

PATHWAYS project

Exploring transition pathways to sustainable, low carbon societies

Grant Agreement number 603942

Deliverable 2.3: 'Integrated analysis of D2.1 and D2.2 to assess the feasibility of different transition pathways'

Country report 11: The Dutch land use domain

Joyce Zwartkruis, Marcel Kok, Henk Westhoek
PBL Netherlands Environmental Assessment Agency

18 December 2015

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'). This report analyses the land use domain for the Netherlands, as the case study, for deliverable 2.3. ('Integrated analysis of D2.1 and D2.2 to assess the feasibility of different transition pathways').

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, Germany, Hungary) and empirical domains (electricity, heat, mobility, agro-food and land-use).

Content

Executive summary	4
1. Introduction.....	6
2. Assessment of breakthrough feasibility of the various niche-innovations.....	9
2.1. Business and biodiversity	9
2.2. Agricultural nature conservation	11
2.3. Resilient landscapes: room for the river	13
2.4. Local renewable energy production in the landscape	14
2.5. Urban farming	15
2.6. Tourism	17
3. Assessment of regime reorientation.....	20
3.1. Agricultural regime	21
3.2. Nature regime	25
3.3. Water regime	29
3.4. Urban regime	31
3.5. Summary of regime findings	33
4. Conclusions and wider discussion	35
5. References	37

Executive summary

The purpose of this document is to make an interpretive assessment of the feasibility of sustainability transitions pathways within the Dutch land use domain. This document builds on the analysis of niche innovations and of regime stability in the Dutch land use domain, as presented in Deliverables D2.1 and D2.2 respectively.

First the breakthrough feasibility of the various niche-innovations is assessed. The niche innovations in the Dutch land use domain we have studied are: Business and biodiversity, Agricultural nature conservation, Resilient landscapes, Renewable energy, Urban farming and Tourism. These niches are all examples of multifunctional land use, and are therefore positioned on the edges between two or more regimes. For every niche the internal momentum is assessed, based on an analysis of techno-economic, socio-cognitive and governance dimensions of the niche-innovations. The niches under study are all examples of regime transformation (characterised as pathway B in the Pathways project) niches and have a medium to low momentum.

Table 1 Breakthrough analysis of niche-innovations in the land use domain in The Netherlands

Niche-innovation	Internal momentum	Strong, medium or weak alignment with broader regime characteristics and developments	Likelihood of imminent breakthrough (and/or future potential)	Pathway A or B (or mixed)
Business and Biodiversity	Medium	Strong	Growing and can break through in the future	B
Agricultural nature conservation	Medium	Medium	Stabilized niche	B
Resilient landscapes	Medium	Strong	Is incorporated in the existing regime	B (elements of A)
Renewable energy	Medium	Medium	Growing and can break through in the future	B
Urban farming	Low	Medium	Growing , but is not likely to breakthrough	B
Tourism	Medium	Medium	Niche that can grow, but will remain a niche	B

A description of the related regimes and landscape elements makes it possible to see what elements of the regimes are influenced by the niche innovation, and what the possibilities are that a niche will break through. The four regimes in the land use domain are agricultural, nature, water and urban regimes. The regimes have a strong lock in, except for the nature regime. The cracks and tensions vary among the different regimes: the nature regime has strong cracks and tensions, while agriculture, water and urban show weak to moderate cracks and tensions.

Table 2 Assessment of regime trends in the land use domain in The Netherlands (with indicative ‘scores’)

	Lock-in, stabilizing forces	Cracks, tensions, problems in regime	Orientation towards environmental problems	Main socio-technical regime problems
Agriculture regime	Strong	Weak to moderate	Moderate (some incremental change)	Large, long term investments
Nature regime	Moderate	Strong	Moderate (some incremental change)	Discussion on who has to pay for nature and how to reward it. Uncertainty regarding subsidies.
Water regime	Strong	Weak	Limited; regarding floods, safety is still the main issue addressed.	Institutions have strong traditions/ways of working.
Urban regime	Strong	Moderate	Very limited (some attention for green in the city, but not much)	Build up area is not so much under discussion.

There is no transition unfolding yet. The niches described are in the early market niche phase, except for resilient landscapes. Room for the river, the example of resilient landscapes, did already become part of the existing system. In the land use domain we can argue that ‘radical incrementalism’ is occurring, meaning that change towards sustainability is occurring, but only in small steps. So, it is more likely there will be further diffusion, than a whole-sale transition in which there is a breakthrough and the system is replaced.

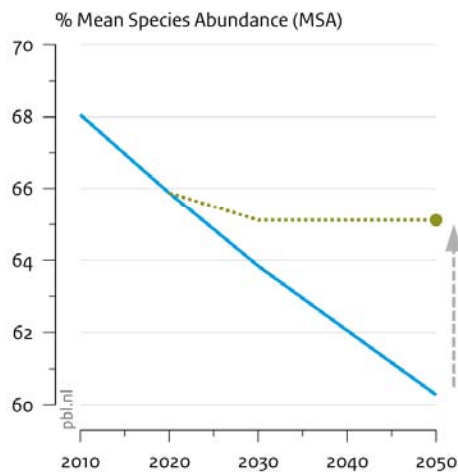
1. Introduction

The goal of this report is to assess the possibility that niche innovations in the Dutch land use domain will break through and change existing regimes. In order to be able to address that question, to start the momentum of various niche innovations will be assessed and the possibilities for niche innovations to take advantage of the windows of opportunity provided by the regime problems will be explored. Furthermore we will assess to what degree, existing regimes are beginning to reorient themselves to address the focal environmental problems.

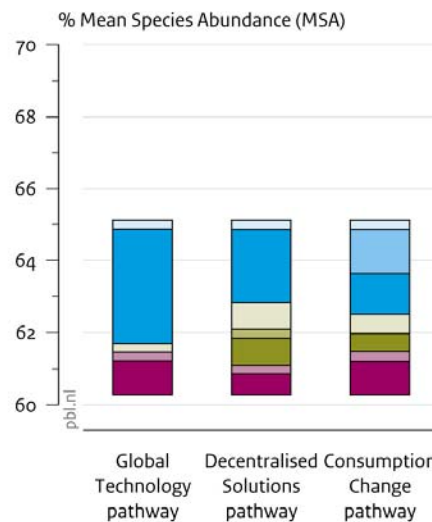
The main challenge in the Dutch land use domain is dealing with the increasing pressure on land use, combine different demands for limited land and stopping the decrease of biodiversity (see Figure 1). Figure 1 shows the different options to prevent biodiversity loss.

Global biodiversity and options to prevent biodiversity loss

Global biodiversity



Contribution of options to prevent biodiversity loss, 2050



- Trend scenario
- Goal
- ⋯ Derivation of 2050 goal
- ▲ Policy gap

- Restore abandoned agricultural lands
- Reduce consumption and waste
- Increase agricultural productivity
- Expand protected areas
- Reduce nature fragmentation
- Reduce infrastructure expansion
- Reduce nitrogen emissions
- Mitigate climate change

Source: PBL; PBL/LEI

Figure 1 Options to prevent global biodiversity loss (Vuuren van, 2015)

Although globally land use and land use changes are a significant cause of GHG emissions, this is only a relatively minor source of GHG emissions in the Netherlands. Mono-functional optimisation, in which there is a lot attention for one type of land use can lead to lower provision of ecosystem services beyond the agricultural products produced in intense agricultural landscapes. Multifunctional land use combines different functions in a certain area, and aims that these functions are strengthening each other

(Ellen et al., 2011). To deal with the challenges in land use and as a result of the decrease in the amount of money available for example for nature conservation, it will become more interesting to look for possible win-win solutions. However, there can be cases in which different functions are not strengthening each other, but exist beside each other without mutual reinforcement. Multifunctional land use is in many cases seen as a solution of dealing with the increasing pressure on land and the sustainability challenge societies face, especially in a densely populated area like the Netherlands.

Transitions in land use, compared to for example energy systems, take longer times, are less driven by specific technologies, result of changes in different regimes, appear at first sight more incremental and have less clear boundaries.

In the PATHWAYS project three pathways are distinguished (see table below). All the niche innovations studied in the land use domain are Pathways B innovations. They have to do with organising land use in different ways, and the technological component is only marginal. The niches studies in this domain are: Business and biodiversity, Agricultural nature conservation, Resilient landscapes (Room for the river), Local renewable energy production in the landscape, urban farming and tourism.

Table 3 Pathways

	Pathway 0: Business as Usual	Pathway A: Technical component substitution	Pathway B: Broader regime transformation
Lead actors	Incumbent actors (often established industry and policy actors)	Incumbent actors (often established industry and policy actors)	New entrants, including new firms, social movements, civil society actors.
Depth of change	Incremental change	Radical technical change (substitution), but leaving other system elements mostly intact	Radical transformative change in entire system
Scope of change	Dynamic stability across multiple dimensions	1-2 dimensions	Multi-dimensional change
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.

The question we address in this report is: Is there a possibility that niche innovations in the Dutch land use domain will lead to a breakthrough and reorientation of the existing regimes?

Four different phases in transitions can be distinguished (Geels, 2006):

1. **Pre-development:** This phase is characterised by R&D support, subsidized small market niches. Novelties emerge in niches. There is not yet a dominant design and different options may compete with each other. There is not yet a match with the existing regime what makes it not easy for niche innovations to breakthrough.

2. **Early market niches:** In this phase the novelty is used in small market niches, that may (still) benefit from subsidies and policy support. A community of dedicated people starts to emerge and activities are deployed to improve the niche innovation.
3. **Breakthrough, wider diffusion, self-sustaining momentum:** In this phase the innovation is breaking through and gets more widely diffused. Both the internal drivers of the niche and the external circumstances at the regime and landscape level creating 'windows of opportunity' make it possible for niches to break through.
4. **Stabilization of new system:** When the innovation enters the mainstream market, and begins to replace the old regime, a new system stabilizes. This may be accompanied by wider changes in the regime and landscape developments.

