

## Use of geo-Information in Policy: limitations and advantages

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### Abstract

In 2010 the impact of geo-information to support policy of the Dutch ministry of Agriculture is analysed. To date the use of geo-information is not very common in the daily practice of the Dutch ministry of Agriculture. The main research question was: Why is geo-information not used within policy and how can this be improved. Geo-information can play a supporting role in all phases of the policy cycle. Advantages such as increasing spatial cognition and effectiveness are recognised. Connecting data and models to spatial themes is an easy way to visualise spatial relationships. Disadvantages are the costs of acquiring data, maintaining hard- and software and how to use these adequately. It is expected, though, that the use of geo-information in appropriate applications leads to better results in a shorter period of time.

*Keywords:* geo-applications, policy.

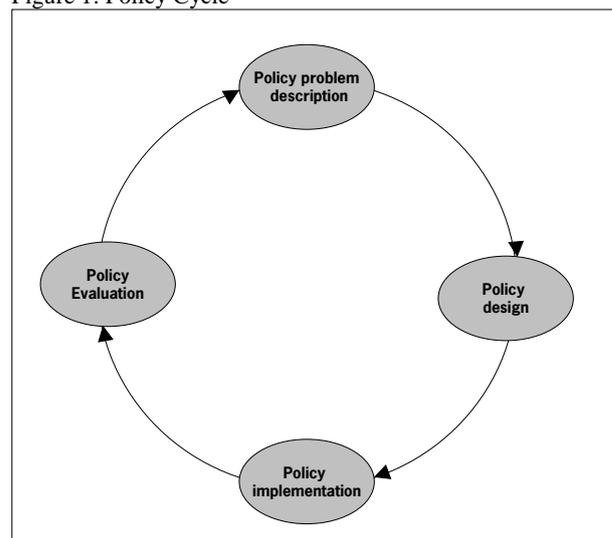
## 1 Introduction

Geo-information and policy are strongly linked. Especially when realising that 80% of information used during decision-making is spatial information. Applying geo-information can solve problems more efficiently [1]. Though, practical experience in literature [2, 1, 3] show only few attempts to use geo-information in policy. Spatial information is considered as too complex by policy makers [3]. In 2010 geo-information is applied in a number of research projects of the WUR to support policy of the Dutch ministry of Agriculture. The impact of geo-information is analysed. The main research question was: Why is geo-information not used within policy and how can this be improved. Another reason for this study was to show examples of geo-information projects that were successful. The geo-information projects were positioned within the four phases of the policy cycle. The concept of the policy cycle used in this paper is shown in figure 1. The following four phases are distinguished:

1. Policy problem description: This phase includes problem definition and problem exploration, describing the problem description and briefly outlining possible solutions
2. Policy design: This phase includes formulating policy objectives, designing policy alternatives, performing ex-ante evaluation and exploring possible policy instruments.
3. Policy implementation: realization of policy; aspects like organization, planning and support play an important role.
4. Policy evaluation: This phase includes monitoring and evaluation of policy realization. It emphasises

accountability and realized objectives and can be a trigger for a new policy cycle.

Figure 1: Policy Cycle



Source [2].

## 2 Case studies

In this chapter the geo-information projects are introduced related to their location in the policy cycle. For each phase one or two examples of geo-information projects are discussed.

## 2.1 Policy problem description

A societal development or event is always the starting point of a policy process. A problem occurs and has to be dealt with. That initiates a policy development. In this phase geo-information can offer a spatial overview and new insights can be obtained by combining and analysing existing data.

In 2010 the ministry was working on simplifying policy categories regarding nature, rural development and landscape, but also needed information on agriculture. Several maps were made to support the first phase of the policy circle. There was a need for maps visualizing recent research related to agriculture. Furthermore a map visualizing the green policy priorities for investing in the future was produced. Maps visualizing research on agricultural topics showed the average size of a farm per municipality, the economic strongest farm type per municipality and the expected amount of farms that are closing down. The information on these maps indicated where to stimulate agriculture or the potential areas for multi-functional agriculture or areas available for competing claims.

The green policy priority map showed the average farm size combined with the existing green policies like natura2000, national parks and national landscapes. This map indicated the potential for the realization of the investment in green policies and the development of agriculture.

This project is a nice example of obtaining new information by combining and analysing existing data.

## 2.2 Policy design

After establishing the policy problem description the design process can start. In this phase geo-information can convey spatial information to support the design process, it can elaborate spatial scenarios, or model spatial processes and support participatory processes.

In 2010 the ministry investigated the usefulness of new geo-information and communication technologies for participation or communication processes with civilians. This was tested and evaluated by selecting a new technology and using this to participate with civilians. For a smart phone an augmented reality app was developed to communicate information on the natura2000 areas to civilians. Civilians could give feedback using the app. The contribution of ICT used for E-participation can lower the threshold to participate. On one side interested persons can be informed or consulted served faster, more often and on more locations. On the other side it offers civilians or societal organizations leads to more easily organize themselves to contact the government. The recent rise of mobile applications offers new possibilities for different forms of participation. Civilians are more and more online via mobile applications, simplifying participation on location. For example civilian alerts via text messages (amber alert) by location or based on specific profiles.

