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Country report 12: Green niche-innovations in the Dutch land-use system

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Executive summary
This report describes niche innovations in the multifunctional land use domain in the Netherlands. The competing claims on land lead to changes in the way land is used. Multifunctional land use combines different functions in a certain area, and aims that these functions are strengthening each other. However, sometimes there is no mutual reinforcement. For example in the case of recreation and forestry, recreation has no positive impact on timber production and vice versa. However, as land used for recreation is used for forestry as well, there will be less land needed. A function is defined as an activity that produces goods or services. Combining different functions of land will reduce the amount of space needed, but can also lead to for example new economic activities (in the case of multifunctional agriculture) or change environmental impacts. In multifunctional land use every type of land use is part of its own socio-technical regime, we have to deal with combinations of regimes. Important land uses in the Netherlands are agriculture, cities (built up areas), recreation (as sport fields and large parks for example), infrastructure, water (storage, transportation) and nature conservation.The niches described in this report are specific examples of combinations of regimes:
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 landscape

The overall momentum in the land use domain is medium. We can make a distinction between maintaining and spatial planning/design innovations. It seems from these niche innovations that combining functions and collaborating with other actors or participating on different movements simultaneously (e.g. protecting against floods and creating nature) will lead to more efficient land use and is directly or indirectly influencing biodiversity. Niche innovations in multifunctional land use seem to be examples of reconfiguration of the regime in all cases. Multifunctional land use combines functions and therefore is most often happening at the cross-section of regimes. Rules and regulations do not always accept the combination what makes it for example difficult to implement new initiatives in existing spatial planning. Breakthroughs are often caused by crises (e.g. floods of the 1990s, oil crises). In the land use domain, all innovations are in Pathway B. Most innovations are about wider societal change 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).

1. Introduction: Background and context of the multifunctional land use domain

1.1. The multifunctional land use domain

During the last fifty years, land use in Europe has changed drastically (ESA, 2006) as a result of human welfare improvement and economic developments. But these developments do unfortunately also cause serious environmental problems (EEA, 2005). The competing claims on land lead to changes in the way land is used (Ellen et al., 2011). 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. To deal with this 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. Multifunctional land use combines different functions in a certain area, and aims that these functions are strengthening each other (Ellen et al., 2011). However, there can be cases in which different functions are not strengthening each other, but exist beside each other without mutual reinforcement. However, as we are focussing on innovation leading to a more sustainable society, we especially focus on the ones that strengthen each other.

The main characteristic of multifunctional land use is that there is more than one output from a single plot of the land. Often one output, commodity (e.g. milk or cereals) will be sold, while biodiversity remains a public good. Farmers are paid for the extra labour they do for nature conservation. Combining different uses of land will reduce the amount of space necessary, but can also lead to for example new economic activities (in the case of multifunctional agriculture) or change environmental impacts.

In this chapter we consider (multifunctional) land use as a domain in itself in which different regimes might be distinguished such as nature, agriculture, forestry, water, urban. Land use domain influences climate change (directly and indirectly via greenhouse gases), biodiversity, water use and ecosystem services. As we are discussing multifunctional land use, and every type of land use is part of its own socio-technical regime, we have to deal with combinations of regimes. There are examples of multifunctional niche innovations within one regime, but in this report we only focus on niche innovations in multifunctional regimes.

1.2. Socio-technical system and most important actors

Land use refers to how people use the land, whereas land cover indicates the physical land type (Figure 1) such as forest or water (Verburg, van de Steeg, Veldkamp, & Willemen, 2009). Different economic or societal 'sectors' use land for different functions. Each of these sectors can be seen as part of an existing regime, with their own institutions, rules and actors involved. Important land uses in the Netherlands are agriculture, cities (built up areas), recreation (as sport fields and large parks for example), infrastructure, water (storage, transportation) and nature conservation.

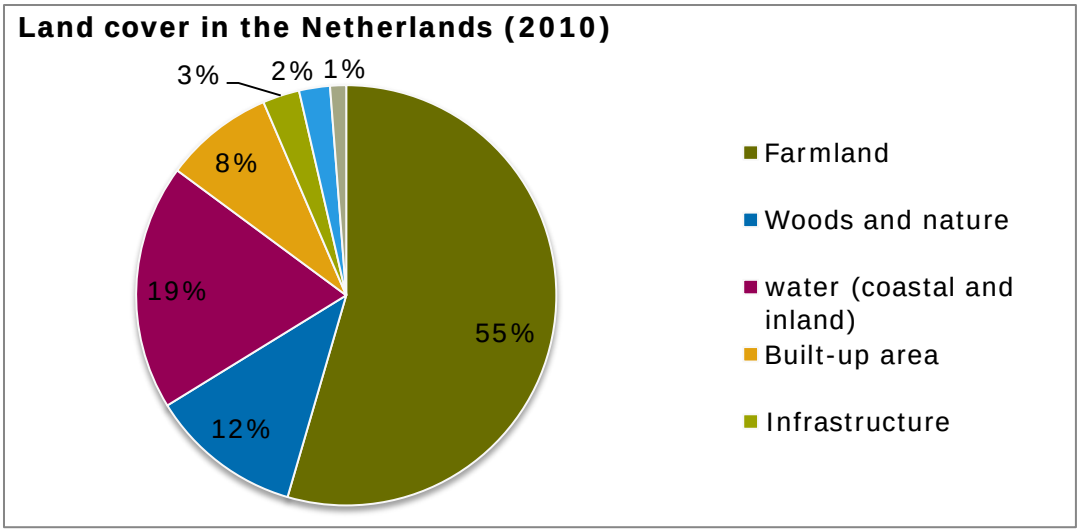

Figure 1 Land cover in the Netherlands in 2010 (CBS, 2014a) (*= paved terrain not in use as infrastructure or built-up area)

Land use is the outcome of many societal functions and activities, e.g. energy production, food production, but also for example recreation, housing, protecting people against water (floods, heavy rainfall etc.) and protecting species and habitat conservation. A sketch of the socio-technical system for land use in the Netherlands is shown below. For every regime this figure will involve different actors, functions and cover.

