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Exploring transition pathways to sustainable, low carbon societies

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Deliverable 2.2: ‘Analysis of stability and tensions in incumbent socio-technical regimes’

Country report 11: Regime analysis of the Dutch land use system

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Preface

This report is produced in the context of work package 2 ('Dynamics of transition pathways') of the FP-7 funded PATHWAYS project ('Exploring transition pathways to sustainable, low carbon societies'). More precisely, this report provides the Dutch country study of the land use regime for deliverable 2.2: 'Analysis of stability and tensions in incumbent socio-technical regimes'.

The analysis in this report is based on a research template that is shared between the different contributors to WP2 to enable comparative analysis of findings between countries (UK, Netherlands, Sweden, Portugal, Hungary and Germany) and empirical domains (electricity, heat, mobility, agro-food and land use).

Executive summary

The land use domain consists of different regimes, namely the agricultural, nature, water and urban regime. Each of these regimes consists of a socio-technical system (tangible elements) and a socio-technical regime (intangible elements). This report describes the different regimes with the goal to assess the stability and tensions in the different regimes. Besides the analysis of the different regimes the overall system trends and developments and external landscape developments are described.

In the external landscape we can make a distinction between destabilizing and stabilizing developments. The main destabilizing developments are climate changes, increasing pressure on land, urbanization, the economic crisis, increasing demand of energy by households and digitalization of society. Furthermore external events like floods or animal diseases have an impact on land use as well. Recent policy changes have led to shifts in the policy on land use and for example the nature regime.

The main stabilizing developments are the fact that land use is hard to change as the character of land use is stable. The way land is used is not easy to change and investments, that are often large, have a long time horizon. Furthermore institutions are locked in, especially in the water and nature regime.

The main challenges related to multifunctional land use are dealing with biodiversity goals. Greenhouse gas emissions do a play a role as well, but the most visible direct effect is on biodiversity. The global goal is to stop the decrease in biodiversity. In order to reach the targets for biodiversity, different pathways can be taken. In this report we will mainly focus on the decentralized pathway, in which solutions are found in consumption, land use and reduction of emissions. The plan for the Netherlands is to expand the nature network with 80,000 hectares new nature between 2011 and 2027. However, much will depend on choices made regarding policy.

For every regime the developments in the socio-technical system and socio-technical regime are discussed. The table below provides an overview of the overall assessments of the different regimes. The analysis showed that the different regimes, except for the nature regime are strongly locked in. Large investments (agriculture, water, urban) with a long time horizon make that change cannot be realized easily. Furthermore institutions are strongly organised.

The main cracks and tensions seem to be caused by policy changes. In all regimes, except for the nature regimes, cracks and tensions are moderate or weak, what means that radical changes are not to be expected on the short run. The nature regime is different as recent policy changes have caused differences in organisation and managing the nature regime. In the land use domain we see that the lion's share of the changes is caused by crises, often originated from the landscape, such as animal diseases, the financial crises or floods.

What is characteristic for the land use domain is that as a result of competing claims on land the regimes are influenced by other land use regimes. Examples of regimes influencing each other are the nature and agriculture regime. These two regimes are sometimes conflicting, but can also strengthen each other. Multifunctional land use is, as is already suggested by the name, a combination of different regimes, and not necessarily a modal shift in which one regime is growing and another one is declining. In order to be able to study multifunctional land use it is important to take into account different regimes. Often changes are caused by changes in other regimes.

In general the main changes in the land regime can be called transformation of existing regimes, rather than 'opening up' the regime for niche innovations emerging into new regimes as a result of major cracks and tensions.

Table 1 Overall assessment of land use regimes

| Overall assessments regimes | | |
|------------------------------------|--|---|
| | Lock-in, stabilising forces | Cracks, tensions, problems and opportunities |
| Agricultural regime | <p>STRONG</p> <ul style="list-style-type: none"> As the lobby in the agricultural sector is strong and relations are established by the chain, the agricultural sector is strongly locked in. | <p>WEAK TO MODERATE</p> <ul style="list-style-type: none"> Recently some cracks and tensions are getting visible, mainly caused by public debates and pressure from NGOs on topics like animal welfare, sustainability and healthy food. |
| Nature regime | <p>MODERATE</p> <ul style="list-style-type: none"> The origin of nature conservation and the institutions organizing it are somewhat locked in. But changes are occurring in conservation practices and financial constructions. | <p>STRONG</p> <ul style="list-style-type: none"> There is a policy shift from protecting nature towards a more central role for nature in society. Furthermore financial resources are changing what makes that the organisation/management of nature is subject to change |
| Water regime | <p>STRONG</p> <ul style="list-style-type: none"> Not easy to change, as projects are determined for a long term. The institutionalised environment is locked in. | <p>WEAK</p> <ul style="list-style-type: none"> There seem to be opportunities to couple the water regime with nature or housing; however water safety is often the core of developments. |
| Urban regime | <p>STRONG</p> <ul style="list-style-type: none"> Once buildings are there, it will not be easy to change in another type of land use. Regulations regulate most of the issues with build-up areas. | <p>MODERATE</p> <ul style="list-style-type: none"> There are not many radical tensions or problems to be expected. The build-up area is not so much under discussion (in the Netherlands). However cities are an interesting place where new initiatives start, like urban farming, smart cities and green roofs. |

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1. Introduction

1.1. Context, goals and research questions:

The goal of task 2.2 is to analyse the degrees of stability and tension in the Dutch land use domain. This analysis is an important step in the broader analysis of transition dynamics using the multi-level perspective (MLP). The MLP suggests that transitions come about through interactions between processes at different levels:

- 1) Niche-innovations gradually build up internal momentum (through positive interactions between learning processes, vision articulation, and social network building),
- 2) Exogenous changes (at the so-called ‘landscape level’) create pressures on the regime,
- 3) Destabilization of the regime (cracks and tensions) creates windows of opportunity for wider diffusion of niche-innovations.

The first step has been analysed in deliverable 2.1 of the PATHWAYS project (J. V. Zwartkruis et al., 2014), in which niche innovations are studied. These niche innovations are combinations of land use functions, so called multifunctional land use innovations. The niche innovations we have studied are:

1. Biodiversity in cities
2. Business and biodiversity
3. Local renewable energy production
4. Resilient landscapes for ecological protection
5. High nature value farmlands
6. Natural heritage landscapes

In the project proposal two Pathways were defined (see table below).

Table 2 Overview of pathways

| | Pathway A: Technical component substitution | Pathway B: Broader regime transformation |
|--------------------------------|--|--|
| Key actors | Incumbent actors (often existing industry actors and national governments) | New entrants, including social movements, civil society actors |
| Focus of transformation | Focus on replacing technologies and management types by better ones with the same function | Technological changes are combined with wider behavioural and cultural changes |
| Speed | Easier to implement in the short-run | Depends on wider societal change, therefore slower in the beginning and more risky |
| Depth and scope | Changes are implemented only in as far as they meet the societal goals | Broader societal involvement and changes |

The innovations described in deliverable 2.1 do all belong to pathway B, as they are examples of wider societal changes and are about a broader societal involvement. New parties are entering the domain (e.g. local energy collective, collaborations between companies and farmers) but existing actors are also developing new tasks (e.g. farmers involved in tourism).

Based on the study of these niche innovations, we assessed the overall momentum in the land use domain as medium. Niche innovations are developing, but are to a large extent dependent on subsidies from for example the government. This dependency on subsidies makes them dependent on policy support. A distinction can be made between maintaining land and spatial planning/design innovations.

- Maintaining land is about measures to maintain certain characteristics of the area. Measures are necessary over and over again, so is money. One investment is not enough, but money is necessary on a regular basis. Examples of maintenance innovations are: business and biodiversity, local renewable energy, agricultural nature conservation and tourism.
- Spatial planning/design innovations ask for an investment in the beginning (e.g. water management and nature conservation) and only a limited amount of money in later stages. One investment can lead to a change in land use. The innovations urban farming and water management and nature conservation belong to this category. It is also possible that a change in spatial planning lead to a change in land use that is not necessarily multifunctional, but a shift from one way of land use to another.

Niche-innovations that combine functions and collaborate with other actors or participate on different movements simultaneously (e.g. protecting against floods and creating nature) tend to lead to more efficient land use and directly or indirectly influence biodiversity.

In deliverable 2.1 the focus was on multifunctional land use. In multifunctional land use, the focus is on combinations of different functions of land use; e.g. nature and water or agriculture and nature. The functions of land use are seen as different land use regimes. Therefore, the innovations described were mainly occurring on the cross-section of regimes (see Figure 4).

Step 2 and 3 will be analysed in this report for the Dutch land use domain.

The research questions are:

- 1) What are the main external landscape developments that affect the Dutch land use regime?
- 2) Do external pressures and internal problems lead to tensions and destabilisation of the Dutch land use regime? Or is the regime still fairly stable, with (most) actors focusing on incremental change?

1.2. Analytical framework

Work package 2 uses a socio-technical framework, which makes a distinction between:

- *Socio-technical system*, which refers to the configuration of elements necessary for the achievement of a societal function (such as mobility, heating, sustenance/food and light/power); these elements may include technical artefacts, production facilities, supply chains, infrastructure, markets, consumption patterns, repair facilities, formal policies. Socio-technical systems refer to relatively ‘tangible’ elements that can often be measured quantitatively (e.g. technical performance, price, market demand). In the land use domain this will mainly refer to ‘tangible’ or ‘visible’ performance, and for example formal policies and production facilities.
- *Socio-technical regime*, which refers to the cognitive, normative and regulative institutions (Scott, 1995) that shape the actions, interpretations, and identities of the actors that reproduce elements of the socio-technical system. These actors include: firms, consumers, policymakers, civil society actors, wider publics, scientists. The

focus is more ‘intangible’ elements, referring to beliefs, motivations, strategies, alliances, goals, norms that underlie concrete actions. In the land use domain this will mainly refer to public opinions and visions, the actors involved and the goals underlying action.

For the analysis of stability and tensions, we will look both at the socio-technical systems and the socio-technical regime and actor perceptions and commitments.

The figure below is a graphical representation of the analytical framework. As the figure shows the land use domain consists of different regimes consisting of a socio-technical regime and a socio-technical system. The land use domain is positioned in and influenced by the landscape.

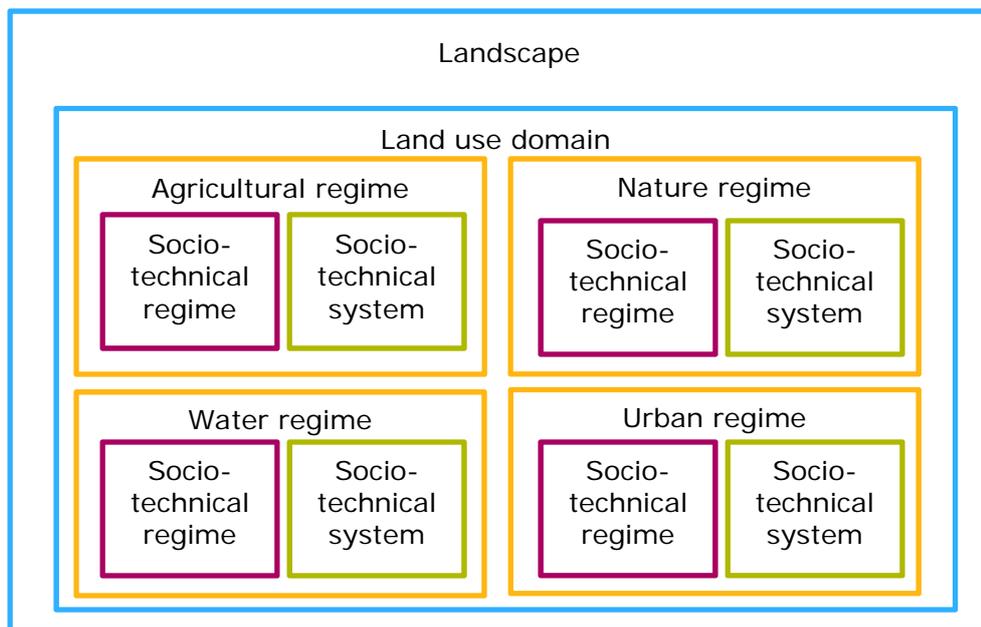


Figure 1 Graphical representation of analytical framework

1.3. Characterization of land use system and project focus

As land is used for various end-use functions, we have divided the **land use system** into different land use regimes: urban areas, agriculture, forestry, nature, water/wetlands. To understand land use transitions, one needs to understand the main dynamics of the different regimes and their interactions, which can lead to changes in relative size (e.g. decreasing agriculture may lead to increasing size of ‘nature’) or new combinations such as multi-functional land use (which have been studied as niche-innovations).

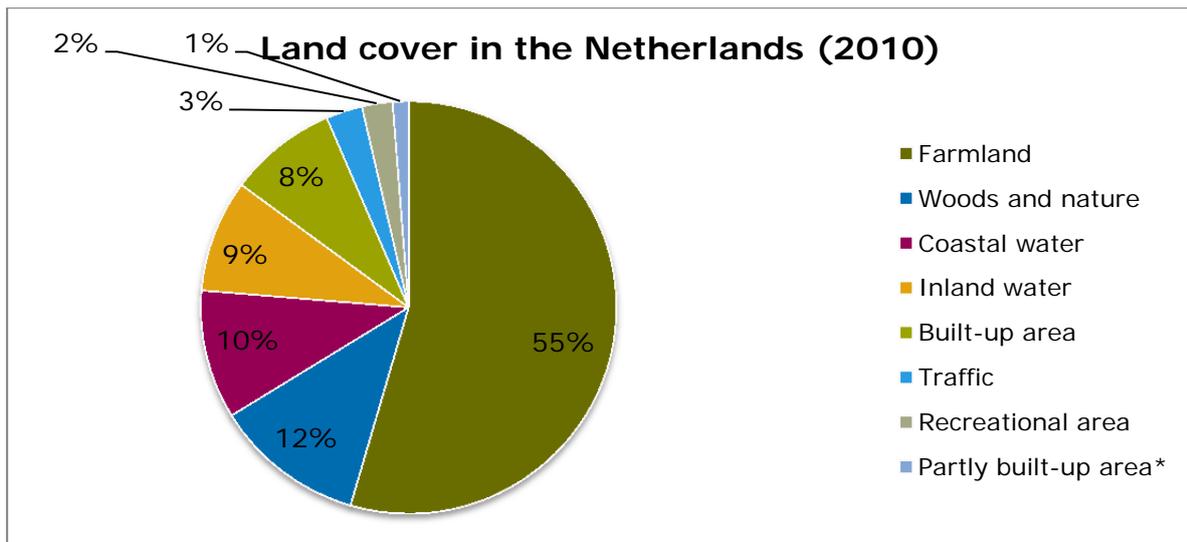


Figure 2 Land cover in the Netherlands in 2010 (CBS, 2014a) (*= paved terrain not in use as infrastructure or built-up area)

This attention for multiple regimes is academically interesting, because much of the literature assumes that green niche-innovations struggle against single regimes, while multifunctional land use in the Dutch case shows many examples of struggles against more than one regime or efforts to combine multiple regimes. The niche-innovations we have studied are examples of combinations of different land use regimes. This leads to practical challenges for task 2.2: the analyses of different regimes should be concise and focused on the main developments, to be able to get an idea of how niche innovations are influenced by regimes and the other way around.

