European Blues

Blue services in a European perspective

Karel van Bommel
Katrin Oltmer
Eric ten Pierick

Memorandum 08-021
August 2009
Project code 30449
LEI Wageningen UR, The Hague

LEI Wageningen UR conducts research in the following areas:

- International policy
- Development issues
- Consumers and supply chains
- Sectors and enterprises
- Environment, nature and landscape
- Rural economy and use of space

This report is part of the research area Rural economy and use of space.

European Blues; Blue services in a European perspective
Bommel, K. van, K. Oltmer and E. ten Pierick
Memorandum 08-021
44 p., fig., tab., app.

Land owners who offer blue services make their land available for activities such as water conservation, peak-flow storage or the containment of the rise of the groundwater level, and receive payments that exceed the compensation for incurred costs. The Netherlands is a pioneer in the concept of blue services, but other European countries may also offer possibilities for such activities. There are a number of institutional factors that either hamper or stimulate the realisation of blue services. The factors this study focuses on are, for example, the land price, transaction costs, property rights and the underlying policy rules on several administrative levels. Subsequent to a description of different factors, this study presents case studies of the United Kingdom, Hungary and Germany (the Dinkel river) in which the factors are evaluated according to their contribution to the realisation of blue services. The study focuses on the blue service 'peak-flow storage'.

Landeigenaren die blauwe diensten aanbieden, stellen hun grond tegen een marktconforme vergoeding beschikbaar voor activiteiten als wateropslag, piekberging of peilverhoging. Nederland is een voorloper op het gebied van blauwe diensten, maar ook in andere Europese landen zijn dergelijke activiteiten mogelijk. Er zijn een aantal (institutionele) factoren die het tot stand komen van blauwe diensten stimuleren of belemmeren. Factoren die in dit onderzoek aan de orde komen zijn onder andere de grondprijs, transactiekosten, eigendomsrechten en de achterliggende wetgeving op verschillende beleidsniveaus. Na een beschrijving van de verschillende factoren, is middels casestudies gekeken in hoeverre de genoemde factoren een rol spelen bij het wel of niet tot stand komen van blauwe diensten in het Verenigd Koninkrijk, Hongarije en Duitsland (de Dinkel). Het onderzoek richt zich uitsluitend op de blauwe dienst 'piekberging'.

Orders
+31.70-3358330
publicatie.lei@wur.nl

LEI is ISO 9000 certified.

Contents

Preface

This research was conducted as a part of 'Knowledge Base 1: design and use of the green and blue space' (KB1: Inrichting en gebruik van de groene en blauwe ruimte) of Wageningen University and Research Centre. From an international perspective, the Netherlands is the forerunner in the development of water-related services ('blue services'), whereby farmers and other landowners perform water management tasks. This does not mean that the Netherlands is the only European country with a need for these services. The aim of this research was to develop Wageningen UR's expertise in blue services - expertise that can be used in various European projects. The research of European cases can also provide new insights that are relevant to the Dutch situation and therefore strengthen and improve our knowledge in this field.

The research was conducted by Karel van Bommel, Katrin Oltmer and Eric ten Pierick, all of whom work at LEI. They benefited from comments from and discussions with the advisory committee, which comprised Gabe Venema, Krijn Poppe and Aris Gaaff. I thank Du Bingzhen for her contribution during her practical placement at LEI.

Prof. Dr. R.B.M. Huirne
Director General LEI Wageningen UR

Summary

Background
From an international perspective, the Netherlands is the forerunner in the development of water-related services ('blue services'), whereby farmers and other landowners perform water management tasks. Although the Netherlands is not the only European country that needs these services, the characteristics of a country or area determine to a great extent the design of such services. For example:

- *The institutions differ per country*
  In the Netherlands, water boards are responsible for the regional water system, while other countries have other authorities;
- *Type of services*
  Raising the water levels in peat polders is an important service in the Netherlands, but in other countries the prevention of erosion is more important;
- *Spatial characteristics*
  In a densely populated country like the Netherlands, land is scarce and therefore expensive. Not all areas in Europe have high land prices

The aim of this research was to develop Wageningen UR's expertise in blue services - expertise that can be used in various European projects. The research of European cases can also provide new insights that are relevant to the Dutch situation and therefore strengthen and improve our knowledge in this field.

Research question
What institutional factors stimulate or hamper the establishment of blue services in different countries or regions of the EU?

Definition
Blue services are activities related to nature, water, landscape (including cultural heritage) and accessibility that improve the quality of the rural area and go further than the legal obligation of the farmer/land manager and that are compensated for in conformity with the market.

Scope of the research
The research focuses on the blue service of peak-flow storage. Because of climate change, rainfall is becoming more extreme, increasing the chances of floods all over Europe.

European Union
The EU has big impact on the possibilities of blue services. On the one hand there are the agri-environmental schemes in the Rural Development Plan - the second pillar of the European Common Agricultural Policy - which advocates blue services. On the other hand, the state aid test limits the possibilities of compensation that is in conformity with the market, because the payments that farmers receive from agri-environmental schemes are based only on costs and loss of income. Therefore, a farmer cannot generate extra income by providing blue services; this limits the willingness among farmers to provide these services.

Institutional framework
An institutional economic approach to blue services identifies different levels of analysis, namely resource allocation and agency theory, transaction cost theory, property rights theory and social theory. Cases of blue services can be approached from the viewpoint of all these levels.

Demand side

The demand side consists of the water authorities, who are responsible for safety of citizens. In the Netherlands, this responsibility rests with the water boards (regional waters) and the state (main rivers). The Water Directive Framework shows that different countries have different institutional organisations for river basin management, but in general it is considered that raising the dykes is not a sustainable solution and that creating retention areas is a more sustainable way of accommodating peak flows.

These retention areas can be created by buying land, paying damages or through blue services. Whether blue services are an attractive option depends mainly on the frequency of floods and on land prices, compared to the gross production value in agricultural use.

Supply side

Peak-flow storage can best be provided by farmers who have grassland (for grazing cattle), as floods are less devastating for grassland than for arable crops or vegetables. The loss of gross production value is much lower than with other farm types. It can be desirable for an exchange of grassland for arable land to take place before a retention area is created through blue services.

If the blue service limits the future use of the land for building purposes, the value of the land may decrease (a part of the land price consists of an option value related to future land uses). This decrease in value should be compensated for.

Possibilities in Europe

The possibilities for blue services are rather limited: first because of the frequencies of floods, and second - and more importantly - because of the land price. In most situations the land price is too low for institutionally more difficult arrangements like blue services, because of the higher transaction costs. The case of Hungary shows that the land price was too low and that it would be wiser for the water manager to buy the land.

Higher land prices are found in more densely populated areas, because land is scarce there. The map of Europe showing the population density gives a first indication of possible areas. Parts of Germany, Belgium, England and Italy are more densely populated; the possibilities in Scandinavia, Spain and France are limited.

Samenvatting

Achtergrond
Vanuit een internationaal perspectief is Nederland een voorloper op het gebied van blauwe diensten, waarbij agrariërs en andere landeigenaren watermanagementtaken uitvoeren. Dit betekent echter niet dat Nederland het enige Europese land is met een behoefte voor deze diensten. Maar de karakteristieken van een land of gebied bepalen in sterke mate de blauwe dienst, zoals:

- *De instituties verschillen per land*
  In Nederland zijn waterschappen verantwoordelijk voor de regionale watersystemen, terwijl in andere landen er andere instituties gelden;
- *Type dienst*
  Peilverhoging om het veenweidegebied te behouden is een belangrijke blauwe dienst in Nederland, maar in veel andere landen zal erosiebestrijding veel belangrijker zijn;
- *Ruimtelijke condities*
  In een dichtbevolkt land als Nederland, is land schaars en daarmee duur. Dit is niet overal in Europa het geval.

Onderzoeksvraag
Wat zijn beperkende en stimulerende (institutionele) factoren voor blauwe diensten in verschillende landen en regio's in Europa?

Definitie
Blauwe diensten zijn activiteiten met een (marktconforme) vergoeding, die betrekking hebben op natuur, water, landschap (inclusief cultureel erfgoed) en toegankelijkheid die de kwaliteit van het landelijk gebied versterken en bovenwettelijk zijn.

Afbakening van het onderzoek
Het onderzoek beperkt zicht tot de blauwe dienst piekberging. Vanwege de klimaatsverandering wordt de neerslag extremer, waardoor de kansen op overstroming in heel Europa toenemen.

Europese Unie
De Europese Unie heeft een grote impact op de mogelijkheden van blauwe diensten. Aan de ene kant zijn er de agromilieuverbintenissen in het platteland ontwikkelingsplan, de tweede pilaar van het Europese gemeenschappelijke landbouwbeleid, waarbinnen blauwe diensten prima passen. Aan de andere kant is er de derde staatssteuntoets die de mogelijkheden van marktconforme vergoeding beperkt, omdat de agrariërs alleen een vergoeding van de kosten en gederfde opbrengsten. Hierdoor kan een agrariër geen extra inkomen genereren uit het bieden van blauwe diensten, waarmee de bereidheid onder agrariërs om deze diensten aan te bieden wordt beperkt.

Institutioneel kader
Een institutioneel-economische benadering van blauwe diensten identificeert verschillende analyseniveaus, namelijk de principaal-agent-theorie, transactiekostentheorie, eigendomsrechtentheorie en de sociale theorie. Blauwe diensten kunnen vanuit al deze gezichtspunten worden benaderd.

Vraagzijde
De vraagzijde bestaat uit waterautoriteiten, die verantwoordelijk zijn voor de veiligheid van hun ingezetenen. In Nederland ligt voor regionale wateren deze verantwoordelijkheid bij waterschappen en voor de grote wateren bij de Rijksoverheid. De Kaderrichtlijnwater laat zien dat in verschillende landen er verschillende institutionele organisaties verantwoordelijk zijn voor het stroomgebiedbeheer, maar in het algemeen is een

trend waarneembaar dat het verhogen van dijken niet als een duurzame oplossing wordt gezien en dat retentiegebieden meer duurzaam zijn voor het opvangen van pieken.

Deze retentiegebieden kunnen worden gerealiseerd door het opkopen van het land, of het betalen van schadevergoeding voor blauwe diensten. Het hangt vooral van de frequentie van overstroming en de grondprijs, in verhouding tot de schade, af of blauwe diensten een interessante optie zijn.

Aanbodzijde

Piekberging wordt aangeboden door agrariërs met graasvee en grasland, omdat deze beter tegen overstroming kunnen dan akkerbouw- en tuinbouwproducten. Kavelruil kan gewenst zijn, zodat het retentiegebied uit grasland bestaat.

Blauwe diensten beperken de bouwmogelijkheden, waardoor de waarde van het land kan dalen, omdat de grondprijs voor een deel uit optiewaarde bestaat. Deze waardedaling zou moeten worden gecompenseerd.

Mogelijkheden in Europa

De mogelijkheden voor blauwe diensten zijn beperkt, allereerst vanwege de frequentie van overstromingen. Ten tweede - en deze reden is veel belangrijker - vanwege de grondprijs. Meestal is de grondprijs te laag om een institutioneel lastiger instrument als blauwe diensten in te zetten, dit vanwege de hoge transactiekosten. De case Hongarije laat zien dat de grondprijs echt te laag was en opkopen zou voor de waterautoriteit veel verstandiger zijn.

De hogere grondprijzen worden in de meer dichtbevolkte gebieden gevonden, omdat grond daar schaarser is. Een kaart van Europa met de bevolkingsdichtheid geeft een eerste indicatie waar mogelijke gebieden liggen: delen van Duitsland, België, Engeland en Italië. In Scandinavië, Spanje en Frankrijk zijn de mogelijkheden beperkt.

1 Introduction

1.1 Background

From an international perspective, the Netherlands is the forerunner in the development of water-related services ('blue services'), whereby farmers and other landowners perform water management tasks. Although the Netherlands is not the only European country that needs these services, the characteristics of a country or area determine to a great extent the design of such services. For example:

- *The institutions differ per country*
  In the Netherlands, water boards are responsible for the regional water system, while other countries have other authorities;
- *Type of services*
  Raising the water levels in peat polders is an important service in the Netherlands, but in other countries the prevention of erosion is more important;
- *Spatial characteristics*
  In a densely populated country like the Netherlands, land is scarce and therefore expensive. Not all areas in Europe have high land prices.