The structure of the report is as follows. In chapter 2 for every niche innovation an assessment of the breakthrough feasibility of the niches will be discussed. In order to be able to assess the possibility that a niches will lead to a breakthrough we will first discuss the internal momentum of each niche innovation. Internal momentum refers basically to the speed of changes and size of the niche. The next step is to asses to what extent the niche innovation aligns with the wider regime and landscape developments. For every niche we will conclude with a section on the possibility that the niche innovation will break through more widely. Section 3 will assess the dominant regime trends and assess to what extent the regime reorientation is or will occur. In chapter 4 we will conclude with an assessment of the niche innovations that will break through and a suggestion of which transition pathway (A or B) will be unfolding. In the wider discussion we will discuss the scale of the transition challenge, the importance of actors and concrete plans in the sector.

2. Assessment of breakthrough feasibility of the various niche-innovations

In this section we describe the different niches and the regimes they are dealing with. The table below shows for every niche the related regimes. This chapter is based on deliverable 2.1: Dutch niche innovation in the multifunctional land use domain (Zwartkruis, Westhoek, Kok, & Schooleenberg, 2014).

Table 4 The regimes related to the niche innovations

<i>Niche innovations</i>	<i>Regimes</i>			
	Nature	Agriculture	Water	Urban
Business and biodiversity	X	X		
Agricultural nature conservation	X	X		
Resilient landscapes	X	X	X	
Renewable energy	X	X		
Urban farming		X		X
Tourism	X	X		X

In this section we will describe the different niche innovations, the internal momentum (based on diffusion rates, size of social networks and commitment of actors), the alignment with broader regime and landscape developments and the possibilities for a breakthrough.

2.1. Business and biodiversity

Business and biodiversity is about companies putting extra attention on biodiversity. An example is the Skylark foundation in which among others Heineken is developing programs for arable farmers since 2002. This niche is a Pathway B example, as it is heading towards a broader regime transformation.

2.1.1. Internal momentum

Techno-economic factors

The number of participants in projects is rising. For example around 4% of the arable farmers in the Netherlands were part of the Skylark foundation in 2014. However, the number of initiatives and participants is dependent on the financial situation of the businesses.

Socio-cognitive factors

The social network of business and biodiversity is increasing and new actors are entering the market. Large industrial players are involved as well and the commitment is increasing. Biodiversity is becoming an important element of companies' strategies, as businesses are aware of their dependency on biodiversity. Since there is a community of practice, learning among projects is increasing as well.

Governance and policy factors

Policy support is increasing and projects like The Economics of Ecosystems and Biodiversity (TEEB) are gaining attention and biodiversity is increasingly linked to economy.

As the attention for biodiversity among businesses is increasing and the network is increasing this niche has a medium momentum.

2.1.2. Alignment of niche-innovation with wider regime and landscape developments

This niche-innovation Business and biodiversity occurs between the agricultural and nature regime. The agricultural regime has a strong lock in and weak to moderate cracks and tensions. There is a strong lobby in the agricultural sector, and a couple of large companies have a lot of power in the agro-food chain. Recently however, there is more public attention for topics like animal welfare, environmental impact and healthy food. That makes that on a small scale changes are possible and becoming visible.

The nature regime has a moderate lock in and has strong cracks and tensions. As the government budget for nature is decreasing, there are other sources needed to pay the investments. This creates new windows of opportunity for innovations.

In the wider landscape the changes in policy have an effect on the niche business and biodiversity. On a European level the goal is set to stop decrease of biodiversity, and business and biodiversity is one way to reach that goal. The amount of payments available for nature conservation is decreasing, so other resources should be found to maintain nature. Furthermore policy is decentralised, what makes provincial authorities responsible for nature conservation. The national policy on nature is changing from protecting nature towards creating a central role in society for nature. Citizens do become involved in initiatives like agricultural nature conservation.

The niche innovation 'business and biodiversity' can be a solution to the decreasing budgets for nature conservation and therefore aligns strongly with wider developments in the regime. Businesses step into the challenge of protecting biodiversity by rewarding farmers. This is mainly due to the sense of urgency businesses feel as they are very much dependent on natural resources.

2.1.3. Possibilities and tensions for niche innovation to break through

There is a high possibility that the niche business and biodiversity will break through. More companies see sustainability as one of their responsibilities, biodiversity is however not always part of it yet. Via payments by businesses the farmers are paid for the extra work they do for biodiversity, and they are no longer dependent on the government subsidies to do so. This development can result in higher involvement of farmers and businesses in agro-biodiversity issues. Based on this analysis we can conclude that this niche innovation is in the second phase of a transition, namely early market niche, as the momentum is increasing and there are possibilities that the niche will breakthrough.

2.2. Agricultural nature conservation

Agricultural nature conservation is a Pathway B innovation, as the core is not on technology, but the main change is in how agricultural nature conservation is organized. Instead of only getting a payment for their production, farmers can get a payment for the work they do for maintaining nature. There is a shift from individual efforts to collective efforts in the landscape (allowing more flexibility).

2.2.1. Internal momentum

Techno-economic factors

After a decrease of the amount of area used for agricultural nature conservation, recently the amount of area is increasing again (see figure below).

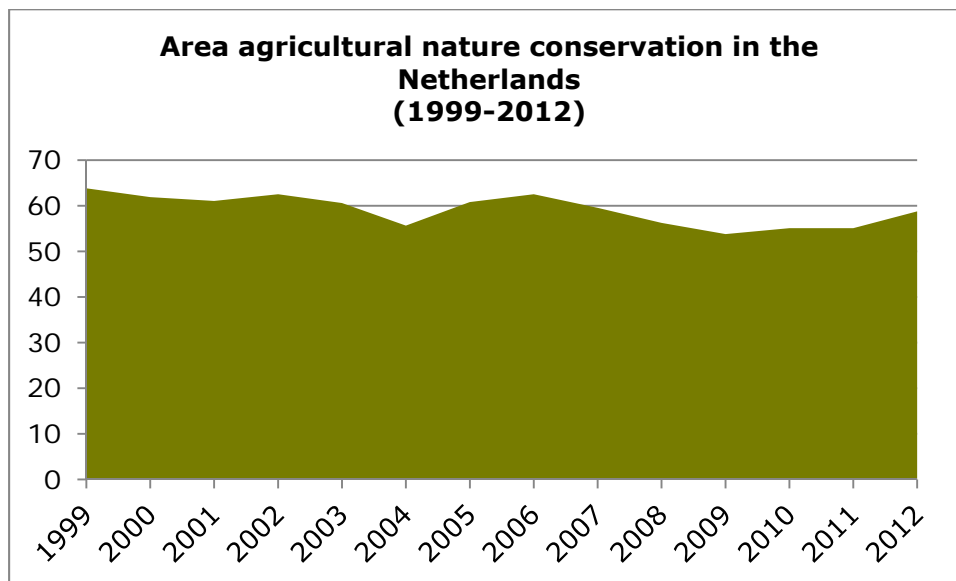


Figure 2 Total area agricultural nature conservation in the Netherlands (adapted from (CBS, PBL, & Wageningen UR, 2014d)

Besides the amount of land, the amount of money arable farmers get for nature and landscape is relatively small, but constant. The income from primary production is varying very much (Figure 3).

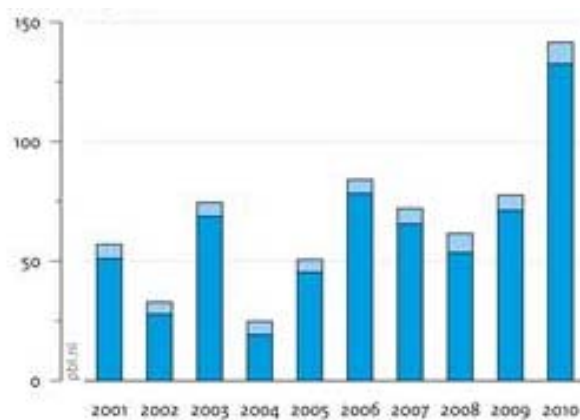


Figure 3 Income farmers (dark blue) and reward for nature conservation (light blue) in 1000 euros (Arnouts et al., 2013).

Socio-cognitive factors

The network of initiatives around this theme is increasing. The main reason for farmers to become involved in agricultural nature conservation are increase of income, idealistic reasons to make it possible to combine agricultural production and nature and interest in nature. The table below shows the motivation of different actors and the sources and inputs.

Table 5 Actors and their motivations and sources/inputs. Adapted from (Arnouts et al., 2013)

Actor	Motivation	Sources/inputs
Farmers (in ANVs)	Money Show that it is possible to combine nature and agricultural production	Land, labour and knowledge
Volunteers/citizens	Improve the quality of the landscape and nature Leisure activity	Labour
Government	Landscape is a collective good, maintenance is a government task	Money (subsidies form municipalities, provinces and GLB (Common Agricultural Policy) Make policy and develop plans to develop the nature. Encourage maintenance by farmers and citizens

Governance and policy factors

As it can be expected that only 25% of the farmers will apply agricultural nature conservation without subsidies (PBL, 2013), the dependency on policy is high. However changes are occurring in domestic nature policy, as the responsibility for nature policy has shifted from the national to regional government.

The internal momentum of agricultural nature conservation is medium. The attention, the number of initiatives and the network is growing. However, agricultural nature conservation is very much dependent on subsidies. As policy is changing, the future is uncertain.

2.2.2. Alignment with wider regime and landscape developments

Agricultural nature conservation occurs between the agricultural and nature regime. This development can become a license to produce for the agricultural sector, especially in areas in which increasing production is not the way to go. On the other hand agricultural nature conservation is trying to increase the biodiversity on agricultural land, what will have an impact on the total biodiversity.

A shift in payments for nature conservation is helpful in maintaining nature by farmers. In the renewed CAP the shift from payments per hectare to payments for services is facilitating the changes. This niche innovation tries to solve the challenges of both farmers and nature conservationists, although there is discussion on whether this type

of nature can be called nature. The alignment with wider regime and landscape developments is medium.