1.4. Data-sources

Quantitative information for ‘tangible’ system elements is based on data from LEI WageningenUR (Agricultural Economic Institute), CBS (Statistics Netherlands) and PBL Netherlands Environmental Assessment Agency.

Qualitative data and interpretations draw on secondary sources (books, articles, reports) and primary sources (White Papers, policy documents, newspapers, company annual reports, and industry journals) complemented with a workshop with experts at PBL and 2 additional semi-structured interviews (see annex 1 for interviewees and participants).

1.5. Report structure

The report is structured as follows. Chapter 2 describes overall system trends and longitudinal developments. Chapter 3 identifies the main external landscape developments that affect the land use regime. Chapter 4 to 7 describe the longitudinal developments in the Dutch agriculture, nature, water and urban regime. And Chapter 8 provides conclusions on stability and cracks in both regimes.

2. Overall system trends and longitudinal developments

2.1. Characterisation of the land use regime

The Dutch land use regime consists of many actors on different levels. Generally in the Netherlands land is used intensely, often competing claims exist is expensive, and many different actors are involved that influence the land use. Which actors are involved depends on the type of land use. For example in the case of water, the water authority plays an important role, while in the urban regime the municipality plays a role. Therefore the figure below, representing the general land use system, shows the actors involved based on their role (e.g. user, owner).

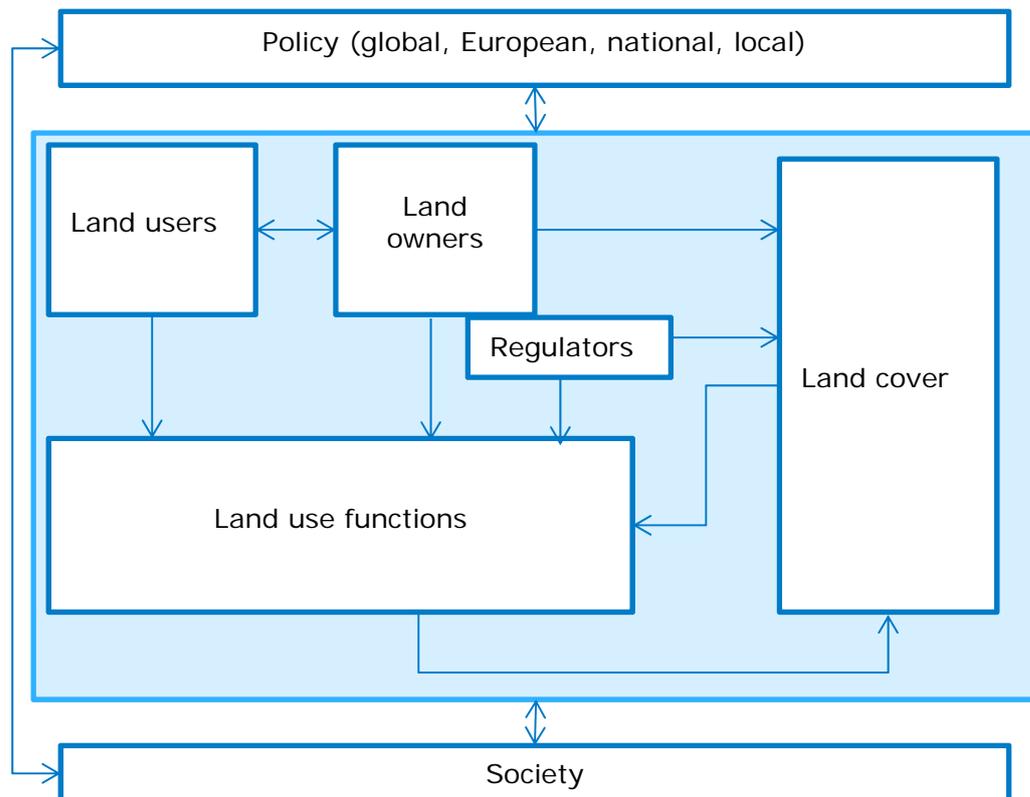


Figure 3 Socio-technical land use system

In general three types of actors can be distinguished in the socio-technical system, being regulators, land users without land and land owners (Figure 3). Land owners are important actors as they hold the property of the land with all the immaterial dimensions attached to it e.g. identity of the place. In addition to the immaterial dimension embedded in land ownership, land owners need to forge revenues from the land and looking for a license to act as well as a business model. In order to develop a business model land owners are also dependent on land users or consumers making use of services or products. Some actors are both owners and users. Regulators are parties that influence the land use system via policy and regulations. Although land use is typical a sovereign issue for countries, it is influenced by European regulations and Global agreements (Evers, 2014), and national rules and regulations are further implemented on provincial and municipal levels. Indirect users (without land) influence the system via market/needs/demands. And land owners influence via land management. Society is influencing the system via demands and needs, but also via

discourse on issues like nature, food or animal welfare. Policy is influencing the whole system via regulation. Functions of land can differ from the land cover. For example farms can have recreational purposes as well.

2.2. The different regimes

The land use domain consists of different regimes. In the figure below we distinguished the different regimes based on the function. The figure also mentioned the niche innovations described in deliverable 2.1; they are mainly positioned in the overlap between different regimes.

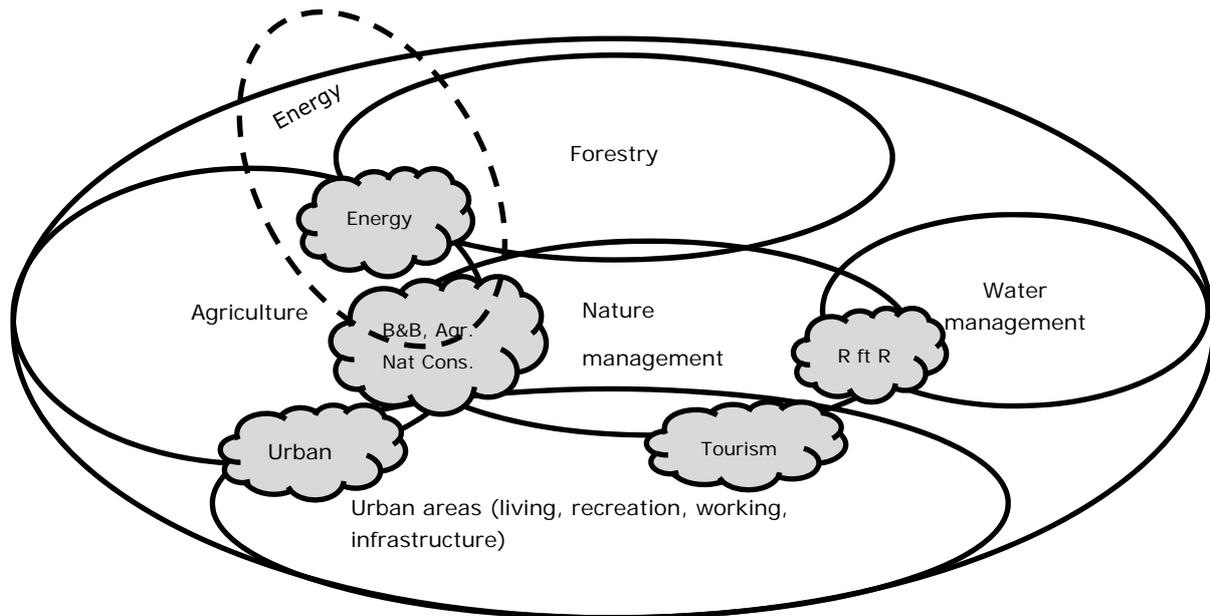


Figure 4 Different land use regimes with the corresponding niche innovations

These niche innovations are occurring in the combination of the following regimes:

- Business and biodiversity: Agriculture and nature
- Agricultural Nature Conservation: Agriculture and nature
- Energy: Agriculture, Forestry and energy
- Urban farming: Agriculture and urban areas
- Room for the river: Nature and water
- Tourism: Urban areas and Nature

The regimes discussed in this report are: Agriculture, Nature, Water and Urban. But before these different regimes are discussed in more detail, we will describe the general developments in the land use domain.

2.3. Longitudinal developments in the land use domain

As the figure below shows, changes in land use are noticeable over the last century: A decline in nature area and agriculture area and a growth in build-up areas. Between 2000 and 2010 half of the former agricultural area is used for buildings, while 20% became nature area (CBS et al., 2014b). Furthermore the amount of people living in cities is still growing.

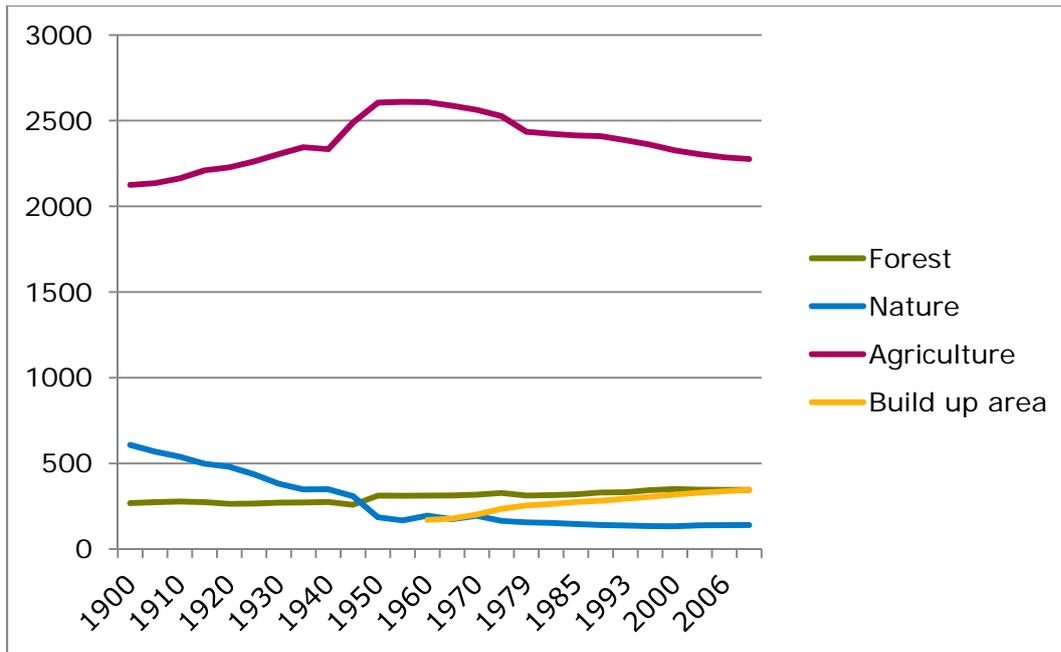


Figure 5 Land use in the Netherlands 1900-2008 (CBS et al., 2013c)

Regarding climate change, different scenarios show that it can be expected that the temperature will increase, the amount of rainfall will increase during winter and decrease during summer. Furthermore more heavy showers are expected during the summer season. That will make the Dutch winters less cold but rainier, while summers will get warmer and more dry (PBL, 2015).

Policy

Spatial planning is laid down in National Spatial Planning Policy documents. The first is developed in 1960. The policy documents are developed on national level and set the main setting of spatial planning (Ministry of Infrastructure and the Environment, 2012)

The First National Spatial Planning Policy document (1960) had an outwardly-focused model for growth for the Randstad (Western part of the Netherlands) around an open central area (the Green Heart). Furthermore the idea was to support development of the Northern and Eastern part of the Netherlands. The residential areas were combined into urban districts as much as possible.

In the Second National Spatial Planning Policy document (1966) a map was designed in which four types of urbanization were mentioned. A number of places were designated to act as overspill towns for the Randstad. Because of the growth of mobility, smaller cities and villages that were able to grow became more attractive and suburbanization started.

The Third National Spatial Planning Policy document (1976) was on renewing cities: old parts of cities were renovated. The word 'growth centre' appears, mainly focussing on the same places as the former overspill cities.

The Fourth National Spatial Planning Policy document (1988) mentions the first generation of Key Projects involved large-scale restructuring in towns and cities. Amsterdam Schiphol Airport and the Port of Rotterdam are designated as 'main ports' and seen as driving force for

the economy and spatial development. On the other hand the environment became an attention area as well, and the quality of space needed to be improved.

The Supplement to Fourth National Spatial Planning Policy Document (also known by the acronym VINEX) was developed in 1991. This policy emphasised the locations for new large-scale residential building in and in close proximity to the towns and cities.

The Fifth National Spatial Planning Policy Document (2001) has never passed the Chamber, and became the National Spatial Planning Policy Document (Nota Ruimte; 2004). As the procedure to develop the Nota Ruimte took a while, and some parts of the policy are implemented by provinces, the policy of provinces was no longer a direct implementation of national policy. This document had for the first time explicit attention for the provision of sufficient green recreational opportunities.

Besides the policy documents, there are structure visions (*structuurvisies*) on both municipality and provincial level, laying down the main spatial planning issues for the area. In zoning plans (*bestemmingsplannen*) the municipality determines the land use in the area within the municipality. The zoning plans mention the rules and regulations related to the use of the area (Overheid.nl, 2015b).

Multifunctional land use

Recently there is more attention for multifunctional land use. The main reason for this is the increasing pressure on land use, the decreasing amount of subsidies available for nature conservation and development and the awareness of environmental pressure as a result of different forms of land use.

Longitudinal developments in the agricultural regime

The amount of agricultural land use is declining since the 1960s. Most of the areas that used to be farmlands did become build up areas, and only one-fifth was changed into nature. Since the 1980s the number of farms decreased by 53%, while the total amount of agricultural area decreased with only 9%, resulting in an increasing size of farms (CBS et al., 2014e).

The agricultural regime is however influenced by many crises since the 1990s. Examples of crises related to animal health are BSE (Bovine spongiform encephalopathy) (1997), swine fever (1998), foot and mouth disease (2001), chicken flu (2003) and Q-fever (2007-2009). These diseases led to changes in the agricultural sector. An example of such a change is the restructuration of the pork sector, leading to a reduction of the amount of pork farms in the southern part of the Netherlands.

While the agricultural sector in the Netherlands did profit from European subsidies in the past, the amount of subsidies is declining. That makes it necessary for the sector to become more independent from subsidies. The agricultural sector had a special, rather protected, position in the past, but is nowadays increasingly seen as an economic sector similar to other economic sectors.

