes interesting (from an economic point of view).

The CBA provides an overview of the costs and the benefits from various years during the life-time of the project and, for this reason, specifying the cash value of the costs and benefits is desirable so that comparing costs and benefits is then made possible. Translating future costs and/or benefits into their cash value is a technique known as discounting<sup>8</sup>.

At the start of 2007, the Ministry of Finance<sup>9</sup> fixed a new discount rate to use in the costs-benefits analyses for infrastructure projects. The advice is:

- A risk free, real discount rate of 2.5% has to be applied for all costs-benefits analyses;
- The risk free real discount rate has to be increased with a rate, if possible a project specific one, to cover the macro-economic risk. The standard risk surcharge is equivalent to 3%<sup>10</sup>.

Using a real discount rate means that all the costs and benefits should be specified in real terms (in the prices of the basis year) and should not be worked using nominal costs and benefits.

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<sup>5</sup> (Guide to) Costs-Benefits Analyses for ICT projects, ECORYS (2007)

<sup>6</sup> At the request of the Steering Group, no information about any individual organisations is included in the CBA.

<sup>7</sup> For example: A euro that one receives in year X, will not have the same value as a euro which one already has. Thus interest can be added to the value of this euro making it worth more in it did in year X.

<sup>8</sup> The Excel program has standard formulas so that the cash value can be quickly calculated.

<sup>9</sup> Ministry of Finance (2007), *Updating Discount rate*, Letter to the House of Representatives, IRV 2007-0090 M

<sup>10</sup> Ministry of Transport, Public Works and Water Management, Ministry of Finance, Netherlands Bureau for Economic Policy Analysis and Rebel Group 2004 Risk Evaluation

For the fixed costs, the risk free discount rate of 2.5 % should always be used, and for the benefits, a risk free discount rate of 2.5 % (in certain cases with a risk surcharge of 3%).

In order to set the correct discount rate, it is important to know to what extent the effects of the costs-benefits analyses depend on the macro-economic development. The introduction of INSPIRE does not depend on any macro-economic development and that is why the benefits (in the same way as the costs) are discounted by 2.5% and a risk surcharge is not applied.

### 3.3 Overview of social costs and benefits

#### *Positive balance using CBA INSPIRE basis model*

For the unlocking and harmonisation of geo-information which conforms to INSPIRE, two models have been developed:

3. Basis model. The government converts the Directive into national legislation and tries to minimize the impact on organisations that manage information which INSPIRE is mandatory for. Only the most suitable datasets are unlocked and harmonised.
4. Collective model. The government converts the Directive into national legislation, but each organisation that manages geo-information, which INSPIRE is mandatory for, has to harmonise the metadata, data and services and unlock them in a standard way.

These two models have been worked out in the cost-benefit analyses as variations of the project alternative.

The balance of the costs and the benefits of the introduction of INSPIRE using the basis model shows that, over the total life time of the CBA, the benefits exceed the costs by 34.0 million euro (net cash value). The costs are 32.1 million euro and the benefits total 66.1 million euro. The introduction of INSPIRE also produces some strategic effects which cannot be quantified, but which have positive effects. Thus the introduction of INSPIRE using the basis model means that society profits and that it is attractive to invest in INSPIRE.

In the following table, the most important outcomes of the costs-benefits analyses for the whole of society are listed.

Table 0.1 Overview of social costs and benefits - INSPIRE basis model

Costs and benefits	Net cash value (in mln. euro)
Costs	32.1
Benefits	66.1 + PM (+)
<b>Balance (benefits -/ - costs)</b>	<b>34.0 + PM (+)</b>

#### *Balance using CBA INSPIRE collective model is lower*

If we take the collective model as our point of departure, then the balance of the costs and benefits decreases to 22.9 million euro (net cash value). The costs increase to 40.9 million euro (cash value), an increase of 8.8 million euro (cash value). In comparison to the basis model, the benefits decrease to 63.7 million, a decrease of 2.4 million euro.

Table 0.2 Overview of social costs and benefits re. INSPIRE collective model

Costs and benefits	Net cash value (in mln. euro)
Costs	40.8
Benefits	63.7 + PM (+)
<b>Balance (benefits-/- costs)</b>	<b>22.9 + PM (+)</b>

The table below illustrates the differences between both models.

Table 0.3 Overview of the social costs and benefits re. INSPIRE basis model and the collective model and the difference between them. (Net cash value in mln. euro)

Costs and benefits	Basis model	Collective model	Difference
Costs	32.1	40.9	8.8
Benefits	66.1 + PM (+)	63.7 + PM (+)	-/- 2.4
<b>Balance (benefits -/- costs)</b>	<b>34.0 + PM (+)</b>	<b>22.8 + PM (+)</b>	<b>-/- 11.2</b>

PM represents the (as yet unquantifiable) benefits that will come from the strategic effects

If we take the basis model as our point of departure, then the balance of the costs and benefits decreases to 22.9 million euro (net cash value), a decrease of 11.2 million euro. The costs increase to 40.9 million euro (cash value), an increase of 8.8 million euro (cash value). In comparison to the basis model, the benefits decrease to 63.7 million euro, a decrease of 2.4 million euro.

The most important conclusions are that:

- in the basis model the benefits of introduction of INSPIRE vastly outweigh costs;
- in the collective model the benefits outweigh the costs;
- the costs in the basis model will be retrieved after eight years, and
- an introduction via the basis model is definitely more efficient than via the collective model, as fewer costs have to be made and more benefits are generated.

### *Not-monetary benefits*

Apart from the benefits described above (and the monetary benefits), there are other strategic effects, that are not expressed in money (the P.M. in the tables above) which occur as a result of the introduction of the INSPIRE Directive. These strategic effects are briefly described below. In Chapter 5 we explain the effects in more detail.

The main strategic impact that INSPIRE has is to strengthen policy in the areas of e-government and geo-information (GIDEON). The principles underpinning e-government and INSPIRE dovetail (single storage/plural use and management at the source). The Directive is being introduced by means of an act of government which will ensure that projects are prioritised. The Directive provides standards as well and place national developments and policy which relates to geo-information in a broader international context.

INSPIRE dovetails with the philosophy of Nederland Open In Verbinding (the Netherlands Open And Connected). Choosing Open Source and open standards enhances the performance of a government and allows it to provide a maximum level of service. The belief is that ‘open’ choices will also lead to an increase in the interoperability between ICT building bricks and governments. This collaboration will also increase if data can stream freely via the creation of

standardised portals where this harmonised data is available. InterWad, the program under ICTU which completely dovetails with NOIV has set up a portal which will be linked to the INSPIRE structure.

For a data provider, INSPIRE leads to a more open service which not only chain partners, but national and international organisations can use too. This may lead to modifications in information policy or the creation of publication and provision policy. The conditions that INSPIRE sets out to ensure the availability of data and provisions (7/24) may trigger new agreements concerning management and an increase in the number of services' tasks. For data providers INSPIRE will lead to better services profiling and a larger network.

From a users perspective use of the INSPIRE Directive leads to more efficient policy and planning, especially in cross-border areas. INSPIRE may also lead to the better cohesion of this policy.

For software providers, INSPIRE influences the release policy. These providers may include their INSPIRE software in the standard software package or may offer separate extensions. Providers of services will focus on implementation routes, the execution of architecture scans for INSPIRE and knowledge-sharing sessions. Finally, INSPIRE offers new opportunities for organisations to build their own, specific data portals linked to the INSPIRE portals. Private parties too can start to offer data at an INSPIRE portal. The private parties will use the INSPIRE data for added-value services.

Thus the relationship between costs and benefits, including the non-monetary benefits, turns out to be even more positive. This means that the advantage for society is even larger than it appears to be from just examining the balance of monetary benefits and costs.

### *Costs*

The introduction of INSPIRE in the Netherlands costs data providers money. The costs for users is negligible, as users simply retrieve information via the INSPIRE portal. In the current situation all data exchanges are already arranged, so the costs users have to make will be small.

The data providers have to make sure that their datasets meet the INSPIRE Directive. For Annex I various meetings have been organised to designate each theme. For Annexes II and III this still has to be done. In order to pre-empt this, we have asked all those organisations providing data for a theme in Annex I, to illustrate the costs they will make as a result of INSPIRE. Looking at the parties that are data provider for Annex I (among others, the Land Registry, the Directorate General for Public Works and Water Management, the Ministry of Agriculture, Nature and Food Quality, the Provinces and the Water Boards), one can see that a large number of the organisations are included who could be source holders for Annex II and III as well.

Organisation by organisation, we have looked at the costs which have to be made in order for the datasets to meet the INSPIRE Directive. This means that metadata has to be modified, a metadata management system has to be implemented, data has to be harmonised, an infrastructure has to be build (software, hardware, network connections), management secured and costs have to be included to fund meetings which may be necessary to fine-tuning the services. For some data providers, their actual working processes will change too. The costs involved are both investment costs and structural costs. Costs will also vary, depending on the

number of datasets. The total investment costs for the Netherlands amount to about 17 million euro, including 4.4 million euro of costs ring-fenced for PDOK (25%).

Apart from this, the data providers have friction costs too <sup>11</sup> (0.3 million euro, cash value) and there are additional expenses required to meet domestic/national introduction co-ordination costs (7.0 million euro, cash value). Finally, the annual structural costs are about 0.9 million euro. The table below gives an overview of the costs involved in the basis model.

Table 0.4 Overview of total costs of basis model

Type costs	Type organisation	Annual costs (in mln. euro)	Cash value (in mln. euro)*
Investment costs	Data providers	-	16.9
Co-ordination costs	Geonovum	0.4 – 0.7	7.0
Friction costs	Data providers	-	0.3
Structural costs	Data providers	0.9	7.9
<b>Total costs</b>		<b>1.3 – 1.6</b>	<b>32.1</b>

\* Because the numbers have been rounded up, the totals of some amounts are not exact.

The cash value of the costs is about 32 million euro. The annual costs vary between about 1.3 and 1.6 million euro over the years up to 2024.

For the collective model the costs increase. Extra costs have to be made for metadata to be modified and adaptations of ETL tools and servers to be made, as there are more data providers in this model. The collective model also means that there will be increased annual management costs because more datasets are involved. The total extra investment costs amount to 1.5 million euro (cash value), and the structural management costs 7.3 million euro (cash value). There is an overview of the costs of the collective model below.

Tabel 0.5 Overview of the costs of collective model

Type costs	Type organisation	Annual costs (in mln. euro)	Cash value (in mln. euro)*
Investment costs	Data providers	-	16.9
Co-ordination costs	Geonovum	0.4 – 0.7	7.0
Friction costs	Data providers	-	0.3
Structural costs	Data providers	0.9	7.9
Additional investment costs	Data providers	-	1.5
Additional structural costs	Data providers	0.2 – 0.8	7.3
<b>Total costs</b>		<b>1.5 – 2.4</b>	<b>40.9</b>

\* Because the numbers have been rounded up, the totals of some amounts are not exact.

In summary, the collective model leads to extra costs of nearly 9 million euro over the life-time of the costs-benefits analysis, a major part of which is caused by the annual management costs. You will find a further explanation of these costs in Chapter 4.

### *Benefits of INSPIRE basis model*

The introduction of INSPIRE according to the basis model leads to a number of effects. These effects are briefly described below and a more detailed explanation is given in Chapter 5:

<sup>11</sup> Friction costs are caused because the introduction of INSPIRE in the Netherlands will probably not go at the same speed as the European Commission has set out, see Chapter 4 for more information.

- a) Efficiency benefits for data providers;
- b) Efficiency benefits for users and;
- c) Other (strategic) effects.

#### *Efficiency benefits for data providers*

With the coming of INSPIRE and the choice of the basis model, The Netherlands has chosen to designate one data provider per theme (and feature type). This means that, in this situation, fewer datasets need to be managed. It is expected that an efficiency benefit of 5% will be made (for providers with datasets in Annex I and II) up to 20% (for providers with datasets in Annex III). This is about 200,000 to 400,000 euro annually. In total we are talking about a benefit of 2.4 million euro (cash value). The efficiency benefits for the data providers at the moment are relatively restricted.