2.2.3. A stabilized niche with some potential for growth

The niche is addressing the tensions in the agriculture and nature regime. Nature policy is shifting focus and agri-environmental payment schemes do facilitate that shift. The total area of agricultural nature conservation in the Netherlands is more or less stable, but when farmers are rewarded for agricultural nature conservation the area protected will increase.

This niche innovation can be viewed as a stabilised niche. There is some room for growth, but overall it is not expected that a breakthrough will happen on the short run. As policy is not stable (yet), and will probably be changing the question is whether the phase of stabilizing a new regime will be reached on the short run.

2.3. Resilient landscapes: room for the river

Resilient landscapes are landscapes that are adapted to changes in the environment. In the Netherlands we focus on room for the river; a project on water, as water is an important element in the Dutch landscape. The Room for the River case study is an example of a multi-functional land use in which river plains are created both for public safety as well as for other functions such as nature, agricultural land, urban/built-up areas and open water. While in the past the focus was on developing channels to make transport possible, the problems with water quality, climate change and biodiversity did lead to changes towards a multifunctional approach in which water is combined with nature (and agriculture). The Dutch Room for the River project serves as an example of an innovative approach that shows a 'reconfiguration of regime boundaries: the regime itself is not substituted by another (many aspects and actors remain as before), but the changes in this regime do affect other regimes as well (change in land use on the river plains).

2.3.1. Internal momentum

Techno-economic factors

The room for the river case is an example of a niche innovation that already started in 2001. At the moment many solutions are technically feasible and the measures are part of the policy.

Socio-cognitive factors

Different actors, like Rijkswaterstaat, NGOs and land owners were able to connect to each other and realize their own goals leading to collaborative actions. That made that solutions not only refer to water, but also nature and agriculture. Windows of opportunity for several policy domains came together, for example biodiversity goals, protection population against floods and developing nature. That leads to a combination of functions in one place.

Governance and policy factors

As a result of floods in the 1990s, there was a lot of policy support, leading to a budget of 2.2 billion euros for Room for the River projects. Most of the elements are part of the current policy.

The niche innovation resilient landscapes, room for the river has a medium momentum. Because the project room for the river is already running since 2001, the high momentum for the project has been reached a couple of years ago.

2.3.2. Alignment with wider regime and landscape developments

This Room for the River project occurs between the water and nature regime and to a lesser extent the agricultural regime. The niche innovation room for the river can be defined as a success as it connects different goals and tackles challenges in the water, nature and agriculture regime. The solution provided by combining room for the river projects with for example nature conservation led to a higher involvement of many organisations and made it possible as well to develop new ideas. This niche innovation is strongly influenced by the floods in 1953 and 1990s and has a high government involvement. The alignment with changes in the wider regime and landscape is strong.

2.3.3. Incorporated in existing regime

Room for the River has already become part of the regime. When looking back, this innovation can be seen as a niche as it started as a new way to deal with water management. Combining different functions in the same area led to more possibilities. The most important tensions are however the high costs involved in developing more room for the river. This niche is in the fourth phase of transition, as it is already part of the new regime. The measures developed in the room for the river program are now widely applied.

2.4. Local renewable energy production in the landscape

The niche local renewable energy production in the landscape is a bit different from the other niches. Local renewable energy is a result of developments in the energy domain that does have an impact on the land use domain. It can be framed as a landscape development and is a result of the growing demand for renewable energy. As we focus on the role of renewable energy in the landscape, we focus on wind energy and solar energy as these two types of renewable energy are most visible in the landscape.

2.4.1. Internal momentum

Techno-economic factors

The number of projects on renewable energy is increasing and new models are developed to pay investments in local cooperatives. So is the number of farmers producing energy for third parties (not only for themselves) growing very fast, from 897 in 2008 tot 1222 in 2013 (CBS, 2014a). The demand for renewable energy is high as alternative for fossil fuels will become scarce in the future, lead to geopolitical instability and contributes to global warming.

Socio-cognitive factors

Social networks around renewable energy are increasing and new organisations, like local energy cooperatives are entering the market. However, there is societal resistance as well. Especially in relation to wind farms there is the so-called NIMBY effect (Not In My Back Yard).

Governance and policy factors

As renewable energy can take a place in the landscape, there are new ways needed to deal with spatial planning. As energy is no longer only produced by energy companies, but also by citizens, this asks for adapted regulations on for example taxes.

The attention for renewable energy is growing, what makes that changes are likely to occur and the need for renewable energy is increasing. However, the NIMBY effect is hard to solve. This niche innovation has a medium momentum.

2.4.2. Alignment with wider regime and landscape developments

The niche renewable energy is influencing the energy regime. However, as this report focusses on land use, we focus here on the role of renewable energy in the landscape. The regimes that deal directly with renewable energy production in the landscape are mainly the agriculture and urban regime, and to a lesser extent the nature regime.

The nature regime is not so much locked in, while both the agriculture and urban regime are locked in. Renewable energy production can be in competition with agriculture or nature, but is also easy to combine. In practice many farmers have solar panels on their roofs, and wind mills are often positioned in the rural areas. However, for the large scale wind mill parks areas close to highways, ports or industrial areas are often used. The niche has a medium alignment with wider regime and landscape developments.

2.4.3. Growing niche that is likely to break through

The chance that the niche will break through is large, as the need for renewable energy is high. However, the role of renewable energy in the landscape is often under discussion as well. For example in municipalities people don't want to have a wind mill park in their backyard. This niche is the second phase of a transition; an early niche market, when viewed from the perspective of land use. The role of renewable energy in the landscape is increasing and still is very much dependent on subsidies and policy support.

2.5. Urban farming

Urban farming can be defined as producing food in, around and for the city. It creates a connection between (local) food production and the need of citizens for care, recreation, leisure, education, deals with waste and maintenance of (urban) green areas (Jansma et al., 2010). There are many types of urban farming varying from producing food in cities or their near environment in a professional way to people growing food on their balcony or roof garden. The main difference with conventional agriculture is that urban farming is not only focusing on production (what is the case in conventional agriculture) but also on creating value based on social capital (Nijhuis, 2011).

2.5.1. Internal momentum

Techno-economic factors

The number of initiatives in urban farming is increasing. But the total 'market share' remains limited. Numbers are hard to find, as there is discussion on what is urban farming and what not. Several studies have categorized the different types of urban agriculture. First of all, with regards to spatial distribution, urban farming can roughly be divided in intra-urban (within the city) and peri-urban (outskirts) agricultural practices (De Muynck, 2011). Intra-urban farming takes place in/on buildings or in

between buildings; and peri-urban farming takes place in the direct outskirts. A fourth type is agriculture focused on urban areas (e.g. with educational programs etc.).

Muynck (2011) concludes that there is definitely possible progress to make, especially in closing the cycles of waste, water, and energy flow. Veen and colleagues conclude (2012) that looking expected benefits from urban farming on the environment, there is little (academic) evidence for these claims.

However, there is a lot anecdotal data (for example case studies) that give indications for these claims. Therefore, one of the most important challenges for the development of urban farming is to work on the supporting evidence of these claims. The government can play an important role in the development and dissemination knowledge on urban farming.

Socio-cognitive factors

However, there is a lot of attention in society, the social network is increasing and the number of initiatives is growing. That increases the potential to grow and can lead to a higher momentum in the future. It is not expected that the niche will become really mainstreamed and therefore urban farming will remain a niche. There are promises for sustainability, but there are still many uncertainties regarding the effects on sustainability. It seems that one of the effects of urban farming is that people are more involved in food production, what can have an indirect effect on the consumption of fresh produce and even sustainability issues.

Governance and policy factors

There is no active policy support for urban farming, and in some cases spatial planning causes difficulties, as every spot has a certain spatial destination that is not easy to change.

Urban farming is a niche innovation with a low momentum at the moment. That is mainly due to the small scale at which urban farming is present at the moment and the fact that there are no business models yet.

2.5.2. Alignment with wider regime and landscape developments

This niche-innovation occurs between the agricultural and urban regime. There is a positive public debate, however financing and political will are marginal, what makes that urban farming is still very much dependent on initiatives taken by individuals and groups of volunteers. It is however medium aligning with the attention for food and authenticity in the Netherlands and connects to initiatives regarding social activities in a certain area.

2.5.3. Growing but not likely to breakthrough

The chance that the niche innovation urban farming will break through is very small. It may gain more popularity, but at this moment it is not yet to be foreseen that many people in urban areas can feed themselves with urban farming. However, there is an indirect effect, as people become more involved in agriculture and nature when they experience it in their surroundings. Furthermore it is very much dependent on volunteers, individuals with some knowledge on farming, while farmers have more knowledge and expertise to grow crops more efficiently. In order to reach the

biodiversity goals urban farming will not make much difference, but it is important for the social basis of the topic. There is a dedicated community of people involved in this niche, building experience with urban farming. The question is whether one dominant design will be developed. It seems that urban farming will remain a niche, and is in the second phase of transition, early market niche.

2.6. Tourism

The last fifty years, the role of the landscape changed from production towards a multifunctional landscape, in which there is a prominent role for recreation. Farmers are no longer the only developers of the rural areas in the Netherlands. The number of farms has decreased with 83% between 1950 and 2012 (CBS, 2014b), and also other parties are using and owning the rural areas. More people living in the cities are visiting the rural areas and the wishes of consumers are playing a more prominent role. They are no longer only demanding products, but became citizens of the rural areas and are spending their spare time in rural areas. As the distinction between the rural areas and cities is becoming smaller, and the rural areas are getting more 'urban', the landscape is becoming a so-called 'metropolitan landscape' (PBL, 2013; Van der Valk & Van Dijk, 2009). The niche innovation tourism, is combining the nature, agriculture and build environment regime, as it is focusing on attracting people to visit the landscape, with as a side effect the conservation and improvement of biodiversity. When tourists are visiting nature areas, more money can become available for protection.