Since the 2000s niche-innovations for sustainability have popped up and are drawing attention into multifunctional farming: combining agricultural production with for example education, care, nature conservation, selling products directly to consumers and recreation. Furthermore interest for local, sustainable, organic and/or authentic products is increasing. Recently, there

is more attention for urban farming, allotment gardens and growing your own food. Although the amounts of food produced by non-farmers are not very significant so far, there seems to be a shift in the perspective on food of consumers which may influence the agricultural regime eventually.

Longitudinal developments in the nature regime

Since 1975 the understanding came that the quality of nature was decreasing and action was necessary to maintain nature. Scientific approaches within ecology, such as evolutionary ecology and restoration ecology, made that there was more emphasis on ecological processes, the restoration of natural areas, creating ecological networks (such as the NEN; National Ecological Network) and renewed efforts to combine agriculture with nature conservation. This led to a shift in thinking about nature and its management: besides protecting existing nature, there was more attention for restoring and developing new nature. Furthermore the focus shifted from separation of nature and agriculture towards integration between the two (Buijs et al., 2014). The National Ecological Network was formally introduced in 1990 in the first Dutch Nature Policy Plan. Thereby an explicit aim was expressed for nature development in 'degraded land' and the interconnecting of different nature areas through ecological corridors. This was not only a shift in policy goals, but also led to a more prominent and proactive role of the government in nature policy and management (Buijs et al., 2014).

As part of the Rutte I formation (2010), the focus became on citizens collectives in which taking care for the landscape and nature conservation were taken care of. The state secretary Bleker caused an important change in policy on nature: he reduced the subsidies for nature conservation and postponed the creation of the National Ecological Network (Ecologische Hoofd Structuur).

Until 2012 policy on nature was mainly determined by the national government. Since the presentation of the 'Natuurpact' (Nature agreement) in September 2013, there was a 'go' for decentralisation of nature conservation and renewing of the Subsidy System for nature and landscape management (SNL) from January 2016 onwards. Thereby the responsibility moved from national government towards provinces (Portaal Natuur en Landschap, 2015). Before this decision was taken, provinces were only responsible for nature, and not for agricultural nature conservation. Since Mrs Dijkma became state secretary in 2012, the idea is to make provinces responsible for both nature and agricultural nature conservation. This is part of the decentralization policy of the Dutch government. From January 2016 onwards the Agricultural Nature- and Landscape management 2016 (ANLb2016) will replace the Subsidy System for nature and landscape management (SNL). The core of the new system is a collective approach in which the specific region is central. Agricultural nature conservation and landscape management will only be applied in the regions in which the chances for improved nature conservation can be reached.

From around 2000 onwards the amount of rural estates increased. That changed the rural area, as it were no longer only farmers living in the area, but also other citizens. Part of the budget from nature conservation was derived from the building of estates in the rural area. Furthermore the Postcodeloterij (lottery supporting charities) provided an important share of subsidy as well. There is a shift from subsidies for nature conservation from public parties towards private parties (like the Postcodeloterij).

Media attention, for example the movie *Inconvenient Truth*, 'De Wildernis' and media attention for the European Hamster led to more awareness on nature as well.

The financial crisis made that the role of the government and financing nature conservation was discussed as well. Policy became decentralised, resulting in provinces and municipalities becoming responsible for nature conservation. Furthermore citizens got a more prominent role in organising nature conservation as well.

The plan for the Netherlands is to expand the nature network with 80 000 hectares new nature between 2011 and 2027 (PBL, 2014a). However, its realisation will highly depend on political choices made in the coming years.

Longitudinal developments in the water regime

Since the floods of 1953 in the province of Zeeland and later on the almost flooding of the rivers in the 1990s there is more attention for water safety. After the flood of 1953 the Delta plan was developed in order to prevent that a flood like that will not happen anymore. Dams were built in the province of Zeeland to protect the area against the sea. In the 1980s the idea of combining water management with nature conservation was developed in Plan Stork (Plan Ooievaar). After the high water levels of 1995 and 1998 the plan 'Room for the River' got in place in which areas around rivers were used for water storage. This was a change in dealing with water, as the focus was no longer only on creating higher and stronger dikes, but on giving more space for the river to flow and store water in times of higher water levels. A lot of the nature areas are developed around rivers, combining nature development and protection against water.

In 2000 the European Water Framework Directive was established. This is a directive aiming at improving our water environment. It requires governments to take a new holistic approach to managing their waters. It applies to rivers, lakes, groundwater, estuaries and coastal waters (European Commission, 2015).

Longitudinal developments in the urban regime

There is a shift from people living in the rural areas, towards urbanization. From the end of the 1990s onwards there is more attention for allotment gardens. People start to grow their own food. From the 2010s onwards this attention for allotment gardens is even broader and urban farming starts to develop.

Since 2000 there is more attention for using empty buildings in a different or new way. The financial crisis (from 2009 onwards) had a huge impact on the building sector. The housing sector collapsed and only from 2015 onwards the housing sector is beginning to move again.

The distance between the city and the rural areas is decreasing as a result of increased mobilization and the entrance of ICT, making it possible to for example order groceries online.

2.4. Overall environmental performance of the land use domain

Although globally land use and land use changes can be a significant cause of GHG emissions, this is only a relatively minor source of GHG emissions in the Netherlands. In peat soils drainage is an important source of emissions.

Since man have domesticated the Netherlands the biodiversity has, based on the quality and quantity of nature, decreased from 40% of the original biodiversity in 1900 (compared to 1700) till 15% of the original biodiversity in 2000. As the figure below (Figure 6) shows, the

biodiversity loss in the Netherlands is larger than in the rest of Europe (where around 40% is remaining) and the world (around 70% remaining). Biodiversity is in this figure expressed in MSA: Mean Species Abundance. An MSA of 15% means that the population of indigenous plant- and animal species is 15% of the natural situation in both number of species and abundance, and represents the original biodiversity.

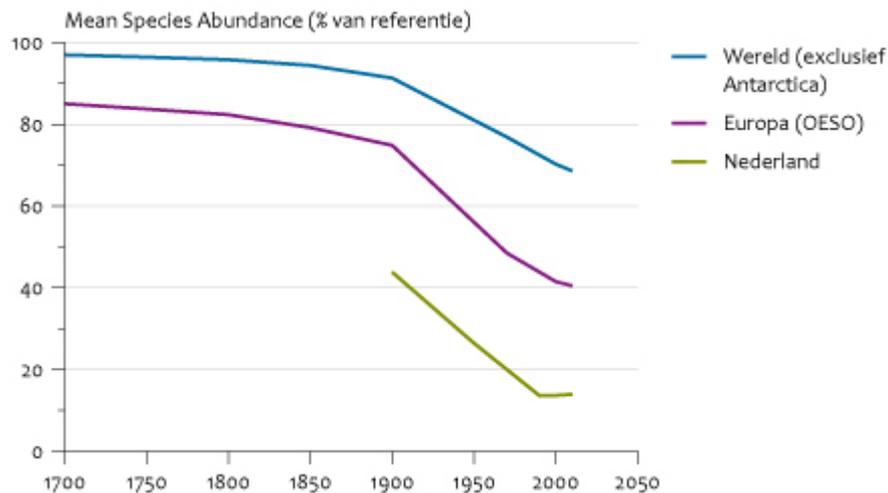


Figure 6 State of Biodiversity World, Europe and The Netherlands (CBS et al., 2013b)

The main causes for a decrease in MSA, are changes in land use, environmental pressures such as Nitrogen deposition and fragmentation of ecosystems (PBL, 2012). Globally, biodiversity loss is mainly happening in forests, grasslands and savannahs. Worldwide the amount of nature is still decreasing, in Europe this decrease is slowing down since 2000, while in the Netherlands the loss is stabilised and even a small improvement can be observed.

Since 1995 there are less mammals, dragonflies and higher plants endangered and since 2005 the number of endangered birds and reptiles is decreasing as well. Butterflies and amphibians are not showing a recovery (CBS et al., 2014h). The Dutch Living Planet Index (LPI) is also increasing. The LPI represents the average trend of mammals, birds, reptiles and amphibians. Since 1990 this group has increased with 22%, mainly due to the increase of mammals, birds and reptiles. On average the decrease of quality and size of nature areas is slowed down and even stopped, but that does not count for all species (e.g. the number of butterflies and amphibians are decreasing) and ecosystems (PBL, 2014a). It is however not clear how much of these improvements can be contributed to governmental measures (CBS et al., 2014g).

The global goal is to stop the decrease in biodiversity. In order to reach the targets for biodiversity, different pathways are possible (see Figure 7) for an exploration of the possible contribution of different options in three alternative pathways). The niche innovations analysed in this project mainly fit with the decentralized solutions pathway, in which solutions are found in multi-functional land use (land sharing), reducing infrastructure expansion, expanding protected areas and increasing agricultural productivity.

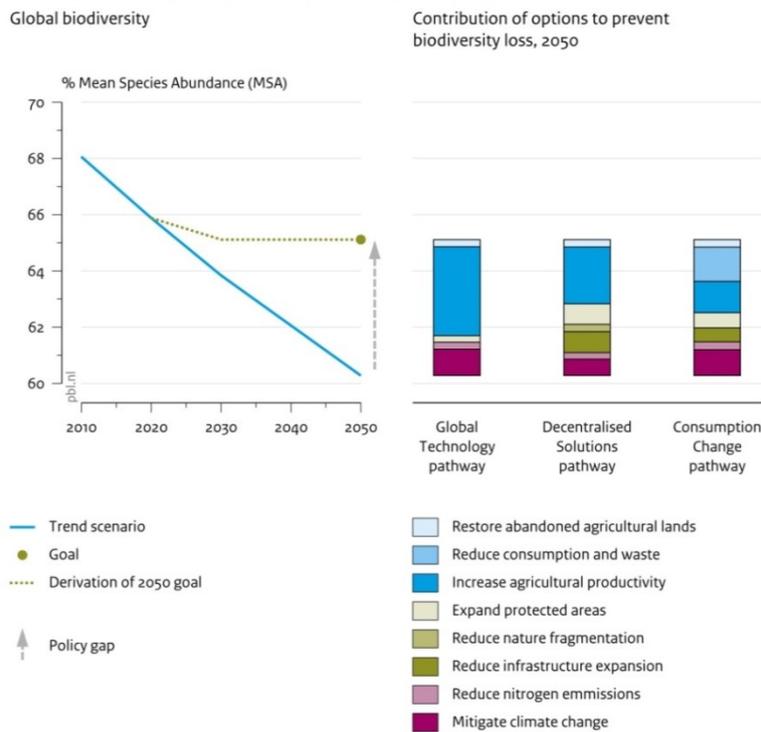


Figure 7 Global biodiversity and options to prevent biodiversity loss (PBL, 2014b)

Because changes in diets and wider availability of food from all over the world, the ecological footprint is increasing. In the figure below the land in different areas that is needed for the Dutch consumption is presented. The lion's share of land use is associated with paper and pulp.

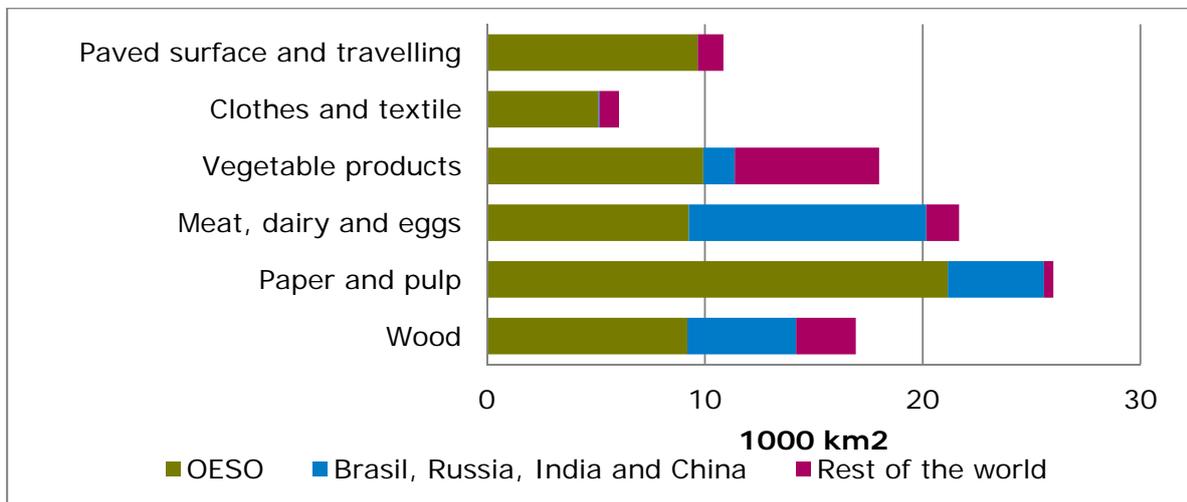


Figure 8 The footprint of Dutch consumption expressed in land use (adapted from (CBS et al., 2009))

The figure below shows the biodiversity loss associated with the Dutch consumption (in 2005). The lion's share of biodiversity loss is associated with vegetable products.

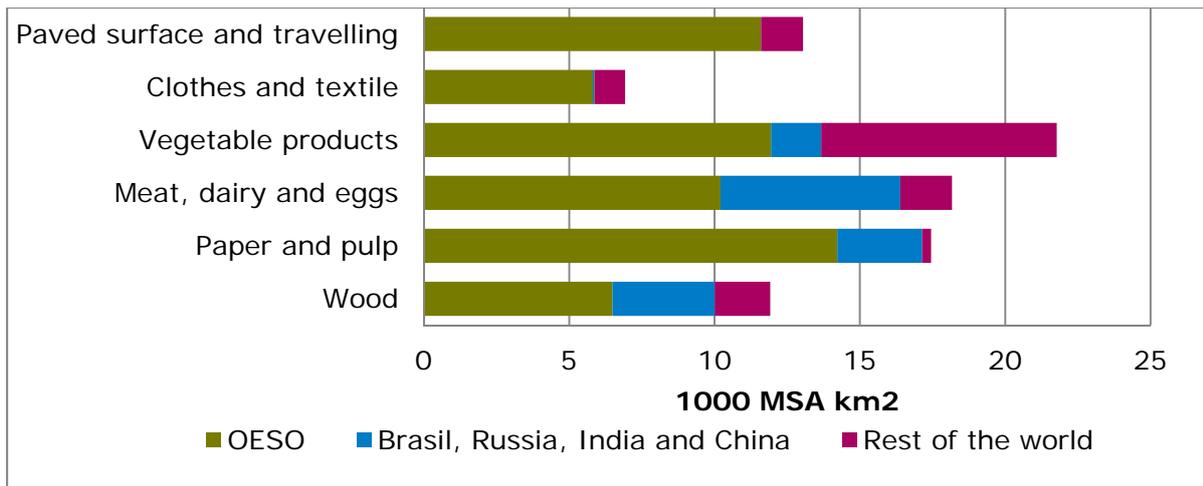


Figure 9 The footprint of Dutch consumption expressed in biodiversity loss (adapted from (CBS et al., 2009))

3. External landscape developments

This section discusses the main external landscape developments. A distinction can be made between stabilizing and destabilizing factors.