#### *Efficiency benefits for users*

Users of geo-information spend a lot of time finding information; this is predominantly information that is not managed by the users themselves (these could also be data providers). Apart from this, it is important for the user to know exactly what the information says, in which unit the data is displayed, and what other metadata should be present. INSPIRE makes sure that the data is unlocked via the INSPIRE portal and that the data includes meta data too. This way it is easier for the users to find the data and less time is needed to look for data and associated metadata. The use of the data is also easier, as less verification has to take place when data is harmonised. The benefits are mainly to be found at international project level, where a lot of time is spent on searching for the right data.

Provinces and municipalities have an extra efficiency benefit. PDOK is an initiative of, and taken by, the government. Provinces and municipalities are not linked to this initiative. The introduction of INSPIRE causes changes in the way data is obtained by provinces and municipalities. Currently the provinces and municipalities obtain information on an individual basis and they spend a lot of time doing this because they have to search separately. Using the INSPIRE Directive, all the provinces and municipalities can turn to the PDOK portal and retrieve the information they require via one portal. This way, less time is spent obtaining geo-information.

The efficiency benefits increase from 0.4 million euro to about 8.2 million euro per year if all the datasets of Annex II and III are unlocked via the INSPIRE portal. In total this is a benefit of about 14.9 million (cash value). The table below summarises the benefits of the basis model.

Table 0.6 Overview of total benefits of basis model

Type benefits		Annual benefits (in mln. euro)	Net cash value (in mln. euro)
Efficiency benefits	Data providers	0.1 – 0.4	2.4
	Users	0.4 - 8,2	63.7
<b>Total</b>		<b>0.5 – 8.6</b>	<b>66.1</b>

#### *Benefits of collective model*

If the collective model is chosen, some of the effects mentioned above, will not occur. The efficiency benefits for the data providers included in the basis model disappear because, in the collective model, each data provider has to keep on managing and unlocking its own datasets.

The efficiency benefits for the users are just as great. The benefits are mainly realised in international projects because retrieving geo-information from other countries will be easier; the information will be clearer too. The Dutch set up (basis model versus collective model) has no impact on this. The collective model has no influence on the effects that provinces and municipalities will experience.

Table 0.7 Overview of benefits of collective model

	Type organisation	Annual benefits (in mln. euro)	Cash value (in mln. euro)
Efficiency benefits	Data providers	0	0
	Users	0.4 – 8.2	63.7
<b>Total benefits</b>		<b>0.4 – 8.2</b>	<b>63.7</b>

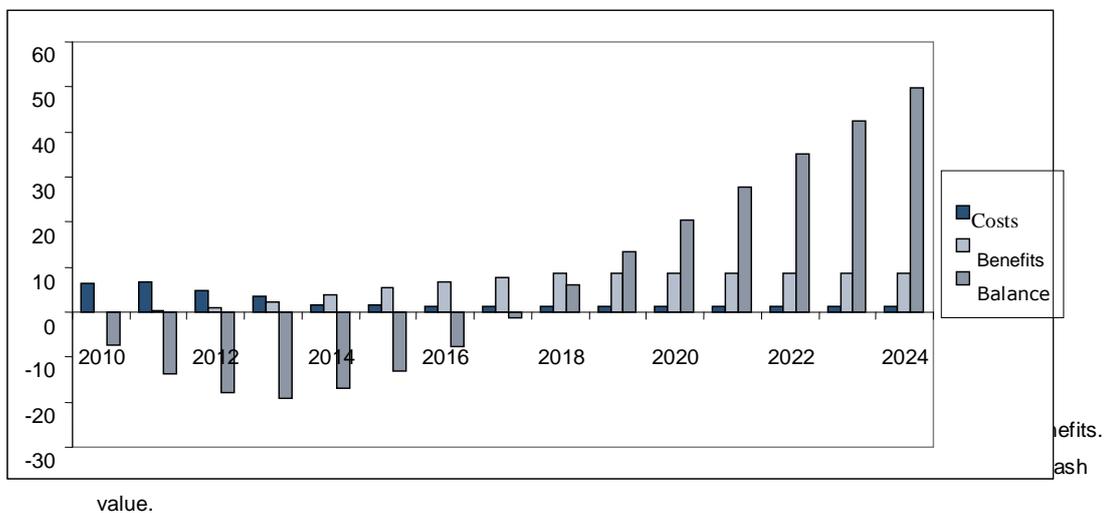
*Other (strategic) effects*

Apart from the effects described above, the introduction of INSPIRE has other non-monetary costs and effects. These strategic effects are described in detail in Chapter 5.

*Costs and benefits over time*

Investments come before profits. The figure below is an illustration of how the phasing of the costs and benefits of the basis model will look over time. The cumulative balance of the costs and benefits is also shown.

Figure 0.1 Phasing of the costs and benefits over time in the basis model (amount in mln. euro)<sup>a)</sup>



*After eight years the investment of the basis model is recovered*

Up to 2013, the annual costs exceed the benefits and the negative cumulative balance of both increases. From 2014 onwards, the benefits are larger and the negative cumulative balance decreases. From 2018 onwards, the cumulative difference of costs and benefits is positive and the costs that have been made re. INSPIRE are recovered. In this way INSPIRE has a recovery period of eight years. In the collective model, the recovery period is nine years.

*Major part of the costs until 2015*

Most of the costs will be incurred until 2015, with a peak in 2013. Until that year investment is made in the implementation of INSPIRE in all three Annexes, thereafter the major part of the investment will be made in Annexes II and III. The costs of PDOK (25 % of which are ring-

fenced for INSPIRE) run up until 2013. After 2015, the only costs remaining will be structural costs (management and maintenance, program costs) and they will stay constant at about 1.3 million euro.

#### *Results of speed of response analysis*

Using the speed of response analysis, it becomes clear that the costs-benefits analyses are reasonably firm. It is mostly the assumptions associated with the effects on users (the efficiency benefits) which exert a decisive influence on the outcomes of the costs benefits analyses. The number of international projects with geo-information and the time savings for the user which will be achieved by implementing INSPIRE appear to be of crucial importance.

The work methods and the results of the speed of response analysis can only be fully understood after reading Chapters 4 and 5. Thus, the full details of speed of response analysis can be found at the end of Chapter 5.

## 4. Explanation of the costs

### 4.1 Introduction

This chapter describes the costs which will be incurred with the introduction of INSPIRE. In paragraph 3.3 of the previous chapter, these costs were identified and, in this chapter, a more detailed breakdown of the costs is provided. The method used to calculate the costs will also be explained. Paragraph 4.2 discusses the costs associated with the basis model and in paragraph 4.3 we look at the costs associated with the collective model.

### 4.2 Basis model

In the following paragraph we will discuss the costs of the basis model in comparison with the zero alternative.

#### 4.2.1. Total costs

To be able to realise the introduction of INSPIRE, various costs have to be made during the initial years of the project. For example, investment costs in the systems have to be made right up to 2015, and costs are also involved in ensuring that information can be unlocked so that a wide range of users can access it. Apart from this, there are costs involved which relate to the co-ordination of the national introduction of this European set of guidelines. Friction costs<sup>12</sup> also arise as the speed of the introduction of INSPIRE in the Netherlands will probably not be at precisely the same pace as the schedule set out by the European Commission. Because of this, differences arise that will have to be made up and the Netherlands has to allow an additional budget to cover this. From 2012 onwards there will also be annually recurring management costs for the data providers. We call these the structural costs.

An overview of the total costs (in cash value) is listed below. We also listed the nominal value of the annually recurring costs.

Table 0.1 Overview of total costs re. basis model\*

Type costs	Type organisation	Annual costs (in mln. euro)	Cash value (in mln. euro)*
Investment costs	Data providers	-	16.9
Co-ordination costs	Geonovum	0.4 – 0.7	7.0
Friction costs	Data providers	-	0.3
Structural costs	Data providers	0.9	7.9
<b>Total costs</b>		<b>1.3 – 1.6</b>	<b>32.1</b>

\* Because the numbers have been rounded up, the totals of some amounts are not exact

<sup>12</sup> Source: Meeting of experts

The cash value of the costs amounts to about 32.1 million euro. The annual costs vary between about 1.3 and 1.6 million euro in the period till 2024.

The calculations which were made to assess these costs are explained in more detail below.

#### 4.2.2 Costs during the first years of INSPIRE

##### *Investment costs, including partial costs re. PDOK*

The investment costs necessary for the introduction of INSPIRE are only made by data providers. From discussions held with experts, it has already become clear that the users will have to modify their software to be able to cooperate with GIDEON and the basis registrations (such as BAG and BRO). These costs are, therefore, part of the zero alternative and are not related to INSPIRE. From 2010 up until 2014, data providers will incur certain costs in order to meet the INSPIRE Directive. An inventory of the expenses that each organisation will incur has been made; these include the costs for the INSPIRE metadata, data harmonisation, unlocking (services) and fine-tuning/meetings. Dutch users do not need to incur any costs for converting the INSPIRE datasets back to RD or for their own applications, as these are already included in the software packages and no extra development or transformation costs need to be made.

The investment costs for PDOK are also partly allocated to INSPIRE. The various types of investment costs are worked out in greater detail below. The percentage of the total investment costs (exclusive of the costs for PDOK) which is allocated, on average, to the different types of costs, is always indicated.

##### 1. Modifying or developing the metadata

Data providers have to purchase and configure metadata management systems. Then the metadata has to be entered in a manner which conforms to the INSPIRE Directive. Based on the information gleaned from the use cases, for an organisation providing data, a range of between 6 - 47 % of the total investment costs should be reserved for the costs related to the accreditation of the metadata.

##### 2. Harmonisation of data

These costs include the harmonisation and transformation (ETL) of data, and the costs for securing management and supervision during the initial phase. An organisation needs between 16 - 67 % of the total investment costs to cover harmonisation etc.

##### 3. Unlocking of data (services)

To make unlocking of the data possible, INSPIRE services (catalogue, council, conversion and download) have to be set up. Costs are also incurred for an INSPIRE server, a database and 7/24 availability. These costs will be between 7 - 40 % of the total investment costs.

##### 4. Fine-tuning and discussion

Costs are allocated for internal fine-tuning, publicity and meetings costs; a proportion of these costs is incurred because of the modifications to working processes and policy which are required. To cover these activities, an organisation needs to allocate between 8 - 24 % of the total investment costs.

## 5. PDOK

Finally, a quarter of the PDOK's investment costs are allocated to INSPIRE. These costs are incurred by data providers as well, and from 2009 up until 2013<sup>13</sup> these will vary from between 0.4 and 1.4 million euro annually.

Based on the estimates made by data providers<sup>14</sup>, the investment costs will amount to 16.9 million euro (cash value) in total. Some of these activities are the same as those that would take place in the zero alternative and predominantly involve tasks related to GIDEON and the NGR (PDOK). The unlocking of geo-information and the provision of services will be connected to the NGR at a later stage. The extra costs incurred to make unlocking possible (which have to be made before that time), for this reason, fall under the costs for INSPIRE.

With respect to the work which is entailed in harmonising data, it is hard to make a distinction between GIDEON and INSPIRE. However, the data providers have included the harmonisation costs necessary for INSPIRE in their impact analysis. This is why these harmonisation (or conversion) costs of 25% are included in the costs-benefits analysis<sup>15</sup>.

Table 0.2 Investment costs

Type costs	Annual costs (in mln. euro)	Cash value (in mln. euro)
Investment costs data providers	-	12.9
Allocated costs PDOK (25%)	-	4.0
<b>Total</b>		<b>16.9</b>

In this costs-benefits analysis, the costs of each individual organisation are not detailed. There appears to be a relatively large difference in costs between the various organisations, in both the amounts and the way in which the costs are divided over the various activities. This is not surprising, as the level of impact on each organisation differs widely. The organisations are also going through different phases of investment, so the number of activities that still have to be undertaken varies widely.