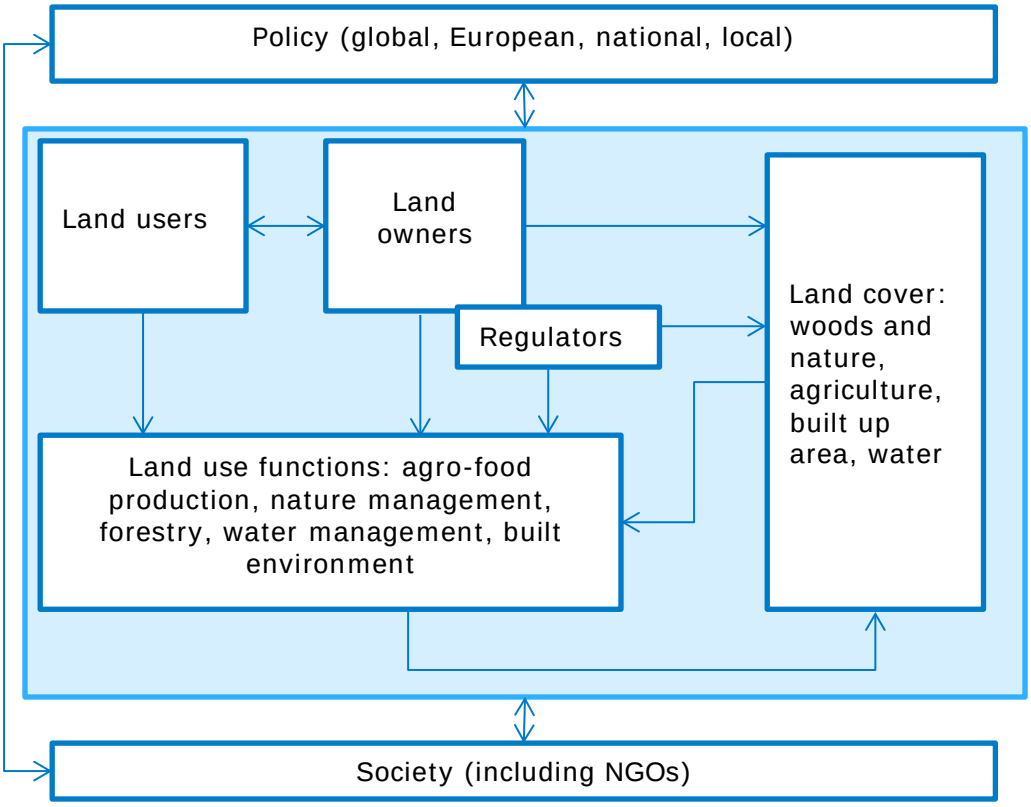

Figure 2 Socio-technical system for multifunctional land use

In general three type of actors can be distinguished in the socio-technical system, being regulators, land users without land and land owners (Figure 2). Land owners are very 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 embed 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 can be both owners and users.

- Regulators: These parties influence the land use system via policy and regulations
    - Global: Convention on Biological Diversity (CBD) of the United Nations
    - European: Although land use is typical a sovereign issue for countries, it is influenced by European regulations (Evers, 2014). Examples of regulations at European level are: Natura 2000, CAP, Water Framework Directive, Bird and Habitat directive (Vogel- en habitat richtlijn, VHN) of the European Union
    - National government: Ownership, registration, and spatial planning.
    - Provinces: Design and executing policy, receive money from the national government for nature policy.
    - Municipalities: Spatial planning at municipality level
    - Rijkswaterstaat
    - Waterschappen

- Land users (without land): Influence via market/needs/demands
    - Citizens: for living, recreation, working, transport
    - Farmers: for growing products, livestock
    - Companies: making use of land (buildings)
    - Rijkswaterstaat
    - Drinkwater companies
    - WaterschappenNGOs (e.g. create areas for recreation, but also nature conservation)

- Land owners: Influence via land.
    - Rijkswaterstaat: Implementation organisation of the Ministry of Infrastructure and environment: Developing and maintaining roads and water belonging to the government. An increasing amount of tasks is getting outsourced to market parties, but they have the public responsibilities.
    - Waterschappen
    - Province: own provincial roads
    - Municipality: own municipality roads, parks etc.
    - Terrain maintaining organisations e.g. Natuurmonumenten
    - NGOs
    - Farmers
    - Private owners
    - Companies: making use of land (buildings)

Every type of land cover can have one or multiple functions (Table 1). In this reportwe will especially focus on innovations that are in different regimes (or have different functions) at the same time.

Table 1. Land functions and land cover

	Land cover			
Function	**Farmland**	**Water**	**Built up (including roads)**	**Woods & nature**
Food production	X	X	X	X
Transport/logistics		X	X	
Living/working			X	
Energy production	X	X	X	X
Providing resources (sand, wood, stone, drinking water etc.)	X	X		X
Protection/conservation	X	X		X
Recreation	X	X	X	X
Buffer (species, animals, CO2 etc.)	X	X		X
Economic value (price)	Medium	-	high	low
Biodiversity value	Depending	depending	low	high