3.1. Main destabilizing pressures on the land use domain

The developments in the landscape can have a destabilizing effect on the land use domain, possibly leading to changes. In this section the destabilizing developments are mentioned.

The first landscape development is climate change. Changing climate is expected to in particular influence water management. Heavy showers and increasing water levels in rivers are examples of issues one has to deal with. Adaptation measures are required to deal with climate change impacts.

Furthermore an increasing pressure on land can be noticed, resulting from changing demands of citizens. The build-up area is growing (see Figure 5) and consumption patterns are changing (see Figure 8), leading to increasing land needed to fulfil the consumption needs. There are increasingly competing claims on the limited available area, what makes that multifunctional land use is gaining importance.

Urbanization is leading on the one hand to increasing distance between production and consumption, and on the other hand increasing dependence of farmers on people living in the cities. The increasing aging of the population and the exodus of rural areas lead to different demands of buildings. The number of farms is decreasing, what makes that the former farms are now owned by non-farmers. That could lead to changes in the atmosphere of the rural areas. Farmers have to be aware of the changing demands of their neighbours. But this creates also opportunities for new ways to earn money and more and different services. The increasing urban population make that cities can become a part of the solutions for environmental problems. For example by introducing green roofs or developing smart cities in which flows of nutrients and water are used in an efficient way.

The financial economic crisis was a stimulus as well for people to look for other ways to earn money. The financial crisis did have an impact on land use as well in two ways. On the one hand the amount of subsidies was decreasing and on the other hand the housing market did change. As a result of the crisis, investments in new buildings were decreasing as well. The attention in re-using existing buildings did increase. The pressure on farmers is increasing, both to get a reasonable income and to farm in a sustainable way. That makes that they are interested in for example combine nature conservation and farming. There is also a shift in funding sources from public towards private sources. With the establishment of organisations like “De PostcodeLoterij”, for example nature conservation is also paid for by private actors.

Recently provisioning of ecosystem services is getting more attention off as a result of the increasing awareness of ecosystem services nature provides for man. The idea of combining biodiversity and economy is part of what is called The Economics of Ecosystems and Biodiversity (TEEB). This approach states that in order to maintain wealth the ecosystem also needs to function well. Blue and green services became more entangled was well.

The increasing demand of energy by households and the awareness that fossil fuels are limited leads to increasing attention for renewable energy produced by for example wind mills or solar panels. As solar panels are mainly positioned on roofs, especially wind mills do influence the land use.

The increasing digitalization did also have an impact on the land use domain. Because of the introduction of internet and different types of media, more information is available for individuals. Furthermore via online channels food can be sold and bought. These developments can decrease the distance between consumer and producer, as people can see via websites or apps where the food they bought is produced.

Furthermore external events or crises are influencing the land use domain as well, such as the floods (1953, 1990s) and food crises with animal diseases (swine fever, chicken flu and BSE).

Policy

In policy there are changes visible as well. For example in agricultural policy and environmental policy there is a shift from promoting production towards policy decoupled from production. There is also a change from nature development towards the perception of nature (e.g. Natuurvisie).

Policy at different levels is influencing the regime. The Convention on Biological Diversity (CBD) of the United Nations is a global legal framework for action on biodiversity. It is inspired by the worldwide increasing attention and commitment for sustainable development. It can be seen as an important step forward in ‘the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising from the use of genetic resources’ (CBD, 2015).

At the European level the main policy that is influencing the Dutch land use domain are the Bird and Habitat Directive and the European Water Framework Directive of the European Union. The Bird and Habitat Directive the goal is ‘ensure that the species and habitat types they protect are maintained, or restored, to a favourable conservation status throughout their natural range within the EU (European Commission, 2014). The European Water Framework Directive is a directive aiming at improving our water environment. It requires governments to take a new holistic approach to managing their waters. It applies to rivers, lakes, groundwater, estuaries and coastal waters (European Commission, 2015).

The most recent Dutch policy is Nature Vision (2014). Policy was mainly focussing on connecting the nature areas in the so called National Ecological Network (NEN; Ecologische Hoofdstructuur). This was a new approach on nature in which the connection of different areas became the main focus of nature policy. This connection makes it possible for species to move around.

Differences in policies are visible between the period before state secretary Bleker (focus on National Ecological Network), with Bleker (change in responsibilities between provinces and national governments) and Dijksma (decentralisation of policy regarding nature).

3.2. Main stabilising landscape aspects

Besides the destabilising aspects in the land use domain as explained in the previous section, some stabilising measures can be noticed as well.

First of all, land use is not easy to change. Once land is used in a specific way, it is not easy to change that. Although urban areas are developed fast, it is not easy to change urban areas back into nature again.

Furthermore finances and investments make it difficult to change land use. For example in the agro-food regimes farmers invest a lot in e.g. land, machines, and buildings. It is not easy to

set aside their business and start something else, because of these investments. This makes the system relatively difficult to change.

Lastly especially the water and the nature regime are locked in. Institutions exist for a long time. The basic idea of how to deal with these types of land use is locked in in the institutional environment.

3.3. The main challenges and developments in the multifunctional land use domain

The main challenges related to multifunctional land use are dealing with biodiversity goals. Greenhouse gas emissions do a play a role as well, but the most visible direct effect is on biodiversity. The global goal is to stop the decrease in biodiversity. In order to reach the targets for biodiversity, different pathways can be taken (see Figure 7). In this report we will mainly focus on the decentralized pathway, in which solutions are found in consumption, land use and reduction of emissions. The plan for the Netherlands is to expand the nature network with 80 000 hectares new nature between 2011 and 2027 (PBL, 2014a). However, much will depend on choices made regarding policy.

Overall we can state that policies have a big influence on multifunctional land use. Land use is difficult to change, as land in use for buildings cannot easily change into nature. However, in the past a lot of land used for nature, forest or farming became build-up area. It is however not easy to change that again.

Multifunctional land use is, as the name already suggest, on different ways to use land. The niche innovations described in D2.1 are especially focussing on niche innovations that deal with different regimes (e.g. nature and agriculture, water and nature). The interesting point therefore is in how the different regimes are (or will be) combined. In the following chapters we will therefore describe the regimes separately, but we will take into account the effects the regimes have on other regimes.

4. Developments in the agricultural system and regime

4.1. Developments in (tangible) system elements

Agricultural production is increasing (see Figure 10), but the number of farms is decreasing rapidly. Between 2000 and 2013 the number of farms declined with 31% from 97,500 till 67,500. The total amount of agricultural area did in the same period decline with only 6%. As a result the average size of a farm increased with 35% from 20 hectares in 2000 to 27 hectares in 2013 (CBS et al., 2014a).

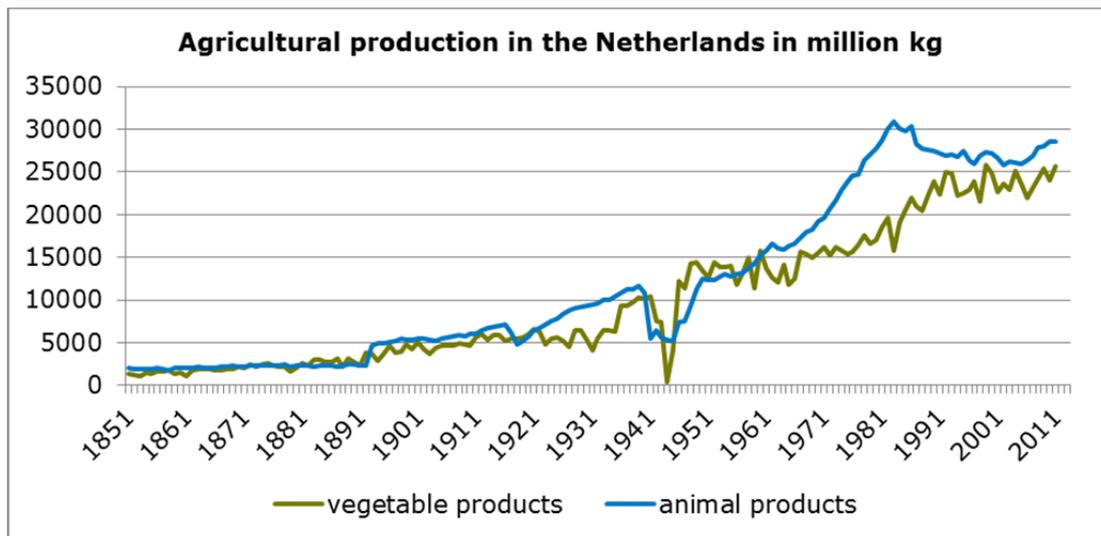


Figure 10 Agricultural production is increasing (CBS, 2015)

The most important agricultural products in terms of production weight are dairy, feed and potatoes (CBS, 2014b).

The agricultural sector is under pressure. As the figure below shows (Figure 11), the income of Dutch farms is changing over time.

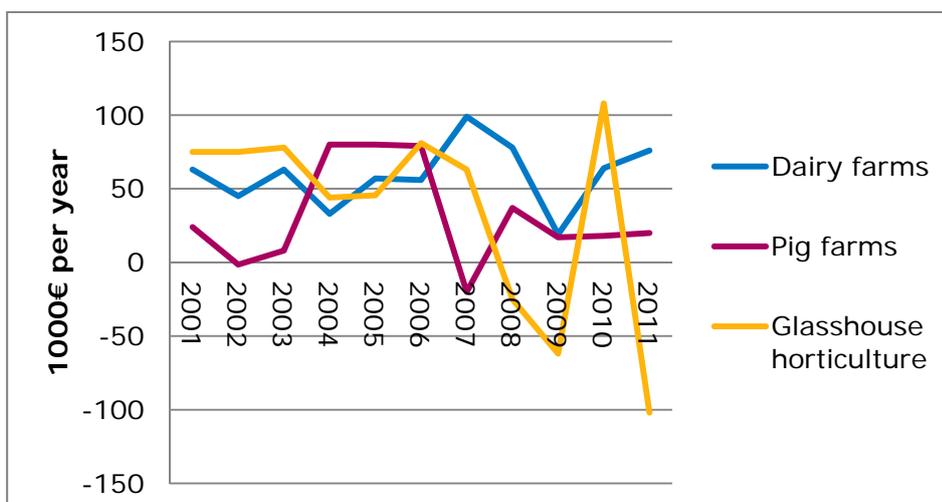


Figure 11 The income of Dutch farms (Adapted from (PBL, 2013a))

The figure below shows a schematic representation of the agriculture land use regime (Figure 12).

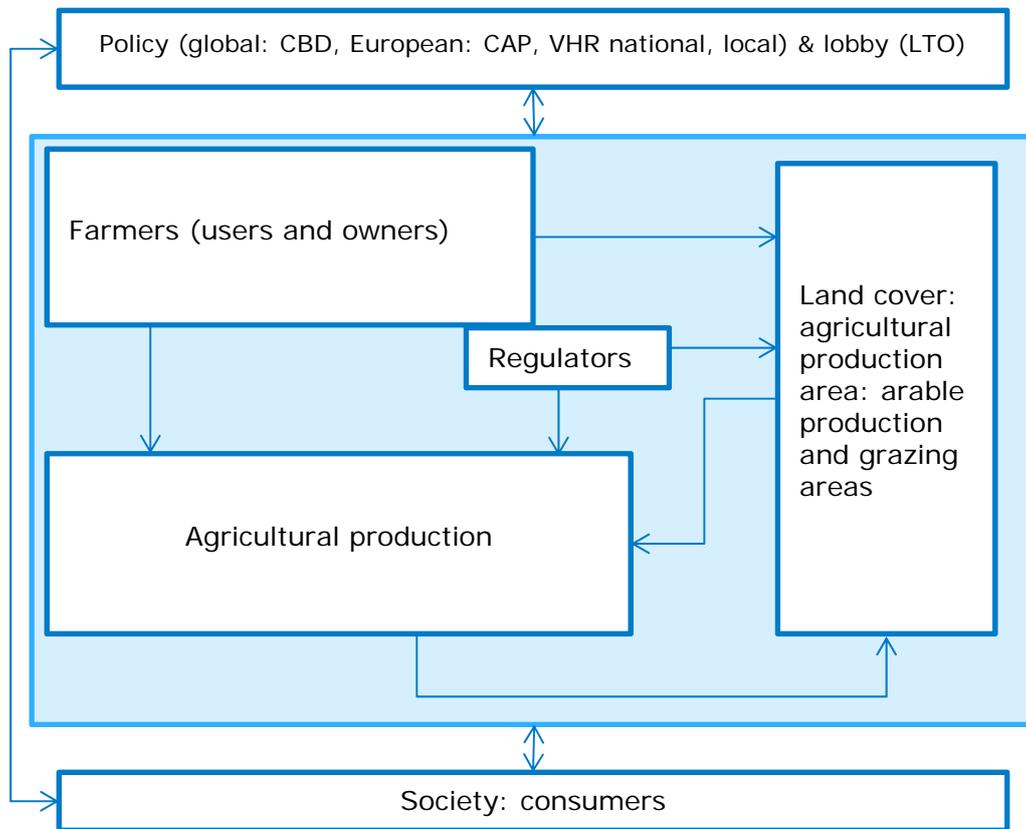


Figure 12 Socio-technical system for agricultural land use

4.2. Developments in social groups and (intangible) regime elements

There are many social groups are involved in the agricultural regime:

- LTO (the agricultural and horticulture organisations): This farmers association is representing the farmers. Actually there are three different sub organisations: LTO Noord (for the Northern part of the Netherlands), ZLTO (for the Southern part of the Netherlands) and LLTB (for Limburg, one province of the Netherlands, in the South). Every sub organisation has a different culture. In total around 50 000 farmers are represented by LTO. LTO makes a case of economic and societal position of the farmers. LTO lobbies at national and international level in order to create a stronger position for the farmers.
- Farmers: Most of the land belongs to the farmers themselves or they rent it from someone. Especially for soil bound agriculture it is important to have a certain amount of land. Farmers are under pressure as it becomes more difficult to survive the race to the bottom that is going on. Some people say the only way for farmers to keep maintaining their firm is to increase in scale or find secondary activities (e.g. combine production with education, care, direct selling). Increase in scale however can cause difficulties when someone has to take over the farm. As land is expensive, the buyer has to invest a lot to take over the farm. Furthermore it is difficult to find someone who wants to take over the farm anyway, as not only large investments are needed, but the income is limited as well. The large investments in both machines and machinery by farmers are a reason as well, that change is hard to realize. Once

large investments are made, in stables for example, it is hard to change farm management or activities on a farm.