### Co-ordination costs

Geonovum takes care of the supervision and co-ordination of the national introduction of INSPIRE. This is why this organisation is now faced with the program costs for 2009 up until 2024. A report drawn up by Geonovum illustrates that the program costs for INSPIRE lay between 350,000 and 700,000 euro per year. From 2009 up until 2015, all the program costs are allocated to INSPIRE, after that, this decreases to half of the program costs up until 2024 (the life-span of the costs-benefits analysis). Costs incurred for communication and publicity about the introduction of the INSPIRE Directive are included in the program costs.

Table 0.3 Co-ordination costs

Type costs	Annual costs (2009 t/m 2016) (in mln. euro)	Cash value (in mln. euro)
Co-ordination costs	0.4 – 0.7	7.0

<sup>13</sup> For this we refer to the budget and planning in the Project initiation document and the PDOK phased plan.

<sup>14</sup> Data providers have drawn up analyses to measure the impact of the introduction of INSPIRE in their organisations. These analyses form the basis for the calculation of the investment costs.

<sup>15</sup> Source: Geonovum

### *Costs legislation and regulations*

For the introduction of the INSPIRE Directive in the Netherlands, costs also have to be made to integrate these guidelines into Dutch legislation and the body of regulations. The Ministry of Housing, Spatial Planning and the Environment has already incurred those costs and they should, therefore, be considered as sunk costs. For that reason, these costs are not included in the costs-benefits analysis.

### *Friction costs*

Friction costs arise because some of the guidelines involved in the introduction of INSPIRE have not yet been finalised. Developments in the Netherlands will differ in the long term from those set out by the European Commission; that friction has to be repaired, and will mean that data providers will have to incur extra costs. We took the period up until 2014 as our point of departure. This mainly applies to the datasets (and data providers) in Annexes II and III which will be unlocked according to the INSPIRE Directive at a later date.

If we include 5 extra days for the modification of data, per data provider per year, the costs are estimated to be about 70,000 euro per year (5 days against a high hourly rate and 22 data providers). When an inventory is made of the data providers who have to deal with the friction costs, we took the co-ordination of work between the municipalities and the provinces as our point of departure. They should certainly be able to achieve this in an integrated manner.

Table 0.4 Friction costs

Type costs	Annual costs (2010 until 2014) (in mln. euro)	Cash value (in mln. euro)
Friction costs	0.1	0.3

### 4.2.3 Structural costs

As well as the costs incurred during the initial years of the project, the data providers also have annually recurring management costs. Depending on the Annex and the data provider, these will start in the period 2012-2015 and run until the end of the project (2024).

Costs of annual fine-tunings and meetings for all data providers fall under the structural costs. In each organisation employees spend (a part of their) time on INSPIRE once the program is up and running. The data providers meet 10 days a year on average to fine-tune the work.

As soon as the parts are installed, there are also annual costs incurred in the management of the ICT and in the maintenance of (meta)data from the moment that it is unlocked. Costs are incurred because of the constant need to meet the high requirements of INSPIRE with regard to, among other things, performance and 24/7 availability.

Information provided by the data providers has formed the basis of our assessment of the structural costs. The data providers indicated, in their impact analysis, what structural costs they will have to make as a result of the introduction of INSPIRE.

Table 0.5 Structural costs

Type costs	Annual costs (in mln. euro)	Cash value (in mln. euro)
Structural costs	0.9	7.9

The introduction of INSPIRE will probably cause an increase in the use of geo data. The costs related to this, however, are limited and so are not listed separately in the costs-benefit analysis.

### 4.3 Collective model

In this paragraph we will discuss the costs that will be incurred if we take the collective model as our point of departure for the introduction of INSPIRE.

The collective model is a variation of the basis model. In this model, each organisation with a dataset under INSPIRE is deemed a data provider. This means that one or more datasets will arise per theme, so on top of the costs of the basis model, some extra costs will also have to be made. The other costs do not differ from the basis model and thus are not described again. The additional costs concern:

- Adapting metadata and harmonising data;
- Purchasing ETL tool and servers and
- Management costs.

The first two items are investment costs; the last one is a structural one. A new overview of the costs incurred in the collective model is illustrated below, followed by an explanation of the calculation of the additional costs that are made in this model.

#### 4.3.1 Total costs

In the collective model, costs are also incurred during the initial years of the introduction of INSPIRE and structural costs too. The new total overview looks like this:

Table 0.6 Overview total costs collective model

Type costs	Type organisation	Annual costs (in mln. euro)	Cash value (in mln. euro)
Investment costs	Data providers	-	16.9
Co-ordination costs	Geonovum	0.4 – 0.7	7.0
Friction costs	Data providers	-	0.3
Structural costs	Data providers	0.9	7.9
Additional investment costs	Data providers	-	1.5
Additional structural costs	Data providers	0.2 – 0.8	7.3
<b>Total costs</b>		<b>1.5 – 2.4</b>	<b>40.9</b>

\* Because the numbers have been rounded up, the totals of some amounts are not exact

In this variation the total costs are 27% higher than the costs in the basis model.

### 4.3.2 Additional investment costs

Only a proportion (72) of the current number of the relevant datasets (165) recurs in the basis model. The current number of datasets is specified based on the ‘Overview of datasets and source keepers per theme/feature type of Annex I collective model’ and the overview ‘INSPIRE environment on map.xls: SourcekeepersNL’,<sup>16</sup>

In the collective model, there are 93 (=165-72) more datasets compared to the basis model (for more details, see paragraph 2.2). The additional costs for creating metadata fields and parameters, and for harmonising the data amount to 15,000 euro per dataset. This results in a total of 1.3 million euro (cash value) of additional costs for creating and introducing the metadata, and harmonising the data. The meta-information has to be described separately for each dataset, and the data has to be harmonised which leads to inefficiencies and higher costs.

Apart from this, additional data providers (see also paragraph 2.2) incur more costs for ETL adaptations and the separate INSPIRE servers that are included in the investment costs. In the collective model there are four extra data providers.

The costs for this amount to 20,000; this is 45,000 euro<sup>17</sup> per data provider respectively which results in the additional costs of 0.2 million euro (cash value) in the period 2010-2015.

Table 0.7 Additional investment costs collective model

Type costs	Annual costs (in mln. euro)	Cash value (in mln. euro)
Adapting metadata and harmonising data	-	1.3
ETL Adaptations and server	-	0.2
<b>Total additional investment costs</b>		<b>1.5</b>

### 4.3.3. Additional structural costs

For data providers, the collective model requires a lot more management of the systems as several datasets operate at the same time and co-exist alongside one another. Some of the costs of the meetings have been included in the costs associated with the basis model. In total the extra meetings cause an additional expense for the data providers of about 130 000 euro annually, or 1.6 million euro during the total life-time of the costs-benefits analysis (cash value).

There are also extra management costs as a result of the high requirements of INSPIRE for among other things, reliability and 24/7 availability. In total there are 93 extra datasets, but some of these are in the same organisation. The overlap is estimated to be about 33%. This is why it is assumed that extra management costs are incurred for about 60 datasets (2/3rds of 93); these amount to 10,000 euro per dataset. The costs will run from 2012 onwards and be finished in 2015. The level of the costs varies from 200,000 to 600,000 euro yearly.

<sup>16</sup> Source: Geonovum. Drawn up on the basis of the currently available information about the themes of Annex II and III.

<sup>17</sup> On the basis of estimates from Grontmij

Table 0.8 Additional structural costs

Type costs	Annual costs (in mln. euro)	Cash value (in mln. euro)
Management of the systems	0.2	1.6
Structural management costs	0.2 – 0.6	5.7
	<b>0.4 – 0.8</b>	<b>7.3</b>

In summary, over the total life-span of the costs-benefits analysis, use of the collective model incurs extra costs of nearly 9 million euro, the major part of which is incurred by the annual management costs (structural costs).

## 5. Explanation of the benefits

### 5.1 Introduction

This chapter is about the benefits that arise from the introduction of INSPIRE. In paragraph 3.3 these benefits were identified; in this chapter, a more detailed explanation and a description of how they are calculated is given. Paragraph 5.2 describes the benefits that are associated with the basis model and paragraph 5.3 discusses those that are associated with the collective model. This paragraph is about the other (strategic) effects.

This chapter closes with a ‘speed of response’ analysis in paragraph 5.5.

### 5.2 Basis model

In this paragraph we discuss the effects and the benefits of using the basis model.

#### 5.2.1 Total benefits

The table below gives an overview of the benefits of the introduction of INSPIRE if the basis model is used as our point of departure. In this table, we can see the annual benefits and the net cash value of these benefits.

Table 0.1 Overview of total benefits of basis model

Type of benefit		Annual benefit (in mln. euro)	Net cash value (in mln. euro)
Efficiency benefit	Data providers	0.1 – 0.4	2.4
	Users	0.4 – 8.2	63.7
<b>Total</b>		<b>0.5 – 8.6</b>	<b>66.1</b>

The cash value of the benefits amounts to 66.1 million euro. The annual benefits increase to between 0.5 million euro and 8.6 million euro in the years up to 2024.

The greatest advantage is realised by improving the efficiency for the users. For data providers the efficiency advantage is limited. The benefits will now be explained in more detail.

#### 5.2.2 Efficiency advantage to data providers

The introduction of INSPIRE ensures that, in the basis model, one source holder per dataset is designated to manage and maintain the dataset. In the current situation, all the organisations manage and maintain their own datasets. INSPIRE’s introduction will not mean that all the datasets will disappear, however the management costs of the datasets will certainly decrease.

Less effort is required to be able to manage the datasets which do not have to (by mandate) conform to INSPIRE. This is predominantly an advantage for organisations which are not going to be data providers. For Annex I and II it is expected that management costs will decrease by 5 %, for Annex III the saving will be 20 %<sup>18</sup>. The advantage will be realised for all organisations together and not for each organisation. The saving will probably only be realised after approx. 10 years. This means that the efficiency advantage for data providers will slowly increase from the time of INSPIRE's introduction onwards. For the 34 themes there are, in total, about 165 datasets (in both the zero alternative and the collective model). With the introduction of INSPIRE, the number of these initial datasets decreases to 72. The 93 datasets that are among these, will not all disappear. Organisations may choose to keep managing these datasets for their own use, however they will then not meet the conditions of the INSPIRE Directive. Some datasets however, will disappear completely. The costs for management will decrease as a result of this. We think that the management costs per data provider will amount to approx. 20,000 euro. When we take annual savings into consideration, then the management costs of about 22 data providers decrease. If the efficiency advantages for all three Annexes are realised to their fullest extent (after 10 years), the savings in management costs is approx. 360 thousand euro annually. The annual benefit increases to approx. 360 thousand euro in 2020 and then keeps on running at this level. The cash value of the efficiency advantage drops to 2.4 million euro.

Table 0.2 Efficiency advantage data providers

Type of benefit		Annual benefit (in mln. euro)	Cash value (in mln. euro)
Efficiency advantage	Data providers	0.1 – 0.4	2.4
<b>Total</b>		<b>0.1 – 0.4</b>	<b>2.4</b>

### 5.2.3 Efficiency advantage for users

#### *Efficiency advantage for projects with international geo-information*

The efficiency advantage for users is predominantly found in searching, gathering, checking and the use of the data in projects for which INSPIRE is mandatory. In the main, this concerns projects for which international geo-information is gathered and used.

As it happens, the current exchange of geo-information in the Netherlands is well organised. All the organisations that use geo-information, for legislative tasks, have already arranged the method of obtaining this geo-information. This usually occurs by the digital transmission of information but still sometimes involves the sending of a CD-Rom containing data. INSPIRE can influence this method, as a party receiving information needs only one software package, but probably has more packages or systems for managing this (depending on the number of exchanges of an organisation). This saving however is small.

Projects which use international geo-information vary in size and in the amount of time that is spent on gathering geo-information for them. However it is clear that quite a large proportion of the project time which is available (sometimes as much as 80-90%)<sup>19</sup> is spent on gathering and verifying data.

As our point of departure we decided to assume that for each (average) project, 50 days on average is spent on gathering and checking the data. With the introduction of INSPIRE, time

<sup>18</sup> Source: Expert meeting

<sup>19</sup> " " "

can be spent more efficiently because the data can be unlocked via the INSPIRE portal, so less time is required for searching for necessary information. Based on the input made during the expert meeting, it was specified that the time spent on the searching and checking of data could be halved. The efficiency advantage as a result of the introduction of INSPIRE is 25 days per project.