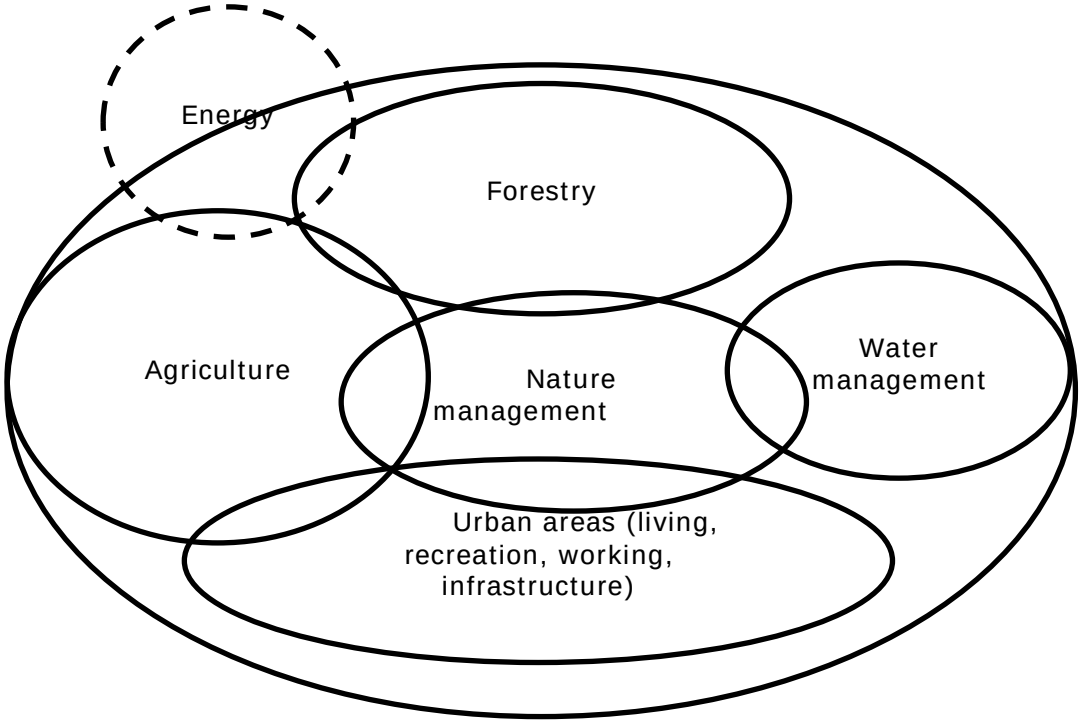

Figure 3 Different land-use regimes

The figure above (Figure 3) shows the dominant land use regimes in the Netherlands. A regime can be defined as the actors, technologies and governance involved in one type of land use. It can be argued there are more overlapping areas than presented in this figure, for example energy production at sea. But this figure shows the overlap in regimes as we found in the niche innovations we addressed. We added the energy regime, as renewable energy production is also getting a more visible role in the landscape in what is called: Energy landscapes. However, energy production in itself is another domain and will be described in a different chapter of this work package. In this chapter we only focus on the influence of energy on land use and in particular the landscape. As we will describe later on in this report, the niche innovations that we study are positioned in the overlaps between different regimes, as we focus on multifunctional land use.

1.3. Main developments in the land use domain in the Netherlands

Agricultural production was and is the primary activity in rural areas. However, because of the industrialisation and the expansion of the service sector, the land used for agriculture is shrinking, urban sprawl and changing societal preferences ask for different kinds of activities in the rural areas. As a result emerging activities include agro-tourism, leisure and living, but also ecological processes and services that contribute to a healthy production landscapes (Brouwer & Van der Heide, 2009). In nature areas the focus is as well on combinations of nature, such as nature and water (water collection areas such as dunes), nature and recreation (90% of natural areas are open for recreation such as walking and cycling) and nature and business. An important change has been taking place in forestry, as there was a shift from wood production and forests to protect erosion in areas towards the forest as nature area used for recreation as well. Wood production still plays a role, but only a minor one.

Policy

While historically spatial planning in the Netherlands focussed on mono-functionally optimisation and separating different functions in the landscape, it became increasingly known that multifunctional land use is central to deal with conflicting claims on available land (Van Ark, 2005). The Netherlands is a densely populated area and regulated country. Access to land and land registration are well-organised by means of clear legislation in combination with a land registration by type of use and cadastral system (Wageningen UR, 2008). Spatial development in the Netherlands has changed. In the past there was a powerful coalition between spatial planning and public housing, but this coalition lost power. The integral policy was replaced by a powerful sectorial policy, e.g. infrastructure policy. Policy became more decentralized as well, and the government shifted responsibilities to provinces and municipalities (van der Wouden, Evers, & Kuiper, 2011).

Spatial planning plans developed by the national, provincial and local governments, determine how the land can be used. In these plans the main use of the land is determined, for example agriculture or housing. It is not possible for example to use land suitable for agriculture for housing, however, multifunctional land use is possible (within the boundaries). As a consequence the different types of land differ in value. The economic value of land areas where houses can be built is much higher than agricultural areas, and agricultural areas are in turn more costly than nature areas.

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, 2014c).

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 species[1] (PBL, 2014a).

1.4. Challenges and goals

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

[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.

peat soils drainage is an important source of emissions. However, in this report we will in particular focus on biodiversity aspects of multifunctional land use.
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 4) 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.

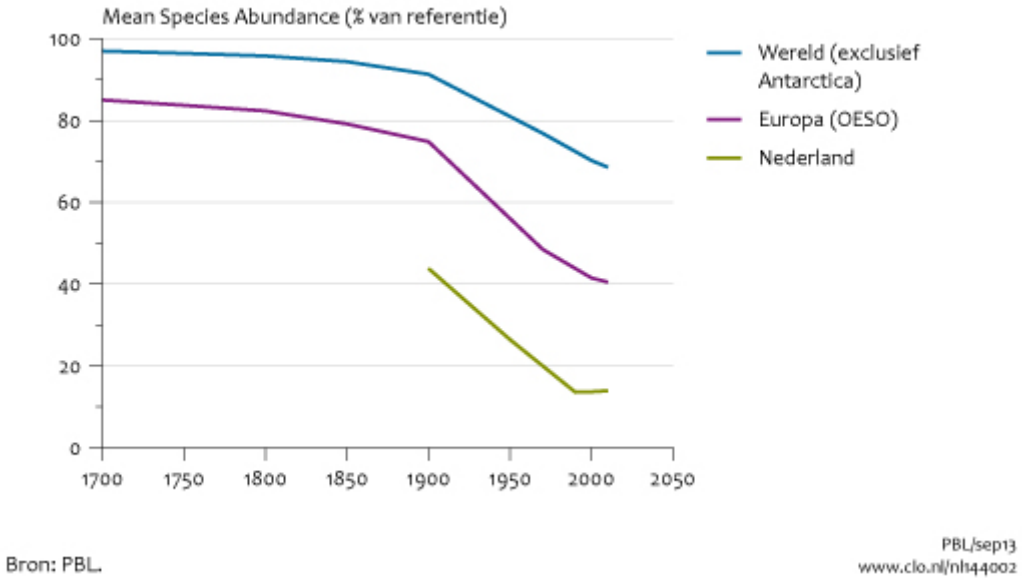

Figure 4 Biodiversity (CBS, PBL, & Wageningen UR, 2013)