This project supports the participatory process. The geo-component is the location of the civilian in relation to the object of which the government likes to receive feedback on.

## 2.3 Policy implementation

When a policy is designed it needs to be implemented. Geo-information can offer support in this phase by creating a spatial overview of realised objectives or projects or by

supporting the implementation process with spatial instruments such as interactive maps, mobile applications or spatial analyses.

The ministry is a partner in a national initiative to offer public services on the map (PDOK). This initiative involves setting up a spatial data infrastructure that partners can use to exchange their spatial datasets. Datasets need to be exchangeable and accessible according to INSPIRE specifications. The ministry needed support in setting up services mapped to DataSpecifications for Natura2000 areas according to INSPIRE. The data model of mapping the natura2000 dataset is created and implemented and the ministry is now able to offer the natura2000 dataset via a „INSPIRE-compliant“ WMS in the Dutch national spatial data infrastructure. This is an example of support of the implementation process with use of spatial instruments (webservices for data and metadata) for making spatial data exchangeable and accessible.

Another research question was to provide insight in the effectiveness of solving bottlenecks in the cycling route network. The ministry used a route network map and a separate database with details about bottlenecks including the cost of solving them (e.g. placing a bridge across a motorway to provide access for cyclist to the other side of the road). The objective was to increase the amount of people that access „green areas“ within a 10 minutes cycling distance from their homes. A spatial analysis method was used to analyse this by „solving“ each bottleneck and determining the increase. Combining the outcome and the cost it was possible to visualise which bottleneck would contribute the most to the objective. This is an example of supporting policy by spatial analysis of geo-information.

## 2.4 Policy Evaluation

After of during the implementation process it is important to evaluate whether the policy achieved its objectives. Policy evaluation can be done by performing ex-durante or ex-post evaluations. This will indicate the realisation of the objectives and can form a start for a new policy cycle. Geo-information can play a role in this phase by offering spatial evaluation information on the policy realisation.

The effects of an outbreak of damaging organisms in the green space form a risk for the Dutch economy. The ministry needs detailed, current and reliable information on where specific plants, forests or individual trees exist. This information is necessary to set up a maintenance strategy and as a basis for monitoring programs to prevent illnesses and infestations. This project resulted in an inventory of geo-datasets with vegetation data on various levels of scales in the Netherlands and an exploration of possible applications. This project is an example of the contribution that geo-information can offer to risk policy by providing insight in the location of trees and vegetation. This information supports the design of a more complete and up-to-date maintenance plan in case of a disaster.

### 3 Impact of use of geo-information

Maps were always used to inform and communicate [4]. Especially within regional development processes in which environmental issues are important, geo-information can play an supporting role in understanding the situation[5]. A map is easier to understand than written text and it also offers the possibility to combine large quantities of data from different sources [6], which leads to the exposure of spatial processes and patterns [7](De Wit et al, 2009). Taking the potential of geo-information into account, the high expectation level of policy officials is not surprising.

Despite the potential of geo-information, the public sector has been struggling for some time now with the deliberation between costs and benefits. This is an issue because the public sector does not emphasise economic benefits, but the realisation of political objectives. For this reason it is important to perceive the added value of geo-information in relation to the political objectives to justify the real costs. If the added value of geo-information is not sufficiently highlighted, then a successful implementation can be hampered [8]. The geo-information projects described in the previous chapter show a clear and supporting role within all phases of the policy cycle. It is interesting to know what the advantages and disadvantages were of using geo-information within these projects. We distinguished three advantages:

1. Increasing spatial insight: Geo-information offers insight into the location of one or more themes and the relationship between the themes. The green policy priorities maps (result of project in phase 1) are a prime example. This map shows the chances and possibilities of realising green investments in relation to agricultural development.
2. Increasing effectiveness: Connecting the database of route networks and the map increases the effectiveness by visualising which bottleneck will contribute the most to the objective when solved.
3. Improving communication: A map can improve the communication on a theme, but only if the map is readable. This was carried out in the implementation project on INSPIRE: agreeing on the meaning of a certain object/word/map. Or in other words standardising. Another example is the smartphone application. This application was used to interactively give information locally and to ask civilians their opinion about a policy.

There were also disadvantages:

1. Time and costs for acquiring data: the inventory of available geo-datasets with vegetation data showed that it takes time to find the needed data.
2. Time and costs for producing datasets of good quality: The INSPIRE implementation project gives an indication of the effort needed.