The total size of the market in the Netherlands for processing, managing analysing, data etc. is worth about 370 million euro<sup>20</sup>. For an average sized project of about 75.000 euro,<sup>21</sup> this means that annually there are about 5,000 projects which use geo data. In a meeting with experts, the assumption was made that, in the longer term, about 10 % of these projects, will be using international geo-information. The efficiency advantage in future will, therefore, be about 500 % annually. Because INSPIRE is being introduced gradually (see the time paths of the Annexes) this effect will increase little by little and only after a period of about ten years will it be completed.

The total annual benefit amounts to 6.3 million euro. That is, 500 projects with a time saving of 25 days, times by the hourly price for lower functions (64 euro per hour), which gives a benefit of 6.3 million euro.

However, this benefit is not fully realised straight away. From 2011 to 2018 it slowly increases, and only from 2018 onwards is the benefit realised most fully. In this way the benefit increases to about 300,000 euro in 2011 to about 6.3 million euro from 2018 onwards. The total cash value of this benefit is 48.8 million euro.

#### *Efficiency advantage for provinces and municipalities*

PDOK is an initiative taken by, and intended for, the government. Provinces and municipalities are not in the scope of PDOK. Without the introduction of INSPIRE, the provinces and municipalities would not have to make any adaptations to the way they obtain and use geo-information. The provinces and mainly the larger (self regulating) municipalities gather geo-information themselves and then make it available for their own internal and external use. The INSPIRE portal ensures that the process is easier and so it takes less time for the provinces and municipalities to gather the geo-information that falls under INSPIRE).

In the provinces, on average, 0.5 full-time equivalent (fte) working hours is spent on gathering geo-information. As a result of INSPIRE the provinces estimate that only half of this time (0.25 fte) is now required to gather this geo-information. The remaining 0.25 fte is spend on gathering geo-information for which INSPIRE is not mandatory.

At municipality level the picture varies quite a bit. It is predominantly the large Dutch municipalities which have a geo-information department or a unit that works full time on it. There are also some municipalities that do not make any efforts (or hardly any) in this field. On average, per municipality, 0.1 fte working hours are spent on gathering geo-information. By introducing INSPIRE, less time is needed for gathering of geo-information, probably about half the time (0.05 fte) working hours.

This benefit will also not be fully realised straight away in the municipalities and the provinces. When we take 56 euro per hour as our point of departure, the benefit increases from 0.1 million

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<sup>20</sup> Source: Geo-sector in kaart, Geobusiness Nederland, 2009

<sup>21</sup> Opgave Grontmij

euro in 2011 to 1.9 million euro in 2018. The total cash value of this benefit is, therefore, 14.9 million euro.

Table 0.3 Efficiency advantage

Type of benefit		Annual benefit (in mln. euro)	Cash value (in mln. euro)
Efficiency benefit	Users (international)	0.3 – 6.3	48.8
	Provinces and municipalities	0.1 – 1.9	14.9
<b>Total</b>		<b>0.4 – 8.2</b>	<b>63.7</b>

## 5.3 Collective model

This paragraph is about the benefits that can be realised if we take the collective model as our starting point for the introduction of INSPIRE.

### 5.3.1 Total benefits

When INSPIRE is introduced following the collective model, it means that each organisation which has data which INSPIRE is mandatory for is designated as a data provider. In the table below there is an overview of the benefits related to the introduction of INSPIRE if we use the collective model. This gives one an insight into the annual benefit and the net cash value of this benefit.

Table 0.4 Overview of total benefits of collective model

Type benefits		Annual benefit (in mln. euro)	Net cash value (in mln. euro)
Efficiency benefit	Data providers	-	0
	Users	0.3 – 6.3	48.8
<b>Total</b>		<b>0.3 – 6.3</b>	<b>48.8</b>

With the collective model, the benefit amounts to 48.8 million euro (cash value). The annual benefit increases from about 300,000 euro to 6.3 million euro in the period up to 2024.

In a situation which uses the collective model as its point of departure, the data providers have no efficiency advantage. The greatest advantage is realised by an improvement in efficiency for the users. An explanation of these benefits will be given in the following subparagraphs.

### 5.3.2 Efficiency advantage for data providers

The efficiency advantage that is realised with the introduction of INSPIRE, according to the basis model, disappears in the collective model. The point of departure for the collective model is that all of the organisations that have data for which INSPIRE is mandatory, will have to unlock it too. As there is no central data provider, and each organisation that has information becomes a data provider itself, this will not reduce the work involved in the management of datasets.

### 5.3.3 Efficiency advantage for users

In the collective model, the efficiency advantage for users is the same as it is in the basis model. The current exchange of geo-information in the Netherlands is arranged well. In the collective model there will be no impact on this, in the same way as there is no impact in the basis model. The efficiency advantage takes place in projects which use international geo data where there are time savings to be made as less time has to be spent on finding the geo-information. The way other countries are organised is important for the realisation of this benefit but, the way the Netherlands organises this, has no impact.

The total annual benefit amounts to 6.3 million euro. That is, 500 projects with a time saving of 25 days with an hourly price for lower functions (64 euro per hour) gives a benefit of 6.3 million euro.

However this benefit is not fully realised immediately. From 2011 to 2018 the benefit slowly increases, but only from 2018 onwards is it realised most fully. The benefit thus increases from about 300,000 euro in 2011 to about 6.3 million euro from 2018 onwards. The total cash value of this benefit is 48.8 million euro.

Using the collective model for the introduction of INSPIRE also causes an impact upon the provinces and municipalities. The total efficiency advantage for provinces and municipalities amounts to approx. 1.9 million euro (see paragraph 5.2.3). In this scenario too the benefit is also not immediately fully realised. The benefit increases from 0.1 million euro in 2011 to 1.9 million euro in 2018. The total overall cash value of this benefit drops to 14.9 million euro.

Table 0.5 Efficiency advantages for users

Type of benefit		Annual benefit (in mln. euro)	Cash value (in mln. euro)
Efficiency advantage	Users (international)	0.3 – 6.3	48.8
	Provinces and municipalities	0.1 – 1.9	14.9
<b>Total</b>		<b>0.4 – 8.2</b>	<b>63.7</b>

## 5.4 Strategic impact analysis

### 5.4.1 Introduction

As well as examining the costs and benefits, it is also necessary to trace what strategic impact or effect INSPIRE has. In this context, the important questions are:

- What influence does INSPIRE have on policy goals that were already formulated and on the architecture?
- What influence does INSPIRE have on the increase of services by providers?
- What influence does INSPIRE have on innovation?

We will deal with these questions in this paragraph, taking the various government policy areas and the services offered by ICT providers into account. This impact analysis is of a qualitative nature, which links it to the methodology used in the costs-benefits analysis and the *Guide for*

*costs-benefits analysis for ICT projects*<sup>22</sup>. A wide range of strategic notes have been used in this analysis, including: NORA2.0, the Vision and Implementation strategy used by GIDEON and input obtained from all the meetings that were held.

It is important to separate the impact and effects from the means; the harmonisation of data, for example, cannot be regarded as an effect which is caused by INSPIRE. The harmonisation of data is a means that may cause the closer fine-tuning and execution of policy between countries.

#### 5.4.2 Existing policy

##### *e-government*

The Government and local government bodies such as the provinces, the water boards and the municipalities work hard to improve digital services and reduce the administrative burdens on citizens and companies. Indeed, the policy of the e-Government is focused on improving the services and reducing the burdens for citizens, companies and institutions.

Even though INSPIRE focuses on the provision of geo-information and not specifically on the broader field of digital services, it does make a contribution to information housekeeping which forms the basis for good digital services. Good digital services benefit from being able to access information that is based on clear and fine-tuned data whose quality is known; data that is easily accessible as well and not ‘locked up’ within an organisation or system.

Comparisons between the principles used by the government for services and INSPIRE relate to the accessibility and availability of geo data of a consistent standard and illustrate that the principles are the same and are connected to each other. The table below shows a comparison of some fundamental principles of e-Government (from NORA2.0) and those of INSPIRE. Please note, the context of e-Government is weighted towards services and in INSPIRE it is all about services and data. We can conclude that the principles of INSPIRE vis à vis digital services are closely linked to the policy of the e-Government. So INSPIRE supports and strengthens the policy principles of the e-Government.

INSPIRE also dovetails with the philosophy of ‘Nederland Open In Verbinding’ (the Netherlands Open And Connected). Choosing Open Source and open standards enhances the performance of a government and allows it to provide the highest level of service. The rationale underpinning this is that ‘open’ choices also lead to an increase in the level of interoperability between ICT building bricks and governments. This collaboration increases if data can stream freely through a standardised environment of portals where harmonised data is made available. InterWad, the program available from the ICTU which completely conforms to the NOIV Directive, has a portal which will be linked to the INSPIRE structure.

Table 0.6 Some of the matching fundamental principles of e-Government (from NORA2.0) and INSPIRE

Some e-Government principles	Some INSPIRE principles
Subsidiarity. Single storage/data supply; plural use	Geographical information should be gathered and managed once at the site where this can be done most efficiently.
Interoperability. Single storage/data supply; plural use	It has to be possible to combine and share

<sup>22</sup> According to a cabinet decision, a social cost-benefits analysis (CBA) should be made for all projects of national importance. This should be executed to conform with the Evaluation of Infrastructure Projects, which was written within the framework of OEI Directive for the costs-benefits analysis is (CPB/NEI, 2000). OEI means Overview Effects Infrastructure.

<p>Interoperability. No one is sent “from pillar to post”: information is shared and used government-wide</p> <p>Single storage/data supply; plural use</p> <p>Transparent. Organisations give a clear, accessible picture of the services and products that citizens, companies and social organisations can purchase from them.</p>	<p>geographical information from diverse sources with various users and applications throughout the whole of Europe.</p> <p>It should be possible to share geographical information that is gathered at one level, with all the other levels of government.</p> <p>Geographical information that is required for use by the government at all levels to devise good policy has to be accessible under conditions that do not hamper its wider use.</p> <p>It has to be easy to discover what geographical information is available, if it is suitable for a specific purpose and under what conditions one can obtain and use the data.</p>
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In the National Execution Program (NUP) - Better Services and the e-Government, the basis registrations are listed as basis provisions. A proportion of the basis registrations of the NUP fall under an INSPIRE theme. These consist of: the basis registration Large Scale Topography, the basis registration Topography, the basis registration Land Registry and the basis registrations Addresses and Buildings (BAG). The basis registrations of the NUP, which should be considered as a means of executing e-Government policy, are included like this in the European context. The basis registrations can be exchanged in cross-border projects and contacts, by linking to the national INSPIRE portal. The project team BAG also writes the data specifications for the exchange of address information within Europe, so that the INSPIRE data specifications would not deviate too much from the data model BAG. This means that INSPIRE links the e-Government policy in this field with policy at European level and so ensures a better level of security for national e-Government policy.

**Example: Harmonisation can potentially intervene in policy**

Currently each province has its own way of calculating noise contours around highways. Harmonisation may lead to agreements being made not only about the colours of the contours (the key), but also about how they are calculated. Perhaps specific formulas may only be used or specific calculations software to project a noise contour around a highway on a map. Contours may move, including the rights that third parties may extract. Houses that initially were outside the scope of the contours/ border values are suddenly within them. Where building was once allowed, this is suddenly no longer permissible. Where initially a grant facility was applicable, in the new situation this arrangement is redundant. This may mean that provinces have to modify their policy so that the costs that are connected (claims, extra grants to be provided) to these policies are not taken for granted. Source: IPO, INSPIRE starts today

The INSPIRE Directive states how provisions should be set up and under what conditions. The implementation rules connect standards to the quality of the services, for example. This concerns the standards related to performance, capacity and the availability of provisions. The standard that stipulates that a network service has to be available for 99% of the time will have a particular impact on the management organisation of a network service or the portal through which it is offered. If an organisation hasn't already based its own service policy upon 7/24 availability, then the management policy should be adapted accordingly. For management organisations of national provisions within the e-Government, this impact will not be very large; because of their central role they have often already adapted their management policy to 7/24

availability. The impact, however, may be large for management organisations of specific portals or registers that focus on one particular field/subject. This may be a motive for hosting provisions and formalising management. However, innovations of this sort may also arise because of the more chain oriented collaboration that has taken place over the past years and the greater focus on services.