The aim of this research was to develop the Wageningen UR's expertise in blue services - expertise that can be used in various European projects. The research of European cases can also provide new insights that are relevant to the Dutch situation and therefore strengthen and improve our knowledge in this field.

1.2 Research question

What institutional factors stimulate or hamper the establishment of blue services in different countries or regions of the EU?

1.3 Definition of blue services

'Blauwe diensten' (blue services) is an established term in Dutch water management literature. In the international literature, however, the term has not yet been introduced. Blue services is a convenient term for water-related services whereby farmers or other landowners offer their land for water management. The Netherlands Ministry of Agriculture, Nature and Food Quality (LNV) defines water-related services as 'water management related activities for third parties, that are compensated for in conformity with the market' (Van Bommel and Reinhard, 2003).

In the Netherlands, blue services are a part of 'environmental schemes' or 'green services' - terms that were introduced in the Second National Structure Plan for Green Areas (SGR2) (LNV, 2002). The minister of the LNV uses the following definition of green services: 'Green services concern activities related to nature, water, landscape (including cultural heritage) and accessibility that improve the quality of the rural area and go beyond the legal obligation of the farmer/land manager.' The services also go beyond Good Agricultural Practice, as defined by the EU.

The second precondition is that blue services are demand driven. Water-related services can fulfil private demands as well as public (social) demands. Private demand can come from other farmers (irrigation water), industries (process water or cooling water) or drinking water companies (a derived demand from household and industry). Social demand for water is, for instance, the raising of ground water levels to preserve nature areas (a derived demand for water) or for recreational water facilities. This demand can come from nature conservationists. To ensure the safety of the population downstream, which is a public issue, a

water board can have a demand for extra water storage capacity upstream to decrease peak-flow discharges. This storage capacity can be realised by means of a water-related service.

It should be pointed out that blue services go beyond simply compensating for the losses of the landowner who is providing the blue service; in other words, the amount of the payment for a blue service should not be based only on the costs incurred by the supplier of the service.

1.4 Types of blue services

Water conservation
Water conservation can be divided into the short-term conservation of rainfall (rain storage) and the long-term conservation of water from the wet winter season for the drier summer season (seasonal storage).

Rain storage

Description
Rain storage temporarily raises ground and surface water levels. The purpose is to keep fresh water in the area. Fresh water is of a better quality than the water imported from other areas. Both private and public parties can benefit from rain storage. Mainly nature conservation organisations, water managers and other farmers will benefit from the extra water of a better quality in dry periods. With climate change, the dry periods will get longer and the demand for water will increase.

Preconditions
The requesting party will seek a long-term contract. Security of the supply is necessary for decisions on alternative measures, such as constructing basins. The storage is limited not to a location, but to a water system. An agreement for a whole area with an agricultural water cooperation can be sufficient. The suppliers prefer to maintain flexibility within their farm practice. Rotation of their storage can be integrated in their crop rotation plan.

Impact
In principle, the impact on the farm structure is limited: hardly any alterations are needed within the crop rotation plan, as long the storage of the water is secured. However, if the water is polluted, the impact of storing it can be great: crops can be damaged. Storing water might also affect quality labels, as the farmer cannot control the quality of the water. The risk of a lower turnover, of a lower crop quality and of crop diseases increase. The build-up of water storage may result in dry ditches turning into water carrying ditches and becoming subject to environmental law, which requires fallow zones alongside ditches.
Rain storage has a positive impact on nature: there are more natural fluctuations and the water quality is improved.

Seasonal storage

Description
Seasonal storage is the storage of water in the ground or in the open with the purpose of building up a water reserve in the wet period to be used during dry spells. The build-up of reserves is done in the winter season and usually involves large quantities.

Although the Netherlands has an annual rainfall surplus, it suffers from water shortages in dry spells and the winter surplus is not sufficiently stored. In the spring, both agriculture and nature need water for the start of the growing season.

The suppliers of this service are extensive farmers (e.g. extensive dairy or beef cattle farmers). Storing large quantities of water can make agricultural use difficult.

Preconditions
Seasonal storage has a greater impact on both the water system and the farm structure of the suppliers. Both the demanding and the supplying party prefer long-term arrangements, because of the huge investments required to alter the water system and the farm set-up. Because the service is linked to land, the land price is likely to drop: there will be lower agricultural returns and limitations on future use, especially if the land is to become a part of the planning schemes. As the demanding parties require clean water, the suppliers have to meet quality standards.

Impact
Seasonal storage has a big impact on both the water system and the farm structure. Technical measures have to be taken to make seasonal storage and supply possible. Within the farm structure it must be possible to operate without the flooded land.

Peak-flow storage

Description
Peak-flow storage is the temporary storage of water on land to prevent flooding downstream. Peak-flow storage can occur from once a year to once a every 50 years. Flooding downstream results in a much higher cost (damage) than the cost of peak-flow storage. The demanding party is usually the water system manager, such as a water board. The storage facility should be created at a place where it causes the least possible damage. The land at such a place is usually already suboptimal for agricultural or other use. Extensive grassland is usually used for peak-flow storage.

Preconditions
Peak-flow storage can be required throughout the year. The water manager must be certain about the storage quantity and that the storage facilities can be rapidly made available. The location is less important than the storage capacity.

Water managers have to choose between buying land for peak-flow storage or paying the farmer for peak-flow storage (the blue service). The frequency of usage and the current use of the land determine this choice. For the Netherlands, blue services are interesting in situation where the frequency of flooding is less than once every five years, as buying the land would be too expensive.

Impact
The impact is determined by the frequency of usage of the area for water storage. The higher the frequency, the larger the limitations for farm management. With a high frequency, the farm structure has to be changed.

Calamity-prevention storage

Description
To prevent a calamity, drastic measures have to be taken and a vast storage capacity is necessary. Calamity-prevention storage usually happens very rarely, for example once every 100 years. Areas that have dykes are completely flooded to prevent catastrophes downstream, like the flooding of a city.

Preconditions
These areas have to be kept open (no building of new houses or commercial buildings). In the case of usage, the damage will be compensated for.

Impact
Further development of these areas is limited, to prevent extra damage. The impact will be great when the area is flooded.

Supply of clean water

Description
Users downstream request water of a higher quality than that laid down in the Water Framework Directive. The quality of the water can be improved in two ways: by purifying it or by making agreements with farmers upstream to use less fertiliser, manure and/or pesticides. In the latter situation, the farmer has a lower yield, because the crops do not have perfect conditions; therefore, the loss in yield should be lower than the cost of purifying water. The requesting parties can be water companies, industry or intensive agricultural farms. In some cases (i.e. when the water user depends on a constant supply), the service can be combined with water storage. In other cases, the service can be combined with environmental schemes, organic farming or nature.

Preconditions
The farmer has to reduce the use of manure, fertiliser and/or pesticides in order to meet the water quality standards of the requesting party. The supplying party should not be dependent on water upstream, as that would make it impossible to guarantee the water quality. Therefore, the service is possible in the case of stored rain water or when the quality of the water beneath the ground is guaranteed vis-à-vis the water company. Because of the changes the farm structure or farm management must undergo, long-term agreements are preferable.

Impact
A combination with organic farming is likely. This improves the prospects of organic farmers because they will have an extra source of income.

Strengthening the landscape

Description
Measures for maintaining and strengthening water-related nature and landscape depend on the region. In mountainous areas, such measures are related to the reduction of erosion, while in regions that have drought-sensitive nature, they are related to both water quantity and water quality. There is usually a public demand to preserve the landscape or nature. Such measures can also involve maintaining ditches. Sometimes these services can be combined with environmental schemes; in fact, the distinction between water-related services and environmental schemes is not always clear, nor is it very important.

Preconditions
Many of the services are considered free by-products of the agricultural landscape. But other services - such as erosion protection or preserving peat polders - involve adjusting the farm practices and, in general, lower agricultural production.

Impact
The biggest impact is positive: landscapes and nature are preserved. There is also a possible positive effect on recreation and water quality.

Cleaning of waste water or drain water

Description
Farmland can in some situations be used for filtering effluent water, especially where there is a great shortage of water such as in the south of Europe or on islands.

Preconditions
It must be possible with the crops that are grown (danger of diseases).

Impact
The measure can reduces costs, as the cleaning capacity of sewage treatment plants can be reduced.

1.5 Scope of the research

Because of climate change, rainfall is becoming more extreme, which increases the risk of floods all over Europe. European water managers have to adapt to higher short-term peaks in rivers. Building higher dykes is not always the solution - and is definitely not the most sustainable option. Using agricultural land for storing temporary peak flows can be a solution in more countries and river basins. To compare countries, it is more useful to focus on one type of blue service than to describe various countries and their various services. We therefore chose to focus on peak-flow storage in three countries.

The research focused on farmers who supply agricultural land for peak-flow storage. However, water can also be stored on estates or in nature reserves. Such authorities as water boards, municipalities and regional and national governments are responsible for public safety. We consider that peak-flow storage is a public demand and therefore liable to state aid, according to EU legislation.

1.6 Outline

Section 2 provides a description of blue services, the Dutch political context and the European context. Section 3 presents the theoretical and analytical framework. The three subsequent sections describe three case studies (the United Kingdom, Hungary and the differences between Germany and the Netherlands concerning the cross-border river, the Dinkel). The conclusions derived from the research are presented in Section 7.

2 Political context

Blue services have to be placed in the political context. First, we look at the European context, as it determines to some extent the Netherlands' agricultural, rural and water policy and in turn the possibilities for blue services. Second, we describe the national political context and its effect on blue services.

2.1 European context

The EU plays an important role for blue services in Europe through the second pillar of the Common Agricultural Policy and the Rural Development Plan, and through the limitations imposed by the state aid test.

2.1.1 European Common Agricultural Policy

The European Common Agricultural Policy (CAP) was established in the 1950s (EU, 2004) as direct product support, with incentives for optimal production. This policy was very successful - in fact, too successful: in the 1980s, the EU was faced with almost permanent surpluses of all major farm commodities. Some of these surpluses were exported (with the help of subsidies), while others were stored or disposed off within the EU. These measures had high budgetary costs, distorted some world markets, did not always serve the best interests of farmers, and became unpopular with consumers and taxpayers. At the same time, society became increasingly concerned about the environmental sustainability of agriculture, with the Rio Earth Summit[1] being a notable landmark in the early 1990s.

Many important changes to the CAP were made in the 1990s (EU, 2004). Production limits have helped to reduce surpluses and new emphasis has been placed on environmentally sound farming. Farmers have to keep a closer eye on the market and to respond to changing consumer priorities, while receiving direct income aid.

This shift of emphasis included a major new element: a rural development policy that encourages many rural initiatives that help farmers to diversify, improve their product marketing and otherwise restructure their businesses. This policy is the second pillar of the CAP (see 2.1.2 below). A ceiling was put on the budget to reassure taxpayers that CAP costs would not run out of control. In 2003, a further fundamental reform was agreed upon.

Farmers are no longer paid just to produce food. Today's CAP is demand driven. It takes consumers' and taxpayers' concerns fully into account, while giving EU farmers the freedom to produce what the market wants. In future, the vast majority of aid to farmers will be paid independently of what or how much they produce. In the past, the more farmers produced, the more subsidy payments they received. Under the new system, farmers still receive direct income payments to maintain income stability, but the link to production has been severed. In addition, farmers have to respect environmental, food safety and animal welfare standards. Farmers who fail to comply with these standards face reductions in their direct payments (a condition known as 'cross-compliance'). Severing the link between subsidies and production ('decoupling') will make EU farmers more competitive and market oriented. They will be free to produce according to what is most profitable for them while still enjoying a stable income.