The main causes for a decrease in MSA, are change in land use, environmental impact and fragmentation of ecosystems (PBL, 2012). Globally, biodiversity loss is mainly happening in forests, grassland and savannahs. Worldwide the amount of nature is still decreasing, but in Europe the decrease is slowing down since 2000.
Since 1995 there are less different mammals, dragonflies and higher plants endangered and since 2005 the amount of endangered birds and reptiles is decreasing as well. Butterflies and amphibians are not showing a recovery (CBS, PBL, & WageningenUR, 2014c). The Dutch Living Planet Index (LPI) is increasing as the figure below shows (Figure 5). The LPI represents the average trend of mammals, birds, reptiles and amphibians. Since 1990 this group has increased with 22%. This increase is due to decreasing emissions, the increase in amount of natural areas and improvements of environmental and water quality. On average the decrease of protected 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, PBL, & WageningenUR, 2014a).

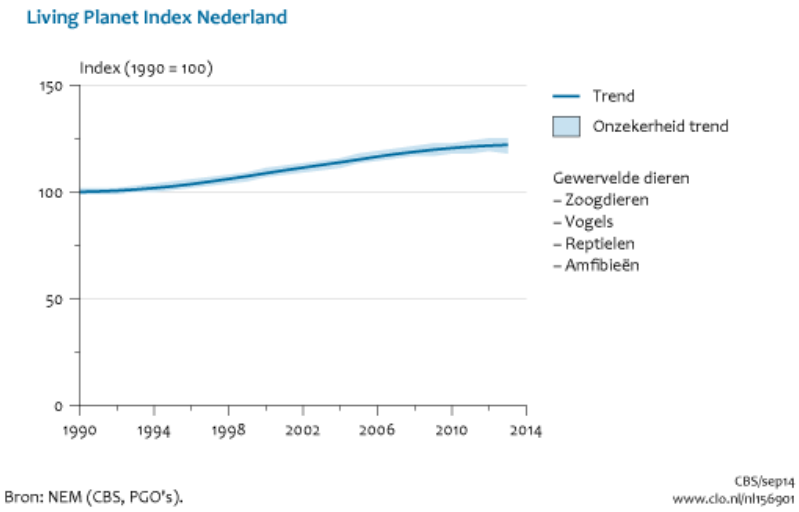

Figure 5 Living Planet Index the Netherlands (CBS, PBL, et al., 2014a)

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 6). 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.

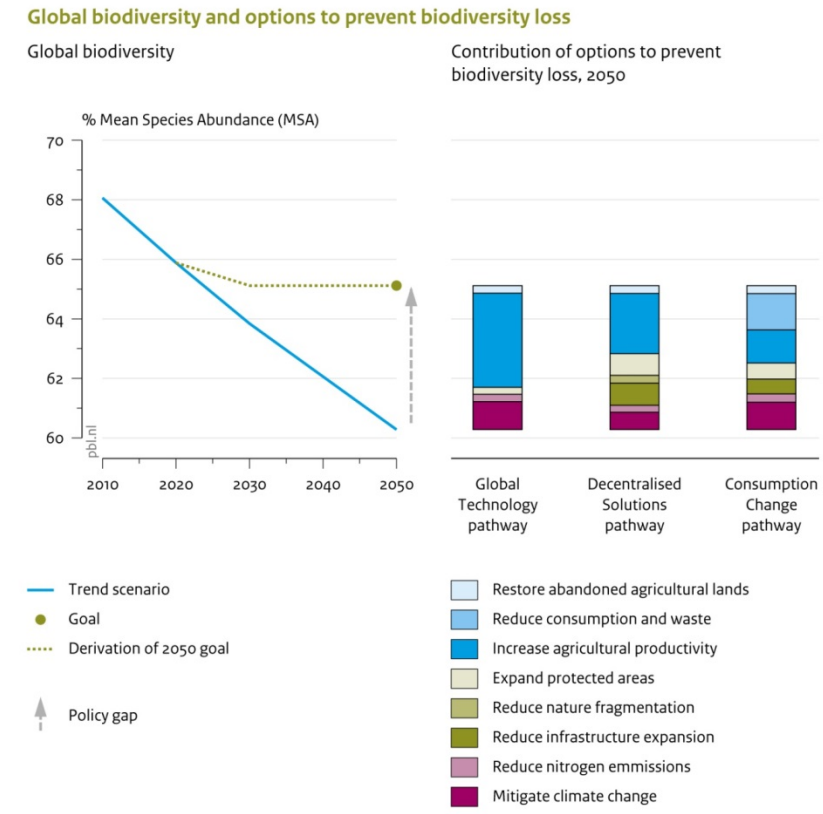

Figure 6 Global biodiversity and options to prevent biodiversity loss (PBL, 2014c)

2. Case selection

2.1. Long list of green niche-innovations

Below we present the long list of green niche innovations. In section 2.2 we will explain the selection we made.