- Different NGOs are active in the agricultural regime as well. Organisations like Wakker Dier and Dierenbescherming are mainly focussing on animal welfare issues related to farming. The Dierenbescherming for example developed a label (Better life label) for good practices in animal husbandry. Products with this certificate can be bought in the supermarkets.

- The main policy influencing the agricultural regime comes from the national and European government. While there was a ministry with the term agriculture in the title from 1935 till 2010 (Agriculture, Nature and Food quality), agriculture policy is now part of the ministry of Economic Affairs. That can be a signal of the development towards agriculture as being a 'normal' economic sector, which is not so much supported with subsidies, but is taking care for itself. European policy is mainly represented in the Common Agricultural Policy (CAP). In the CAP the European Union takes care that food in Europe is sustainable, healthy, safe and affordable. Within the CAP every Member State can develop its own agricultural policy. Since 2002 there is a political party: Partij voor de Dieren: Party for the Animals. They were able to address animal related issues in policy. Nowadays they have representatives in place at European, national, regional and local levels and even in water authorities.

- Agro-food businesses and supermarkets play an important role as well in the agricultural regime. Many big companies, like Unilever and Douwe Egberts are positioned in the Netherlands, but also many small companies exist. Supermarkets have a lot of power in the agro-food chains, and therefore can determine the demand for products and the quantity and quality of products. This has a more indirect influence on land use.

- Citizens/Consumers are the ones that buy agricultural products and the composition of their diet influences the land used for agricultural production. Animal products do need a different and larger amount of land compared to vegetable products. Recently there is more attention for authentic, organic, sustainable and regional products. In some areas the amount of farmers selling their products directly or via a shorter chain to consumers is increasing, what makes the distance between consumer and farmer smaller. Furthermore, recreation and other activities at farms are gaining popularity as well, what makes citizens involved as well in other ways than in the consumer role.

The main discussions and issues in the agricultural regime

The availability and success of chemical fertilizers and pesticides and the improvement of agricultural management in general did lead to an increase in agricultural production between the 1950s till the 1980s. Since the end of the 1980s this growth is declining as animal welfare and reducing environmental pressure became more important (Bekke & De Vries, 2001; Smit, 2011). From this point onwards the influence of public debates and concerns on the agricultural sector became more visible. The agro-food sector became very important for the Netherlands and the Netherlands became one of the largest exporters of food worldwide.

In 1957 the Common Agricultural Policy (CAP), established by the European Union, was developed in which regulations regarding food production were laid down. The first goal was to increase agricultural productivity by promoting technical progress (EEC, 1957). That goal was reached. The average (world market) price of agricultural products declined, and productivity increased while the world population was growing. Agricultural output was subsidized, there was support of the market for commodities, import barriers for producers from outside the EU were implemented and export subsidies were in place (Hazell & Wood, 2008; Smit, 2011). However, production support did also led to unbridled production,

resulting in 'butter mountains' and 'milk lakes' (Smit, 2011). So far the interests of policymakers and pressure groups were relatively congruent, but in the 1980s, agriculture became a focal point for environmental policy (Frouws & Tatenhove, 1993) and soon afterwards the idea of sustainable agriculture was introduced (J. V. Zwartkruis, 2013). Food safety and quality rules and regulations for food producers and processors have become more stringent because of for example the outbreak of mad cow disease, avian influenza, dioxins in chicken meat and swine fever (Ruben et al., 2006). Furthermore the agro-food sector was influenced by the increasing globalization, what makes it possible for consumer to permanently choose between many products from all over the world (Ruben et al., 2006).

New societal values like environmental awareness, conservation of nature and the quality and safety of food have risen up in the agricultural sector (Bekke & De Vries, 2001). The role of rural areas and the role of agriculture in rural society were changing as well. Agriculture is no longer viewed as a food production activity only, but the emphasis has shifted to environmental sustainability and the countryside as a place of 'consumption' (Hassink et al., 2012). In order to maintain a strong agricultural sector in the Netherlands two directions can be recognized. On the one hand further intensification, scale increase and a stronger focus on the market. On the other hand, an approach in which multifunctional land use comes in as well, broadening of agricultural activities by combining agricultural activities with non-agricultural activities, such as care, education and nature conservation (Dammers et al., 1999; Hassink et al., 2012).

The role of agriculture in the landscape is discussed by the public as well. The cow in the meadow is seen as an important element of the Dutch landscape. Some of the large dairy companies, such as Friesland Campina, put a lot of attention on the cow in the meadow. In 2014 77.8% of the farmers had cows in the meadow for a shorter (7.7%) or longer period (70.1). In 2012 a covenant was developed to encourage cows in the meadow. A broad spectrum of 65 actors signed the covenant, among which farmers organisations, dairy companies, the government, societal organisations, retailers, researchers, feed industries etc. The goal was to maintain a percentage of 81.2 % of cows in the meadow (NZO, 2014).

5. Developments in the nature system and regime

5.1. Developments in (tangible) system elements

As Figure 5 shows, the amount of nature area in the Netherlands was declining since the 1950s. Especially dehydration and over-fertilization are exerting pressure on nature. However, the environmental pressure on water and nature areas is declining (PBL, 2012).

Regarding policy for biodiversity, the Netherlands, just as all the EU Member States and the EU itself, has ratified the Convention on Biological Diversity (CBD) of the United Nations, that aims to slow down the world wide decrease in biodiversity (PBL, 2014a, 2014b). Furthermore the Bird and Habitat directive (Vogel- en habitat richtlijn, VHN) of the European Union wants to stop the decrease of biodiversity, by developing a network of nature areas of protected areas by assigning areas as natural areas, maintaining areas, decreasing environmental pressure, and improving areas (e.g. repair, maintenance, ecological restoration and de-fragmentation) (PBL, 2014a).

The CBD and VHN have short term goals and long term goals. The short term goal is to slow down or stop the decrease of the quality of nature. On the longer term sustainable preservation and recovery of nature are central. The “red list” is used as an indicator for the situation of endangered species¹ (PBL, 2014a).

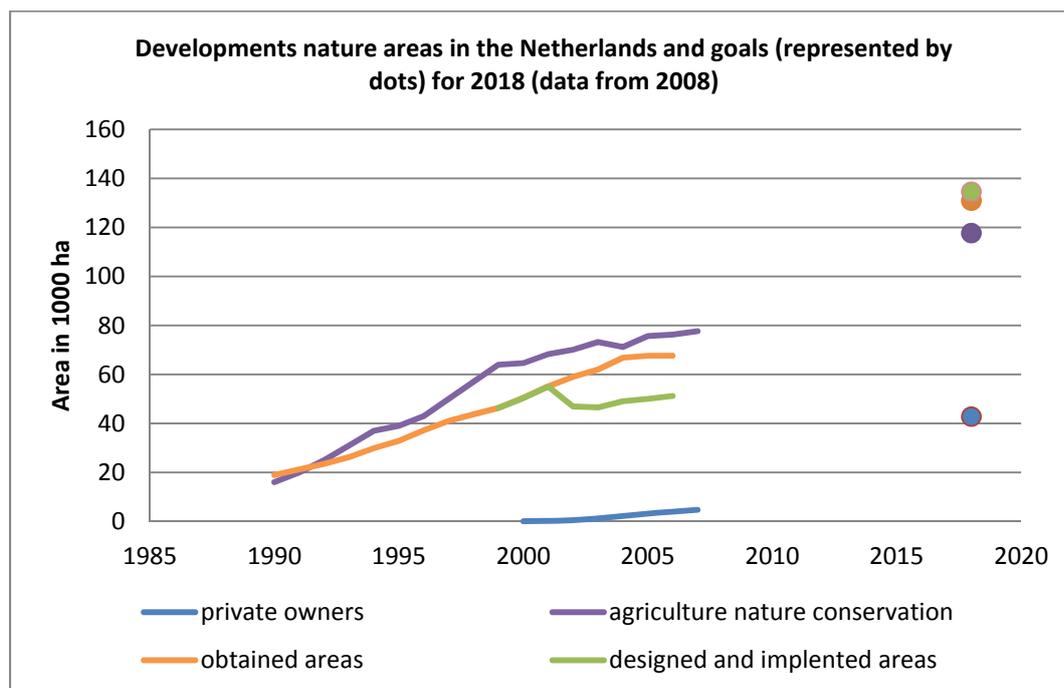


Figure 13 Realisation National Ecological Network in the Netherlands (adapted from (PBL, 2009)).

The red list indicator (RLI) is a way to measure biodiversity. The figure below (index=100 in 1995) shows the length of the RLI (the number of species on the red list) and the colour of the RLI (the extent to which the specie is endangered). According to this figure there is recently a change in the RLI. There was a decrease until 1995, but since 1995 there is a slightly improvement. However, still one-third of the species in the Netherlands is endangered (CBS et al., 2014h).

¹ The red list has different categories varying from very endangered to susceptible. The more endangered species there are, the more red is the list.

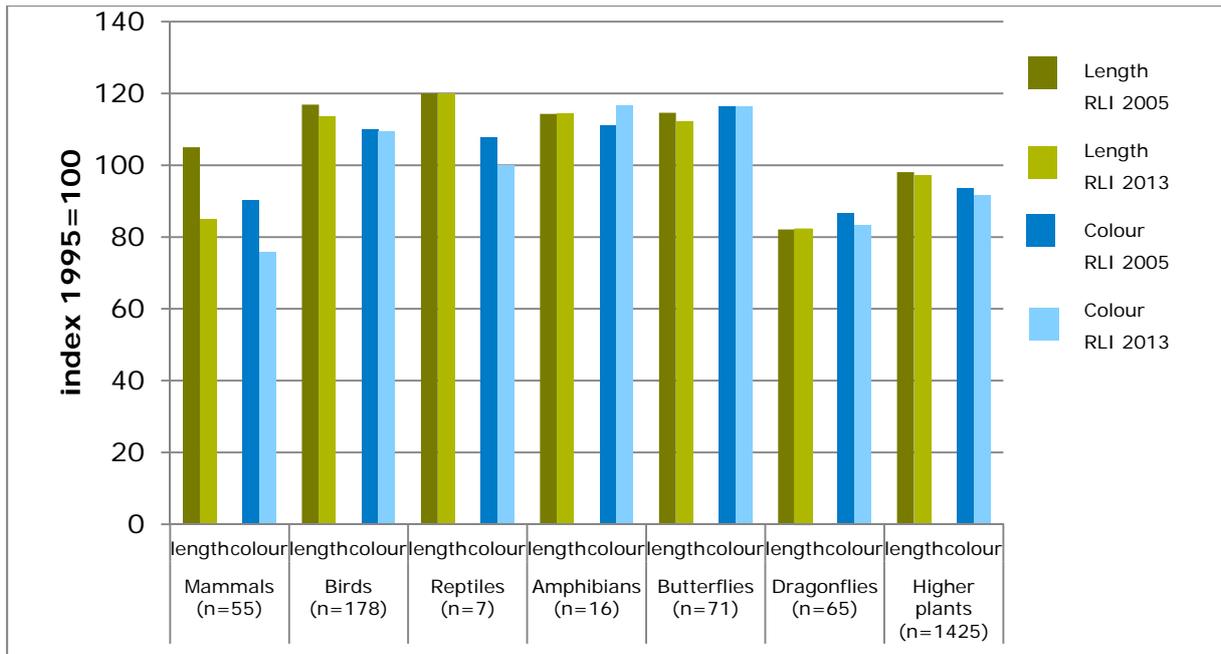


Figure 14 Red list indicator per species (CBS et al., 2014h)

The figure below gives a schematic representation of the nature regime.

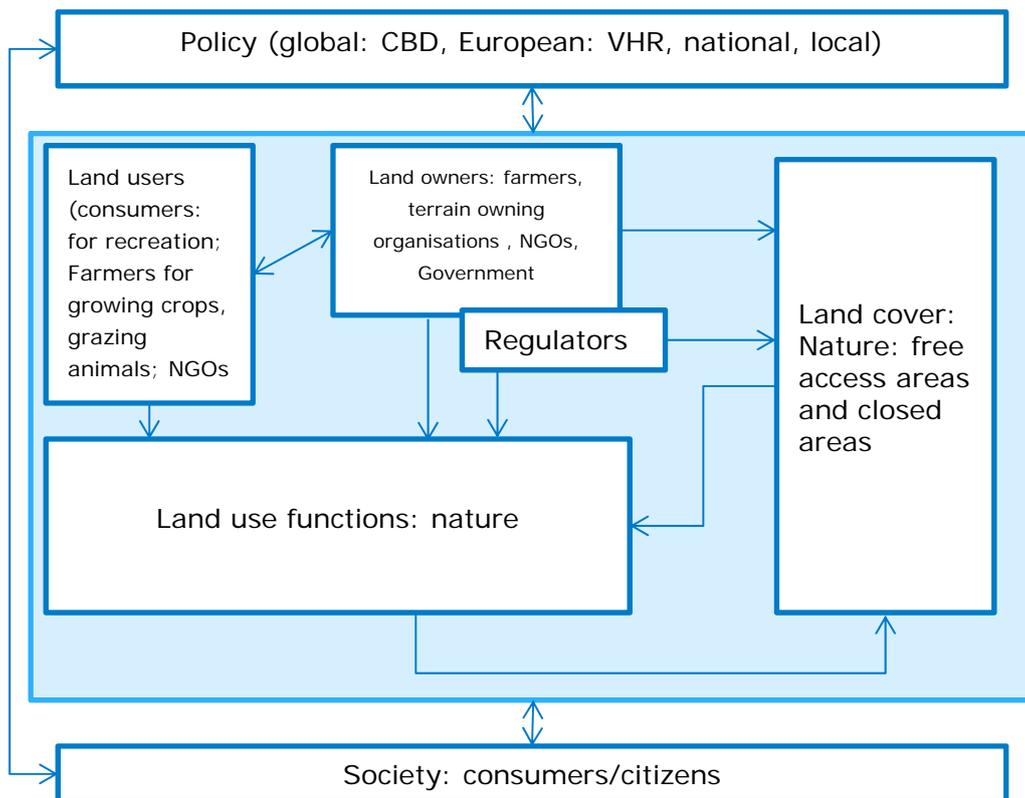


Figure 15 Socio-technical system for nature land use

Around 50% of the nature area in the Netherlands is owned by the government (see figure below).