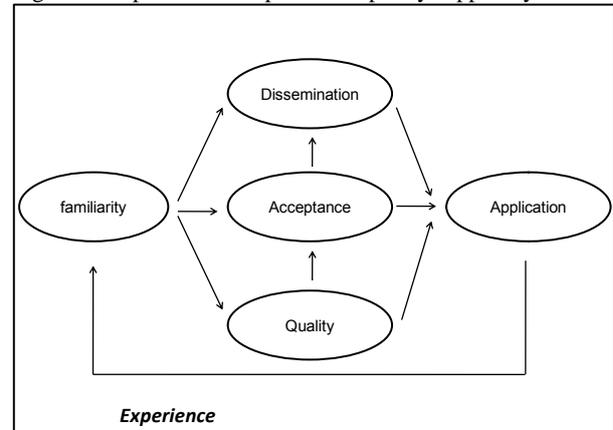
The use of geo-information takes time and come with a price tag. It also requires the appropriate use of available data, soft- and hardware. However without using geo-information there will still be costs. The expectation is that the use of geo-

information can lead to faster and better results. Sometimes this can be achieved with lower costs.

### 4 Removing barriers for use of geo-information in policy

As stated the use of geo-information in policy is still limited despite the advantages. The question is what are those barriers for the use of geo-information and how to remove them. Literature research shows that when evaluating use of geo-information in general only objectives, division of roles, authority structure and legal rules or the formal aspects are evaluated. However, informal aspects often play an important role, but in practice they hardly ever seem to be taken into account during an evaluation [9, 8, 6, 1, 7] developed a framework which visualizes the contribution of formal and informal aspects to a successful implementation of geo-information (figure 2).

Figure 2: Implementation process of policy support systems



Source: [1]

The terms in figure 2 relate to:

- Familiarity with the possibilities of geo-applications is a first requirement for starting to use geo-applications
- Dissemination means the availability of a geo-information infrastructure and the opportunities policy officials need to use a geo-information infrastructure.
- Acceptance of geo-applications depends on the advantages for the user. A requirement is the familiarity with the geo-applications.
- Quality of the available data, hardware and software is a requirement for high quality.
- Application of use of geo-information is only achieved if sufficient dissemination, acceptance and quality are created.
- Experience develops from use. Positive experience contributes to familiarity.

In literature it is often stated that geo-implementation generally means purchasing hardware and software. However only purchasing hardware and software is not enough for a successful implementation. Aspects such as legal rules, organisational agreements and knowledge building [10] also

play an important role. A proper implementation of geo-applications means a change in working processes. People are generally afraid for these kind of changes, since they think that those changes can lead to reduced authority, control in work, career possibilities and satisfaction with working conditions [6]. An often given advice is to invest more in evaluating user requirements, changes in working processes, education and acquiring knowledge and/or experts for the new tasks [8, 11, 10, 12, 6].

Another barrier is formed by Geo-ICT. In general Geo-ICT does not live up to the expectations of the managers. It does not deliver the wished-for geo-applications that are needed to accelerate decision making processes. Geo-applications are in general too generic, static, not competing with existing instruments, technically oriented instead of problem-driven and too much focused on strictly rational reasoning[13]. Therefore, improvements are welcome.

## 5 Recommendations

The recommendations are grouped in three categories related to the terms used in figure 2.

### 5.1 Spatial thinking and working

In an ideal world policy officials are aware of the possibilities of geo-information in all phases of the policy circle. To proceed to this ideal situation the following recommendations are made. They are linked to familiarity, acceptance, use and evaluation.

- Promote best practices: Publishing results of geo-projects contribute to dissemination, acceptance and quality.
- Courses for policy officials: These courses should inspire spatial thinking and increase familiarity with possibilities of the use of geo-information.
- Cooperation between policy and research: Geo-applications cannot be seen separate from a problem description, development, implementation and evaluation. For an effective contribution insight in relevant policy dossiers is required. Cooperation can be achieved by participation of a GIS-expert in a project team during a complex project.

### 5.2 Availability and quality of a spatial data infrastructure.

This group of recommendations is about accessibility to a spatial data infrastructure for policy officials.

- Dissemination of geo-information via a geoportal. The quality is described in reliable, complete and current geodata. The data can be consulted and combined via interactive viewers. The results can be printed and used in own documents and reports.
- GIS functionalities on desktops. GIS functionality should be easy to use for all staff members. Applications for often occurring processes could be included.
- Helpdesk for support: Support including advise, training and application development.

### 5.3 Implementation of new geo-applications in an organisation

These recommendations are about the introduction and management of new geo-applications within an organisation and managing the changes that are involved.

- Assess user requirements. The question that has to be solved needs to be crystal clear. Resulting in new geo-applications that closely fit user requirements.
- Offer relevant training. If a geo-application implicates a major change in a working process, the staff involved should be trained to manage the new method.

## 6 Concluding remarks

Looking back on the presented policy related geo-projects it can be concluded that the geo-projects were very diverse and interesting. It shows the wide range of possibilities of applying geo-information and hopefully it only is a prelude to what is possible in the future. The recommendations are equally diverse and emphasise the importance of spatial thinking and working, availability and quality of a spatial data infrastructure and the implementation of new geo-applications in an organisation. It will be hard to govern the implementations of all recommendations at once, but one step at the time will also lead to a positive result.

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