2.1.2 Second Rural Development Plan

As the second pillar of the CAP, the EU developed the rural development plan (RDP), which integrates instruments to meet such objectives as agricultural restructuring, territorial/local development and environmental integration. The first RDP ended in 2006 and has been followed by the second RDP (2007-2013). Land management and environment (Axis 2) are important in the second RDP (EU, 2006a). Payments under

[1] Member States and regions whose per capita GDP is less than 75% of the EU average.

Axis 2 aim at delivering environmental services through agri-environmental measures in rural areas and preserving land management (including in areas that have physical and natural handicaps). One of the strategic issues in Axis 2 is water management, related to the EU Water Framework Directive (WFD). All these activities are supposed to contribute to a sustainable rural development, including the protection and improvement the environmental resources. Co-financed activities should clearly target EU priorities such as combating climate change, enhancing water quality, or reducing the risk or impact of natural disasters. The total budget for the RDP in the period 2007-2013 is €96b. (2004 prices). A minimum of 25% of the funding of the RDP should go to Axis 2 (i.e. at least €24b.). For both Axis 1 (developing physical potential and promoting innovation in agriculture) and Axis 3 (marketing and trade), a minimum of €10b. is required. The Member States can decide upon the remaining 45% according to their priorities. The 25% shows that Axis 2 is the most import policy objective for the EU. The maximum EU co-finance rate for Axis 2 is 55% (80% in convergence regions) (EU, 2006a). The Member States have to design national RDPs, following the guidelines presented by the European Commission (EC). The EC has to approve the national strategic plans.

2.1.3 EU policy on flood-risk management

Floods constitute a significant risk to human health, economic activity and the environment in Europe. Two trends suggest that these risks will increase. First, the magnitude and frequency of floods are likely to increase as a result of climate change (higher intensity of rainfall and rising sea levels). Second, there has been a marked rise in the vulnerability due to the increase in the number of people and economic assets located in flood-risk zones. As a consequence of the devastating floods in 2005, the EU is considering developing a policy on flood-risk management. In 2006, an impact assessment of the EU Flood Action Programme was concluded (EU, 2006b). The assessment showed that the most cost-effective and appropriate regulatory level was a combination of cooperation between the EC, Member States and other involved parties, plus a flexible legislative instrument.

The CAP/RDP includes provisions for Member States to use funds for flood-related measures. States may define the type of flood measures themselves. At present, there is no policy framework available to apply an integrated long-term approach at river basin level.

In river basins such as the Rhine, Oder, Meuse, Danube, Saar, Moselle and Elbe, the countries bordering these rivers have established bodies (international river commissions) to strive for a coordinated approach to river basin management. The degree of cooperation between countries in a river basin and the priority given to flood protection varies between the river basins, and is usually a function of the time that has elapsed since the last flood. Member States have undertaken and are continuing to undertake national measures to deal with floods. The character of floods and the degree of flood risks vary throughout Europe, as does the approach to flood risks. Several Member States have defined levels of protection, whilst in others there are no statutory rights to a particular level of protection. The existing links within the WFD can be used for the integral (trans-boundary) river basin management plans.

2.1.4 State aid test

Introduction

The strongest limitation on blue services is the EU's state aid test, which limits a commercial approach to blue services. Control over government aid is one of the main parts of the policy on competition within the EU, and this includes the agricultural sector. The purpose of the policy is to create equal preconditions on competition for all sectors and countries on the Common Market. Measurements that will falsify competition by giving preferential treatment to certain companies are not allowed (Europa decentraal, 2004).

State aid

Articles 87, 88 and 89 of the EU Treaty state that 'any aid granted by a Member State or through State resources in any form whatsoever which distorts or threatens to distort competition by favouring certain undertakings or the production of certain goods shall, insofar as it affects trade between Member States, be incompatible with the Common Market'.

The EC and the European Court of Justice have given a very broad interpretation to the concept of 'aid' with regard to the body granting it. The bodies may be the state itself, a regional or local authority, a body over which the state directly or indirectly exerts a decisive influence, or private companies or public corporations. Accordingly, any advantage conferred by the state is regarded as state aid where it:

- Confers an economic advantage upon the recipient;
- Is granted selectively to certain companies or products;
- May distort competition;
- Affects trade between Member States.

The prohibition applies to a large number of aid measures, whether direct (grants) or indirect (e.g. measures that ease the financial burden on a company), and regardless of their basis or purpose. However, an absolute ban on state aid is impossible, and the treaty provides for a number of exemptions for aid that are compatible with the Common Market and for aid that may be compatible under certain conditions.

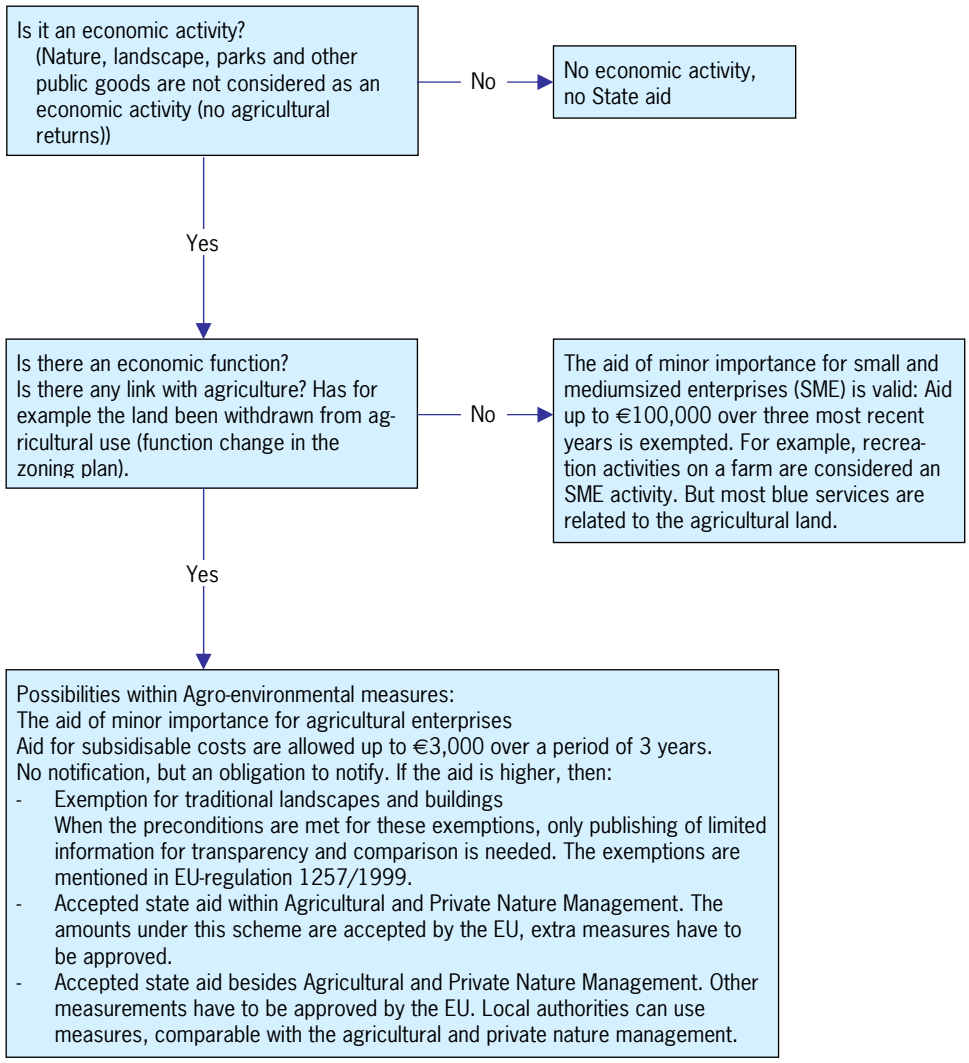
The procedural regulation on state aid stipulates that any aid or aid scheme must be notified to and approved by the Commission before being implemented. However, the prior notification requirement has been relaxed by the regulation on the control of horizontal state aid, which authorises the Commission to exempt certain categories of aid, including aid for small and medium-sized enterprises and aid of minor importance. By drafting new Community guidelines and frameworks, the Commission has clarified the conditions under which other forms of state aid in pursuit of horizontal objectives - such as regional development aid, environment aid and research aid - may be granted.

The exemptions for agricultural enterprises are, however, limited. Concerning aid of minor importance, small and medium-sized enterprises have an upper limit of €100,000 per three years. Agricultural enterprises have an upper limit of €3,000 per three years. Blue services are usually financed, directly or indirectly, by state means (Bureau Juridische Zaken, 2005).

The best way to avoid illegal aid is to invite public tenders for blue services; this will ensure a true market price and fair competition. It is even possible to tender the result, like a certain amount of water storage capacity for flood control. This will make the blue service available to more parties than only agricultural enterprises. However, the blue services still have to be notified to the EC. If every possible measure with state aid has to be reported to the Commission, the process of ratifying the measures will be tremendously time consuming. Therefore, the EC advocates a catalogue of measures. The Member States, together with local authorities, have to specify a long list with possible measures together with maximum payments. This list must be approved by the EC. State and local governments can use these accepted measures without any problem. The benefit is that it is clear what is accepted, but it restricts the flexibility.

Figure 1 comprises a scheme to determine whether or not a blue service has to be reported to the EC.

Figure 2.1 **Scheme to determine whether or not a blue service has to be reported to the European Commission**



The EC is working on guidelines for state aid in the post-2007 period, which can be a part of the second RDP. The EC stimulates countries to draw up a catalogue of green and blue services, which can be used by lower level governments. The catalogue consists of the green and blue services that have been approved by the EC. This reduces the administrative burden, because not every case has to be approved by the EC. The Netherlands Ministry of Agriculture, Nature and Food Quality published in 2006 such a catalogue with over 450 different services (LNV, 2006), all of which satisfy the European guidelines and maximum compensations for different activities. The compensation for green and blue services has to meet the following principles:

- Only paying for what goes beyond that which is required by law;
- Only paying for services that cannot be delivered without costs;
- It must be possible to monitor the service;
- The may be no distortion of competition.

As a result, the compensation is based upon extra costs, including labour, loss of income and real transaction costs of 20%. Also benefits have to be taken into account. When the purpose of the land is changed (at the notary and in spatial plans), the change in the value of the land can be compensated for.

2.2 Dutch context

2.2.1 Introduction

The Netherlands is situated in the delta of three of Europe's largest rivers (Rhine, Meuse and Scheldt) and half its surface is below sea level. The Netherlands has been shaped over the ages by water-level management and land reclamations. These activities have created the space for the country's high standard of living. However, we are forced to conclude that our technological approach to water management has reached its limits. Climate changes and soil subsidence threaten the Netherlands' very existence. The country is getting wetter in winter, which increases the risk of flooding and other problems caused by water. In summer, less precipitation and more evaporation will result in water depletion and groundwater becoming brackish in the western part of the country. Moreover, the water system is influenced by competing claims on the available space and by the more intensive use of this space in a densely populated country. Drastic changes in the Netherlands' water management are required: from keeping the water out to accommodating the water. Recent flooding has made it clear that technical solutions are no longer sufficient; space for rivers has to be found.

Several policy plans in different policy areas facilitate and even prescribe that water has to be considered the guiding principle for spatial planning. Plans in the following policy areas are described below: spatial planning policy, water policy and rural policy.

2.2.2 Spatial planning policy

The National Spatial Strategy (VROM, 2004) contains the government's view on the spatial development of the Netherlands and the most important objectives associated with that development. In accordance with the government's coalition agreement, the strategy represents the contribution of national spatial planning towards a strong economy, a safe and liveable society, and an attractive country. The National Spatial Strategy replaced the national strategies on spatial planning and/or the national spatial planning key decisions that were part of the Supplement to the Fourth National Policy Document on Spatial Planning (Vierde nota over de ruimtelijke ordening Extra and its update in the VINAC) and the Second National Structure Plan for Green Areas (SGR2) of the Netherlands Ministry of Agriculture, Nature and Food Quality.