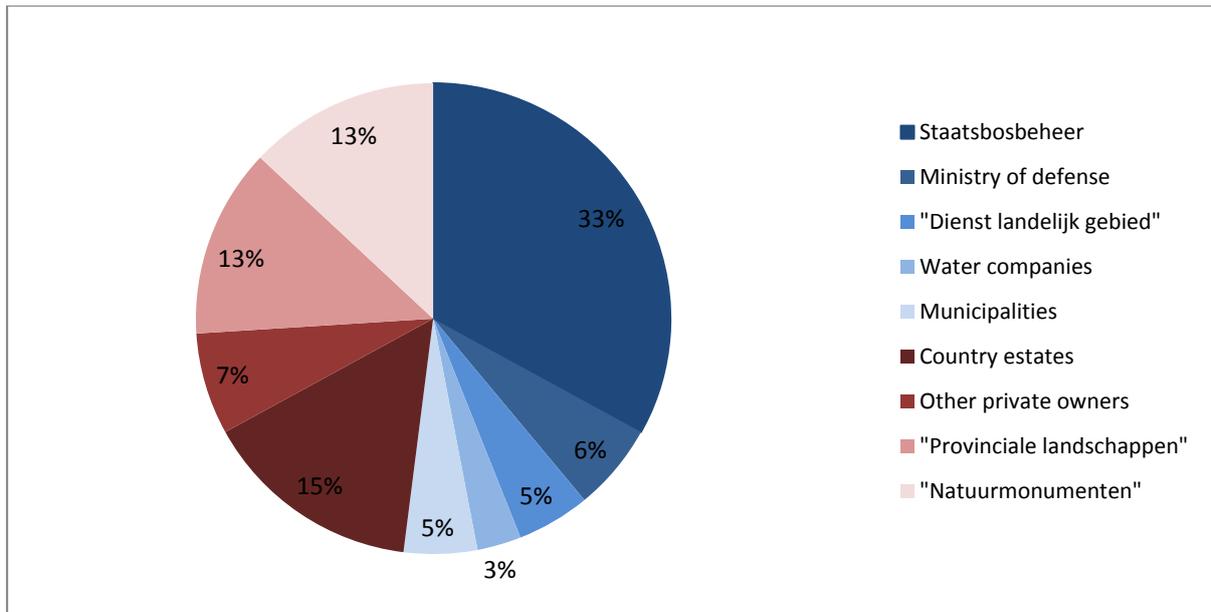


Figure 16 Owners of nature areas in the Netherlands in 2012. The blue categories are governmental organisations and the red categories are other types of owners. (Translated from (Arnouts et al., 2013)

5.2. Developments in social groups and (intangible) regime elements

The main social groups in the nature regime are: the owners of areas, governments and citizens.

The law has acknowledged some private organisations as terrain maintaining and nature protecting organisations. These organisations own the areas or long lease them and the areas are reserves. Seven organisations are acknowledged by the Dutch government, among which Vereniging tot Behoud van Natuurmonumenten in Nederland; Provinciale landschappen and Nederlandse Vereniging tot Bescherming van Vogels (Overheid.nl, 2015a).

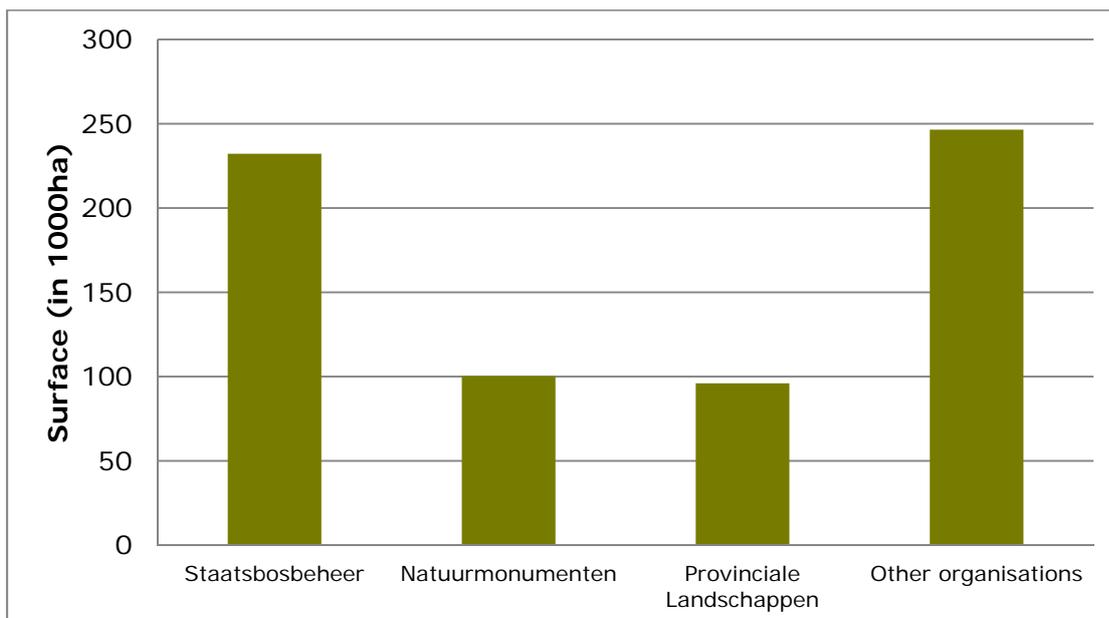


Figure 17 Maintenance and/or ownership of land Source of data EC-LNV, SBB ,NM, Provinciale landschappen, RVR (CBS et al., 2013d)

The government is making policy on nature. International policy goals (laid down in VHS and CBD) are leading in this policy. Nature policy has recently changed a lot. Since 1990 nature policy was mainly focussing on 'sustainable preservation, recovery and development of nature and landscape values'. The National Ecological Network (NEN; ecologische hoofdstructuur) was part of this policy. In the NEN different nature areas are connected (PBL, 2014a).

In 2010 (Rutte I) the tasks related to nature of the national government were moved towards provinces (decentralisation) and landscape policy was loosened (deregulation). In 2013 the Natuurpact (Nature alliance) came into place in which the National Government and provinces state their ambitions for nature development until 2027. The international goals on nature development, such as CBD and VHN) were leading. The national government became responsible for reaching the international targets. Provinces are responsible for maintenance and development of the Nature network the Netherlands and Natura 2000 areas (internationally protected areas) (PBL, 2014a).

A turning point in the discussion on nature was the 'Rijksnatuurvisie 2014. Natuurlijk verder' in which nature needs to get a central position in society. The government is looking for nature combinations in which both biodiversity and economy are improved (PBL, 2014a).

The owners of nature areas make reserves out of the nature areas. In some areas visitors have to pay an entrance fee, while other areas are free to access. In policy there is a shift visible from nature development towards nature perception. Since the Natuurpact nature is expected to have a more prominent role in society.

The number of people being a member of a nature organisation has doubled up to 2 million members between 1995 and 2005. If local green organizations are counted as well and individual memberships are counted as family memberships, almost half of the Dutch population is a member of or donor to a nature conservation organization (Buijs et al., 2014)

The main discussions and issues in the nature regime

Regarding nature a couple of prominent discourses can be acknowledged.

Until 2010 there were no abrupt institutional changes in Dutch nature conservation policy. There was continuity through path dependency visible in the Netherlands for many years, in which routine behaviour of ecologists and politicians reproduced the institutional setup of nature policy for years. There were critical actors who challenged the dominant discourse and practices; however, they were not able to seriously challenge the dominant discourse. In critical discourses from the 1990s onwards, the topic of nature conservation was reformulated from a predominantly ecological challenge to also an economic and societal challenge. The counter discourses of the late 1990s became new institutional arrangements after years of remaining 'institutionally dormant' because of discursive agencies (State Secretary Bleker) and changing contexts (political populism and economic crisis) (Buijs et al., 2014). The turn in Dutch nature policy is however not only related to change in government: it is also related to much larger changes in the economic, political and societal contexts (Buijs et al., 2014; J. Zwartkruis & Westhoek, 2015).

The public discussion remains what exactly is the definition of 'nature' and how to deal with nature. According to some people nature is an area in which there is only limited human influence, why for others nature can be managed by man. Related to that different opinions exist on whether or not nature is open for visitors.

In an area in the Netherlands, called the Oostvaardersplassen, there was for example the discussion on whether or not to feed the grazing animals living in the area during a very cold winter. Some people state one should not feed the animals, as that is part of nature, while others state you should feed them in order to prevent they die because of hunger, because the area is developed by man.

The payments for nature are under discussion as well. As subsidies are declining, the owners of nature areas need to find other resources for paying the costs for maintenance. Since the Natuurpact the term 'natural capital' is introduced in which there is more attention for the benefits of nature for humans. It is about the capacity of nature to take care for fertile soils for food production and delivering resources such as wood, biomass and water carrying capacity. This is not only important for nature areas but also for city parks, farmland and industry sides. The ecosystem services are the goods and services delivered by nature. The idea of researchers focussing on The Economics of Ecosystems and Biodiversity (TEEB) is that if worldwide ecosystems degrade, ecosystem services for citizens disappear and wealth will decrease.

The authority of scientific knowledge has diminished in the last decades, within and outside nature policy, what makes that the legitimacy of arguments based on scientific knowledge has decreased as well (Buijs et al., 2014).

6. Developments in the water system and regime

6.1. Developments in (tangible) system elements

The water system consists of different elements as different functions of the water system exist. Besides protection against the rivers and sea, there is the water storage function, distribution function, sanitation and drink water function. That makes that not only the water level is important but the quality matters as well.

In the Netherlands the Water Framework Directive is an important policy element. This directive is established in 2000.

In 1996 a Proposal for a Water Framework Directive was presented with the following key aims (*European Commission, 2015*):

- expanding the scope of water protection to all waters, surface waters and groundwater
- achieving "good status" for all waters by a set deadline
- water management based on river basins
- "combined approach" of emission limit values and quality standards
- getting the prices right
- getting the citizen involved more closely
- streamlining legislation

Regarding rivers the idea was to organise water management by river basin - the natural geographical and hydrological unit - instead of according to administrative or political boundaries. While several Member States already take a river basin approach, this is at present not the case everywhere (*European Commission, 2015*).

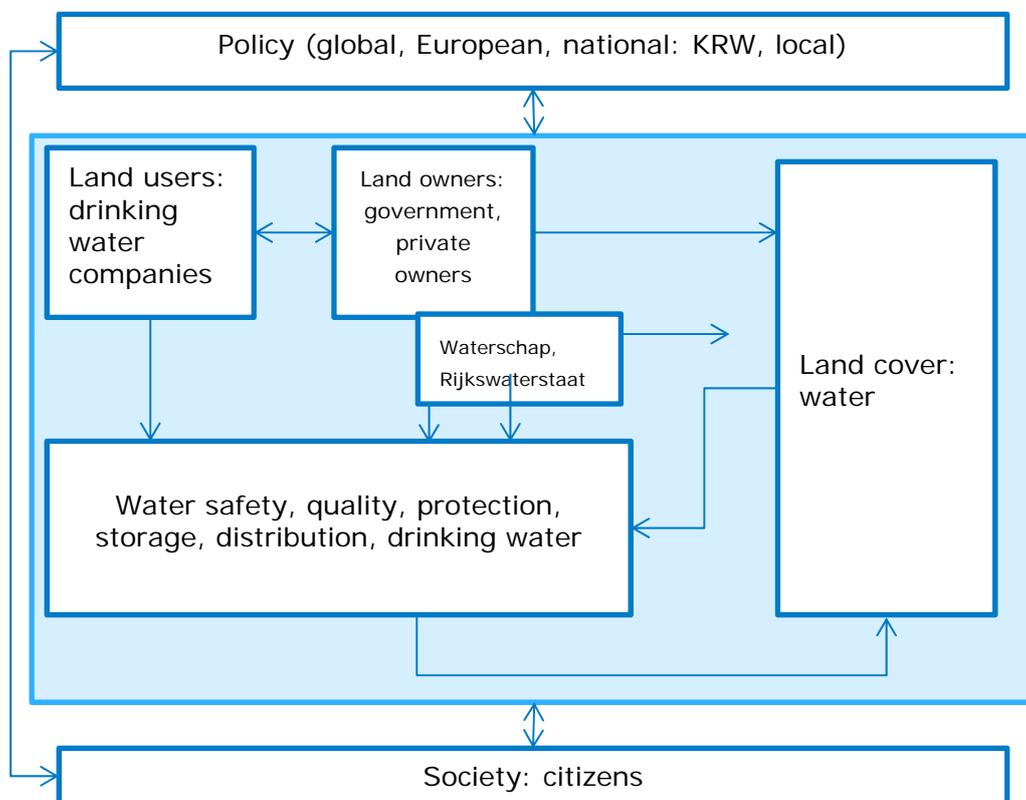


Figure 18 Socio-technical system for water

Related to the water system the main topics that play a role are:

- Water quality: the quality of surface water in the Netherlands does not meet the standards as set in the Water Framework Directive (Kaderrichtlijn water, KRW) yet. The Water Framework Directive is part of the European policy on water quality of surface water and soil water. The goal was to have water with good quality in all European water in 2015, or in 2027 at the latest (CBS et al., 2014c).

The Dutch surface water is of medium to bad quality. The most important reasons are (CBS et al., 2014d):

- emissions from the past leading to too high concentrations of persistent substances
- Over-fertilization with nutrients nitrate and phosphorous
- The design over water: the direction of most of the streams is adapted, what makes that the ecosystem of the bank of the stream is hardly developed. Leading to less natural habitats for plants and animals. Furthermore water levels are regulated what limits the natural dynamics.
- Because of pumping stations and flood-control dams the water is disintegrated, what makes it hard for fish to migrate.
- The use of chemical pesticides leads to death of organisms living in the water.

The focus of policy on water in relation to spatial planning has changed. While after the flood of 1953 the focus was mainly on protection against floods, spatial quality became important as well in programs like Room for the River. It was no longer top down determined to develop a dike, but there was more room for local initiatives. The Delta program is a follow up of this approach.

6.2. Developments in social groups and (intangible) regime elements

The main social groups involved in the water regime are:

- Farmers: Farmers are partly dependent on groundwater levels. Historically, farmers did have an important vote in water authorities. Although that is changing, farmers are an important stakeholder.
- Citizens: For citizens protection against floods and drinking water of good quality is important. As this report mainly focusses on land related issues, we will mainly focus on the water safety issues related to preventing floods.
- Drinking water companies: They are responsible for drinking water with good quality.
- Governments: The European Water Framework Directive is leading for policy making.
- Rijkswaterstaat: Rijkswaterstaat is the implementation organisations of the Ministry of Infrastructure and Environment and is taking care for a safe, liveable and accessible country.
- Water authority (Waterschap or Hoogheemraadschap): A water authority is a regional governmental organisation that is responsible for the water management in the area.

Since 1988 a number of improvements were made on water legislation. The focus became on addressing pollution from urban waste water and agriculture (the Urban Waste Water Treatment Directive, the Nitrates Directive). Furthermore there was a new Drinking Water

Directive (1998) and a Directive for Integrated Pollution and Prevention Control (IPPC), (1996), addressing pollution from large industrial installations (European Commission, 2015).

In 1995 there was asked for a more global approach to water policy:

“Whilst EU actions of the past such as the Drinking Water Directive and the Urban Waste Water Directive can duly be considered milestones, European Water Policy has to address the increasing awareness of citizens and other involved parties for their water. At the same time water policy and water management are to address problems in a coherent way. This is why the new European Water Policy was developed in an open consultation process involving all interested parties.”(European Commission, 2015)

Interested parties were asked to comment on it, such as local and regional authorities, water users and non-governmental organisations (NGOs). Most of them welcomed the broader approach.