Table 2 Long list case selection

Niche innovation	Explanation	Judgement (bold ones are taken as niche innovations)
Agriculture & extra services, e.g. health care, campsites, conference rooms.	Combine agriculture and health care	Mainly extra activities for farmers. Mainly impact on societal issues
Room for the river	**Combine water and nature / agriculture**	**Increase in biodiversity and nature areas**
Combining agriculture with the production of renewable energy	**Combine renewable energy production and agriculture / nature**	**Using land for agricultural production and renewable energy production**
Expansion of forest landscapes through rewilding	Develop new nature	Not really happening in the Netherlands, and if they exist, mainly at river areas. Mainly change of land use instead of multifunctional land use
Landscape and tourism	**Combine recreation and nature**	**Dealing with innovative business models and rewarding systems**
Urban farming	**Combine urban areas and farming:**	**Quite new development. Mainly indirect influence on GHG emissions and land use**
Combining agriculture and nature conservation	**Combine nature conservation and agriculture**	**New business models**
Natural cemeteries	Combine nature and cemeteries	Very small niche, still in development
Businesses paying for biodiversity	**Combine agricultural production and nature**	**Similar to agricultural nature conservation, but different business model underneath**
Closed nutrient cycles (local/regional)	Combine energy and agriculture	More related to agro-food system

2.2. Selection of 6-8 main niche innovations

Case selection is based on important topics under discussion in both the Netherlands and Portugal. Furthermore, as we are focussing on multifunctional land use, we focus on combinations of two or more regimes. In the figure below (Figure 7) we plotted the different niche innovations we will address in the following section.

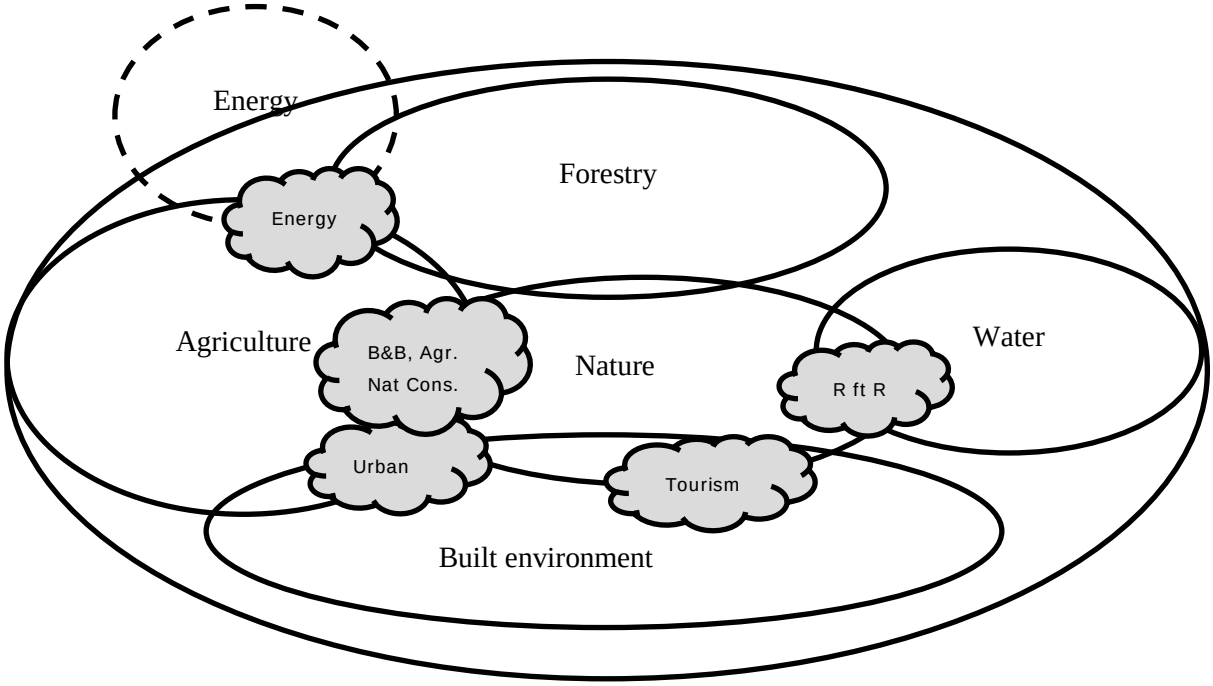

Figure 7 Land use regimes with niche innovations

The table below (Table 3) will show the cases corresponding to the number in the figure above and the reason why they are interesting to study as niche innovations in the multifunctional land use domain.

Table 3 Niche innovations studied

Combination of regimes	Dutch niche innovations	Why interesting	Other developments related
1.Biodiversity in cities	Urban farming	Farming in or close to the city, for example on roofs, or in cellars of buildings. Main contribution: Producing food close to the citizens leads to less transport (and GHG emissions) and raises public ecological awareness, probably marginal effects on biodiversity in the city are present.	• Biodiversity in cities (green roofs for water collections, green walls, climate parks) • Local products used for food production
2. Business and biodiversity	Business and biodiversity	Collaborations between agro-food businesses and Agricultural nature conservation associations or farmers Main contribution: Increasing biodiversity and reducing GHG emissions and other environmental impacts in collaboration with businesses.	• Design industrial estates • Collaboration health care and nature • Wellness and recreation
3.Local renewable energy production	Renewable energy production in agricultural systems (e.g. biogas, using by-products for energy production) solar/wind farms	Integration of renewable energy production with farming/ agro forestry systems to make farmers (partly) self-sufficient or serving as (regional) energy providers. Main contribution: reduction of GHG emissions and fossil fuel use	• Wind mills in forest of Staatsbosbeheer • Use manure for energy production
4.Resilient landscapes for ecological protection	'Ruimte voor de rivier' (Room for the river)	Organise land use with regard to public safety. Use land surrounding rivers as flood basin and at the same time prevent the building of hard dykes. Main contribution: Increase of biodiversity around the rivers (compared to hard dykes)	• Dunes as coastal protection • 'Sand motors' • Tidal marshes • Meandering rivers for water distribution, water quality regulation and biodiversity
5.High nature value farmlands	Agricultural nature conservation: Agri-environmental schemes	New schemes for paying the farmer for integrating nature conservation and agricultural production. Leads to more nature conservation on farms Main contribution: More nature conservation on farms can lead to an increase in biodiversity and natural areas	• Buffering of nature for agriculture • Green and blue services and new business models • Agriculture on peat soils
6.Natural heritage landscape	Tourism/ recreation in nature areas	Recreation in agricultural areas and in particular recreation at farms Main contribution: Because tourists are visiting nature areas, more money becomes available for protection and people appreciate nature.	• Put out fish and create fish pools being nature areas at the same time

3. Analysis of momentum of 6-8 niche innovations

3.1. Biodiversity in cities: 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). Urban farming is aiming at the known client close to the farm instead of the anonymous client in the regional, national or global market. Furthermore it decreases the mental and physical distance between the consumer and food production (Jansma et al., 2010).