Although the Netherlands is very experienced in technical solutions related to water, the Netherlands' water policy is switching from technical solutions to making land use subservient to water control. The new water policy demands more space for water, even though space is scarce in the Netherlands. The National Spatial Strategy identifies water as a structuring principle that will be an integral element in the spatial planning processes. To meet this extra demand for space by water, multifunctional land use is a possibility. These water assignments will have impact on 490,000 ha; for about 375,000 ha, multifunctional use will be the answer.

2.2.3 Water policy

The changing climate has major consequences for the spatial development in the Netherlands. To ensure public safety concerning flooding, extra space is needed. Where possible, space for water will be found by combining water management with other functions. For example, water offers possibilities to combine functions with the agricultural sector, mineral extraction, nature development, freshwater buffering, recreation and housing.

Negative influences on the water system caused by spatial interventions will be compensated for by water-neutral or water-positive methods. The aim is to achieve a situation in which it is possible to prevent or reduce problems in groundwater and water quality or quantity from being shifted to surrounding areas. The most important tool in this process is the 'water test'. This test dictates that the initiator of all spatial plans and decisions must take water management into consideration from the very beginning, and in close consultation with the water manager. The results of these considerations are described in the plan's elucidation (the 'water section'). The water manager draws up criteria for the water test together with the project initiator. The water test should ensure that potential negative consequences for water management be prevented. If that is not possible, some way must be found to compensate for the negative consequences.

The national government assesses provincial and municipal plans and decisions to see whether or not they pass the water test. In developing spatial water policy, area plans for river catchments also play an important role. These plans show the spatial consequences of introducing and maintaining standards in regional water systems. Municipalities must elaborate area plans for river catchments in their urban water plans (no later than 2006). After that, provinces and municipalities establish the relevant spatial agreements for the regional water systems in their provincial policy and regional plans (no later than 2007) and in municipal structure and local plans. The national government monitors the process to ensure that this actually happens.

Due to the extra space required for water, the demand for combining agriculture and water management is rapidly increasing. Water-related services are a way to combine both functions. Such services can be defined as activities or measures that are focused on the achieving further social demands related to water management, for which the entrepreneur should be rewarded. The water service can be directly related to water management or can be a derived service for nature purposes. The Union of Water Boards has designed a model contract for entrepreneurs and land owners who suffer damages through the future spatial planning of the regional water system. More structural water management measures include blue services.

There is a three-step strategy regarding water quantity: retaining, storing, draining. From the viewpoint of safety (i.e. flood prevention), preventing floods by means of retaining water is the best option. If this is not sufficient, storing water is the second option and draining is the third option. This means that more water will retained in regional waters, instead of draining the water into the main waters. The big benefit of this three-step strategy is that it prevents the offhand draining of water and the passing on of water problems to downstream areas. It also makes the responsibilities and the costs more clear (ROB, 2001).

2.2.4 Rural policy

In the SGR2 and the Agenda for a Vibrant, Dynamic Countryside (Agenda Vitaal Platteland; AVP), the Netherlands Ministry of Agriculture, Nature and Food Quality suggested that landowners could produce water-related services. These 'blue services' are defined as 'water management related activities for third parties, that are compensated for in conformity with the market'. The demand for, not the supply of water-related services will determine where and for which services compensation will be paid. The services will go further than what farmers will perform as described in the EU's Good Agricultural Practice.

The Netherlands' rural policy is closely related to the European CAP, because agriculture is partly dependent on the subsidies from the first pillar of the CAP, while the second pillar supports (through the second RDP) investments in rural areas. The Netherlands' Investment Budget for Rural Areas (Investeringsbudget Landelijk Gebied; ILG) is partly funded by the RDP. With the ILG, the provinces have be-

come responsible for rural areas, instead of the Ministry of Agriculture, Nature and Food Quality. The provinces and the national government make 7-year agreements concerning their targets and the financing of the necessary activities by the national government.

2.2.5 Conclusion

The general conclusion that can be drawn from the Netherlands' policy papers is that many hectares are affected by the goals of water management. Water will become the structuring principle. As space is scarce in the Netherlands, multiple land use can contribute to solving water problems. Land owners - especially farmers - can deliver blue services. These services provide an extra source of income for farmers and keep the countryside vibrant.

3 New institutional economics and water-related services

3.1 Introduction

In the perspective of new institutional economics, the concept of institutions refers to the rules of the economic game. More formally, institutions are defined as the humanly devised constraints that shape human interaction (North, 1990). Institutions occur at different levels of analysis (figure 3.1).[1]

Figure 3.1 New institutional economic theories and institutions at different levels of analysis

Level of analysis		Type of institutions	Frequency of change	Theory	Purpose of theory
1	Embedment	Informal (customs, traditions, norms, religion)	100-1000 years	Social theory	Often non-calculative
2	Institutional environment	Formal rules of the game (property rights)	10-100 years	Property right theory	Get the institutional environment right
3	Governance	Play the game (contracts)	1-10 years	Transactions costs theory	Get the governance structure right
4	Resource allocation and employment	Prices, quantities, incentives	continuous	Neoclassical economic theory/ agency theory	Get the marginal conditions right

Based on: Williamson (1998)

The first level is the social embedment level, which includes informal institutions, such as customs, traditions, and norms. Although this level has been investigated by some economic historians and other social scientists, it is mostly taken as given.

The second level refers to the institutional environment. This level focuses on the definition and enforcement of property rights (Coase, 1960; Demsetz, 1967), resulting in the property rights theory.

The third level is concerned with the institutions of governance. At this level, new institutional economists - such as Coase (1937) and Williamson (1975) - studied alternative modes of organisation (e.g. markets, firms and networks). It is the domain of transaction cost theory.

The fourth level concerns resource allocation and incentive alignment. Neoclassical economists, with price and output as the main decision variables, are concerned with resource allocation. Incentive alignment is the domain of new institutional economists (e.g. Alchian and Demsetz, 1972, and Jensen and Meckling, 1976). Their efforts result in agency theory.

The remainder of this section describes the levels of analysis as given in table 3.1 in reverse order. We start with the level at which resource allocation is considered (3.2), followed by transaction cost theory (3.3), property rights theory (3.4) and social theory (3.5). The reason for taking this order is that the descriptions of the case studies in Sections 4, 5 and 6 follow the same order.

3.2 Resource allocation and agency theory

The decision making about resource allocation includes aspects of water quality and the frequency of flooding. If in the case of peak-flow storage the water quality is insufficient, it is not possible for a farmer to

[1] Williamson (1998) commented that an evolutionary level in which the attributes of human actors have their origins in the Pleistocene could also be introduced. In addition, he stressed that lower levels provide feedback to higher levels and that, in the fullness of time, the system is fully interconnected.

combine agricultural production with the blue service. When the water is polluted, the crops are no longer suitable for consumption or a dairy factory will not accept the milk produced. Hence, water quality must not limit the agricultural production.

Concerning frequency, the expected frequency for the use of the peak-flow storage facility determines how the storage is organised. Arranging peak-flow storage through a blue service is from an institutional viewpoint a difficult solution, as contracts have to be made between the water manager and the farmer, and a monitoring system has to be set up. The following rule of thumb can be set up with regard to the frequency:

- When the use is more frequent than once every 5 years, the best economic solution for the water system manager is to buy the land. The payments for the service would be higher than the costs of acquiring the land;
- When the need for the storage area is less frequent than once every 15 years, damage compensation is the best alternative, because of transaction costs. Arranging it through a blue service is much more complicated than compensating for the damage;
- With a frequency of between once every 5 years and once every 15 years, blue services might be an option.

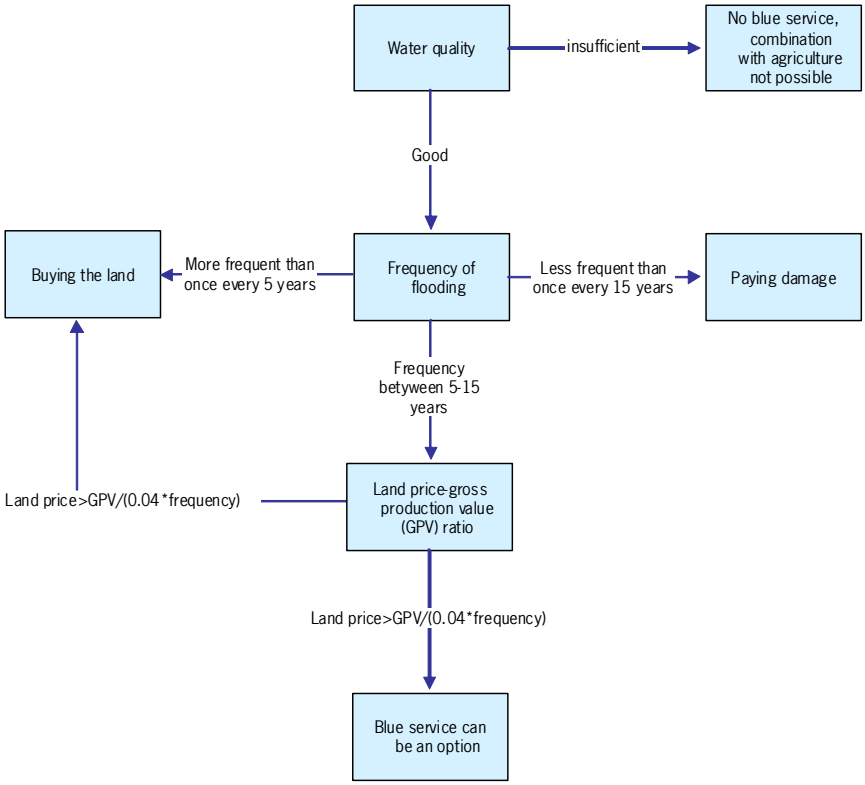
Along with water quality and the expected frequency, the land price in relation to the value of the damage of the service (production loss or devaluation of the land) is a very important aspect that determines the realisation of a blue service. In particular, the interest costs for acquiring land should at least be equal to the loss of production, for example:

- The gross production value of one hectare of grassland is €1,000;
- Inundation occurs once every 5 years;
- This results in an average loss per year of €200 (1000/5);
- For calculations, a 4% interest rate is often used;
- The loss divided by the interest rate, to determine the lower limit for the land price: 200/4% = €5,000.

In other words, taking into account the three described moments of decision making - namely water quality, expected frequency and land price (in relation to the value of the damage) - a blue service would be an interesting option for the water manager if the land price exceeds €5,000 per hectare.

Figure 3.1 shows a decision scheme that includes the three moments of decision making.

Figure 3.1 **Scheme to decide whether a blue service for peak-flow storage is an option**



The aspects described in figure 3.1 are not the only ones that have to be included in the decision making. As shown in table 3.1, also the other levels of analysis have to be taken into account, such as transaction costs (3.3), property rights (3.4) and social theory (3.5).

The decision scheme in figure 3.1 has to be read from the viewpoint of the water manager. However, the water manager has to make a contract with a farmer; therefore, the blue service should also be interesting for the farmer. The farmer's first concern is whether it is compatible with the agricultural function of the land under consideration. Grassland can stand a flood much better than arable land. If onions are flooded for two days, the crop is destroyed and therefore the damage is much higher than in cases in which grassland is inundated for two days. It is easier for dairy farmers and bovine farmers to incorporate the blue service than it is for arable farmers. In practice, only cattle farmers deliver blue services. Possible options are land exchanges between cattle and arable farmers, such as occurred in the Dinkel river area in the Netherlands: arable farmers and cattle farmers exchanged land, with the result that the cattle farmers farmed on the land in the inundation area and the arable farmers on the land outside the inundation area.

Even if the blue service can be incorporated in the farm structure, it does not mean that the farmer will provide the service, because not all farmers want their land to be flooded or they consider the payment too low. Because not all farmers are willing to provide the service, it can be desirable to precede the blue services by land exchange between farmers who want to provide these services and farmers who are reluctant to provide them. In cases in which the blue service limits the future use of the land for building purposes, it is possible that the value of the land decreases, because a part of the land price consists of option value of future destinations for the land. This decrease in value should be compensated for.