Although water policy has made progress in Europe and individual Member States, European waters are still in need of increased efforts to get them clean or to keep them clean. Scientists, experts and an ever increasing amount of citizens and environmental organisations are asking for this. Water protection is one the great challenges in the EU in the 21st century (European Commission, 2015).

The main discussions and issues in the water regime

Many aspects are related with water, such as quality and biodiversity. But as we focus on land use, the discussions that will be discussed in this section do mainly relate to floods and plans to deal with rising water levels in river basins.

Building outside the dikes is popular in the Netherlands. The amount of houses build outside the dikes (between the dike and the river) in areas that are not build up areas yet, is increased between 2000 and 2012 with 81%. This is mainly due to construction of new houses in the Southern part of the Netherlands. The amount of houses outside the dikes within the build-up areas has in the same period increased with 34% (CBS et al., 2014f).

In the policy on large rivers (2006) the focus is on maintaining space for the large rivers in the Netherlands. This means that in the area in which the river flows it is usually not allowed to build houses. In the water storage area of a river bank it is allowed to build houses if the safety of the area is not endangered, there are no obstacles constructed for increasing the water capacity and the water level and carrying capacity of the area are maintained (CBS et al., 2014f).

7. Developments in the urban system and regime

7.1. Developments in (tangible) system elements

Between 2008 and 2013 the population of the four largest cities has grown tremendously. There is a strong connection between size of the municipality and the population growth: The smaller the municipality, the smaller the growth (CBS et al., 2013a).

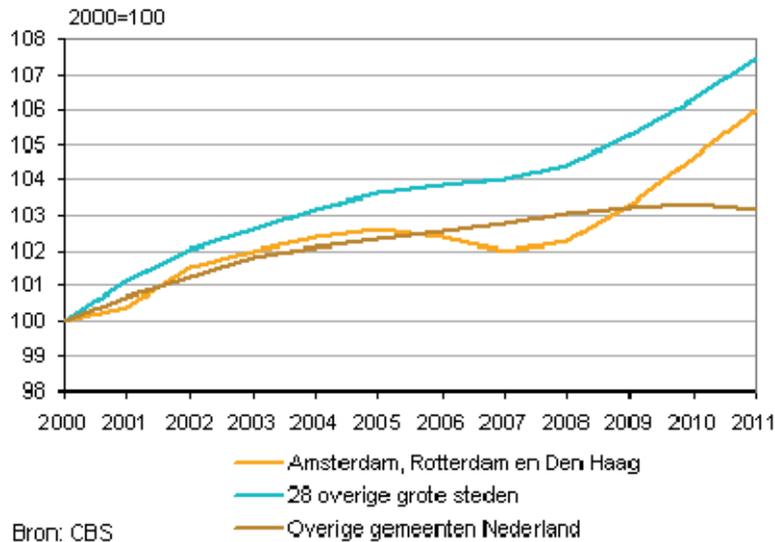


Figure 19 Growth population in the Netherlands: Large cities and other municipalities. (CBS, 2011)

The urban areas (cities) are expanding by building new residential areas, industry areas, recreation areas and railways or highways. The urban area itself becomes more urban because of restructuring, condensation and transformation. In 2011 around 40% of the Dutch people lived in the 22 largest city agglomerations. When taking into account the cities and villages around these cities, around 9 million people are living in the urban area in 2011. The concentration of people and activities in urban areas is on the one hand a breeding ground for growth and innovation, on the other hand a high concentration of people in a certain area also causes some problems with for example scarcity of space, accessibility and hindering the neighbours. Because of the size of cities and the investments in infrastructure and build environment make that every change takes a lot of time and decisions (CBS et al., 2015). It can be expected that the Dutch population will grow between 2012 and 2025, however not in every region. Again the population of the cities will grow, while population in the regions in the south-western or north-eastern part will decline (CBS & PBL, 2013).

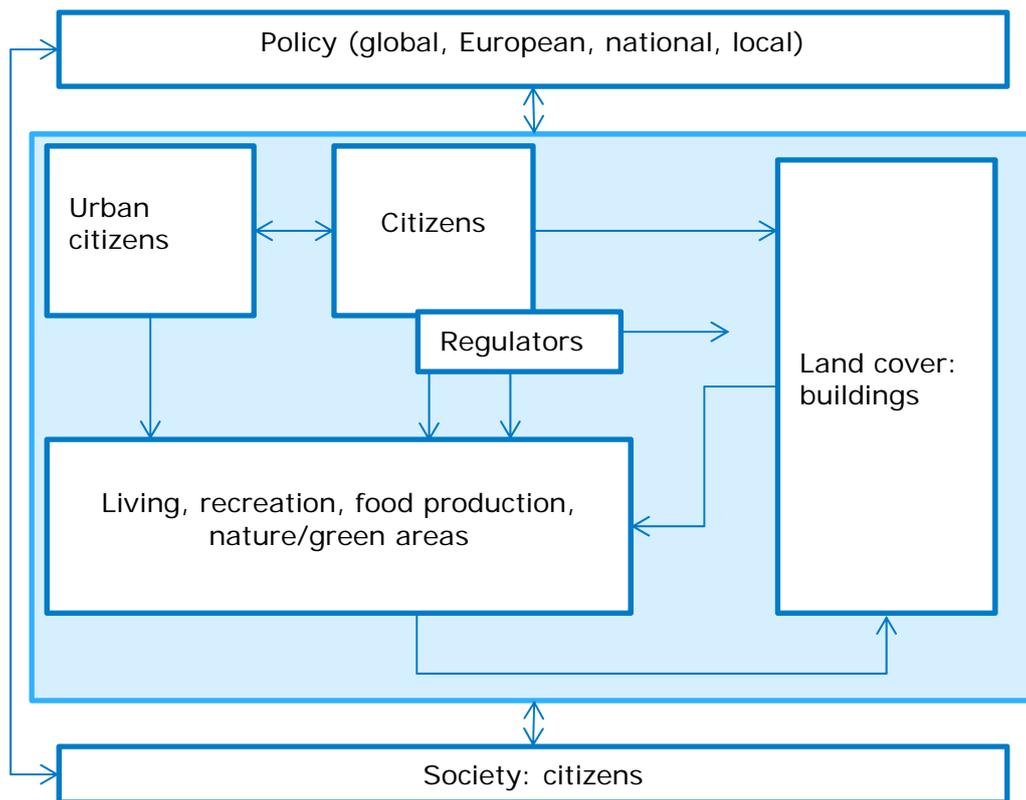


Figure 20 Socio-technical system for urban areas

As Figure 5 shows the amount of urban area is still increasing. The largest share (around 50%) of the former agricultural land has become build up area (CBS et al., 2014b).

The number of farms is declining, leading to more people (non-farmers) living in the rural areas as well. This leads to different relations between people living in the rural areas.

7.2. Developments in social groups and (intangible) regime elements

The main social groups in the urban domain are:

- Citizens: more than half of the Dutch citizens are living in cities. Furthermore, more people are living in the rural areas as well, while they do not have a farm. That makes that farmers have to deal with their environment in a different way. It does make a difference when the people surrounding farmers are farmers as well or not.
- Farmers: As cities are growing, the city is also becoming closer to the farms, what makes that one has to take into account what the effect of the outputs of farms such as smell, noise and fine dust on the environment is.
- Government: spatial planning is mainly organised locally. The municipalities develop plans (bestemmingsplannen) in which the destination of areas is determined.
- Companies: The density of companies (per square kilometre) is highest in the Randstad and some larger cities in the rest of the Netherlands, e.g. Groningen, Maastricht.

The main discussions and issues in the urban regime

Different flows of urbanization and re-urbanization are visible over the past decades. Until 1960 there was urbanization in the Netherlands. People started to move towards cities. Between 1960 and 1975 suburbanization in which people from cities start to live in the rural areas surrounding the cities. From 1975 till 1980 there was depopulation of towns as people started to move farther away from the cities. This was a result of increasing mobilization and wealth. After 1980 there was re-urbanization again, as people experience the disadvantages of commuting to work every day. Furthermore the government tried to make the cities more attractive to live in.

The attention for green areas in the cities is growing. Although there are no norms for the amount of green area per house, the Nota Ruimte mentions 75m² per house as a guideline. The amount of green areas especially in the large cities is little, because of a huge amount of houses combines with a small amount of public green areas. There are also parts of the Netherlands in which there is not much green in the cities itself, but the cities are surrounded by green areas (e.g. Friesland and Groningen). Between 2000 and 2003 there was a slightly increase in green areas in the living environment in the big cities, while between 2003 and 2006 a slight decrease was visible. The municipalities are responsible for the amount of green in the cities. The government encourages the developments of new parks and improvement of the connection between parks with 'Investeringsbudget Stedelijke Vernieuwing'. Between 2005 and 2009 there was 23,8 million euro available for the 31 largest cities of the Netherlands (CBS et al., 2010).

The idea to make cities eco-efficient is gaining popularity: renewable energy, less CO₂ emissions, recycling of waste and environmental friendly traffic management (Hajer & Dassen, 2014). The term 'smart city' is coined at the beginning of the 21st century, in which cities are constructed in innovative ways, based on smart technologies making cities more safe, clean and efficient. ICT is an important element of these ideas.

The financial crisis had an impact on the housing sector as well. After years of increasing prices of houses, the prices for houses dropped and it became harder for citizens to sell their house. Furthermore the unemployment was rising what makes that more people had to sell their house. Often the price they got was less than they had paid in the past, resulting in debts.

Changes in the urban area are hard to make as large investments in buildings and infrastructure are done, and buildings are not easy to change. Innovative ways to change the urban area therefore need a lot of time and investments as well.

8. Conclusions about stability and tensions

This report described for The Netherlands the stability and tensions in different regimes in the land use domain. In order to be able to make a statement on the stability and tensions of the land use domain, we will summarize in this paragraph the main lock-in factors and cracks and tensions that we observed in the different regime. For relevant actors in each regime both the lock-in or stabilising force and cracks, tensions and problems are assessed (weak, moderate or strong). A strong lock-in means that the system is difficult to change because of for example a strongly organised sector, in which different actors are closely connected. A weak lock-in suggests that the system is more easy to change; innovations can more easily applied and less resources or time may be required to change a system. A strong tension, crack or problem will possibly open up a regime to a lot of changes, on the short run. A weak tension, crack or problem is not influencing the system so much, and the chance that an innovation will change the regime is small. An overall assessment of the lock-in and cracks and tensions of the system is made based on the assessment of the regime elements. The idea is that a strong locked-in regime is more difficult to change compared to a weak locked-in regime.

We will conclude this chapter with some overall conclusions on the stability and tensions in the land use domain in general.

8.1. Agricultural regime

The agricultural regime has changed considerably over time, but these changes can be characterised as intra-regime changes: changes within a regime leading to transformation of the existing regime rather than an ‘opening up’ and new regimes emerging. The main developments are an increase in agricultural production, a decrease in the number of farms and an increase in the size of the farms in hectares or number of animals per farm. The agricultural regime is mainly influenced by the demand for products from within and outside the Netherlands. The demand determines to a large extent what will be produced. Diets are often laid down in culture, which is hard to change.

What is changing is agricultural policy. Where in the past Dutch farmers were supported with subsidies; the agricultural sector is nowadays increasingly seen as a ‘normal’ economic sector. This means subsidies are declining and prices will be more influenced by the national and international market. An example is the abolishment of the milk quota in Europe (April 2015).

Because farmers made large investments in machines, buildings and land, they will not easily change their way of farming in a radical way. For example a horticulture farmer will not easily change towards keeping pigs or the other way around. In that sense the agricultural system is strongly locked in. The main cracks and tensions in the agricultural regime are on the policy side of the regime. When policies are changing, farmers may have to adapt their way of managing their farms.

There is however an example of an intra-regime changes as well, leading to multifunctional land use. As a result of policies that limit production (by for example milk quota in the dairy sector or environmental regulations), the only option to increase income for farmers is to broaden activities. That development has led to more agricultural nature conservation, especially in the dairy sector and engaging in other activities such as tourism, health care activities on the farm to find additional sources of incomes. However, as the milk quota is recently abandoned, this kind of developments may change as well.

Table 3 Conclusions about stability and tensions in the Dutch agriculture regime

| Agriculture regime | | |
|--------------------------------------|--|---|
| | Lock-in, stabilising forces | Cracks, tensions, problems and opportunities |
| External landscape pressures | <ul style="list-style-type: none"> Land will remain necessary to produce agro-food products. Investments in land are high Land use is hard to change from one type into another type | <ul style="list-style-type: none"> Increased competition for land Expansion of the European Union Change from involvement of government towards more responsibility with society (all actors) |
| Farmers | <p>STRONG</p> <ul style="list-style-type: none"> Farmers did investments in land and machines, what makes it difficult to change the land use or farm management. Farmers manage the land in a particular way, according to habits, culture and machinery and land. | <p>WEAK</p> <ul style="list-style-type: none"> Price issues can increase pressure and lead to more efficient/intensive production Farmers are looking for other ways to generate a (better) income. More non-farmers living in rural areas do lead to other relations between farmers and their neighbours. |
| Consumers | <p>MODERATE</p> <ul style="list-style-type: none"> Food patterns are laid down in culture that is hard to change. Diets determine the amount of land necessary for food production | <p>WEAK</p> <ul style="list-style-type: none"> Increasing attention for product and production characteristics like authenticity, local production, animal welfare and sustainability. However the effect of this attention is often not visible in purchasing behaviour. |
| Retail | <p>STRONG</p> <ul style="list-style-type: none"> The purchasing of goods is determined by a couple of large players | <p>MODERATE</p> <ul style="list-style-type: none"> The retail is influencing farmers to produce for a lower price, or in a more sustainable or animal friendly way |
| Policy makers | <p>MODERATE</p> <ul style="list-style-type: none"> Agriculture receives subsidies (depending on political parties in charge) A lot of the policy related to agriculture is organised on European level, for example regulations like the Water Framework Directive and the Bird and Habitat Directives. | <p>MODERATE</p> <ul style="list-style-type: none"> Subsidies are influential in determining actions, but the government is not always seen as trustworthy as the government changes policy too often. Policy on nature and policy on agriculture can conflict |
| Public debate and opinion | <p>STRONG</p> <ul style="list-style-type: none"> Agriculture is an important element of the Dutch landscape: the total amount of agricultural area is relatively stable | <p>MODERATE</p> <ul style="list-style-type: none"> The public discussion on food is growing, however only in a specific group of society. Issues like local vs global production, healthy diets, authenticity and sustainability are getting attention The public debate on mega farms seems to be influential. The NIMBY effect (not in my back yard) plays a role here. Food scandals and animal welfare issues are influencing the agricultural regime |
| Pressure from social movements, NGOs | <p>MODERATE</p> <ul style="list-style-type: none"> There is a strong lobby in the agricultural sector at national and European level. | <p>MODERATE</p> <ul style="list-style-type: none"> NGOs focussing on animal welfare issues are getting more attention. Furthermore new initiatives arise in which NGOs collaborate with |

| | | |
|--------------------|--|---|
| | | companies |
| Scientists | STRONG <ul style="list-style-type: none"> Strong connection between agricultural system and research communities. | |
| Overall assessment | STRONG <ul style="list-style-type: none"> As the lobby in the agricultural sector is strong and relations are established by the chain, the agricultural sector is strongly locked in. | WEAK TO MODERATE <ul style="list-style-type: none"> Recently some cracks and tensions are getting visible, mainly caused by public debates and pressure from NGOs on topics like animal welfare, sustainability and healthy food. |

8.2. Nature regime

The nature regime has moderate stabilising forces, but recently more cracks and tensions are visible that may possibly lead to changes. The main cause for these cracks and tensions is changing nature policy and in the lower amount of financial resources being available for nature subsidies. Other resources need to be found to pay the developments of nature areas. As a lot of organisations involved in nature conservation are dependent on subsidies, this is a crack in the system that probably can create space for niche innovations focussing on new ways to reward nature. New ways to finance acquisitions of new areas as well as the management and maintenance of existing nature areas are needed.