2.6.1. Internal momentum

Techno-economic factors

While the total number of farms in the Netherlands is decreasing rapidly (from 75 151 in 2008 till 67 481 in 2013) the number of farms with secondary activities is growing. So is the number of farms with agro-tourism growing as well: in 2008 2147 farms had agro-tourism activities while in 2013 the number of farms with agro-tourism was 2777 (CBS, 2014a). The figure below shows the diversity in secondary activities on Dutch farms. It seems that the agricultural sector is opening up and showing what they do on farmers' markets, during open days, shops at the farm and excursion possibilities.

Socio-cognitive factors

Relating to the combination of nature and tourism the discussion starts on how to reward nature. Nature is a 'social good' and belongs to everyone and no-one. Therefore it is difficult to determine who has to pay for maintenance. The idea is that if people spend their leisure time in nature, they will become more aware of it and willing to help protecting the area. Via the route of awareness raising nature could be protected. On the other hand, combining nature conservation and tourism is hard, because it are separate worlds. New collaborations between existing institutions are often difficult to fit in existing regulations.

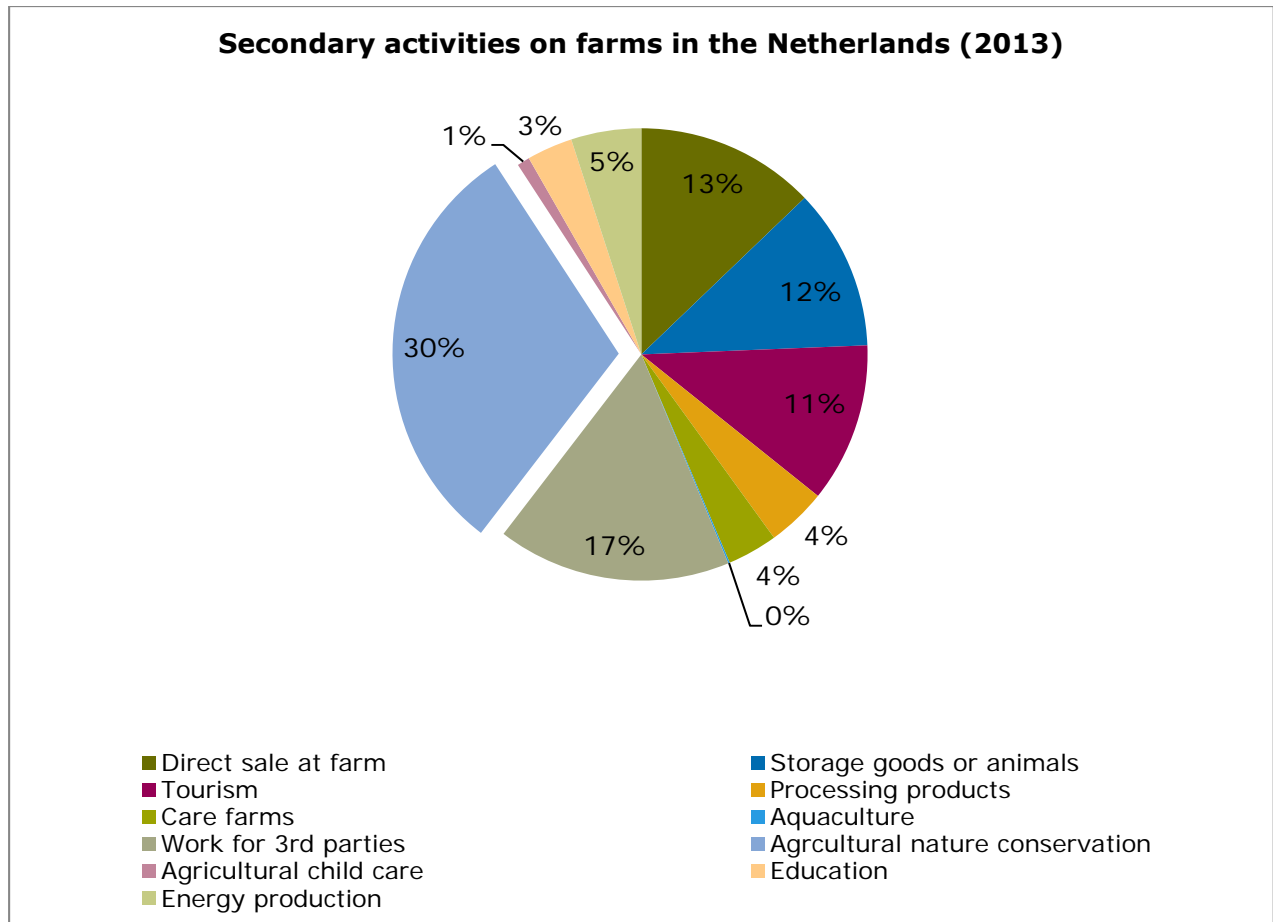


Figure 4 Secondary activities at farms in the Netherlands in 2013 (CBS, 2014a)

Governance and policy factors

For entrepreneurs willing to invest in recreation, procedures to get a permit may took a long time and ask for great investments. This is sometimes associated with a reserved attitude of the municipality, although there are examples as well of initiatives in which municipalities played a role in encouraging actors to develop projects (Boendermakers & Van Ommeren, 2011; Daalhuizen, 2004; PBL, 2013).

The internal momentum of tourism is medium. It is getting more attention, but the scale at which these developments are occurring is limited.

2.6.2. Alignment of niche-innovation with wider regime and landscape developments

This niche-innovation occurs between the urban, agricultural and nature regime. The niche innovation could be seen as a solution for the issues with financing in the nature regime. Recreation in nature could be a new route to help finance nature areas, especially as the number of members of nature organisations is declining. Furthermore, as the image of agriculture is important for the sector, combining tourism and agriculture can help the agriculture regime to be more open and show what is happening. This type of activities is medium aligning with developments in the wider regime, and can be an alternative for farmers that want to increase their income without expanding their size.

2.6.3. Possibilities to grow, but will remain a niche

It is not expected that the amount of initiatives in agro-tourism will become mainstream on the short term. This development will remain a niche, however the niche can become stable. But a development that has started is that farmers are opening up their farms in show in many ways what they do during open days, by inviting people to visit or camp on their farm or sell their products from home. Furthermore, in order to be able to keep maintaining nature areas, it is important to keep the public involved as well. New ways of rewarding nature conservation are needed. Furthermore, the number of people making use of this type of recreation is limited and is not expected to increase a lot. Therefore it can be expected that this will remain a niche development. It is in that sense in the second phase of transitions, the early market niches. For this innovation it is not expected to become mainstream. But the agricultural and nature sector are opening up and showing what they do, what does change the relation with society.

3. Assessment of regime reorientation

Changes in the land use domain are different from other domains, because of the geographical and spatial element of land use changes. The way land is used is not so easy to change, because of sunken investments. It seems that changes are going slowly, but if we expand the timespan to 100-150 years radical changes can be noticed. For example, agricultural land use has completely changed, protected areas came up in response, and the total area used for buildings is increasing (see figure below).

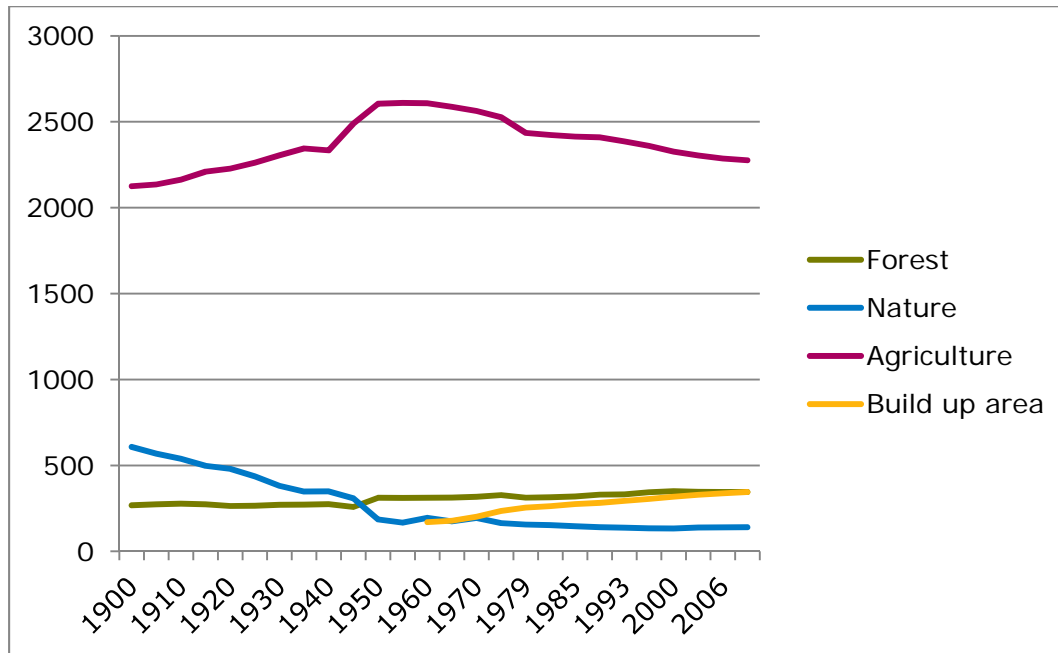


Figure 5 Land use in the Netherlands 1900-2008 (CBS, PBL, & Wageningen UR, 2013b)

In the external landscape of the land use domain 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.

In the land use domain we distinguish four regimes: agricultural, nature, water and urban regimes. This chapter is based on D2.2 Analysis of stability and tensions in incumbent socio-technical systems (Zwartkruis, Kok, & Westhoek, 2015).

3.1. Agricultural regime

3.1.1. Summary of regime developments: lock-in, stabilizing forces, cracks and tensions in the regime

Agricultural production is increasing (see Figure 6), 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, PBL, & UR, 2014).