Agency theory[1]

Temptations to abuse water systems and to uphold or introduce inefficiencies for personal gain stem partly from 'principal agent problems'. Generally speaking, such problems are deficiencies related to contracts

[1] Based on Walter Huppert, Water Management in the , 'Moral Hazard Trap' The Example of Irrigation.

and agreements between exchange partners, for example between the provider (the agent) and the customer/client (the principal) of goods or services (Furubotn and Richter, 1997).

Many water-related services cover longer periods of time and are susceptible to a great number of external influencing factors. There is no spot market for this kind of service. Instead, the production and delivery of the service require a contract that is conditional on a variety of parameters. In institutional economics, one speaks of 'incomplete' contracting situations in cases like these (see e.g. Furubotn and Richter, 1997).

Nevertheless, even in such incomplete contracting situations, the parties concerned might consider it desirable to enter into an exchange relationship because the expected benefits outweigh the expected cost. Before they can do this, they must come to a consensus on the contractual goal with a verifiable definition. The agent usually has more information on the provision process than the principal. Such an information asymmetry and the related lack of transparency are both necessary and desirable since they reflect the division of labour and the specialization of the agent. However, the actor who is not as well informed - the principal - runs the risk of being exploited by the better informed agent. Whether or not the agent will behave in such a manner depends on his or her moral attitude and on the nature of the contract between the two parties.

An uneven distribution of information after the conclusion of the contract, namely during contract implementation, entails a 'moral hazard' risk. Such an information asymmetry may relate to two types of information. First, it can refer to information on the quality of the service provided and the efforts made in reality by the agent to ensure optimal service provision. When this type of information is not accessible to the principal, the resultant scenario is referred to as hidden action of the agent. The principal cannot observe or monitor the actions of the agent he or she has commissioned, only the results of these actions. However, since the results can also be influenced by other factors related to the service provision, the result of the agent's activities says little about the effort the agent has put into achieving it.

Second, the respective contractual partners may also be unequally informed about the exogenous factors influencing their contractual relationship - a situation referred to as hidden information. In this case, the agent acts on the basis of new information about changing framework conditions, which at that stage is unavailable to the principal. The agent might be able to observe certain indicators and draw conclusions about changes in the immediate environment. In contrast, the principal remains unaware of the portent of these indicators because he or she is too far removed from the place of action. The principal is thus unable to determine whether the agent is really using this information to promote the principal's interests as good as he or she can (Arrow, 1985). Furthermore, the principal's ability to hold the agent accountable is strongly impaired: in the case of suboptimal performance, the agent may refer to external factors that are outside his or her own control and therefore disclaim responsibility.

3.3 Transaction cost

Every economic exchange involves a transaction cost. Transaction costs can be divided into three major categories:

1. *Search or information costs*
   These are the costs involved in answering the question where, when, how and at what price the wanted product can be obtained. For example, a water manager who wants to 'buy' capacity for peak-flow storage has to gain information about possible locations for the water storage, identify the landowners of the land under consideration and compare the costs of the different possibilities for water storage;
2. *Bargaining costs*
   These costs arise through negotiations about price and conditions between the parties involved in the transaction and through drawing up an appropriate contract. For example, once the water manager has found a landowner who wants to offer his or her land for water storage, the two parties need to define the conditions of the contract (price, amount of water storage capacity, etc.);

3. *Policing or enforcement costs*
   These are the costs involved in a) ensuring that the parties stick to the agreements in the contract and in b) taking action, such as imposing penalties, if one or both of the parties does not comply with the agreements. The penalties are mostly enforced through a legal system that is already institutionalised. For example, if the water manager does not fulfil the payments to the landowner, the latter can take the former to court. Since the amount of the payments will have been laid down in a legal contract, the landowner will win the case.

Institutions can facilitate a reduction in transaction costs (Hubbard, 1997). Institutions define rights and duties assigned to the ownership or use of a resource and establish guidelines for the exchange of property rights and thus reduce uncertainty in interactions between parties with respect to the resource (e.g. negotiated decisions are simplified, the amount of information that must be collected is reduced, guidelines for negotiations and mechanisms for enforcing contracts are provided). On the other hand, there are also costs involved in establishing and maintaining institutions. Thus, there are:

A. Transaction costs of decision making and exchange in order to achieve a particular aim regarding resource allocation;
B. Costs of the establishment and maintenance of institutions.

Institutional change is beneficial when the reduction in A exceeds B. Challen (2000) calls this institutional efficiency: 'The efficient set of institutions for governing a particular set of allocation decisions will be that which minimizes the sum of transaction costs incurred in making the decisions and in establishing and maintaining the institutions.'

In the example described in the previous section, we concluded that €5,000 per hectare is the lowest possible land price at which blue services would be an attractive option for the water manager. However, this value does not include the transition costs related to the establishment of a blue service. The total costs can therefore be considerably higher.

3.4 Property rights

The concept of property rights is a fundamental institutional factor that determines the ownership and use of land (Barlowe, 1972). The ownership of land actually implies the ownership of a bundle of legally-defined user rights, and not the ownership of the object as such. In fact, 'it is rights, never objects, that are owned, and the rights themselves are limited by law' (Dales, 1992).

Agricultural land is a private property and is attached with the right to be used for agricultural production. In order to follow social objectives - such as reducing flood risks or ensuring environmental protection - the government can limit these private property rights by means of various policy measures. Examples are peak-flow storage for reducing flood risk or restrictions in fertiliser use for environmental protection. Such a government intervention in private land use implies a reallocation of a part of the bundle of property rights to society. If the policy measure includes compensation payments for farmers, the government is in fact buying part of the bundle of property rights from the farmer.

Bearing this in mind, it is rights that determine the price of a particular plot of land, rather than the plot of land as such. For instance, a plot of land attached with the right to develop housing is worth more than a plot of land attached with the right to be used agriculturally. Accordingly, assigning a plot of land as peak-flow storage lowers the price of that plot of land, since private use of that land is limited.

3.5 Social theory

According to Williamson (1998), the highest level of the institutional hierarchy, as shown in table 3.1, includes informal institutions, such as customs, traditions, religion, ethics, social norms, and aspects of lan-

guage and cognition. These types of institutions are the basis for all higher levels of a society's institutions. These basic social and cultural institutional foundations change very slowly over time, with adaptation periods of as long as 1,000 years and no shorter than 100 years.

The Netherlands has a tradition of fighting against water in order to keep the land dry and to reclaim land from the sea. The 'new' land is very fertile agricultural land. Since it took so much effort to obtain the land, especially farmers cannot understand why it should be given back to the sea. It would be against their tradition.

3.6 Conclusion

An institutional economic approach to blue services identifies various levels of analysis, namely resource allocation and agency theory, transaction cost theory, property rights theory and social theory. Cases of blue services can be approached from the viewpoint of these various levels.

The following three sections describe cases of existing or potential cases of blue services. Each case study considers a selection of (or all) the levels of analysis described in this section.

4 Case study: United Kingdom

4.1 Introduction

This section provides an overview of how the UK is dealing with reducing flood risk. It starts with the description of a policy that includes elements of blue services, namely the Catchment Flood Management Plans (Section 4.2). The tradition of cost-benefit analysis in the UK in relation to flood-risk assessment is then discussed. Here, the theory of resource allocation is dealt with (Section 4.3). Finally, public awareness campaigns as a measure to handle flood risk are described. The theory of property rights and that of transaction costs also come up. It has to be noted that public awareness campaigns as described in this section have nothing to do with blue services. However, they are worth mentioning since they contain a number of institutional factors. The conclusions are presented in Section 4.4.

4.2 Catchment Flood Management Plans

The average damage from flooding in England and Wales is estimated at 1 billion pounds (ca €1.5 billion) per year, with nearly 2 million properties at risk from flooding. Since recent flood events, the UK recognizes that flooding is a natural process and that flooding may need to increase in some areas in order to reduce it in other, more sensitive locations, such as towns and cities. The policy tool the UK has introduced in order to manage flood risk is the Catchment Flood Management Plan (CFMP).

CFMPs are developed by the Department for Environment, Food and Environmental Affairs (Defra) and the Environment Agency with the aim of working with other key decision makers within a river catchment on policies for sustainable flood-risk management. The main aims of a CFMP are to understand the factors that contribute to flood risk within a catchment and to recommend the best ways of managing flood risk within that catchment over the next 50 to 100 years.

The Environment Agency regards the CFMP as a new approach to flood management in which local actors can take part. Some organisations will have a greater interest in participating in the local CFMP consultations, such as local councils, nature organisations, the national farmers union and marine organisations. The emphasis of CFMPs is put on cooperation between the various parties in an area: CFMPs are supposed to guide future decision makers in the main issues relating to flood-risk management, rather than to impart additional legal or financial powers or responsibilities to landowners, occupiers, central, regional or local government or others. Every river catchment was supposed to deliver a CFMP in the course of 2007. A successful example of a CFMP is the Parret Catchment Project.

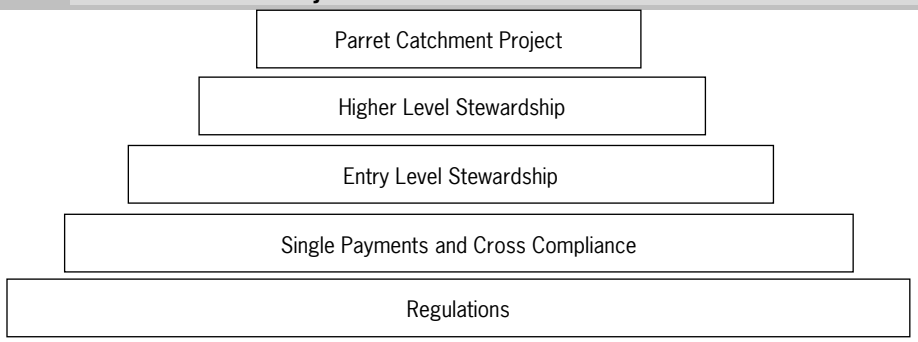
The Parret Catchment Project

The Parret Catchment Project was started by Somerset County Council even before the introduction of the CFMPs. This project is a 'Wise Use of Floodplains Project' (an EU Life-Environment Project). These projects address water and floodplain problems, such as:

1. Past practices that have disconnected rivers from their floodplains;
2. Incompatible demands, for example the need for functioning floodplains and the demand for riverside development;
3. Intensive agricultural practice;
4. Bureaucracy around water management: various aspects of water are managed separately (such as agriculture, water abstraction and land use planning), with conflicting objectives, and temporal and spatial scales.

Furthermore, the Parret Catchment Project cooperates with three Dutch partners and one German partner in 'Joint Approach for Managing Flooding' (JAF, 2006).[1] The relation of the Parret Catchment Project to other agri-environmental schemes and general regulations is shown in figure 4.1.

Figure 4.1 Parret Catchment Project in relation to other schemes



The Parret Catchment Project is a broad-based partnership whose long-term goal is to develop a sustainable approach to water and land use management that benefits the economic, social and cultural life of the Parret Catchment and conserves and enhances the environment. In order to achieve this, the Project includes the following objectives:

1. Changes to agricultural land management;
2. Creating temporary flood storage areas on farmland;
3. Controlling run-off from developments;
4. Creating new wetland habitats;
5. Raising riverbanks;
6. Upgrading pumping stations;
7. Spreading floodwater across moors;
8. Building tidal sluices or barriers;
9. Upgrading channels to enhance gravity drainage;
10. Restricting new development on the floodplain;
11. Woodland development.

Objectives 2 is a blue service, according to the definition in this study. The Project has developed six flood retention demonstration schemes, which have been in operation since the end of 2004 (table 4.1). Each scheme is tailor-made according to site characteristics, such as topography, hydrology and ecology. Furthermore, the schemes have been subject to landowner agreements and legal procedures, such as licensing, approval and consents. The flood retention part of the Project is called the Farming Water Project.

Table 4.1 Flood retention demonstration schemes in the Parret River Catchment

		Ha	Payment (£)	m^3	£/ha	£/m^3
1	Creedy Bridge	15	33,000	15,000	2,200	2.20
2	Bower Hinton Farm	0.4	37,000	5,000	92,500	7.40
3	Balham Hill Farm	1	5,000	1,200	5,000	4.17
4	Moortown Farm	30	12,000	200,000	400	0.06
5	Voker's Bridge	0.4	35,000	6,000	87,500	5.83
6	Parsonage Farm	0.1	20,000	1,000	200,000	20.00

[1] The Dutch partners are Waterschap Regge en Dinkel, Waterschap Velt en Vecht, and Waterschap Groot Salland. The German partner is Wasserverband Eifel-Ruhr.