Veen et al. (2012) defines urban farming as: The production, processing and marketing of food and food related products and services, in urban and peri-urban areas, by making use of urban resources and final residuals. According to this definition urban farming is not always taking place in the city, but can also be situated in the near environment of a city (Veenhuizen & Danso, 2007).

Urban farming is an example of a new sort of land use that connects the regimes agriculture and urban areas delivering new functions such as food production, education, community meeting places, recreation.

Urban farming integrates different functions simultaneously on the same piece of land. For example, urban farms can consist of agricultural plots, with a restaurant, farm shop and can serve as 'classroom' as well. Therefore, the urban farming case follows Pathway B: A broader regime transformation in which there is a shift to a new socio-technical system with not only technical changes, but wider behavioural and cultural changes.

Although urban farming is a small movement, it is getting political and societal attention.

3.1.1. Techno-economic aspects

Looking at urban farming from a market perspective, the following characteristics can be defined (De Muynck, 2011):

- There is both commercial and non-commercial urban farming
- It is covering the supply chain (see chapter on agro-food) not only about food production, but food processing and dissemination are covered as well.
- It makes use of resources, products and services from the city and delivers these back.
- Located either on permanent locations, or temporary, alternating locations.

Business models for urban farming can be found in *differentiation* (fresh, direct sales with a restaurant, shop as partner), *diversification* (e.g. 'traditional' crops, education, recreation, water retention, city development) and *low costs* (e.g. using residual heat, residual space).

Finding investors and money, however, is the most important bottle neck for urban farming, as projects are often too small making it hard for the returns to outweigh the costs. In combination with recreation it is often possible to outweigh the costs. The main problem is upscaling and new locations. Furthermore, risks are difficult to estimate as there is a lack of experience and practical examples. Another challenge is the temporary nature of most urban farming initiatives, making it hard to keep a solid business model in place (Metaal, 2013).

Furthermore, many of the social benefits (except for recreation) are hard to quantify and do not add to the revenue of the initiative itself but may have a widespread effect on society. Efforts to work collectively to professionalize urban farming would be the next

step for urban farming in the Netherlands, now that the pioneer stage is reaching its peak. As urban farming is per definition locally oriented, there is a need for exchange of knowledge and practical experience between initiatives on a national level (NFSL, 2013).

The "Nationale Federatie Stadsgerichte Landbouw" (NFSL, 2013), the Dutch National Federation of Urban oriented Agriculture was initiated by Van Bergen, Kolpa Architecten, Wageningen UR/LEI, de Volharding Breda, Priva, the Ministry of Economic Affairs and the Ministry of Infrastructure and Environment. In cooperation with the Dutch government they closed the Green Deal Urban Agriculture, for which they published a report on the economic and financial context of urban farming practices in the Netherlands in September 2013. The NFSL lists the main challenges for investments in urban farming as follows and Veen and colleagues (Veen et al., 2012) came to similar findings:

1. *Standardization urban farming practices could be improved*: as technical specifications and process monitoring are not standardized (there are many types and practices of urban farming), costs and benefits are hard to estimate, making it difficult for investors to determine the financial viability of an initiative. There are examples where the situation is clearer, when a location is managed as total and the initiator is responsible for both exploitation and management.

2. *Input of business assets cannot always be compensated with the revenues*: urban farming thrives where there is little competition for space, like temporarily vacated buildings and empty plots. And as revenues in agriculture are already low, initiators don't expect to earn back all their investments through exploitation. To cope with this, they try to get low costs assets to set-up their initiative with.

3. *Differentiation and innovative concepts do not necessarily lead to funding*: urban farming differentiates itself from traditional farming, for instance with sustainable cultivation, local crop varieties etc. However, the downside of innovative practices is that there is little quantitative evidence on market values. For this reason, urban farming initiatives have the biggest market potential (being innovative) with the least probability of funding though bank loans. Therefore, substantial evidence for the social and ecological benefits of urban farming is crucial for potential loans, public financing etc.

4. *Collective efforts for the professionalization of urban farming should be done following the pioneers*: It was mentioned earlier in this paragraph that urban farming in the Netherlands is just on the stage between pioneering and professionalization. After the initial pioneer stage, the specific needs for support did become clear (e.g. expert knowledge and instruments), offering a momentum to create a common structure and platform for urban farming. Combining bottom-up and top-down efforts will assist this professionalization, although this bottom-up movement will and should not be forced in a certain direction. In this next stage, the idealistic, social motivation of urban farming will transform into a more business oriented approach, in which the creation of added value for society is still of high importance.

Types of urban farming

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.).

Secondly, urban farming initiatives can vary in (Jansma et al., 2011; Veen & Mul, 2010):

- Shape: rooftop gardening, in boxes (on polluted soils), vertical farming, permaculture (e.g. fruit trees), or in large city farms (i.e. livestock, milk production, mechanized,

large scale crop production), or even without location (e.g. sheep herding in the city, to manage green areas).