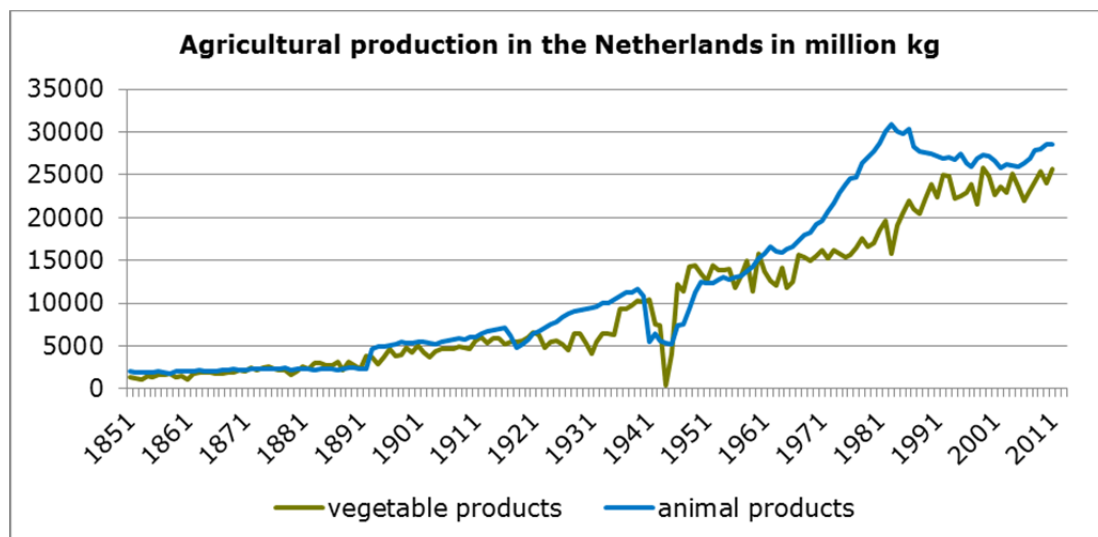


Figure 6 Agricultural production is increasing (CBS, 2015)

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 7), the income of Dutch farms is changing over time.

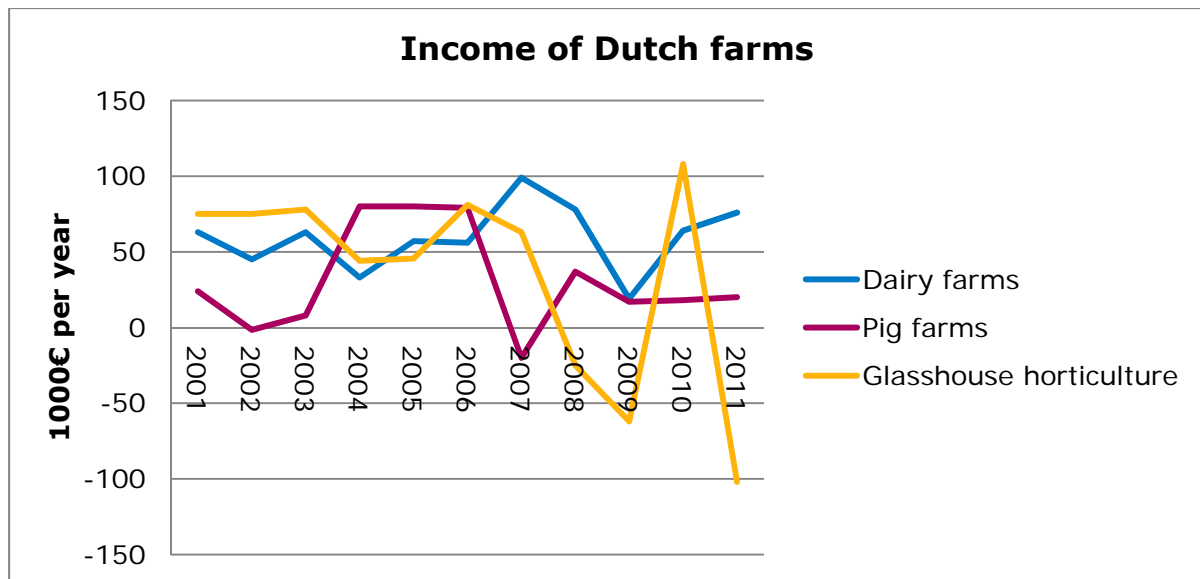


Figure 7 The income of Dutch farms (Adapted from (PBL, 2013))

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

- 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.
- The farmers' associations representing the farmers. In total around 50 000 farmers are represented by LTO (National Farmers association). 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.
- 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 in issues in policy.

- 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. 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 sector has a strong lock in because of the large investments needed. Furthermore there is a strong lobby, and because of agricultural production chains, relations are established in the entire chain and hard to change. Recently there are some cracks and tensions visible, mainly caused by public debates and pressure from NGOs. The main topics in these debates are environmental impact, animal welfare and healthy food.

3.1.2. Scale of transition challenge and orientation towards environmental problems

The agricultural sector has an impact on the environment. Around 15 to 20% of the emissions derive from the agricultural sector. Especially animal production systems have a great impact (see figures below).

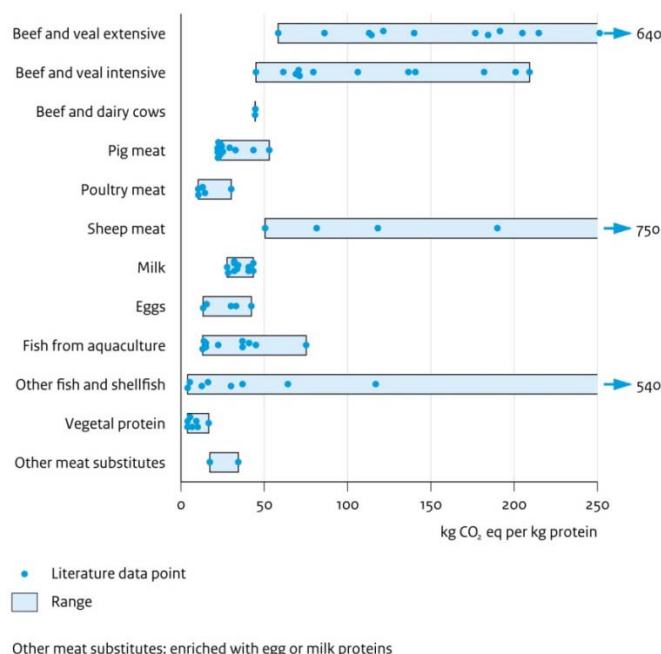


Figure 8 Greenhouse gas emissions per protein source. (Nijdam, Rood, & Westhoek, 2012; Westhoek et al., 2011)

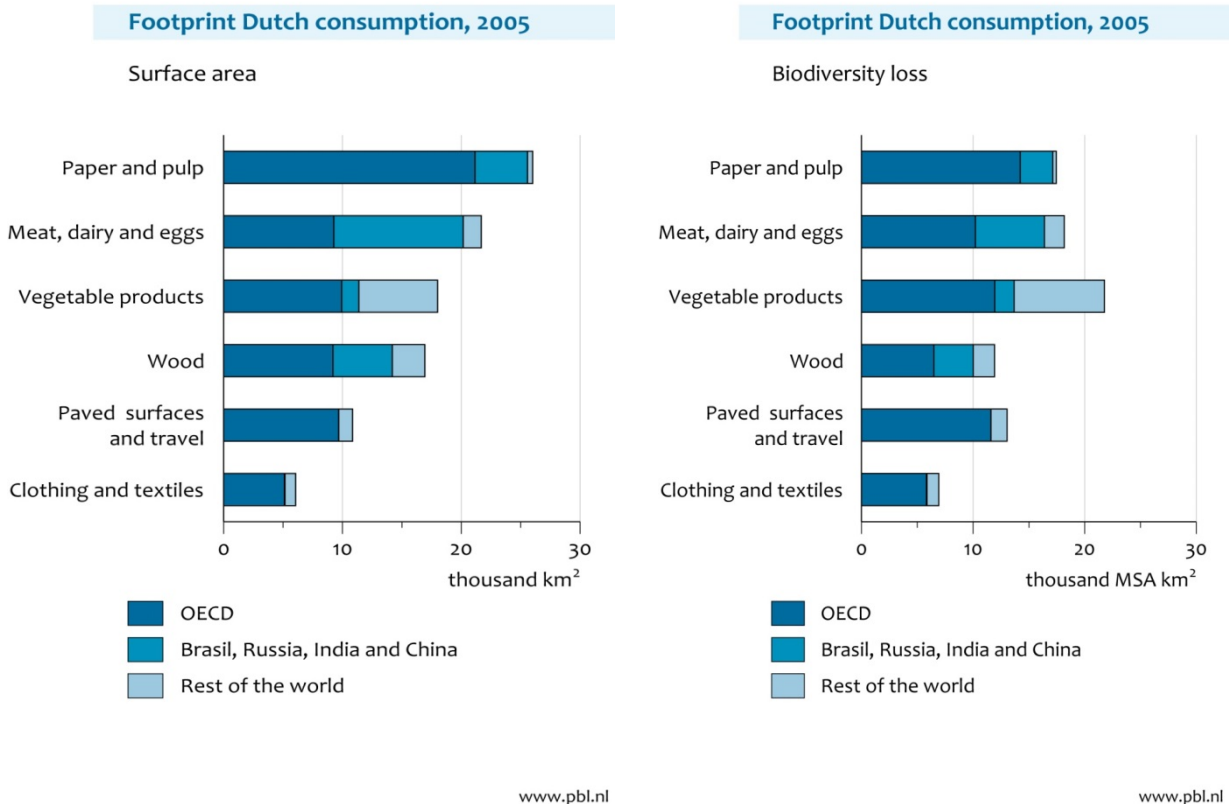


Figure 9 The footprint of Dutch consumption (EEA, 2010)

3.1.3. Main socio-technical challenges

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.

The Common Agricultural Policy (CAP), established by the European Union in 1957, is still of importance for the agricultural regime. The CAP has regulations that are applied by the national governments. The agro-food sector is influenced as well by the increasing globalization, what makes it possible for consumer to permanently choose between many products from all over the world (Ruben, Slingerland, & Nijhoff, 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, Hulsink, & Grin, 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).

3.2. Nature regime

3.2.1. Summary of regime developments: lock-in, stabilizing forces, cracks and tensions in the regime

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).