The table shows that payments per hectare and per m^3 decrease with increasing area size and storage capacity. Considering economies of scale, this is not surprising. It is, however, possible that small schemes are very valuable for the particular area, and that it is therefore worth investing in them.

Farming Water is a successful project since the respective farmers are enthusiastic and willing to cooperate. In some cases, the stored water will be used for irrigation purposes and hence lead to an extra benefit for the farmers. The Parret Catchment Project is currently lobbying Defra for Farming Water payments to be included in the new agri-environmental schemes.

Social theory

There are often attempts to integrate floodplain management into existing agri-environmental schemes, such as the Environmental Sensitive Area Scheme or the Rural Stewardship Scheme. A particular measure these schemes propose is, for example, the reversion to wetland of land that is prone to periodic inundation. The farmers' uptake of these type of schemes is, however, generally low. The reason for this is that many flood-prone areas are very productive agricultural land. The costs of reversion to wetland can hence be very high due to the high value of this fertile agricultural land. Furthermore, allowing land to flood is generally against the tradition and instincts of farmers and is therefore a very sensitive issue, from both an economic and social point of view. A similar situation is occurring the Netherlands concerning the plans to de-polder in the Province of Zeeland. In such cases, social norms and traditions are an important reason for blue services not being established.

4.3 Resource allocation

The UK has a long tradition of applying cost-benefit analysis in policy decision making. It is hence not surprising that the general objective in flood management is not to eliminate flood risk but to reduce it until the potential benefits outweigh the costs. An important part of CFMPs is therefore the estimation of the expected damages in the case of a flood. The following is an example of such an estimation:

The estimated damages to the residential property in town A located in the catchment of river B are:

- €100,000 for a 10:1 (10%) chance event (affecting 10 houses);
- €1,000,000 for a 50:1 (2%) chance event (affecting 100 houses);
- €10,000,000 for a 100:1 (1%) chance event (affecting 1000 houses).

In total, the expected damages from flood in town A located in the catchment of river B amount to €130,000 per year.

Policy decisions based on a cost-benefit framework would imply that measures to reduce flood risk in town A located in the catchment of river B should not exceed the costs of €130,000 per year.

The cost of a potential measure to reduce flood risk should therefore not exceed €130,000 per year. For example, if the water manager wants to apply a flood-risk reduction measure in the form of water storage on agricultural land, he or she can decide either to spend the money buying the land or to enter into a contract with a farmer who offers the water manager a blue service. As shown in figure 3.1 (previous section), the water manager has to deliberate which option would be the most profitable. Factors that have to be taken into account are the land price, the damage cost, the frequency of flooding and the total number of hectares needed to effectively reduce flood risk.

The criterion for evaluating the best option is, as mentioned in the previous section, equal to:
annual damage costs (€130,000) = 0.04 * land price * number

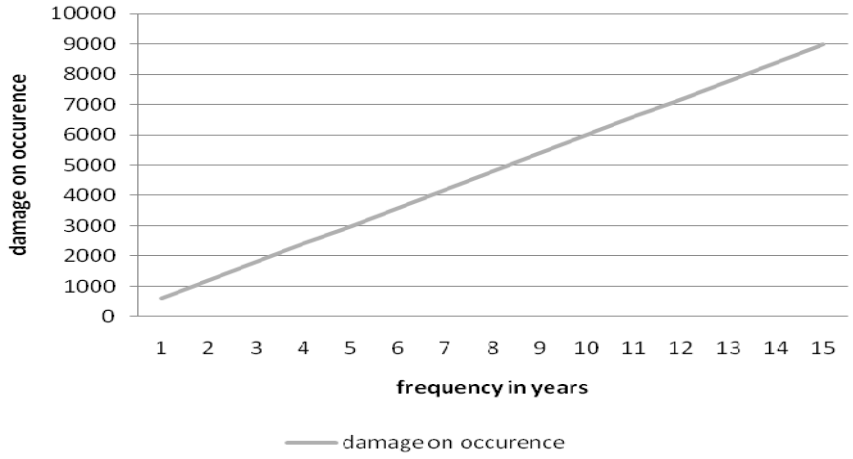
$$\frac{\text{damage costs per ha}}{\text{frequency}} * \text{number of ha} \leq \text{available amount of money (130,000 euros)}$$

$$\frac{\text{damage costs per ha}}{\text{frequency}} \leq 0.04 * \text{land price}$$

Since the available amount of money is fixed for the water manager (in this case €130,000), also the amount he can spend to buy the land is fixed. Supposing the land price is €15,000 per hectare[1], then the costs for obtaining the land are 0.04*15,000 = €600 per hectare. The expected damage upon occurrence, divided by the frequency should be lower than €600 per hectare. The relationship between the frequency and the costs is shown in figure 4.1. In general, if damage costs increase, the frequency at which the land can be used in order for blue services to be profitable is decreasing. In other words, damage costs may be higher if the frequency of inundation is lower.

At a maximum of €600 per hectare, 216 ha is the maximum that can be used for the blue service.

Figure 4.1 **Damage costs for blue services to be profitable in relation to frequency of inundation**



4.4 Public awareness

Compared to other European countries, the UK puts quite some emphasis on public awareness about flood risk in flood management strategies. Public awareness means informing property owners about flood-risk areas and the measures they have to take in order to reduce the effects of floods (this measure is hence not directly connected to a blue service). Public awareness implies that at least part of the responsibility for reducing flood risk is put on the property owners themselves. The Environment Agency therefore puts quite some effort into the development of flood warning systems and into flood awareness campaigns. It has been revealed that only 31% of homeowners in flood-risk areas have actually take any effort to find out whether they are at risk from flooding, and just 10% of those people have signed up to the Environment Agency's (free) flood warning service.

The Flood Awareness Campaign emphasises that the effects of floods can be reduced but not prevented. With the help of flood maps that show a general overview of areas that are in natural flood plains and therefore potentially at risk of flooding from rivers and the sea and that are available on the Internet, people are supposed to find out whether they live in a flood-risk area. If they do live in a flood-risk area, they should take measures such as fitting flood boards, getting sand bags, moving valuable items upstairs and tuning in to weather reports to hear about the latest conditions.

[1] €13,000 per hectare is an approximation of current average prices for agricultural land in England. In March 2007, this price was +/- UKP4000 per acre, which is (with 1 ha = 2.47 acre and exchange rate UKP1 = €1.48) around €14,600 per hectare.

Property rights
Regarding the Flood Awareness Campaign in the light of property rights, it can be said that property rights also include property duties. The campaign puts at least part of the responsibility for reducing flood risk on the property owners themselves. This fits into the general development in countries where the government is reforming the welfare state by drawing back in many fields (such as health care and pension schemes) and putting more responsibilities on the people. This process is a bigger institutional change.

Transaction costs
A public awareness campaign in the form of a national flood warning system reduces the information costs for citizens. Since information costs are part of transaction costs, such campaigns also reduce transaction costs. Citizens are more likely to invest in flood protection devices when the cost of being informed about flood risks and possible measures decreases. Also, insurance agencies may relate their cover to the presence of flood protection devices.

4.5 Conclusions

The UK has a large potential for blue services. In fact, within the framework of the Catchment Flood Management Plans, a type of blue service already exists in the UK. An important criterion for the evaluation of policy measures in the UK is the cost-benefit analysis. The costs of blue service will hence always be evaluated against the benefits, in terms of prevented damage, that it will deliver.

There have been attempts to integrate blue services into general agri-environmental schemes. In many cases the land under consideration is very fertile agricultural land. Therefore, farmers have been very reluctant to participate in such a scheme, since it is against their norms to use fertile land for water storage. It requires a rethinking of - or institutionally speaking, a change in - traditional agricultural norms that storing water in order to reduce flooding is as important as food production and that water storage is also a demand of society, just as food and fibres are.

5 Case study: Hungary

5.1 Introduction

In the last 15 years, the countries in Central and Eastern Europe have undergone some big institutional changes: they were first transformed from Communist countries with central governments into democratic countries, and then into members of the EU. The process of changing from being a centrally led country to being a democratic country presented the opportunity to create fresh institutional arrangements, also concerning water management.

One of these Central and Eastern European countries - Hungary - was chosen for a case study because about two thirds of the country's cultivated land is subject to flooding. The frequency of flooding has increased in recent years. Therefore the Hungarian government is looking for new mechanisms for water management, as technical measurements - such as building dams and digging canals - are not sustainable solutions. Thus, the country's water policy is changing from technical solutions to making land use subservient to water control.

5.2 The situation

The Danube is Hungary's most important river. Other major rivers, all of which are tributaries of the Danube, include the Tisza (the longest river in Hungary), Raab (Rába) and Drava (Drau) rivers (table 5.1).

Table 5.1 The length and watershed of rivers

River	Length (km)	Watershed area (sq. km)
Danube	**417**	**93,000**
of which Dráva	143	4,168
of which Tisza	597	46,737
of which Maros	50	1,885

Source: The Hungarian Central statistical office.

Domestic topographical features are not the decisive factor behind the causes of flooding in Hungary. The water yield of our rivers is dependent to a significant degree on the water management in the upstream countries. Within Hungary's borders, the total area of floodplains along rivers and minor watercourses is 35,000 square km. During the period 1995 -2000, Hungary experienced flooding and had to apply emergency protective measures for varying periods of time every year with the exception of 1997.

5.2.1 River basin management in Hungary

As part of the present transition in socio-economic and political structures, there is an increasing need to coordinate newly emerging and often conflicting water-related interests, such as privatised agriculture, new local authorities and nature conservation organisations. There is a demand for regional water management plans that are based on broad consent and can provide a stable framework for investment projects and for regional development.

Following West European examples, the water administration organisations of Hungary have decided to promote the practice of River Basin Management Plans (RBMP) as a tool for finding consensus among users and for devising commonly accepted long-term policies that are environmentally sound and also feasible from the water management point of view (KHVM, 1994).

The EU Water Framework Directive (WFD) foresees the objective of producing a single River Basin Management Plan for the Danube as an international River Basin District. The Plan will be based on the WFD and

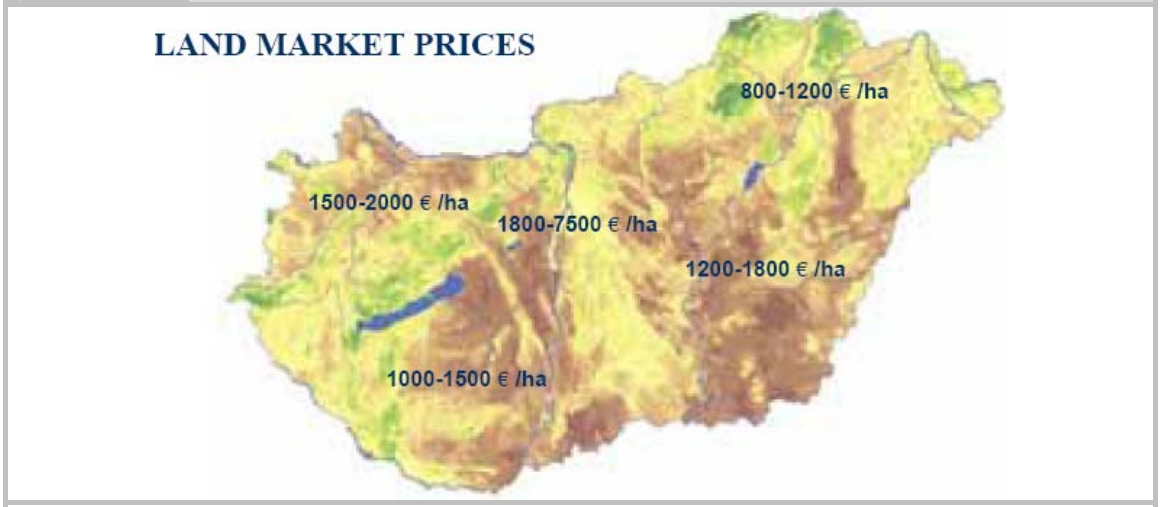
will also meet the requirements set out by the Convention on Cooperation for the Protection and Sustainable Use of the Danube.