Domestic legislation related to basis registrations is an example of the sort of legislation which gives an impulse to the (electronic) provision of information by fine-tuning and standardising data and messages, and by setting up of national provisions. The Government Information Act specifies that third parties have the right of access to a major part of government information.

The Treaty of Aarhus was drawn up to lay down the rules for the offering and providing of environmental information in the European context. The impact that INSPIRE has had on the execution of this legislation and its related policy is that INSPIRE links policy with its realisation. INSPIRE makes already existing legislation and policy related to the availability of government geo-information concrete. The INSPIRE Directive therefore provide standards and describes services in the implementation rules and the data specifications. Updates of policy lines and perhaps legislation about the provision of government geo-information will refer to the INSPIRE Directive as well. An ongoing effect of INSPIRE in such a situation is that the integration of geo-information into the wider information management of the government increases.

### *Geo-information*

INSPIRE and e-Government policy share similar principles but INSPIRE goes much further in the working field of geo-information. In the Gideon White Paper – Basis provisions of geo-information the Netherlands – the vision and implementation strategy of the Ministry of Housing, Spatial Planning and the Environment about how geo-information should be offered and used in the Netherlands is set out.

#### **Vision about the basis provisions of geo-information the Netherlands (GIDEON)**

Within four years the Netherlands, in the framework of further improvement of services, will have a basis provision of geo-information which can be used sustainably, successfully and intensively by all parties in society:

- Citizens and companies can retrieve and use all the relevant geo-information;
- Companies can add relevant economic value to all the geo-information held by the government;
- The government uses the information available at each location in its working processes and services;
- Government, companies, universities and institutions collaborate closely to develop and innovate the basis provision.

GIDEON has a wider scope than INSPIRE. Securing the INSPIRE Directive in Dutch legislation and realising the technical infrastructure is one of GIDEON's seven implementation strategies. GIDEON relates to a much larger number of datasets. As well as the datasets related to the 34 INSPIRE themes and the basis registrations, GIDEON is also familiar with 76 datasets from the BZK studies "Drempels weg". Between those 76 datasets and the 34 themes, there is a quite an overlap. Despite this broader scope, INSPIRE also has a number of general effects on the GIDEON program which only apply to the Netherlands.

The development of GIDEON links in with the INSPIRE Directive. The foundations of the GIDEON principles are included in the INSPIRE Directive. The introduction of INSPIRE provides a legal base for the principles underpinning the provision of geo-information (via the

“Implementation Act EC Directive Spatial information Infrastructure”). This way INSPIRE makes it mandatory for a manager of data which falls under the Directive to, among other things, provide metadata and set up services to promote the data’s availability. GIDEON does not have this mandate but does get a legal base for a proportion of the datasets. The effect of this legal base is that the vision and implementation strategy of GIDEON will become embedded in organisations and better secured in services and management.

INSPIRE provides standards for a number of the datasets and gives specifications for data and services. These standards and specifications will be included in the introduction and implementation of GIDEON. GIDEON ensures that geo data can be found, consulted and obtained by using the National GeoRegister. The National GeoRegister (NGR) collects information about existing geo-information in one integrated portal among which datasets for which INSPIRE is mandatory. The NGR will be connected to the European infrastructure of INSPIRE. By using the INSPIRE standards and specifications and by linking up with its European infrastructure, the Dutch GIDEON is well placed in a wider European context, and subject fields both within and outside of the Netherlands (see below) benefit more from access to more data.

### *Specialisms*

As well as the impact on e-Government, and the general areas in which geo-information is used, the various subject fields (such as water, security, environment) will experience most of the effects of the introduction of INSPIRE. In the use cases the organisations with datasets for which INSPIRE is mandatory have listed some effects for their organisations.

The introduction of INSPIRE will give more value to the provision of information which is based on web services. For organisations providing data, the mandates of INSPIRE will represent an important spring board for the process of unlocking geo data in a question-oriented way. Organisations such as the Land Registry, which already act as data providers, will change the model used from one based on *bringing* to one based on *retrieving*. For INSPIRE the principle *data at the source* is certainly taken as point of departure. The effect of this is that data providers such as the Land Registry and basis registrations and their national provisions will focus more and more on a situation in which a client purchases data, products or services whenever they want and in whatever way suits him or her best. To take this development in the right direction and to give it a framework, data providers often draw up an internet policy vis á vis services and publication.

The filling in of INSPIRE is based on a Service Oriented Architecture (SOA). Web services make searching, consulting and downloading data possible, based on standards, worked out specifications and by organising clear data and processes. The organisations which are data providers for INSPIRE will either already have to have Service Oriented Architecture or *open* architecture in which web services can run. In this sense, “open” means that the architecture has to focus on exchanging data, in both a technical and organisational way. Web services play an important role here. The impact of INSPIRE is not quite this Service Oriented Architecture. The data providers have often already started to build an SOA. These organisations often already have web services in place for their services and chain processes. The impact that INSPIRE has on those organisations and their ICT growth path, can be large if time lines and roadmaps do not match. Because of the milestones set out by INSPIRE, organisations that provide INSPIRE data will need to take further steps towards developing Service Oriented Architecture.

A good example of collaboration is Public Service on the Map, (PDOK) – currently still being developed – in which the Ministry of Housing, Spatial Planning and the Environment, the Government Service for Sustainable Rural Development, and the National Service of the Implementation of the Regulations of Ministry of Agriculture Nature and Food Quality, the Directorate General for Public Works and Water Management of the Ministry of Transport, Public Works and Water Management, the Land Registry, the Dutch Organisation for Applied Scientific Research and Geonovum are working together to make a central provision for location based information. By making information available in a central place, by making mutual agreements about usage and by working together to develop provisions for, for example, the basis registrations and the European INSPIRE Directive, all the partners improve the services both between themselves and for other users.

A web services based provision for information such as PDOK has not been set up just for INSPIRE; techniques to make this possible are either already in use for exchange with their own chain partners, and services or still have to be purchased and/or set up. The costs and efforts related to this, (purchase and/or setting up), may act as an incentive for more collaboration in the setting up of a register or a portal together. Such collaborations are started by, amongst others, provinces. Cross-border projects in the security regions IJsselstreek and Limburg Noord, in which pilot provisions were built, have led to a larger external orientation (Project *Herman*).

#### *Development of knowledge*

The effect that INSPIRE has on both management oriented and on research oriented organisations is that both the body of knowledge and the knowledge network of an organisation is enlarged. For educational organisations, in particular, INSPIRE will lead to the strengthening of knowledge development. The INSPIRE Directive make it possible for organisations such as these to make the collection of data for research and education much easier. The infrastructure brings data providers and users together in a lasting way. The availability of data and the network of data providers are a great stimulus for the development of knowledge. Some use case organisations recognise that they can profile themselves better (as an authority in their field) by participating in INSPIRE as data providers.

This increase in knowledge and the knowledge network can, together with the harmonisation of the data, lead to a more efficient introduction of cross-border policy and research. The quality and execution of the policy and research will improve too, because geo data is (more quickly) available regardless of national borders. One concrete example mentioned in the use cases is the increased efficiency in the completion of the environmental report which is mandatory for the European Commission. INSPIRE will make it easier to find data, and data which can be evaluated more quickly, in international fields of research. The time to collect and process data can thus be reduced and there will be less data redundancy.

#### **Example: EduGis**

EduGIS is a website intended to make high school students familiar with geographical information systems. On EduGIS an explanation can be found about the various aspects of this branch of information technology and it offers the possibility of watching GIS in practise.



The fact that GIS is not yet active in the Dutch education system is mainly caused by the fact that data for education is not available yet. In North America this runs smoother than it does in the Netherlands. In the Netherlands it is the task of the National Clearing House for Geo-information (NCGI) to ensure the unlocking of the geo data files. In January 2004 the Land Registry gave NCGI the task of making the accessibility to data for education easier. Geodan, the executor of this task on behalf of the NCGI, then contacted the Education Centre of the VU to check whether this process, besides making geo data available, could not also be used to arrange the GIS for education. These discussions have led to EduGIS consortium. Teacher trainers and the Royal Dutch Geographical Community are supporting this initiative too, via the EduGIS project, which teaches students to make the first steps in specific Special themes to use GIS when analysing the world around them. INSPIRE offers the possibility of supporting this educational project with harmonised European data.

Source: [www.edugis.nl](http://www.edugis.nl)

With the improvement of cross-border policy, research projects can be executed better too. INSPIRE strengthens international collaboration. However, it is not only a closer level of collaboration that is mentioned as exerting an effect. Another important effect of INSPIRE (mentioned in the impact analysis in the use cases) is the expectation that, with the harmonisation of data at European level and the enlarging of the network, more cohesion will be obtained in policy between bordering countries or regions. It is policy concerning nature and the environment which can make the best use of the fine-tuning offered by INSPIRE; thus cross-border problems can be tackled in a more successful way.

#### 5.4.3 Increasing the services of ICT businesses

Providers of (open source and closed source) GIS packages, conversion tools and spatial databases will, when one considers INSPIRE's connections with standards in the broadest European sense, see their systems grow with the INSPIRE developments. Providers of (open source and closed source) GIS platforms will initiate development and management functions that support provisions such as those of INSPIRE. This function can be included in the standard basic software or offered as a separate extension.

Conversion and ETL (Extraction Transformation and Loading of data from the source for, for example, consultation and exchange) tools will have standard options for the conversion of metadata and the extraction of source data.

Parties on the market that focus more on services will invest predominantly in obtaining knowledge to provide services, specifically for the setting up of software for INSPIRE; services will also be developed for the managing or hosting of INSPIRE solutions. To learn about obtaining knowledge and connecting to wider organisational architecture, service providing companies will offer workshops and training courses probably in a more tailor-made form for larger collaborative relationships.

INSPIRE also leaves open the possibility of offering data to private parties via the INSPIRE portals. This way, companies can broaden their services. This may also provide an incentive to set up paying provisions as it did with the public bodies.

#### 5.4.4 Effects on innovation

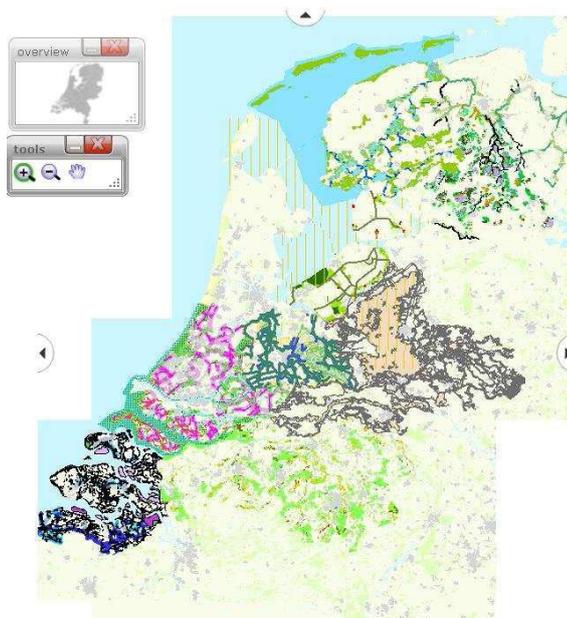
With the implementation of INSPIRE in the Netherlands, innovations can be started or existing innovation concepts in the world of geo-information provision will be strengthened. These innovations certainly get an open, solid, managed provision which is built upon widely accepted standards in which data can be searched, consulted or retrieved.

INSPIRE can act as an incentive for the setting up of portals for a specific field. These portals have a link with the central portals. INSPIRE offers the possibility of setting up field-specific themes and portals, within the portal, because of the standards that are provided in the portals and themes that are set up such as SEIS. SEIS, (the Shared Environmental Information System), is built up according to the same principle as INSPIRE (a decentralised system of unlocking data which remains at the source). SEIS, and perhaps other portals too, gratefully use the architecture that has been developed under the Directive.