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

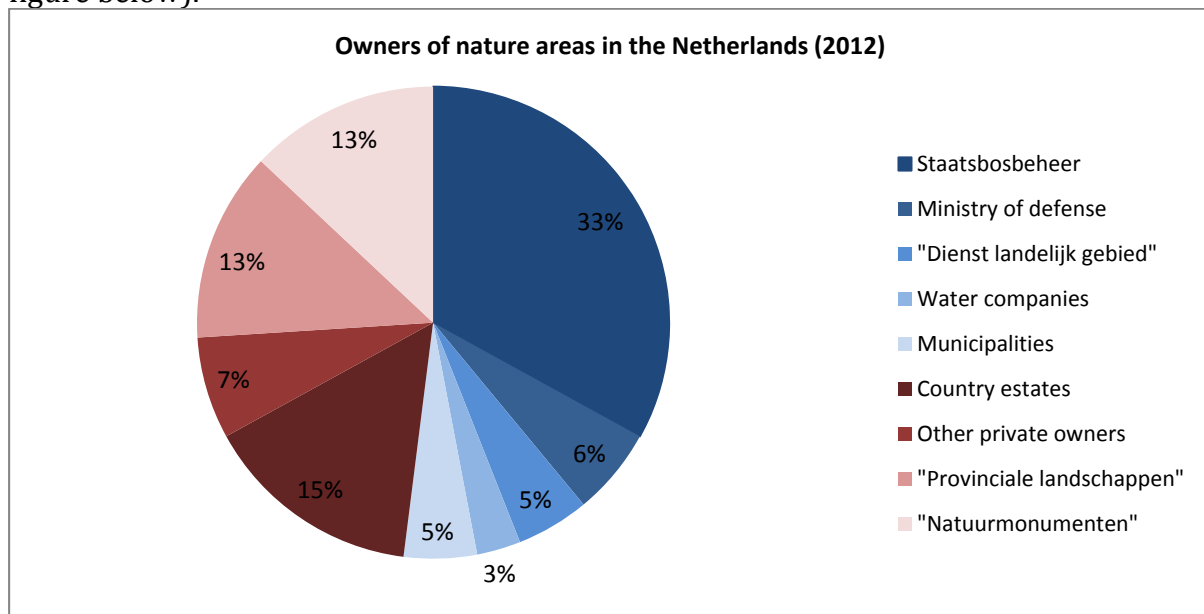


Figure 10 Owners of nature areas in the Netherlands in 2012. The blue categories are governmental organisations and the red categories are other types of owners. (Translated from (Arnouts et al., 2013)

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.

The government is making policy on nature. The international goals on nature development, such as CBD (Convention on Biological Diversity) and VHN (Bird and habitat directive) 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).

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; in Dutch 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 nature regime has a moderate lock in. The institutions involved in nature conservation exist for decades and are somewhat locked in, but changes are occurring in conservation practices and financial constructions. The cracks and tensions are increasing: the amount of subsidies and public funding is decreasing. So other ways to reward nature conservation should be found.

3.2.2. Scale of transition challenge and orientation towards environmental problems

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).

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.

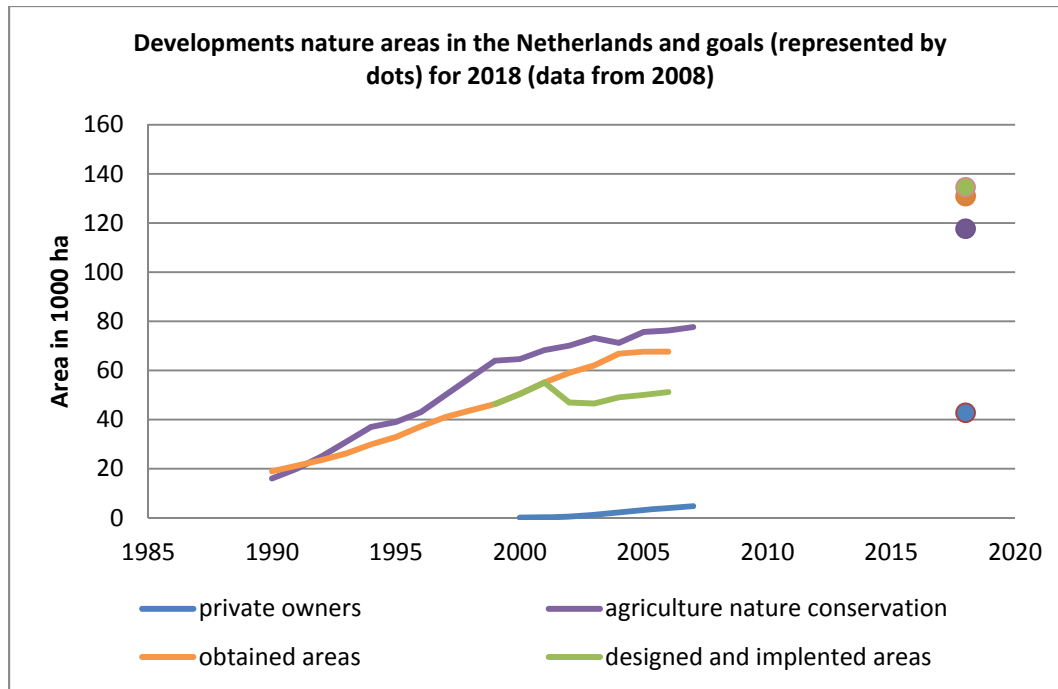


Figure 11 Realisation National Ecological Network in the Netherlands (adapted from (PBL, 2009).

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, PBL, & WageningenUR, 2014).

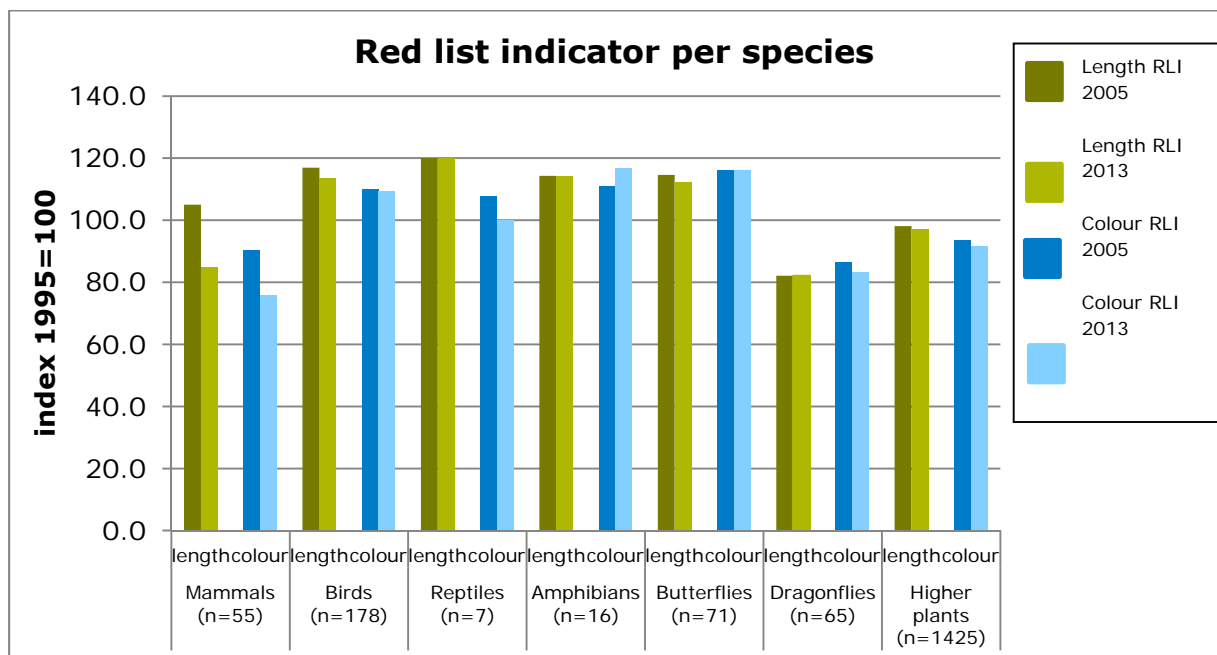


Figure 12 Red list indicator per species (CBS, PBL, & WageningenUR, 2014).

3.2.3. Main socio-technical challenges

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, Mattijssen, & Arts, 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; 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.

Regarding the area in the Netherlands, called the Oostvaardersplassen, a discussion started 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).

3.3. Water regime

3.3.1. Summary of regime developments: lock-in, stabilizing forces, cracks and tensions in the regime

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.

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).

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 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

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.

The water regime has a strong lock in and weak cracks and tensions. The regime is not easy to change as institutions already exist for a long time and many activities are the results of choices made in the past. Furthermore projects are determined for a long term. The cracks and tensions are limited. There might be some opportunities to couple water with housing or nature, but actually safety plays a huge role in this regime and is in the core of the developments.

3.3.2. Scale of transition challenge and orientation towards environmental problems

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).

One of the topics under discussion related to water is the 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, PBL, & Wageningen UR, 2014b).

The Dutch surface water is of medium to bad quality. The most important reasons are (CBS, PBL, & Wageningen UR, 2014c):

- 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 as well. 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.

3.3.3. Main socio-technical challenges

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, PBL, & Wageningen UR, 2014e).

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, PBL, et al., 2014e).