5.2.2 Land prices in Hungary

The land prices are in the range of €1,300-1,800 per hectare; the price of one hectare of average quality land was €1,550. In the western part of the country (Transdanubia) and around Budapest, the prices are generally higher. In southern Transdanubia and in the northern part of the country, the prices are lower. The regional distribution of land prices in Hungary shows extreme variation (figure 4) (Sebestyen, 2005).

The government already has some framework to increase the land prices. So it can be estimated that Hungarian and EU prices will get nearer to each other in the coming years. Low land prices are caused by the profitability and the protected market. The government has already made plans to liberalise the rural land market.

Figure 5.1 Land prices in Hungary



Source: RLM, 2005.

5.3 Agricultural production

In general, it is best to combine peak-flow storage with grassland (i.e. with grazing livestock). In Hungary, such farms have a gross production value (GPV) of around €800 per hectare and the profit per hectare is €125.

In Hungary, 80% of farms have less than two hectares of land; between them, the occupy about 8% of the country's agricultural land. On the other hand, 1% of farms have over 100 ha; these farms occupy 65% of the agricultural land.

5.4 Possibilities for blue services

Resource allocation

With an interest rate of 4% and a land price of €2,000 per hectare, the annual cost of buying the land to the water manager is €80. This is the upper limit for the annual payment for a blue service. The compensation for the blue service is at least the expected damage caused by the water storage. The expected damage is calculated according to the loss by occurrence and the frequency. The damage is usually calculated as a percentage of the GPV.

Transaction costs

The transaction costs for farms that have over 100 ha will probably be lower, because only a limited number of farmers have to be negotiated with. It is also likely that it will be easier for these farmers to incorporate the blue service within their farm management plan.

The monitoring requirements are limited, as only the land has to be available for storing the water. It does not really matter to water manager how it is done on the farm; it is the responsibility of the farmer. The water manager has to assure the water quality and to take action to limit the need to store peak flows; this can include recurrent reports to the farmers. The information gathering process is for a large farm more efficient than for small farms, as it can be used for more hectares.

Institutions

As in all EU countries, the possible blue service is subject to the state aid test, which prevents the government from paying a market price for blue services. The EU prescribes the amount of compensation for losses/costs that is paid to the farmer.

Hungary's Ministry of Environment and Water Management is responsible for preventing floods, a task that it delegates to the state water services. The ministry plans crisis reservoirs in flat areas, which can include agricultural land. Besides the ministry, there are also 12 water management boards for the 12 water districts.

5.5 Conclusion

The low land price in Hungary limits the possibilities for blue services, because it is very attractive to acquire the land and thus allow the water manager full control over it. This reduces the transaction and monitoring costs. Hungary faces frequent small-scale floods and every 10-12 years serious floods. For these serious floods peak-flow storage can be an option. For the more frequent floods, it is more attractive for the water manager to acquire land. At a frequency of every ten years, the damage per occurrence should not be the complete GPV, otherwise the blue service would be just as expensive as acquiring the land. And then the transaction costs will play an important role. It is very like that these are higher in the case of a blue service than by acquiring the land. As two thirds of the land is owned by large-scale farmers, the transaction costs can be rather limited.

At the moment, the land price is the biggest obstacle to blue services in Hungary. However, the government has already created some legal frameworks to increase the land prices to those at the EU level. The land prices are expected rise in the coming years. When the land prices double or triple, the limited GVP losses will also increase. The water managers and farmers who offer the land for water storage can get common profit through blue services. By that time, the blue services will be a possibility in Hungary.

6 Case study: Germany - the Dinkel river

6.1 Introduction

This section describes the plans for a blue service at the Dinkel river, which meanders through Germany and the Netherlands. This case demonstrates that different institutional backgrounds, with differences in standards and norms regarding the underlying legislation, can be a large obstacle to blue services. Section 6.2 gives a short description of the Dinkel and the water management plan for the Dinkel valley. Section 6.3 describes the main problem, namely the differences in legislation. Section 6.4 presents the conclusions.

6.2 The Dinkel - an Interreg project

The Dinkel originates in the district of Coesfeld in North Rhine-Westfalia and enters the Netherlands at Losser/Twente. The Dinkel recrosses the border into Germany (now Lower Saxony) close to Denekamp (NL) and joins the Vecht river at Neuenhaus. The Vecht enters the Netherlands at De Haandrik, where it becomes the Overijsselse Vecht. The total length of the Dinkel is 93km and it falls under the responsibility of three authorities: the Regge-Dinkel water board in the Netherlands (46km), the German state of North Rhine-Westfalia (38km) and the German state of Lower Saxony (9km).

Within the framework of an INTERREG project, the Regge-Dinkel water board, the state of North Rhine-Westphalia and the state of Lower Saxony cooperatively developed a management plan for the Dinkel valley. The aim of this plan is to improve flood protection and to reduce peak-flow discharges by at least 5% through such measures as restoring the original course of the river and utilizing natural retention areas. According to model calculations, the implementation of all measures proposed in the plan could reduce peak-flow discharges by approximately 40% (Tempelman-Bobbink, 2002; EUREGIO, 2001).

6.3 Different legislative backgrounds

The fact that the Dinkel plan covers three administrative districts appeared to be a problem for a successful implementation of blue services. Although the three participating parties were very willing to cooperate and inform each other during the implementation stage of the plan, practical problems occurred due to differences in the legislative background the three authorities have to comply with. An important example with regard to flood protection is the difference in retention standards, which prescribe at which water level the retention areas can be used. In the Netherlands these standards are tighter than in the two German states, which imply that in the Netherlands the retention areas can be used already at lower peak-flow water levels than in Germany. In practice, this implies that at in the case of a peak flow the Regge-Dinkel water board cannot make use of the retention areas on German territory, since in Germany retention areas may be used only at higher water levels. A reason for more generous retention standards in Germany is that river valleys are better protected from housing development. Therefore, there is already more space available for peak-flow discharge, which implies that retention areas are needed only during very high tides. Differences in retention standards may hence also be regarded as differences in the definition of 'flood'.

The differences in legislation attached to a particular piece of land can be connected to the property rights theory. For example, two pieces of land with different retention standards have two differently composed bundles of property rights.

6.4 Conclusions

The Dinkel case shows that in cases of different administration districts, correspondence of legislative backgrounds is an important criterion for facilitating blue services. However, the Dinkel case is only about areas that have already been assigned as retention areas in the case of high peak-water levels. Farmers may be willing to offer their land for water storage even if the retention standards have not yet been reached. This case would represent a 'proper' blue service, since the service is offered on the basis of private decision making and not on the basis of legislation that prescribes that the particular land has to be used for water storage since it has been assigned as a retention area.

7 Conclusions

The first part of this section concerns the European preconditions related to blue services. The second part presents a decision scheme for blue services, while the third part is about possibilities for blue services in Europe.

7.1 European preconditions

The European preconditions consist of the requirement concerning the state aid test. This test prevents governments from paying a market price for green or blue services. A farm is allowed to receive €3000 in three years, because the agricultural sector has more strict limitations. In fact, only compensation for production loss/costs (plus 20% management fee) is allowed. For a farmer, a green or blue service is not attractive if he cannot receive a market price.

Because agricultural holdings already receive subsidies based on the CAP, the agricultural holdings face more limitations concerning state aid.

Behind the European State aid test is the control within the WTO (World Trade Organization) with regard to unfair competition between farmers in different parts in the world. Other countries will make a case in the WTO if they think that governmental bodies are benefiting farmers by paying for green or blue services.

Green and blue services can disturb the market prices for agricultural commodities, as these services will provide a part of the income of the agricultural holding. On the other hand, it can also be considered as an independent agricultural activity for the agricultural holding, and an economic entity will always strive for profit maximization.

The payments for peak-flow storage will in practice always be done (directly or indirectly) by a governmental body. A water board is also considered a governmental body, although it is completely financed by the inhabitants of the water body area. In other countries, it is usually a municipality that is responsible for the safety of its inhabitants.

7.2 Possibilities in Europe

The possibilities for the blue service 'peak-flow storage' can be represented by the following formula F_{chance} (frequency, land price, damage, institutions, transaction costs).

The possibilities for blue services are rather limited, first because of the frequencies of floods. But the second, and more important reason is the land price. In most situations the land price is too low for institutionally more difficult arrangements like blue services, because of the higher transaction costs. The Hungary case showed that the land price was too low and buying the land would be wiser for the water manager.

Higher land prices are found in more densely populated areas, because land is scarce in such areas. The map of Europe, showing the population per square kilometre, gives a first indication of possible areas (see figure 7.1). Parts of Germany, Belgium, England and Italy are more densely populated. In Scandinavia, Spain and France the possibilities are limited.

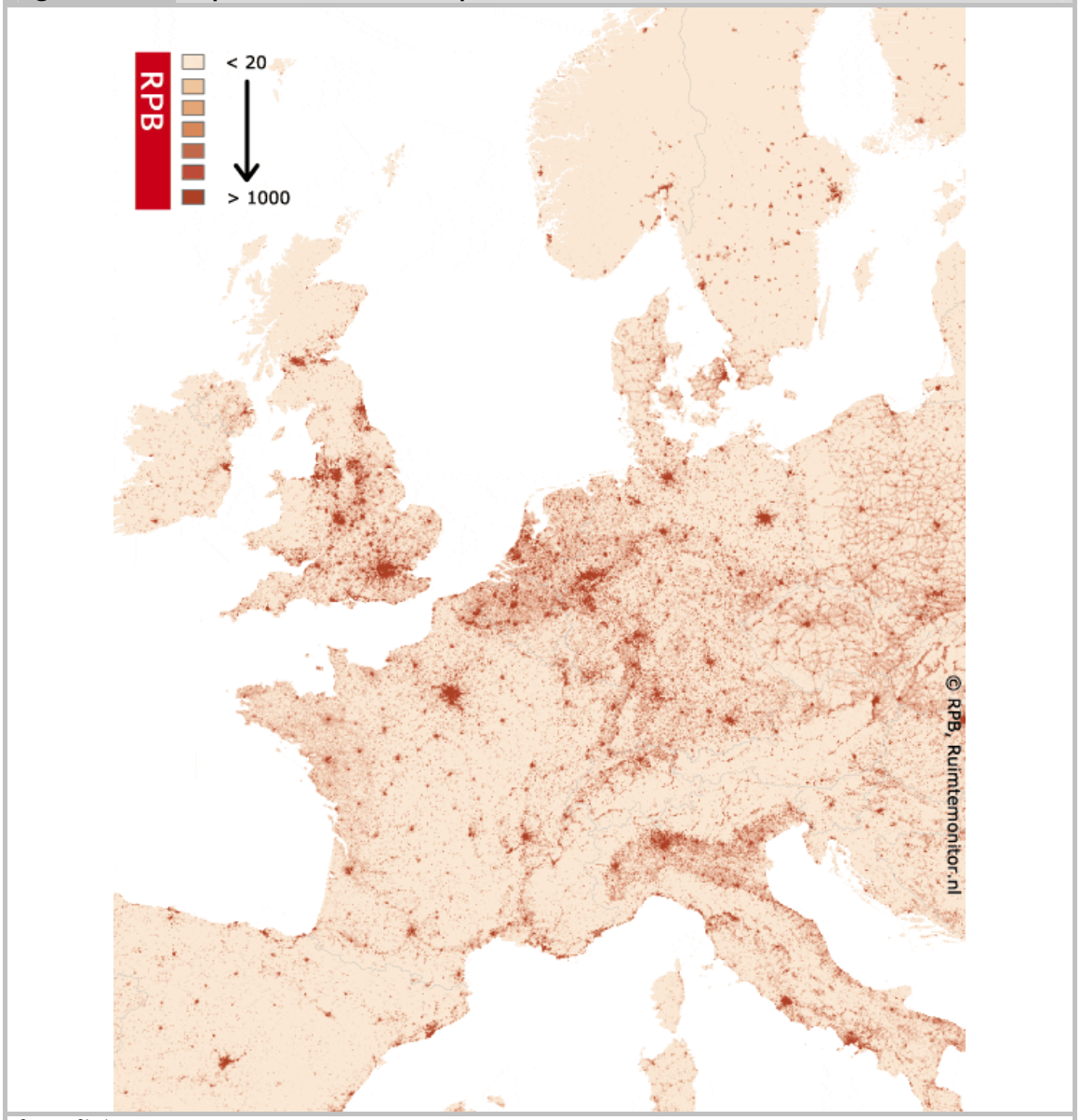
In the case of grassland, the damage caused by flooding is usually rather limited, so that will not be an obstacle to blue services. When the land is used by a farmer who does not want to deliver the service, land exchange between farmers can be an option.