But maps can also be created which are based upon cross-border geo data collection. Environmental effects, for example, and reports and risk assessment maps cross-border can be executed.

##### **Example: EHS**

An illustrative example of the obstacles that still frequently occur in practise is the map of the provincial ecological main structure (EHS) which was built up by the 12 provinces together.



(Source: Provinces, IOG-GEO, 2007)

The unequal agreements which were made about content and visualisation ensure that the EHS map on a national level looks far from clear. INSPIRE is the solution to this problem.

Source: Ministry of the Interior and Kingdom Relations, Drepels weg! Overview of the obstacles in the way of unlocking geo-information and possible solutions.

Companies and institutions can set up notification services for their clients, or consumers, in their own organisation. If data is renewed at the source, this is passed on to potential consumers.

Companies and institutions can use the facilities of the portal for building tailor-made work services such as Print-on-demand or Download-on-demand or for printing in a customised fashion or downloading a cut-out from a geo data file. By making geo data available to the users via INSPIRE, they are able to become involved in the updating of geo data via data providers. At the National Geographic Institute in Belgium, options for ways of getting feedback from users of the geo data are being worked out. A kind of *crowdsourcing*.

### *In summary*

The strategic impact that INSPIRE has is mainly on the strengthening of policy in the field of e-Government and geo-information (GIDEON). The principles behind e-Government and INSPIRE dovetail with each other (single storage plural use and management at the source). The Directive is begin introduced by using an act which causes prioritising in projects. The Directive also provides standards and put national developments and policy concerning geo-information in a wider international context.

For a provider, INSPIRE leads to more open services; its not only chain partners who are served, but those who are interested abroad as well. This may lead to adaptations being made in information policy or to the creation of policy related to publishing and the provision of information. The requirements that INSPIRE sets down for the availability of data and services (7/24) could act as a trigger for new agreements about management and increases in services and tasks. INSPIRE, for providers, will lead to the provision of better services, a better profile for them as data providers and a larger network.

From the perspective of the users of INSPIRE, the Directive leads to more efficient policy-making and project management, mainly in cross-border areas. INSPIRE may also lead to better cohesion in policy.

For both data providers and users, INSPIRE will lead to a strengthening of the development of knowledge. Educational institutions, in particular, will benefit because geo data will be more easily accessible and available, and there is a wider network of data providers. This offers the possibility of developing knowledge about new themes or of deepening knowledge that is already there.

For software-providers, INSPIRE directly influences their release policy. These providers have the option of including their INSPIRE software in the standard software package or offering separate extensions for this. Providers of services will focus on implementation routes, executing an architecture scan for INSPIRE and knowledge sharing sessions.

Via the INSPIRE portal, information becomes available that can be used to develop new services. The combining of datasets leads to new datasets being formed and to new insights being gained. Initially, however, this is mainly done by the market as this process is not one which is directly based on a task of the government.

Finally, INSPIRE offers new possibilities for organisations to build their own, field-specific data portals linked to INSPIRE portals. Private parties can also offer data via an INSPIRE portal. New services such as a notification service can also be offered.

The relationship between costs and benefits (including non-monetary benefits) turns out to be more positive than originally assumed. This means that the advantage for society is even larger and only becomes completely clear when the balance of the monetary benefits and costs is examined.

## 5.5 Speed of response analysis

A speed of response analysis gives insight into the consequences of the modifications of a number of essential assumptions that form the basis for the costs-benefits analysis. It is normal to pay the most attention in a speed of response analysis to the largest expenses. When executing the costs-benefits analysis there seemed to be a degree of uncertainty about some of the assumptions such as:

- Sharing international projects;
- Number of days saved in international projects;
- The savings in management costs;
- The amount of the management costs;
- The time spent by provinces and municipalities; and
- The number of extra datasets in the collective model.

Six variations of these causes of uncertainty were constructed for the speed of response analysis. In each variation, we show the consequences that making different assumptions has on the balance of the costs and benefits. The variations are indicated in the table below.

Table 0.7 Variations in speed of response analysis

Variation	Uncertainties	Modification
1	Sharing international projects	Halving the number of projects
2	Number of days saved in international projects	Time saving for balance € 0
3	Saving management costs	Doubling saving
4	Amount of management costs	Halving of management costs
5	Time spent by provinces municipalities	Quartering saving
6	The number of extra datasets in collective model	Halving of the number of extra datasets

The results of the speed of response analysis are set out in the table below. These results will then be explained in greater detail.

Table 0.8 Results of speed of response analysis per variation

Variation	Basis model			Collective model		
	Costs	Benefits	Balance	Costs	Benefits	Balance
Basis	32.1	66.1	34.0	40.8	63.7	22.9
1	32.1	41.7	9.6	40.8	39.3	-1.5
2	a. minimaal 8 days balance = 0			b. minimaal 13 days balance = 0		
3	32.1	68.5	36.4	No effect		
4	32.1	64.9	32.8	No effect		
5	32.1	58.6	26.5	40.8	56.3	15.5
6		N/A		37.4	63.7	26.3

N/A = Not applicable in this model

### Variation 1

The number of projects in which international geo-information is used is unknown. The estimate that was made by various experts is about 500 projects annually (10% of the total number of projects). In this variation we have, therefore, looked at what the consequences would be if there were not 500 international projects, but only 250 international projects (or 5% of the total number of project). The results show this has no influence on the costs. The benefits, however, decrease considerably. In the collective model the costs exceed the benefits.

### Variation 2

In this variation we looked at the minimum time profit that has to be realised for the users for the benefits to outweigh the costs of the introduction of INSPIRE. A distinction is made here according to the basis model (alternative 2a) and the collective model (alternative 2b). In the basis variation the assumption is made that the introduction of INSPIRE would result in a time profit of 25 days. When we take the basis model as our point of departure, a minimum of eight days time profit should be booked for the benefits to outweigh the costs. For the collective model a minimum of 13 days is required.

### Variation 3

In the basis variation we take a saving of the management costs as a result of introduction of INSPIRE as our point of departure. For Annex I and II we used a 5 % saving and for Annex III a 20 % one. If this saving was doubled, (to 10 and 40 %) it appears to have no effect on the costs. In the basis model the benefits increase slightly. This modification has no effect on the

collective model as the modification influences an effect that is not realised in the collective model.

#### *Variation 4*

For the amount of the management costs, an estimate was made based on experience gained in former projects. As INSPIRE only requires limited investment in software and/or hardware, these costs may not be as large. If the management costs halve, it becomes clear that, in the basis model, the costs remain the same and the benefits slightly decrease. The effect is therefore quite small. For the collective model this modification applies (again) to an effect that cannot be realised with this model and so has no effect.

#### *Variation 5*

The efficiency advantage for provinces and municipalities gained as a result of the saving in capacity that is needed for gathering geo-information, is based on an assumption made by the experts involved. If we halve the assumption of a 50% saving on capacity, or only a quarter savings (25%), then the profitable balance for both the basis model and the collective model decreases. However, in both models, the balance of the costs and benefits is still considerably positive.

#### *Variation 6*

The introduction of INSPIRE ensures that, in the basis model, one organisation is designated as data provider for each piece of information. In the collective model, however, there are more organisations, and these organisations have to incur extra costs. An estimate has been made of the number of extra datasets for which costs have to be incurred. If we assume that only half of the number of datasets for which extra costs initially were thought necessary, actually do incur these extra costs (for example, there seems to be more overlap in datasets), then this has consequences for the level of the costs in the collective model. The consequences are a decrease of 3.4 million euro in the extra costs, so the balance in the collective model becomes more positive.

#### *In summary*

It becomes clear from the speed of response analysis that the costs-benefits analysis is reasonably firm. It is mainly the assumptions associated with the effect for the users (efficiency advantage) which is of crucial influence on the outcomes of the costs-benefits analysis. The number of international projects with geo-information and the time saving for users that is achieved by introduction of INSPIRE appear to be of great importance.

## 6. Use cases

### 6.1 Introduction

The four fictional use cases which we selected are described below; these illustrate the extra value of INSPIRE and assess what the costs, benefits and impact of the Directive are.

Each use case consists of a description of a scenario within a specific field, or field of research, in which the cross-border availability and exchange of geo data is essential.

The use cases were selected based on the following criteria:

- they must relate to themes which are equally divided over the Annexes;
- they must be equally divided over the various working fields in which INSPIRE has a role;
- when selecting the use cases, situations in which a data provider is organised centrally (such as National Institute for Public Health and the Environment) or regionally (such as the water boards) should be taken into account;
- when selecting the use cases, the various models of making data available (basis model, node model or collective model) should be taken into account; and
- the perspective of both the data provider and data user should be taken into account.

Because of the last criterion, we selected one use case from the user perspective and three from the data provider's perspective. The following use cases were chosen:

- Use case 1: Large scale cross-border environmental misdemeanour (users)
- Use case 2: Trace study of an infrastructural project (centralised data providers)
- Use case 3: Trace study of an infrastructural project (decentralised data providers)
- Use case 4: Study for flood scenarios (data providers)

Then a general case by case description is given which includes the players, the scenario, the primary processes and the perspectives of the INSPIRE data involved. After that the specific costs and benefits for the use case are listed and their strategic impact is described.

### 6.2 Use case 1: Large scale cross-border environmental disaster

#### 6.2.1 General description

Central to this use case is the retrieval of the geo data of Annex I, II and III by organisations and the Public Order and Safety Group (Dutch OOV). It is a use case which is assessed from the user's perspective. The two most important bottle necks in the provision of information when

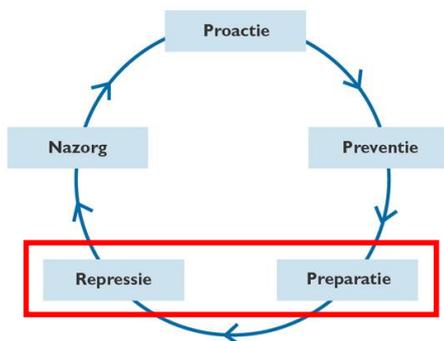
combating a disaster are not having any information and not being able to find information. This became clear from the evaluation of the disaster exercise Eagle One in the safety region Midden-Gelderland, which was held on 5 March 2008.

In this use case a small group of people who were involved (see Players) looked at:

- What can INSPIRE add, compared to developments that are already in place, which will enable us to respond adequately to a disaster which occurs on a regional scale?
- What are the costs and benefits for users when using data made available by INSPIRE?
- What qualitative effect does INSPIRE have on processes, policy, ICT architecture and organisation?

The themes of Annex I and II contain the basis data for processes in the OOV sector (such as underground networks and data for localising). The themes of Annex III contain specific and thematic data that are useful in the OOV sector, irrespective of the specific situation or disaster. For example, meteorological data for a disaster such as a gas leak or data about a drainage basin if a river has become polluted.

The point of departure for these use cases is support of the provision of information in the chain preparation and repression (the real fighting and help in acute emergency situations). Preparation and repression are links in the safety chain. Participants in the use case noted that geo data have an important supporting role across the whole chain.



Proaction is the structural consideration about the acceptability of a risk. It is important, for example, that the fire-brigade is involved in the development of plans at a very early stage.

Prevention means preventing the direct causes of danger and limiting the consequences by introducing preventive measures.

Preparation is the preparation which is involved in fighting disasters.

Repression concerns the real fire fighting and the provision of help in acute emergency situations.

Nazorg is a term which refers to everything that is necessary for things to be able to return to normal in the shortest time possible.

### *Scenario*

The use case is linked to a scenario in which a large scale environmental disaster has taken place in an area in the province of Limburg which borders with Belgium and Germany: a leak of poisonous chemicals from an inland ship. The regional disaster staff and the municipalities involved should react immediately and adequately. The large area size of the disaster means that any plan has to be scaled up regionally before a disaster plan for the whole region can begin to work. The need for information about the affected area that crosses the national borders is huge. The disaster certainly does not stop at the border. Insight into: the number of people living in the affected areas, the owners of the land, the direct users of the ground water, taking in points,

vulnerable objects, evacuation routes and spreading via surface water and air, provides some answers to important questions when fighting a disaster and providing help.