3.4. Urban regime

3.4.1. Summary of regime developments: lock-in, stabilizing forces, cracks and tensions in the regime

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

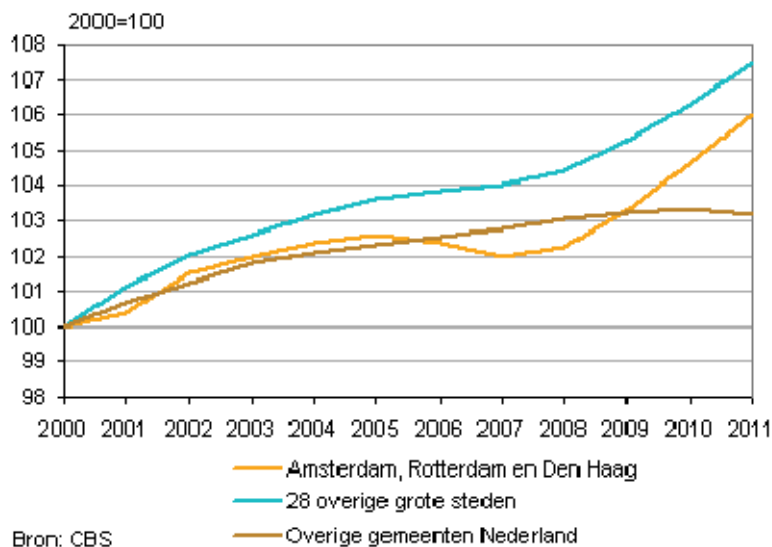


Figure 13 Growth population in the Netherlands: Large cities and other municipalities. (CBS, 2011)

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, PBL, & Wageningen UR, 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).

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, PBL, & Wageningen UR, 2014a).

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.

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 urban regime has a strong lock in. Once building are there, it will not be easy to change in another type of land use. Furthermore regulations regulate most of the issues with build-up areas. The cracks and tensions are moderate. There are not many radical tensions or problems to be expected, as the urban area is not so much under discussion. However, cities are an interesting place where new initiatives start, like urban farming, smart cities and green roofs.

3.4.2. Scale of transition challenge and orientation towards environmental problems

The urban regime is not directly changing and addressing environmental problems at the moment. However, some urban areas are facing challenges that could be related to environmental issues, such as a rise of temperature in cities or problems with water. Recently there is more attention for increasing green spaces in urban areas for different reasons.

3.4.3. Main socio-technical challenges

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, PBL, & Wageningen UR, 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.

3.5. Summary of regime findings

The dominant system/regime trend is that pressure on land is high and within the boundaries of existing developments, actors are looking for solutions. That leads to multifunctional land use in which for example agriculture and nature are combined, or farming in urban areas is taking place. The main changes are occurring on the edges of different regimes. Connecting agricultural production to nature conservation or linking water management measures with nature conservation measures makes that both regimes are slightly changing.

Overall, the land use domain in the Netherlands is the result of a number of dominant trends, but smaller changes are occurring. The impact of these changes to improve the environmental situation seems to be limited (with the exception of 'resilient landscapes'). However, for example agricultural nature conservation does lead to new types of nature. Changes are limited because a lot of the institutions exist already for a long time and are hard to change.

Potential for change arrives from the changing payment structures in place and the decrease of payments and subsidies available. As a result of changing policy and the financial crises, budgets are decreasing and actors are looking for other ways to finance for example nature. This can lead to new solutions. Furthermore the increasing pressure on land makes that multifunctional land use is becoming more interesting as a solution. Furthermore combining solutions to problems in different regimes at the same time makes it easier to implement ideas and serve different goals in one solution. However, for example in the case of room for the river, the focus is still on water management, and nature can profit from it as well. The table below shows a summary of the regime analysis.

Table 6 Assessment of regime trends in the land use domain in The Netherlands (with indicative ‘scores’)

	Lock-in, stabilizing forces	Cracks, tensions, problems in regime	Orientation towards environmental problems	Main socio-technical regime problems
Agriculture regime	Strong	Weak to moderate	Moderate (some incremental change)	Large, long term investments
Nature regime	Moderate	Strong	Moderate (some incremental change)	Discussion on who has to pay for nature and how to reward it. Uncertainty regarding subsidies.
Water regime	Strong	Weak	Limited; regarding floods, safety is still the main issue addressed.	Institutions have strong traditions/ways of working.
Urban regime	Strong	Moderate	Very limited (some attention for green in the city, but not much)	Build up area is not so much under discussion.

4. Conclusions and wider discussion

The table below shows the summary of the findings of the analysis of the niche innovations.

Table 7 Summary of the findings of the analysis of the niches

	Business and Biodiversity	Agricultural nature conservation	Resilient landscapes	Renewable energy	Tourism	Urban farming
Are increasing investments needed?	Yes	Yes	Yes, but have been done already	Yes	Yes	Yes
Is there a positive widespread public debate?	More or less	More or less	More or less	Yes	More or less	Yes
Are there broader policy adjustments?	minor	Yes	Yes	Yes	No	No
Is tackling issues within the existing regimes?	Yes	yes	Yes	yes	No	Yes
What is the internal momentum?	Medium	medium	medium	medium	medium	Low
Pathway	B	B	B	B	B	B

The niche innovations that are probably able to break through on the short run is business and biodiversity. Business and biodiversity can create opportunities to tackle the issues in the nature regime, and is therefore strongly aligned with broader changes. As nature protection and conservation is dependent on payments, and public payments are decreasing, other ways to finance nature are necessary. Businesses are getting more aware of sustainability issues and the role of biodiversity, what makes them more eager to take that into account in their policy. It can be expected that the niches will diffuse and the numbers of initiatives will increase. Agricultural nature conservation is a stabilized niche, that could grow in the future and lead to parallel regime, Resilient landscapes is the niche innovation that is closest to becoming part of the existing regime, as the measures are already becoming part of the current system. Tourism and urban farming have potential to grow, but are not expected to cause regime changes. Renewable energy can grow, but the question is how it will be integrated in the landscape..

In the figure below we made a visual representation of the momentum of the niches and the degrees to which the niches have to deal with lock in of the existing regimes.

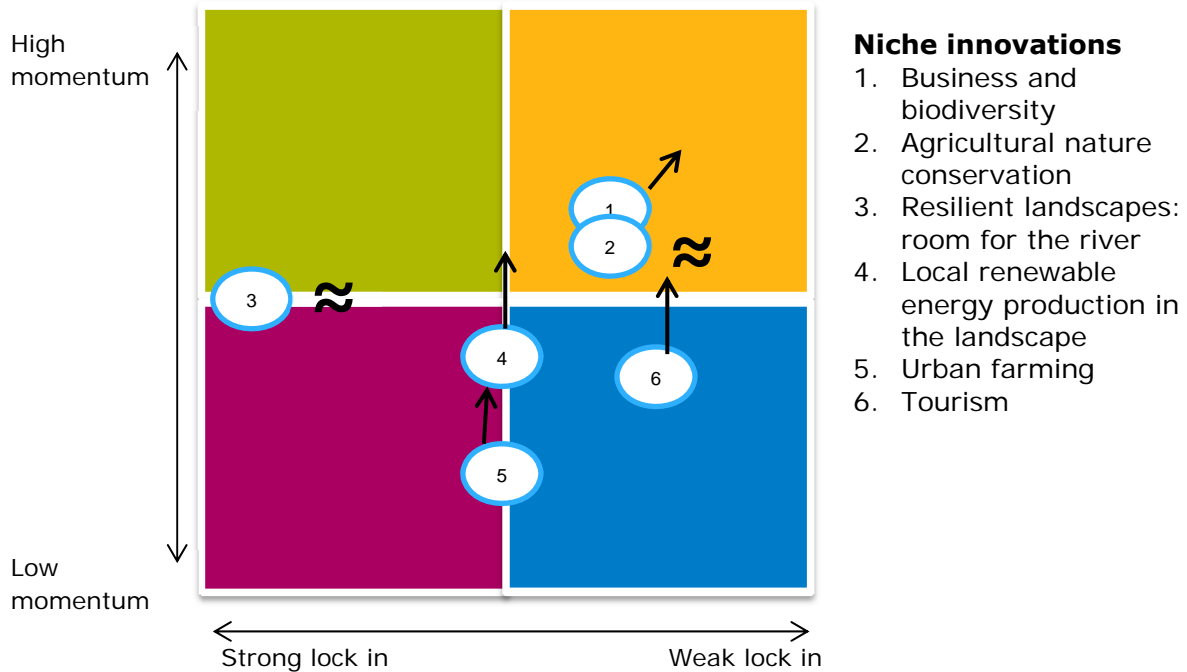


Figure 14 The momentum of niche innovations in 2015 and expected developments.

Wider discussion

The transition challenge in the land use domain is mainly related to land use and biodiversity, and greenhouse gas emissions do only play a minor role. The changes that are the result of multifunctional land use niches do not completely change the way land is used, but combine different functions in one place.

The Dutch government decided to decentralize policy on nature. As a result provincial authorities became responsible for nature policy. The role of nature in society did change as well. From only protecting and creating nature areas towards a more central role for nature in society.

As land use is strongly regulated by the government in the Netherlands, many innovations have to deal with regulations and changing regulations. Therefore we can expect that changes will be facilitated or supported by governmental changes.

The fact that all niches are multifunctional of nature, makes that they are struggling with different regimes at the same time. They can form a solution for one regime and at the same time be problematic for another regime. On the other hand when different problems are tackled by one solution, the niche innovation can be a boost for two (or more regimes) at the same time.

In the land use domain we can argue that change is occurring in small steps, leading to radical incrementalism. All innovations follow Pathway B that is mainly focussing on wider societal changes. Pathway A innovations in the land use domain are hardly available because of the nature of the land use domain. The lions' share of changes is occurring because of changes in policy and payment schemes.