- Level: the shape of the initiative often has a link to the level of urban farming as well. Rooftop gardening, green roofs etc. are on household or building level, whereas there are examples of 'self-sustaining, productive neighbourhoods' , in which an entire city quarter is designed and organized around urban farming including related objectives (e.g. education, restaurants, care, energy). That is however, not easy to realize in the near future. The most elaborate example in the Netherlands of such a neighbourhood is "Agromere".
- Agricultural practices: can vary widely, e.g. livestock keeping (for dairy production or to herd for management of green areas), the cultivation of vegetables, fruits, nuts, herbs and flowers.
- Secondary objectives: in addition to the agricultural practices, urban farming can have a variety of secondary objectives. For example roof top gardening is becoming profitable in some big cities of the US, but in the Netherland still mainly consists of individual balcony planting, and the installation of *green roofs*. The latter are not necessarily focussing on food production, but are installed for noise absorption, water retention and improved insulation. Although called urban farming initiatives, some cases even find their purpose more in these secondary objectives.

The claimed benefits of urban farming

As explained above, food production is often not the only one and sometimes not even the main objective of urban farming initiatives. Often these secondary objectives can be found in the scope of sustainable spatial development. *Sustainable spatial development* can be seen as an optimal balance between the people, planet, profit components and the spatial quality of an area. Urban farming can *theoretically* add to one or more of these four components of sustainable spatial development (Bakker et al., 2013; De Muynck, 2011; Jansma et al., 2011; Veen & Abma, 2011; Veen & Mul, 2010):

- With regard to social sustainability ('people'), urban farming could increase social cohesion and the integration of groups within a community, with for instance shops, restaurants, recreation and day care. But also on individual level does urban farming offer an opportunity to stimulate physical and mental health (i.e. exercise and stress reduction, relaxing), and self-fulfilment (e.g. education).
- With regard to ecological sustainability ('planet'), urban farming could increase biodiversity, water retention, improve micro climate, use and/or produce renewable energy (solar, wind, fermentation), and reduce urban waste flow and (depending on the transport km of the consumers) reduce transport of food (onsite production and sale), but also increase awareness on sustainable living.
- With regard to economical sustainability ('profit'), urban farming can decrease the costs in value chains (e.g. lower healthcare costs because of increased health), and increase value chain benefits (e.g. increasing land prices due to urban farming activities), and increasing employment opportunities.
- With regard to spatial quality, urban farming diversifies and increases the functional use of an area. It also contributes to the amount and quality of urban vegetation and can make use of (temporarily) unutilized or abandoned areas in a city.

Whether urban farming actually contributes to these components strongly depends on the way it is designed, implemented, organized and situated (in size and reach) (De Muynck, 2011). Several studies reviewed a total of over 57 case studies of urban farming in the Netherlands to investigate the claims regarding the benefits of urban farming (Bakker et al., 2013; De Muynck, 2011; Veen et al., 2012). It is hard to get an idea of how many initiatives with urban farming exist in the Netherlands, as many definitions exist. Furthermore they vary in origin and initiator (varying from governmental party, health organisation, farmer to citizen). To follow-up on the objectives of the Pathways project, the paragraph below will only regard findings that address the environmental benefits that were claimed.

In potential, urban farming seems to offer added value to all aspects of sustainability, but Veen et al. (2012) found that the claims on the benefits of urban farming in the Netherlands are insufficiently established. Not only for the direct, but also for the indirect benefits:

- *Short cycles* are often mentioned as sustainable benefit for urban food production but are questionable considering inefficient local and highly efficient global transport logistics. As mentioned before, the sustainability of local transportation systems (consumers driving to local farms) very much depend on consumer kilometres etc. Quantitative evidence for the claimed benefits is not available yet.
- According to De Muynck (2011), urban residual flow (waste, energy, heat, waste water) is currently not being used in urban farming for recycling, heating etc. They found this to be one of the key claims for urban farming, but couldn't find examples (both on the ground and from literature) that actually implemented this.
- As for increasing biodiversity and greenness in the city: Muynck (2011) found some examples of local increase of water retention and biodiversity, but relatively little is known about the actual added value and the possibilities to combine food production, recreation and education with these values.

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.

3.1.2. Actors, social networks, visions, learning (socio-cognitive)

The main actors involved in developing the technology are the founders, implementers and executing actors of urban farming initiatives. These can range from individual households or buildings starting a rooftop garden, to a larger NGO, foundation or private party setting-up a multi-functional urban farming area that can include also restaurants, classrooms, cafes etc.
National government and municipal authorities play an important role for these initiators, as existing law and regulations can be very limiting, having been designed on a specific type of land use. New niche innovations, especially the ones with a multi-functional nature, ask for new regulations and civil servants that can support working with the current system. Local governments of course, also play an important role for the temporary nature and localization of the urban farming initiatives. Wageningen UR/LEI is one of the knowledge institutes involved in urban farming by performing research on this topic.
Nijhuis (2011) states that urban farming is influenced by developments in agriculture (e.g. sustainability issues, longevity of farms, alternatives for upscaling), developments in governance (e.g. more responsibility for citizens, budget cuts and decentralization) and socio-cultural developments (e.g. attention for regional products and quality, globalisation, powerful citizens, demands for food security and availability).

Opposing actors
As can be expected from its location (in low competition areas), small scale and scattered nature, there are no major opposing actors to urban farming practices in the city. However, there is some criticism and scepticism about the claims of urban farming. For instance, prof. Louise Fresco, states that although there is value of urban farming in increasing public awareness on our food and nature, we have to be careful with idealism. Some claims of urban farming are pretentious: the production level of urban farming as it is now, cannot feed the entire world population (Metaal, 2013).

To place a note to Fresco's remark: with the multi-functional, extensive nature of current Dutch urban farming practices, following Pathway B, food production might indeed be too low to replace traditional farming. Although, one can argue that this doesn't mean it does not have added value even in the sense of local food security. Urban farming practices following Pathway A, however, (e.g. intensive but organic, vertical farming), although unaddressed in this case study as there are only a few profitable and successful case study examples worldwide, could be a possible niche innovation in the making.