The main shift in nature policy is from the ‘Kabinet Rutte I’ onwards (2010), in which the focus on the National Ecological Network was loosened. Responsibility shifted from national policy towards provinces (decentralisation) and landscape policies were loosened (deregulation). Recently policy is focussing on the role of nature in society. In nature policy the link between economy and biodiversity is put to the fore in order to find ways to improve both simultaneously (win-win solutions) and focus on the importance and positive impact of nature on society.

In the nature regime the main changes that are starting to occur are examples of starting inter-regime changes: changes that shift from one regime into another regime. In the changes we have described in this report changes are occurring on the border between different regimes. Nature is combined with agriculture or water, and financial resources from different sources are pooled when biodiversity is combined with nature.

Table 4 Conclusions about stability and tensions in the Dutch nature regime

| Nature regime | | |
|------------------------------|---|--|
| | Lock-in, stabilising forces | Cracks, tensions, problems and opportunities |
| External landscape pressures | <ul style="list-style-type: none"> The economic importance of nature is relatively low (compared to other types of land use) | <ul style="list-style-type: none"> Competing claims on land use: More area used for agriculture, energy production, buildings will reduce nature areas |
| Consumers/ citizens | MODERATE <ul style="list-style-type: none"> Most of the nature areas are open for tourists/ recreation. Policy is focussing on a more central position of nature in Dutch society Involvement of citizens is promoted | MODERATE <ul style="list-style-type: none"> Who is paying for nature is a difficult issue as it is a social good. New payment systems are emerging |
| Policy-makers | MODERATE <ul style="list-style-type: none"> Policy on and budget for nature is dependent on the political colour of the policymakers | STRONG <ul style="list-style-type: none"> A change in dominant political parties can lead to stop or decline of subsidies |

| | | |
|--------------------------------------|---|--|
| | <ul style="list-style-type: none"> • EU regulations form the guidelines wherein Dutch policy needs to be developed. | <ul style="list-style-type: none"> • The differences between national and regional/local goals • Policy on nature and policy on agriculture can conflict |
| Public debate and opinion | MODERATE <ul style="list-style-type: none"> • There is a debate on what is meant with 'nature' and how to deal with nature. For example whether or not to feed animals in nature areas in a cold winter. | STRONG <ul style="list-style-type: none"> • The definition and the appreciation of nature differ per actor. Every actor has a different goal related to nature |
| Pressure from social movements, NGOs | STRONG <ul style="list-style-type: none"> • The organisations that maintain nature (Natuurmonumenten, Staatsbosbeheer) have a strong/settled role and own a lot of nature | MODERATE <ul style="list-style-type: none"> • The organisations are dependent on subsidies and fees. Subsidies are declining, and organisations have to look for other sources of income. • Maintenance and owning nature areas is moving from public to private actors |
| Scientists | WEAK <ul style="list-style-type: none"> • The authority of scientific knowledge has diminished in the last decades, within and outside nature policy | WEAK <ul style="list-style-type: none"> • Scientists have developed new ideas together with other actors like nature conservationists or social entrepreneurs. This results in new opportunities. • |
| Overall assessment | MODERATE <ul style="list-style-type: none"> • The origin of nature conservation and the institutions organizing it are somewhat locked in. But changes are occurring in conservation practices and financial constructions. | STRONG <ul style="list-style-type: none"> • There is a policy shift from protecting nature towards a more central role for nature in society. Furthermore financial resources are changing what makes that the organisation/management of nature is subject to change |

8.3. Water regime

The water regime has a lot of stabilizing forces and especially the institutions are strongly locked in. Water authorities exist for decades and are hard to change. Furthermore in the case of rivers, the Netherlands is positioned at the estuary of the rivers, what makes measures dependent on the measures taken upstream.

In plans like Room for the River, areas on and next to river banks are designated as agricultural or nature areas. This is an example of multifunctional land use in which for example nature is coupled to water management. However, water safety is the main concern within these developments, after which increasingly a connection to nature interests is ('meeliften').

Table 5 Conclusions about stability and tensions in the Dutch water regime

| Water regime | | |
|------------------------------|---|--|
| | Lock-in, stabilising forces | Cracks, tensions, problems and opportunities |
| External landscape pressures | <ul style="list-style-type: none"> • Dependent on countries the river passes from source to the sea • Investments in dikes led to dikes as main way to deal with water safety | <ul style="list-style-type: none"> • Climate change is leading to temperature rise, sea level rise and more heavy showers |

| | | |
|---------------------------------------|--|--|
| | <p>related to floods.</p> <ul style="list-style-type: none"> The nature of rivers and dikes is hard to change because of costs and impact on spatial planning. Changes cost a lot of money | |
| Policy-makers | <p>STRONG</p> <ul style="list-style-type: none"> The political structure related to water issues in the Netherlands is really old and traditional. Water authorities and “Rijkswaterstaat” exist for more than hundred years. This makes the organisational structure around water issues very stable. From the past the focus is mainly on dikes, so are investments. The result is that improving dikes is the cheapest solution and does fit the best in the current policy. Spatial planning decisions are taken for the long-term | <p>MODERATE</p> <ul style="list-style-type: none"> In order to make plans relevant for different types of policy, there are examples in which water safety is combined with for example nature conservation (e.g. Room for the river). Water safety was the main goal, but where dikes were mainly on engineering in the past, in Room for the River there was also attention for ecology and spatial planning. Local and national government goals and perspectives are sometimes conflicting: As water safety is a national problem, the national government will deal with it. However in some cases local solutions are necessary what makes that local governments need to solve the issues. |
| Public debate and opinion | <p>STRONG</p> <ul style="list-style-type: none"> People tend to perceive a ‘safe environment’ as normal The idea is that citizens are protected against water with dikes etc. Water safety is framed as a societal problem, what makes it a collective problem (to be) tackled by the government. | <p>WEAK</p> <ul style="list-style-type: none"> There is not so much awareness among citizens |
| Pressure from social movements, NGOs, | | <p>WEAK</p> <ul style="list-style-type: none"> Competing claims on land use: farming, nature, recreation, etc. |
| Scientists | <p>STRONG</p> <ul style="list-style-type: none"> Most of the knowledge on water issues is gained via Deltares. That originated from the past | |
| Overall assessment | <p>STRONG</p> <ul style="list-style-type: none"> Not easy to change, as projects are determined for a long term. The institutionalised environment is locked in. | <p>WEAK</p> <ul style="list-style-type: none"> There seem to be opportunities to couple the water regime with nature or housing; however water safety is often the core of developments. |

8.4. Urban regime

The urban regime is locked in as a result of the character of the urban regime: buildings and infrastructure. Once there, buildings and infrastructure are hard to change radically or to remove. Within the urban areas some changes are occurring as one has to deal with challenges like microclimate, traffic jams and the increasing population. Smart cities is a concept focussing on more efficiently use of resources in cities. The system itself is hard to change, but some ideas to for example decrease the traffic by cars are trying to change behaviour of citizens. This means that the main changes that are expected to happen are intra-regime

changes: changes that happen within the regime. However, some of the agricultural areas have become urban areas as they are bought by project developers. So the urban regime may be expanding at the cost of agriculture.

Table 6 Conclusions about stability and tensions in the Dutch urban regime

| Urban regime | | |
|--------------------------------------|--|--|
| | Lock-in, stabilising forces | Cracks, tensions, problems and opportunities |
| External landscape pressures | <ul style="list-style-type: none"> • Buildings are hard to change • Population in cities is growing | <ul style="list-style-type: none"> • Competing claims on land use • Financial crisis • Collapse of the housing market |
| Industry/companies | <p>STRONG</p> <ul style="list-style-type: none"> • Once positioned in a certain area, especially the industry is hard to remove as for example infrastructure is arranged. • Industry is often concentrated on one area and not so much spread over the city. | <p>WEAK</p> <ul style="list-style-type: none"> • There is more attention for using empty buildings for other purposes. |
| Consumers/citizens | <p>STRONG</p> <ul style="list-style-type: none"> • Majority of the citizens is living in cities leading to concentrations of built-up areas. • The population of cities is growing faster compared to rural areas | <p>MODERATE</p> <ul style="list-style-type: none"> • The population in cities is growing. The question is how that growth will continue in the future. • There is a demand for more green space in the cities and recently allotment gardens and urban farming are gaining popularity, what creates a link with agriculture • There are more non-farmers living in the rural areas |
| Policy-makers | <p>STRONG</p> <ul style="list-style-type: none"> • Regulations on different levels are in place that direct how to deal with build-up areas. Changes in this policy are only marginal. • Policy decisions on spatial planning are decisions that will have an impact for a long period of time. Once implemented they are hard to change again. • Mainly focus on urban areas or green areas (not the combination, as there are separate policies) | <p>WEAK</p> <ul style="list-style-type: none"> • Policy is changing (urbanization, re-urbanization, suburbanization), but not that fast. |
| Public debate and opinion | <p>MODERATE</p> <ul style="list-style-type: none"> • Build-up areas need to fit in the environment • NIMBY: Not in my backyard. People do not want big industry or companies near their house. | <p>MODERATE</p> <ul style="list-style-type: none"> • More attention for using empty buildings for other purposes • Growing attention for green areas in cities • Urban agriculture and local food: although the quantity produced is not so high, it does change the mind-set. |
| Pressure from social movements, NGOs | <p>MODERATE</p> <ul style="list-style-type: none"> • The majority of pressure of social movements is on the place of build-up areas in relation to nature | <p>MODERATE</p> <ul style="list-style-type: none"> • Increase of temperature in cities asks for solutions • Movements against empty buildings |

| | | |
|--------------------|--|--|
| | | or areas in cities |
| Scientists | | <p>MODERATE</p> <ul style="list-style-type: none"> • There is an increasing interest in 'smart cities': cities in which flows of nutrients and water are used in an efficient way |
| Overall assessment | <p>STRONG</p> <ul style="list-style-type: none"> • Once buildings are there, it will not be easy to change in another type of land use. • Regulations regulate most of the issues with build-up areas. | <p>MODERATE</p> <ul style="list-style-type: none"> • There are not many radical tensions or problems to be expected. The build-up area is not so much under discussion (in the Netherlands). However cities are an interesting place where new initiatives start, like urban farming, smart cities and green roofs. |

8.5. Overall conclusion land use domain in the Netherlands

Based on this analysis we can conclude that the land use domain in The Netherlands is locked in, which is not very surprising for a small, low-lying and densely populated country. Except for the nature regime, the land use regimes described are strongly locked in. The institutions in this domain and the structures organising the regime exist already for decades, especially in the agriculture and water regime. The character of land use makes it also hard to change: once an area has buildings on it, it is not easily changed back into agriculture or nature. Furthermore investments in for example dikes are large and have a long time horizon and make that it is not easy to change the way of dealing with land in relation to water. The role of scientists is especially in the agriculture and water regime locked in. The organisation and development of knowledge is with a relatively fixed group of actors. Innovations mainly consist of Pathway B innovations, in which wider societal changes occur and a regime shift from one regime into a new regime is not expected in the short run.

The analysis of the regimes shows that in general the cracks and tensions in the current system are moderate or weak, except for the nature regime. Changes in the nature regime have mainly to do with changes in financial resources and institutions. There is a shift from public to private organisations involved in nature conservation. Policy is a very important and influencing factor as long as farmers, nature conservationists, or other parties are (partly) dependent on subsidies. As the politicians are changing regularly, policies might change as well. In the land use domain we see that the lion's share of the changes is caused by crises, often originated from the landscape, such as animal diseases, the financial crises or floods.

As the tables above show, the different regimes are increasingly influencing each other. The main reason is that competing claims on land exist. As demands from society like food, housing and recreational areas, are increasing, pressure on land is increasing. There may be an opportunity in combining different land use functions and thereby strengthen different regimes at the same time: One man's breath is another man's death. An example of regimes influencing each other is the nature and agriculture regime. These two regimes are sometimes conflicting, but can also strengthen each other. Another example of multifunctional land use is renewable energy production that can be a link between farmers and society (via energy cooperatives) and thereby improve the income of the farmer. In deliverable 2.1 we focussed on examples of multifunctional land use. Multifunctional land use is, as is already suggested by the name, a combination of different regimes, and not necessarily a modal shift in which one regime is growing and another one is declining.

An example in which an inter-regime change can fasten development of an area and simultaneously influence different regimes is the shift from a landscape in which everything was focussing on agricultural production like 50 years ago towards a multifunctional landscape in which the needs of consumers are playing a more important role. A combination of living, working and recreating in the rural areas will become more attractive and thereby the regional economy is strengthened (PBL, 2013b).

Furthermore, changes in one regime can lead to breakthroughs in other regimes. For example the way in which Room for the River created more space for nature areas around river banks shows how changes in policy on water management created space to expand nature areas. At the same time a connection between two regimes: nature and water is constructed. One can imagine that this could lead to difficulties as institutions involved in one regime become involved in another regimes as well.

In general the main changes in the land regime can be called transformation of existing regimes, rather than 'opening up' the regime for niche innovations emerging into new regimes as a result of major cracks and tensions.

Multifunctional land use requires studying different regimes, as changes in one regime will influence changes in another regime. The example of agricultural nature conservation shows that cracks and tensions in both the nature and agriculture regime can lead to new developments.

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Annex 1

List of participants of the workshop and interviews

Interviews:

Rijk van Oostenbrugge

Martijn Vink

Workshop:

Petra van Egmond

Hans Farjon

Menno Smit

Arjen van Hinsberg

Hendrien Bredenoord