5. References

- Arnouts, R., Van den Born, G. J., Daalhuizen, F., Farjon, H., Pols, L., Tekelenburg, T., . . . Roovers, G. (2013). *Leren van het energieke platteland*. Achtergrondrapport. Den Haag: PBL.
- Bekke, H., & De Vries, J. (2001). *De ontpoldering van de Nederlandse landbouw. Het Ministerie van Landbouw, Natuurbeheer en Visserij 1994-2000*. Leuven-Apeldoorn.: Garant-Uitgevers.
- Boendermakers, C., & Van Ommeren, B. (2011). *De participatiemaatschappij: een antwoord op financiële uitdagingen bij het realiseren van innovatieve investeringen in de recreatie*. Utrecht: STIRR.
- Buijs, A., Mattijssen, T., & Arts, B. (2014). "The man, the administration and the counter-discourse": An analysis of the sudden turn in Dutch nature conservation policy. *Land Use Policy*, 38(0), 676-684. doi: <http://dx.doi.org/10.1016/j.landusepol.2014.01.010>
- CBS. (2011, 11 July 2011). Grote steden sneller dan gemiddeld gegroeid Retrieved 11 May, 2015, from <http://www.cbs.nl/nl-NL/menu/themas/bevolking/publicaties/artikelen/archief/2011/2011-3419-wm.htm>
- CBS. (2014a). Statline, Landbouw; bedrijven met verbredingsactiviteiten, hoofdbedrijfstype, regio. In CBS (Ed.). Den Haag/Heerlen.
- CBS. (2014b). Statline, Landbouw; gewassen, dieren en grondgebruik naar hoofdbedrijfstype, regio. In CBS (Ed.). Den Haag/Heerlen.
- CBS. (2015). Statline, Landbouw; vanaf 1851 In CBS (Ed.). Den Haag/Heerlen.
- CBS, & PBL. (2013). Regionale prognose 2013-2040. Vier grote gemeenten blijven sterke bevolkingstrekkers (pp. 24).
- CBS, PBL, & UR, W. (2014). Bedrijfsomvang en economische omvang landbouwbedrijven, 2000-2013. www.compendiumvoordeleefomgeving.nl Retrieved 8 May, 2015, from <http://www.compendiumvoordeleefomgeving.nl/indicatoren/nl2122-Bedrijfsomvang-en-economische-omvang-landbouwbedrijven.html?i=11-61>
- CBS, PBL, & Wageningen UR. (2010). Beschikbaarheid groen in de stad, 2000-2006 (indicator 0299, versie 06, 20 mei 2010). www.compendiumvoordeleefomgeving.nl Retrieved 12 May, 2015
- CBS, PBL, & Wageningen UR. (2013a). Bevolkingsgroei, 2008-2013 (indicator 2102, versie 04, 17 december 2013). www.compendiumvoordeleefomgeving.nl Retrieved 11 May, 2015, from <http://www.compendiumvoordeleefomgeving.nl/indicatoren/nl2102-Bevolking-groei-Nederland.html?i=15-12>
- CBS, PBL, & Wageningen UR. (2013b). Bodemgebruik, 1900-2008 (indicator 1001, versie 07, 22 augustus 2013). www.compendiumvoordeleefomgeving.nl Retrieved 6 May, 2015
- CBS, PBL, & Wageningen UR. (2014a). Bestemming van verdwenen landbouwgrond; periode 2000-2010 (indicator 1530, versie 02, 5 juni 2014). www.compendiumvoordeleefomgeving.nl
- CBS, PBL, & Wageningen UR. (2014b). Europese Kaderrichtlijn Water (indicator 1412, versie 04, 4 juni 2014). www.compendiumvoordeleefomgeving.nl Retrieved 13 May, 2015, from <http://www.compendiumvoordeleefomgeving.nl/indicatoren/nl1412-Kaderrichtlijn-water.html?i=16-114>

- CBS, PBL, & Wageningen UR. (2014c). Kwaliteit oppervlaktewater, 2013 (indicator 1438, versie 06, 9 september 2014). www.compendiumvoordeleefomgeving.nl Retrieved 26 May, 2015
- CBS, PBL, & Wageningen UR. (2014d, Juli 9, 2014). Realisatie nieuwe EHS-agrarisch natuurbeheer, 1999-2012 (indicator 1317, versie 10, 9 juli 2014). www.compendiumvoordeleefomgeving.nl Retrieved November, 2014, from <http://www.compendiumvoordeleefomgeving.nl/indicatoren/nl1317-Realisatie-agrarisch-natuurbeheer.html?i=11-59>
- CBS, PBL, & Wageningen UR. (2014e). Ruimtelijke ontwikkelingen in het rivierbed van grote rivieren, 2000 - 2012 (indicator 2042, versie 05, 17 september 2014). www.compendiumvoordeleefomgeving.nl Retrieved 12 May, 2015, from <http://www.compendiumvoordeleefomgeving.nl/indicatoren/nl2042-Ruimtelijke-ontwikkelingen-in-het-rivierbed-van-grote-rivieren.html?i=31-158>
- CBS, PBL, & Wageningen UR. (2015). Verstedelijking. www.compendiumvoordeleefomgeving.nl Retrieved 10 May, 2015, from <http://www.compendiumvoordeleefomgeving.nl/onderwerpen/nl0031-Verstedelijking.html?i=30>
- CBS, PBL, & Wageningen UR. (2014). Rode Lijst Indicator, 1995-2013 (indicator 1521, versie 07, 17 september 2014) Retrieved November, 2014, from <http://www.compendiumvoordeleefomgeving.nl/indicatoren/nl1521-Rode-Lijst-Indicator.html?i=2-8>
- Daalhuizen, F. (2004). *Nieuwe bedrijven in oude boerderijen.*, Utrecht University, Utrecht.
- Dammers, E., Kranendonk, R. P., Smeets, P. J. A. M., Adolfse, L., Van Woerkum, C. J., Horrevoets, M., & Langerak, L. (1999). *Innoveren en leren. Kennismanagement en plattelandsvernieuwing.*
- De Muynck, A. (2011). *Stadslandbouw en duurzame gebiedsontwikkeling.* Master, Erasmus Universiteit Rotterdam, Stadsontwikkeling Rotterdam & Technische Universiteit Delft.
- EEA. (2010). State of the Environment report No 1/2010.
- Ellen, G. J., Hommes, S., Kalweit, A. M., Van Lamoen, F., Maring, L., Melisie, E.-J., Paalman, M., . . . Steingröver, E. G. (2011). Multifunctioneel landgebruik als adaptatiestrategie. Puzzelen met ondernemers en beleidsmakers.: Kennis voor klimaat.
- European Commission. (2015, 22/04/2015). Introduction to the new EU Water Framework Directive Retrieved 20 May, 2015, from http://ec.europa.eu/environment/water/water-framework/info/intro_en.htm
- Geels, F. W. (2006). Co-evolutionary and multi-level dynamics in transitions: The transformation of aviation systems and the shift from propeller to turbojet (1930-1970). *Technovation*, 26(9), 999-1016.
- Hajer, M., & Dassen, T. (2014). *Slimme Steden - De opgave voor de 21ste eeuwse stedenbouw in beeld:* nai010.
- Hassink, J., Hulsink, W., & Grin, J. (2012). Care farms in the Netherlands: an underexplored example of multifunctional agriculture – toward an empirically grounded, organization theory-based typology. *Rural Sociology*, 77(4), 569-600.

- Jansma, J. E., Dekking, A. J. G., Michels, G., De Buck, A. J., Ruijs, M. N. A., Galama, P. J., & Visser, A. J. (2010). *Agromere, Stadslandbouw in Almere, van toekomstbeelden naar het ontwerp*. Lelystad: PPO.
- Nijdam, D., Rood, T., & Westhoek, H. (2012). The price of protein: Review of land use and carbon footprints from life cycle assessments of animal food products and their substitutes. *Food Policy*, 37(6), 760-770. doi: 10.1016/j.foodpol.2012.08.002
- Nijhuis, L. (2011). *Groen en de stad: Stadslandbouw. Maatschappelijke ontwikkelingen en initiatieven met mogelijke impact op (het beleid van) natuur, landschap en landelijk gebied*: PBL.
- NZO. (2014). Factsheet Weidegang (Vol. December 2014). http://www.nzo.nl/sites/default/files/pointofview/attachment/141215_factsheet_weidegang.pdf.
- PBL. (2009). *Natuurbalans 2009* (pp. 212). Den Haag/Bilthoven: Planbureau voor de Leefomgeving.
- PBL. (2012). *Balans van de leefomgeving*. Den Haag, The Netherlands: PBL.
- PBL. (2013). *Leren van het energieke platteland. Lokale en regionale coalities voor duurzame plattelandsontwikkeling*. Den Haag, The Netherlands: PBL.
- PBL. (2014a). *De toekomst is nú. Balans van de leefomgeving*. Den Haag, The Netherlands: PBL.
- PBL. (2014b). *How sectors can contribute to sustainable use and conservation of biodiversity. CBD Technical series*.
- Ruben, R., Slingerland, M., & Nijhoff, H. (2006). Chapter 1. Agro-food chains and networks for development. Issues, approaches and strategies. In R. Ruben, M. Slingerland & H. Nijhoff (Eds.), *Agro-food chains and networks for development*. Dordrecht: Springer.
- Smit, A. (2011). *Conversion to Organic Agriculture: Opportunities and Constraints*. PhD doctoral thesis, Utrecht University, Utrecht.
- Van der Valk, A., & Van Dijk, T. (2009). *Regional planning for open space*. London: Routledge.
- Veen, E., Berman, B., & Jansma, J. E. (2012). *Stadslandbouw: een verkenning van groen en boer zijn in en om de stad*. Lelystad: Wageningen UR (University & Research centre).
- Vuuren van, D. (2015). *Integrated assessment: Back to the Future Inaugural Lecture*. Utrecht: Utrecht University.
- Westhoek, H., Rood, T., Berg, M. v. d., Janse, J., Nijdam, D., Reudink, M. A., & Stehfest, E. (2011). *The protein puzzle : the consumption and production of meat, dairy and fish in the European Union*. The Hague / Bilthoven: PBL (Netherlands Environmental Assessment Agency).
- Zwartkruis, J., Kok, M., & Westhoek, H. (2015). Analysis of stability and tensions in incumbent socio-technical regimes: Regime analysis of the Dutch land-use domain. <http://www.pathways-project.eu/sites/default/files/Country%20report%2011%20Dutch%20land%20use%20regimes.pdf>.
- Zwartkruis, J., & Westhoek, H. (2015). Deliverable 3.3. Analysis of case studies. Sub-report: Case in the multifunctional land use domain in the Netherlands: Water, Land and Dikes *Pathways*. Bilthoven: PBL.
- Zwartkruis, J., Westhoek, H., Kok, M., & Schoolenberg, M. (2014). Dutch niche innovations in the multifunctional land use domain (pp. 45). Bilthoven: PBL.