In a disaster one needs to quickly gain access to updated underground maps from other provinces and from Germany and Belgium (geo data from Annex I) to, amongst other things, specify locations, get an overview of transport networks, borders of land registry areas, river basin drainage areas and administrative units at national and (predominantly) international level. The geo data from Annex II and, more so, from Annex III, gives specific geo data such as environmental provisions, the spread of the population and atmospheric conditions.

This geo data needs to be searched quickly, easily and immediately; it should also be clearly presented to regional disaster staff and staff at the municipalities via their own GIS viewers.

#### *Points of departure and assumptions for this use case*

- the providers platform for Annex I, II and III is fixed; for Annex I this is actually the situation, but for II and III it is not and certain assumptions are made;
- provisions with the data providers to offer geo data which conforms to INSPIRE;
- all the geo data and metadata from themes under Annex I, II and III are available in a manner which conforms to INSPIRE; and
- consumers in this use case have a GIS viewer and/or desktop GIS provision.

#### *Players*

The players involved in this use case are the safety region, the municipalities of Limburg-Noord and the province itself.

#### *Primary process*

When fighting disasters in the repression link of the safety chain, it is also all about preparation. Within the OOV world, procedures and scenarios have been developed to fight various kinds of disasters and provide help. The Dutch, German and Belgium geo data which is offered via INSPIRE portals will also have to be explored and evaluated (Preparation) so that it can be used properly in situations and just when it is needed. These sources of information will also be used to advise the relevant authorities.

Of course the geo data made available by INSPIRE can also be consulted on an ad hoc basis in the repression link, there is definitely information there. However, in practise, when decisions have to be made quickly, based on questions just asked, this will not be the case.

Therefore the steps below will have to be executed in the preparation link of the safety chain and this may lead to their adoption in procedures and/or scenarios.

#### *1. Consulting registers or catalogues*

In the preparation link of the safety chain, by consulting the registers or catalogues at INSPIRE portals in Belgium and Germany, which geo data have to be available as basis or underground (data from Annex I themes) will be sorted out. Geo data from Annex II or III has to be available for specific scenarios. Special attention is needed here so as to ensure that the most updated information is available as, in the past, outdated information has been used.

## 2. Querying metadata

When querying metadata, we must look at how the data should be interpreted and what constraints apply. This information is important to the future elaboration of a procedure or /scenario.

## 3. Looking at a portal service

Looking at the portal service is a step which can be regarded as a visual evaluation. It can be expected that the real consultation in the safety chain, and certainly in the repression link, will take place via the individual's own GIS viewer. In this GIS viewer, INSPIRE data can be combined with other data and it can be viewed and queried.

## 4. Including geo data in an individual GIS system (viewer/desktop GIS)

There are two ways to view INSPIRE data in the individual's own GIS viewer.

- Dynamic inclusion of the geo-data in the individual system via data service(s)  
The data remains at the source and can be consulted via a WMS and/or WFS.  
Consulting in this way can be influenced negatively because of slower response times because, amongst other things, a co-ordinated transformation has to be executed.  
However techniques are being developed that work with temporary storage which will mean the response times are no longer a disadvantage.
- Static inclusion of geo-data via a GML download.  
Data that is suitable for the provision of information is downloaded in specific procedures/scenarios at fixed times (can be done in an automated way). Then it has to be transformed into the Dutch co-ordinated system and stored locally. This reduces the chance of response and performance problems.

### 6.2.2 Cost-benefits

This use case is one in which the users of INSPIRE are most important. Users will have some costs, but they will mainly have benefits when using INSPIRE.

#### Costs

The costs below have been defined per dataset and user for the situations where INSPIRE offers an infrastructure for the Netherlands, Belgium and Germany, (in this case in the safety region - Limburg Noord):

- discussions and agreements about INSPIRE data used;
- processing in procedures/scenarios;
- automated download;
- transformation to RDnew;
- local storage and
- inclusion in GIS viewer.

In the situation in which there is no INSPIRE in the Netherlands, Belgium and Germany and geo-data is not harmonised cross-border, the following expenses can be listed:

- discussion and agreement about used data;
- processing in procedure/scenario;
- automated download/sending;
- transformations of specific co-ordinated systems to RDnew;
- local storage and
- inclusion in GIS viewer.

### *Explanation*

- In the overview above, we assumed that users have a GIS viewer and a GIS desktop. Licence costs are not counted as costs for INSPIRE.
- Within this GIS software, standard transformation possibilities are offered for transforming to a Dutch co-ordinated system (ETRS89 to RDnew). This is why the costs of the transformation tools are not listed; they are, however, listed for the service or action.
- It is not possible yet to be sure about which and how many datasets are needed for this use case. It is the assumption that ten datasets will have to be included in an individual GIS viewer.

### *Benefits*

If the surrounding countries do not have the geo data available to respond to an environmental disaster of the sort described in this use case, the repression and help can be executed and used less effectively. A good provision of information in the OOV should be cross-border. Reception, evacuation routes, and dangerous situations should be consulted in a clear way by staff in the area of the national and international disaster. The emergency exercise Eagle One in 2005 made it clear that the availability of geo data from various organisations and regions is of crucial importance.

Within the OOV world, INSPIRE strengthens the developments in the field of the shared provision of information. Netcentric working makes it possible – within the main structure of the crisis organisation – in a scaling up situation – to quickly achieve a clear and total picture of the situation, spread over the various layers. This shared total picture forms the base-line for all the decisions that have to be made and the actions that should be taken. This is not only about the provision of information but also about processes, human beings and guidance. Working with regional teams and collaborative liaisons, the OOV will be supported by INSPIRE too; harmonised data makes fine-tuning and managing processes a lot easier. INSPIRE makes also ensures that there is a network of data providers who can be well used in collaborative liaisons.

Finally INSPIRE could lead to a situation where organisations in the OOV-sector no longer collect or manage data themselves, but obtain it via the infrastructure. This will not only lead to a cost advantage but also to an increase in the quality of the geo data which is retrieved from organisations as these organisations are considered to be authorities in their fields.

## 6.3 Use case 2: Trace study of an infrastructural project (centralised data providers)

### 6.3.1 General description

In this use case, making metadata and data for themes in Annex I and II available for the Land Registry, the Directorate General for Public Works and Water Management and the Dutch Organisation for Applied Scientific Research are the most important. These are central data providers. The geo-information is not spread over other locations, but is collected and managed in one central location. Within the themes of INSPIRE in Annex I and II, these organisations are either the provider of a large number of datasets, or of their own data, or are a national provision of basis registrations. For example, the Land Registry is involved in three themes of an Annex I provider and in five other themes. Despite the fact that this use case supply of geo data by the

data providers of Annex I and II is central here, for our picture of a good use case, the use case can be linked to a recognisable scenario in which the request for geo data (cross-border) is large.

The use case is linked to a scenario in which preparations are being made for an infrastructural project (building a railway) between Germany and the Netherlands; preparations such as feasibility studies, archaeological inventories and/or MER. Project organisers and the relevant authorities should be able, based on metadata, to judge whether or not the geo data made available by providers could be included in the various studies and reports being written for the infrastructural project. If it is suitable, they should be able to include data that was made available by providers and their own systems, for use and for consultation purposes.

We will look at what activities and provisions providers had to make in this use case. Here we are talking about the geo data for which INSPIRE is mandatory, provided with metadata which conforms to INSPIRE, or about converting metadata from the old standard, (for example CEN) to the INSPIRE introductory rules for metadata, and making means available for the management and unlocking. Besides, services will have to be set up by searching and making available data and metadata which conform to the INSPIRE Directive. Finally, these provisions and activities have to be secured.<sup>23</sup>

#### *Players*

In this use case the Land Registry is involved as data provider. The Directorate General for Public Works and Water Management and the Dutch Organisation for Applied Scientific Research are both data provider and user.

### 6.3.2 Description of primary process for data providers

#### *From a model of bringing to a model of retrieving*

In the current situation, data providers (the Land Registry, the Dutch Organisation for Applied Scientific Research and the Directorate General for Public Works and Water Management) characterise themselves predominantly as product suppliers (the bringing model). To apply pre-defined products to the clients, amongst other things, uses desks, such as Land Registry on-line (KOL) and DINO-loket<sup>24</sup>. An example of this is the ordering desk Gebiedslevering of KOL, which has functions for the Cadastral map, TOP10NL and GBKN. Periodic and incidental orders are dealt with by the Land Registry via the internet download centre (IDC), where clients themselves can order and download from the server of the Land Registry. DINO functions in a similar way.

In realising the basis registrations Land Registry and Topography and national provisions, such as for BAG and WKPB and the BRO, the Land Registry and Dutch Organisation for Applied Scientific Research /DINO will have to deal with the unlocking of data at the source for clients (retrieving model). This requires organisations to focus more and more on the situation where a client buys data, or products, at a particular time and in a way that suits him/her best. This way of distribution also applies to the INSPIRE provision of information.

#### *Consequences for information and ICT*

The technical component 'web services' has an important place within INSPIRE. National products and services have to be unlocked via 'network services'. These concern web services to make datasets known (discovery and view services) and for unlocking them in the desired structure (transformation and download services). Developing a web oriented distribution

platform, however, is not only important element in the framework of INSPIRE, but is essential for the functioning of data providers in the e-Government (system of basis registrations).

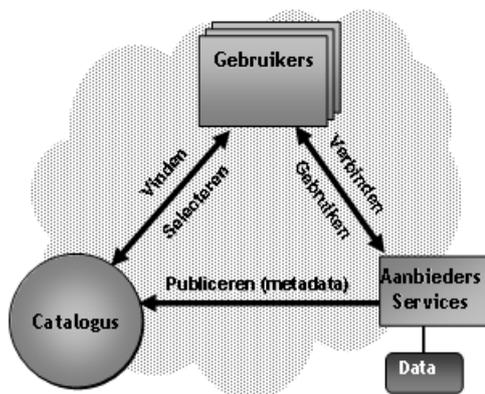
Web oriented distribution of products and services works according to the ‘publish-find-bind’ principle (see Figure 6.1 overleaf). As a source holder (service provider) the Land Registry Dutch Organisation for Applied Scientific Research and the Directorate General for Public Works and Water Management make the offer of products (datasets) and services (web services) known, by publishing metadata about this in a web catalogue. The client (service consumer) searches the offer on the internet and finds it via the published metadata. After a possible viewing of the data, the client might decide to buy the service according to the conditions which are set out, or to unlock the dataset to use it.

<sup>23</sup>Based on the Global impact analysis ‘Setting up provisions of information INSPIRE’ of the Land Registry and Dutch Organisation for Applied Scientific Research.

<sup>24</sup> DinoLoket is the central entrance to access Data and Information about Dutch soil (DINO). The DINO system is the central storage facility for geo-scientific data about the deep and shallow soil of the Netherlands.

In most cases, the source of the basis themes to be provided by Land Registry is within the system of basis registrations and national provisions.

Figure 0.1 Web oriented distribution platform



To unlock the INSPIRE datasets from the source registrations mentioned above, INSPIRE will be organised as if it is a client of the national provision concerned. A process will be set up for this for transformation (mapping) of the data. It will be a challenge to do these transformations on the hoof for smaller datasets, or in a batch procedure.

### 6.3.3 Costs and benefits

#### Costs

For the costs we take the following activities as our points of departure:

- the creation of metadata fields and parameters;
- entering/conversion of data in a technical format conforming to INSPIRE;
- possible choice and implementation of a metadata management system;
- setting up/enlarging metadata service conforming to INSPIRE;
- setting up/enlarging a - view, download and pay - service conforming to INSPIRE;

- harmonising the data to conform to INSPIRE (on the hoof/directly) and
- securing management.

The level of the costs will depend, for a large part, on the content of the themes within Annexes II and III.

### *Benefits*

The technical framework of INSPIRE (specifications in the form of implementation rules and technical guidance) makes it possible for the member states to unlock geo datasets in a standard way via web services that are harmonised at a European level.