In other European countries, the use of agricultural land for flood protection is often regulated by law. For example, Germany has the GAK (Gemeinschaftsaufgabe Verbesserung der Agrarstruktur und des Küstenschutzes; 'common tasks for agricultural structure and coastal defence'), which promotes such measures as the re-meandering of rivers and streams, the change of arable land into permanent grassland and the restoration of river meadows.

Furthermore, agricultural land in flood-sensitive areas (even if the risk of flooding in rather low, such as once in 100 years) is often designated as flood areas in the spatial plan. In terms of property rights, such a case is an example of divided ownership: the government possess the right to use the land as a retention area in the case of extreme flooding. Theoretically, the farmer does not even have the right to claim compensation payments for the production losses caused by a flood. In practice, however, the losses are in most cases compensated for, at least in part.

The use restriction the farmer is confronted with in such a case should theoretically be reflected in a lower land price. Another reason why blue services may be less obvious in other European countries is the difference in the need to make use of retention areas. Space is scarce in the Netherlands, which is why river valleys and water meadows are less protected against the development of housing and industry. The fact that space is planned tighter in the Netherlands than in Germany was illustrated by the Dinkel case (see Section 6).

Figure 7.1 **Population densities in Europe in 2003**



Source: Ciesin.

Literature

Alchian, A. A. and H. Demsetz, 'Production, information costs, and economic organisation'. In: *American Economic Review* 62(1972) 5.

Arrow, K., 'The Economics of Agency'. In: Pratt, J. W. and Zeckhauser, R. J. (eds), *Principals and Agents: The Structure of Business*, Harvard Business School Press, Boston, 1985.

Barlowe, R., *Land Resource Economics*, Prentice-Hall, Englewood Cliffs, 1972.

Bureau Juridische Zaken, *Checklist Staatssteun*, Bureau Juridische Zaken, Directie Concernzaken, Provincie Zuid-Holland, 2005.

Challen, R., *Institutions, transaction costs, and environmental policy: Institutional reform for water resources*, Edward Elgar, Aldershot, 2000.

Coase, R. H., 'The problem of social cost', *Journal of Law and Economics* 3 (1960).

Coase, R. H., 'The Nature of the Firm', In: *Economica* 4 (1937) 16.

Dales, J. H., 'Land, water and ownership', In: W. E. Oates (ed.), *The Economics of the Environment*, Cambridge University Press, Cambridge, 1992.

Demsetz, H., 'Towards a Theory of Property Rights', In: *American Economic Review* 57 (1967) 2.

Europa decentraal, *Handreiking voor een collegebesluit inzake subsidieverstrekking en steunverlening*. Kenniscentrum Europa decentraal, The Hague, 2004.

EU, 2006a, *The EU Rural Development Policy 2007-2013*, European Communities, 2006.

EU, 2006b, *Directive of the European Parliament and of the Counsel on the Assessment and Management of Floods*, European Communities, 2006.

EU, *The Common Agricultural Policy Explained,* European Communities, 2004.

Euregio, *EU-Gemeinschaftsinitiative INTERREG-II für die EUREGIO*, EFRE nr. 94/00/10/020, Endbericht, 31.12.2001, Gronau, 2001.

Furubotn, E. G. and R. Richter, *Institutions and Economic Theory: An Introduction to and Assessment of the New Institutional Economics*. University of Michigan Press, 1997.

Hubbard, M., 'The New Institutional Economics' in Agricultural Development: Insights and Challenges', In: *Journal of Agricultural Economics* 48 (1997) 2.

JAF, www.jaf.nu, 2006.

Jensen, M. C. and W. H. Meckling, 'Theory of the firm: Managerial behaviour, agency costs and ownership structure', *Journal of financial economics* 3 (1976).

KHVM, *Regional Water Management Planning Guidelines*, Ministry of Transport, Telecommunication and water Management, 1994.

LNV (Ministry of Agriculture, Nature and Food Quality), *Structuurschema Groene Ruimte 2, Samenwerken aan groen Nederland*. LNV, The Hague, 2002.

LNV (Ministry of Agriculture, Nature and Food Quality), *Nederlandse Catalogus Groenblauwe diensten 2007*, LNV, The Hague, 2006.

North, D. C., *Institutions, institutional change and economic performance. Political Economy for Institutions and Decisions*, Cambridge University Press, 1990.

Sebestyen, R., *Latest development of the rural land market in Hungary*, RLM, 2005.

ROB (Counsel of public government), Water in orde: bestuurlijke organisatorische aspecten van integraal waterbeleid, Rad voor het openbaar bestuur, Den Haag, 2001.

Tempelman-Bobbink, S., 'Grensoverschrijdend waterbeheer'. In: *Neerslag 5 (2002)*, <http://www.neerslag-magazine.nl/artikel.asp?key=207>, entered on 8 November 2005.

VROM, *National Spatial Strategy*. Ministry of VROM, The Hague, 2004.

Van Bommel, K. H. M. and A. J. Reinhard, Water related services and contract economics, 80th EAAE Seminar, New Policies and Institutions for European Agriculture, Ghent, 2003.

Williamson, O. E., 'The Institutions of Governance', In: *American Economic Review* 88 (1998) 2.

Williamson, O. E., 'The Economics of Organisations: The Transaction Cost Approach', In: *The American Journal of Sociology* 87 (1981) 3.

Appendix 1

Water authorities in European countries

(from www.aquaneteurope.eu)

Belgium

The Flemish government made an order implementing the Decree on Integral Water management on 9 September 2005 (the Walloon government had implemented a similar order on 13 September 2001). This implementing order decides on the geographical classification of the water systems by marking out the river districts, the basins and the sub-basins within the Flemish region. It also decides on the formal creation of different consultative structures on different levels. In practice, this means the creation of:

1. the Coördinatiecommissie Integraal Waterbeleid (Coordination Commission on Integral Water Management) on the level of Flanders;
2. Basin authorities, basin secretaries and basin consultative structures on the level of the basins;
3. District water boards on the level of the sub-basins.
   Relevant documents produced: map of the river districts in Flanders (http://www.ciwvlaanderen.be/uploads/b577.pdf).

Map of the river basins in Flanders (http://www.ciwvlaanderen.be/uploads/b578.pdf).
Map of the international river basin districts in Wallonia (http://environnement.wallonie.be/directive_eau/fiche_ssb/dhi_general.asp).

France

In France, the identification of river basins dates from 1964. This identification has been sharpened since the adoption of the WFD, in order to better correspond to the definition of district.

The list of hydrographic basins forming a district or a French part of an international district was sent to the EC in June 2004.

Relevant documents produced: geographical commissions are a new work scale, which will replace the department's commissions, in order to work at the hydrographic districts' scale.

The Agences de l'Eau (water agencies) are the river basin agencies (six in France). Created in 1964, their status was redefined in 1992: they used to be simple financial agencies, but are now management organisms.

(http://www.eau-loire-bretagne.fr, http://www.eau-adour-garonne.fr, http://www.eau-artois-picardie.fr, http://www.eau2015-rhin-meuse.fr, http://www.eau-seine-normandie.fr, http://www.eaurmc.fr).

The Commission Locale de l'Eau (CLE; local commission for water) is in charge of developing, updating and evaluating SAGEs (Schemas d'Aménagement et de Gestion des Eaux; development and water management schemes). The CLE is composed of representatives of the local communities and local public institutions (50%), representatives of users, riverside owners, professional organisations and NGOs (25%), and representatives of the state and its public institutions (25%).

Relevant documents produced: Schémas Directeurs d'Aménagement et de Gestion et des Eaux (SDAGE; development and water management main schemes), created in 1992 and implemented in 1996, once revised in 2009, will be considered as management plans (RBMP) for the watersheds. The schemes are currently being updated in the various watersheds, and have been and will be the subject of a public and water actors (constituted in watershed committees, 'Comités de Bassin') consultation in 2005 and 2007. SDAGE are written by the Watershed Committee, which is composed of representatives of local communities, state services and users. On the local level the SDAGE are worked out into SAGEs, which allow work to be done on a more precise scale, within coherent hydrographic sub-basins.

Comments: international cross-border districts still do not have real cross-border river basin agencies (examples in France are the Rhine or the Rhone).

Italy

Decree 152/2006 defines the perimeters of the water districts, of which there are nine. The decree also abrogates all sector laws, in particular law 183/89, on soil protection and water resources, abrogating the existing water basin authorities, at national, inter-regional and regional level established in 1989.

In June 2006, the government extended the existence of water basin authorities to 31 December 2006, by which date indications were to be given on the modifications to the decree and the role of the water authorities and the perimeter and institutional assets and powers of the river districts.

Actors involved: Italian Ministry for the Environment.

Relevant documents produced: D. Lgs 152/06: official site: www.comdel.it, or http://www.gruppo183.org/leggedelega/commenti183sudecretoambientaledelegato.html (only in Italian).

Comments: The present situation is worse than the previous one, when the planning of river basins was done by river basin authorities, designated on hydrogeological criteria.

Decree 152/ 2006 designated water districts on criteria that are hard to understand. Moreover, the decree does not make clear what authority the districts will have.

The Netherlands

The Netherlands is divided into four river basin districts: Rhine, Meuse, Eems and Schelde, all of which are international rivers. The river basin districts are divided into sub-districts.

Many authorities are involved in water management. The Ministry of Transport, Public Works and Water Management is responsible for national waters. The provinces are responsible for regional waters but they have delegated a part of their responsibility to the water boards. The municipalities are responsible for the sewer systems.

Actors involved: The river basin districts are identified by the national government, the 12 provinces, the 27 water boards and the municipalities.

Comments: The fact that so many authorities are involved in water management has advantages and disadvantages. The positive effect is that all authorities are bound to cooperate with each other; the negative effect is that such a large number of authorities can make matters very awkward and time consuming.

Spain

A decree identifying river basin districts and authorities is under elaboration. Existing administrative structures for water planning are developing the implementation of WFD, acting in fact as river basin authorities. Water authorities have as geographic scope of responsibility a river basin (in the case of big rivers) or a set of river basins.

If a river basin affects more than one autonomous community or it is an international river basin, then water authorities depend on the Ministry for the Environment. This is the case for the following river basins: Júcar, Ebro, Tagus, Duero, North, Segura, Guadalquivir, Guadiana.

If a river basin belongs exclusively to one autonomous community, the water authorities depend on the regional government. This is the case for the internal river basins of Catalonia, the Basque Country and Galicia, and the Andalusian Mediterranean basin and Andalusian Atlantic basin.

Comments: this task - which was to be completed by 2003 - has been delayed indefinitely by the government. The lack of definition regarding the regional or state character of competences for managing river basins is now very affected by the current revision of autonomy statutes, in which the administrative and political responsibilities of regional governments are laid down. This obviously also affects the administrative definition of river basin.

Up till now, existing water administrative structures have functioned as *de facto* river basin authorities (and their geographical scope of competences as the river basin district). This applies, in general terms, to inter-communitarian river basins, although some of them have recently suffered reductions in their geographical scope (Guadiana and Guadalquivir) in order to create the Andalusian Atlantic basin (under exclusive regional authority responsibility).