Geo data will be unlocked cross-border as long as a European Spatial Data Infrastructure (ESDI) is set up in accordance with the INSPIRE specifications. The construction of a cross-border railway route requires geo data of a cross-border character. The decision-making process in the Netherlands (Rules Spelregels Meerjarenprogramma Infrastructuur en Transport) and Germany has to go through an exploratory phase and a feasibility phase before it can be realised. Within these phases, a number of studies are conducted, in which geo-data has to be used. These include reports on the environmental effects (MER), feasibility studies and costs-benefits analyses (CBA).

The INSPIRE Directive guarantees a consistent use of clear geo data, on both sides of the border. This way, the quality of the studies mentioned increases, so decision-making can be made which are based on better information.

Furthermore, it provides the researchers with efficiency benefits, as searching and finding the right data will take less time. In studies in which international data are used, searching and finding the right data can sometimes take up to 80% of the total number of available days. Finding data that is harmonised at a European level and which is unlocked via an INSPIRE portal, saves a lot of searching time. This may even increase to 50%.

## 6.4 Use case 3: Trace study of an infrastructural project (decentralised data providers)

### 6.4.1 General description

At its core, this use case is the same as use case 2, but there are no centralised data providers, but decentralised ones. A decentralised data provider is an organisation where the geo data are not collected and managed in a centralised way, but in a decentralised way. The relevant data are spread over more locations and only together do they create the total picture. This use case deals with a scenario where preparations are being made for an infrastructural project (the construction of a railway) between Germany and the Netherlands. Preparations related to such a project are, amongst other things, feasibility studies, archaeological interventions and/or MER. The project organisation and authorities involved have to be able to judge, based on metadata, whether the geodata that was made available by the data providers, can be used in the various studies and reports which are necessary for the infrastructural project. If it is suitable, the data that was made available by the providers should be included in their own systems for use and consultancy.

We will look at what activities and provisions the providers had to realise in this use case. What we are talking about here is geodata for which INSPIRE is mandatory, provided with metadata which conform to INSPIRE, or converting metadata from the old standard (for example CEN) to the rules for the introduction of INSPIRE for metadata, and making means available for management and unlocking. Services will also have to be set up for searching and making available data and metadata which conform to the INSPIRE Directive. Finally these provisions and activities will have to be secured.<sup>25</sup>

#### *Description of primary process for data providers*

In the current situation, the Water Boards only provide information for other parties when they are asked. To develop a trace study, a project organisation will approach the Water Boards and ask for information about, for example, water courses, water embankments and ground and surface water. Assuming the trace study involves land under the jurisdiction of other Water Boards, the geo-information is requested at more Water Boards.

25. Based on the Global impact analysis 'Setting Up provision of information INSPIRE' of the Land registry and Dutch Organisation for Applied Scientific Research.

With the coming of INSPIRE, the geo-information of the Water Boards is unlocked via the INSPIRE portal and the Boards themselves do not need to be approached directly. Besides, INSPIRE makes sure that the metadata of all the INSPIRE geo information are fine-tuned with each other in all the Water Boards. So differences between Water Boards about the way in which INSPIRE geo-information should be managed will no longer occur.

#### *Players*

This use case has been based on the Water Boards as decentralised data providers.

### 6.4.2 Steps

To be able to include geo-information in the study, the following steps have to be made.

#### *1. Consulting registers or catalogues*

In the preparation link in the safety chain, by consulting the registers or catalogues of the INSPIRE portal in Germany, the geo data that must be made available can be sorted out. Here, it is important to focus on the fact that the most updated geo data are available. In the past, outdated data was viewed.

#### *2. Querying metadata*

When querying metadata we will have to look at how the data should be interpreted and what constraints apply. This information is important in the more detailed explanation of a procedure/scenario.

#### *3. Including geo-data in their own GIS system (viewer/desktop GIS)*

There are two ways to view INSPIRE data in their own GIS viewer.

a. Dynamic inclusion of the geo data in their own system via data service(s)

The data remains at the source and can be consulted via a WMS and/or a WFS. Consulting in this way can be influenced negatively by slower response times because, amongst other things, a co-ordinated transformation has to be executed. However techniques are being

developed that work with temporary storage, in which the response times are no longer a disadvantage.

b. Static inclusion of the geo data via a GML-download.

Here data that is found, which is suitable for the provision of information, is downloaded using a specific procedure/scenario at fixed times (can be done in an automated way). Then it has to be transformed to the Dutch co-ordinated system and stored locally. This reduces the chance of response and performance problems.

### 6.4.3 Costs and benefits

#### *Costs*

For the costs we take the following activities as our point of departure:

- creating metadata fields and parameters;
- entering/conversions in a technical format which conform to INSPIRE;
- possible choice and implementation of a metadata management system;
- setting up/enlarging metadata service which conform to INSPIRE;
- setting up/enlarging view, download and payment service which conforms to INSPIRE;
- harmonising of the data to conform to INSPIRE (on the hoof/directly); and
- securing management.

The level of the costs depends on the level at which the adaptations are achieved, this also relates to other developments within the Water Boards.

#### *Benefits*

The benefits of INSPIRE are gained partly by the data providers (the Water Boards in this case) and by the users (the consumers of geo-information from the Water Boards).

First of all, INSPIRE ensures that there is a clear and standardised way of managing and unlocking geo datasets. Surely when international geo-information is used, there are advantages here. In this use case, information about the ground water in both the Netherlands and Germany is needed. Because the relevant data providers in both countries use the same standard, the information can quickly be processed. The metadata of both organisations is made available, so no misunderstandings or misinterpretations can arise here. In this way geo-information is used consistently.

There are many differences between decentralised data providers, as to what is a dataset. The meta information from one data provider to the next, for example, may be different or one data provider has described it more extensively than an other. As decentralised data providers have to internally fine-tune their data, a contribution is made to obtaining clear and harmonised datasets.

This provides efficiency advantages to the researchers who use the information from the Water Boards in their studies as searching and finding the necessary information takes up a lot less time when all the geo-information is available via the INSPIRE portal. This applies to both national and the international data (only to the themes that INSPIRE covers, of course). In studies in which international data are used, searching and finding the right information takes up 80% of the total number of days available. With data that is harmonised at European level, and unlocked via an INSPIRE portal, a lot of searching time is saved; this may also increase to 50%. The efficiency advantage for users in this way can be considerable.

## 6.5 Use case 4: Cross-border flood scenario

### 6.5.1. General description

This use case is linked to a cross-border study in which a flood scenario is worked out. The study takes place in the framework of climate change research. It is particularly important in this field for data from various sources to be linked. Neither the climate nor the river basin drainage area respect borders. Climate changes upstream may have huge consequences downstream.

The project organisation and authorities involved should be able to judge if the geo data that is made available by data providers, based on metadata and geo data, can be obtained for the study. If it is suitable, the data will be really used (consulting and downloading). An important fact is that the scenario study is cross-border because of the drainage basin for which flood risks have to be examined. Experience shows that in cross-border research such as this, a lot of time is spent on making an inventory of the available data, and collecting metadata to find out if linking data from various countries is permitted. Certainly, in this kind of cross-border research, the effects of INSPIRE should be clear.

In this use case, a small number of relevant users (see Players) have examined:

- What extra benefit could INSPIRE offer, in comparison with already existing developments, to enable flood risks to be researched adequately and efficiently?
- What are the costs and benefits for users when using data which is made available by INSPIRE?
- Which qualitative effects on processes, policy, ICT architecture and organisation does INSPIRE have?

In this use case, the themes of Annex III were used as a central theme. This Annex contains specific and thematic data which play an important role in this kind of study such as, meteorological data and drainage basin information. These geo data will have to be found quickly and easily on both sides of the border and should be clear to interpret.

#### *Points of departure and assumptions for this use case*

With regard to the providers of data for Annex III themes, assumptions have been made based on the Program Plan 2009 INSPIRE in the Netherlands.

- Provisions to offer geo data which conform to INSPIRE are in place at the data providers.
- All geo data and the metadata of the themes under Annex III are available and conform to INSPIRE.
- The users in this case have a GIS viewer and/or desktop GIS provisions.

#### *Players*

The data providers involved in this use case are Alterra, LNV, the National Institute for Public Health and the Environment and KNMI. Alterra, the National Institute for Public Health and the Environment and KNMI are also involved as users in this use case.

### 6.5.3 Steps

#### *1. Consulting registers or catalogues*

When preparing a study, consulting the registers or catalogues at the INSPIRE portals in Belgium and/or Germany, one can see which geo data are available.

#### *2. Querying metadata*

Based on the available metadata, we will have to look at how the data have to be interpreted and what constraints apply. This information is important in regard to the subsequent setting up and course of the scenario studies.

#### *3. Including geo data in the GIS system of the research (viewer/desktop GIS);*

There are two ways to view INSPIRE data in their own GIS viewer.

- Dynamic inclusion of the geo data in their own system via data service(s)  
The data remaining at the source can be consulted via a WMS and/or WFS. Consulting in this way can be influenced negatively by slower response times because, amongst other things, a co-ordinated transformation has to be executed.
- Static inclusion of the geo data via a GML-download.  
Here data that is found which is suitable for the provision of information, is downloaded using a specific procedure/scenario at fixed times (can be done in an automated way). Then it has to be transformed to the Dutch co-ordinated system and stored locally. This reduces the chance of response and performance problems.

### 6.5.4 Costs and benefits

In this use case, the users of INSPIRE are most important. Users are the ones who will mainly benefit with the introduction of INSPIRE.

#### *Costs*

For the providers of relevant datasets for the scenario studies, the costs of introducing INSPIRE are related to developing and making available meta-information according to the INSPIRE Directive. The harmonising of data is also an activity that incurs expense. For the users the costs of the introduction of INSPIRE are limited. In some cases the GIS systems that are in use will need adaptation. Transforming foreign data to the Dutch co-ordinated system in cases where there is not yet any harmonisation of data between Belgium, Germany and the Netherlands may bring costs for the users.

#### *Benefits*

As previously mentioned, the benefits are found mainly in savings in the phase of data inventory and data collection. It becomes clear from the information from those involved in this use case that, in a large cross-border study, much time (and effort) has to be spent on this. The introduction of the INSPIRE Directive across Europe will provide a saving that can be expressed in monetary terms in the costs-benefits analysis.

Besides the immediate time saving, the introduction of INSPIRE also provides an improvement in the quality of the research according to the parties involved; most importantly because a more efficient data collection leaves more room for the analysis itself. The availability of meta-information that can be clearly interpreted also has a positive effect on the quality of the analysis. The chance of wrong conclusions based on an unauthorised link of international information is reduced.

## Appendix: Meeting Participants, interview partners and expert meetings

### Participants use case meetings:

- Wilbert Kurvers - Province Limburg
- Mario van Wanrooij - Safety Region Limburg Noord
- Ko van Raamsdonk - Land Registry
- Hans Nobbe - The Directorate General for Public Works and Water Management
- Floris de Bree - Dutch Organisation for Applied Scientific Research
- Marianne Krug - Union of Water Boards
- Peter de Leeuw - The Water Board House
- Johan Bode - Water Board in Peel en Maasvallei
- Tamar Bakker - Water Board in Noorderzijlvest
- Wolfram Schmidt - Water Board in Reest en Wieden
- Harrie van Dijk - Province of Gelderland
- Pieter Bresters - Statistics Netherlands
- Birgit Loos - National Institute for Public Health and the Environment
- Annette Willemen - Alterra
- Jeroen Baltussen - Ministry of Agriculture Nature and Food Quality
- Jan Willem Noteboom - KNMI

### Interview partners:

- Evert van der Spek - Ministry of Housing, Spatial Planning and the Environment-BOTMI
- Noud Hooyman - Ministry of Housing, Spatial Planning and the Environment
- Alex Janssen - Municipality Roermond

### Participants of expert meeting:

- Yola Georgiadou - ITC
- Arnold Bregt - WUR
- Tirza van Daalen - Dutch Organisation for Applied Scientific Research /DINO
- Dirk van Barneveld - Ministry of Housing, Spatial Planning and the Environment
- Marcel Reuvers - Geonovum