The following uncertainties can be raised about potential claims (Veen et al., 2012):

- There are no business models available for urban farming on the long run
- Uncertainty on the impact of a green environment in the city is on human health and social cohesion
- Uncertainty on whether short chains are more sustainable compared to the global chains (that are organized in a quite efficient way)
- Uncertainty on possibility to close the circuit of nutrients
- Uncertainty on possibility to combine nature- and biodiversity values in the city with food production, recreation and education

3.1.3. Governance and policy

Historically, cities and agriculture have always been closely connected all over the world. With the onset of industrialization, this changed as people migrated to the cities and the distance to agricultural areas was literally bigger (De Muynck, 2011). In addition, the industrialization of agriculture (the introduction of fertilizer, preservation of food, mechanization of agriculture and new ways of food transport) added to the segregation of urban and rural areas (Veen et al., 2012). This eventually led to our current system where consumer and producer are quite distanced from each other.

As reaction, the need for urban farming was found in (19^{th} century Europe, and more recently mostly in developing countries) the dependence of growing urban populations on the cultivation of food within the city. In Europe, more opportunities for farming plots within the cities came up after WWI and WWII with increasing numbers open spaces for urban agriculture because of the de-industrialization of cities (and more recently, because of stagnation of construction work after the recent economic crisis, and the innovative use of urban roofs) (De Muynck, 2011).

Nowadays in the Netherlands, drivers for restoring the link between cities and agriculture vary between: economic, pragmatic reasons, social, health, idealistic reasons, or ecological arguments. Hence, urban farming initiatives are multifunctional (in varying extent), with main objectives being not only food production, but also to bringing nature / biodiversity back to the city inhabitants (Veen et al., 2012).

Although in 1995 already, the former Dutch Ministry of Agriculture, Nature and Food commissioned a scoping paper on urban farming and there was media and political attention for urban farming, little was actually undertaken by the authorities (Veen et al., 2012). The first important meeting between policy makers on urban farming (in the Netherlands) was held in 2010, starting a city network for urban farming (Veen & Mul, 2010). More recently, a group of private parties, two Ministries and Wageningen University (WUR) have closed a Green Deal for the up-scaling and acceleration of urban farming initiatives. Parallel to that, local initiatives in cities as Amsterdam, Almere, Groningen and Rotterdam are thriving (Veen et al., 2012).
The increasing amount of urban farming initiatives is interesting, as it corresponds with increasing involvement and influence of the market and of social movements. This coincides with the trend of a retreating government, currently taking place in spatial development. With this increasing bottom-up organization and increasing amount of

initiatives, urban farming has a significant change to gain its own momentum in urban development (De Muynck, 2011).

Legislation
Depending on the nature of the activities of a specific urban farming initiative, there is a certain amount of legislation to take into account. The most important laws for the municipality to implement are laws for spatial planning, for environmental management, public safety, and (child) care. Apart from that, the municipality can determine possible locations for mobile trade (e.g. street sales), which might be applicable to the temporary urban farm shops etc. (Jansma et al., 2011).
The main legislation to be implemented by the national government as operator or land owner are laws regarding land tenure and lease, flora and fauna, environmental care and nature management, and water regulations in cooperation with the 'Waterschappen', the Dutch water authorities (Jansma et al., 2011).

The combination with health care, food production, education and urban livelihoods links urban farming to a variety of government departments. The challenge is therefore, to have the Ministers in question take up responsibility together, in order to create a common vision on urban farming. These national vision and guidelines would provide direction and legitimacy for municipalities to address the issue. Examples for this can be found in countries as the US and Japan, where certain municipalities have already developed guiding programs on urban farming (Veen et al., 2012).

3.1.4. Summary statement

Techno-economic aspects:
There are many uncertainties regarding the techno-economic aspects of urban farming. There are no business models available yet for the long run. It is possible to produce food in the urban area, but only on a limited scale.
Socio-cognitive aspects:
The network of people involved in urban farming is growing. Urban farming initiatives are started by different types of persons; citizens, farmers, but also communities, governments or schools can start with urban farming initiatives. There are promising ideas and visions on how agriculture can feed the cities, which fit with the idea of self-sufficient areas. However, to what extent these ideas are feasible is quite uncertain. There is not much knowledge on the price/performance, business models, health effects of for example air pollution in the city, etc.

Governance and policy aspects:
There is no prominent place for urban farming in policy plans. Niche innovations are not actively supported by governments, but they are organized bottom up. Policy could play a role by developing knowledge on these types of initiatives.

3.2. Business and biodiversity

Attention for biodiversity is increasing. The increasing worries on the negative impacts on ecosystems and resources and the emergence of niches in which new ideas for sustainable entrepreneurship lead to different initiatives to develop a connection between business and biodiversity. Examples are companies generating profit by conserving and improving biodiversity and/or taking care of natural resources in a sustainable way (Bosman, Loorbach, Van Raak, & Wijsman, 2013).

Where in the past companies and farmers (and nature organisations) had only a customer-client relation, the relation between companies and farmers or nature organizations improved as a result of the debate on negative impact on the environment and natural resources.

In for example TEEB (The Economics of Ecosystems and Biodiversity) the attention was raised for taking care of Biodiversity and Ecosystems, because a lot of companies are dependent on ecosystems for their production. By taking biodiversity into account, they can strengthen their position on the long term and increase competitor advantages. Since 2007 the economic value of biodiversity is present on the international political agenda as a result of the publication of the first in a series of international TEEB studies.

Since the beginning of the 21th century different collaborative projects are developed in which businesses are collaborating with farmers and/or nature conservation organizations in the Netherlands as a result of the awareness that companies are dependent on biodiversity and natural resources. This is an innovative way of dealing with biodiversity and asks for different approaches to production. The innovation is mainly in developing a different way to incorporate biodiversity goals in management and business and apply it in practice. The ultimate goal would be an increase of biodiversity (or at least maintain its current level).

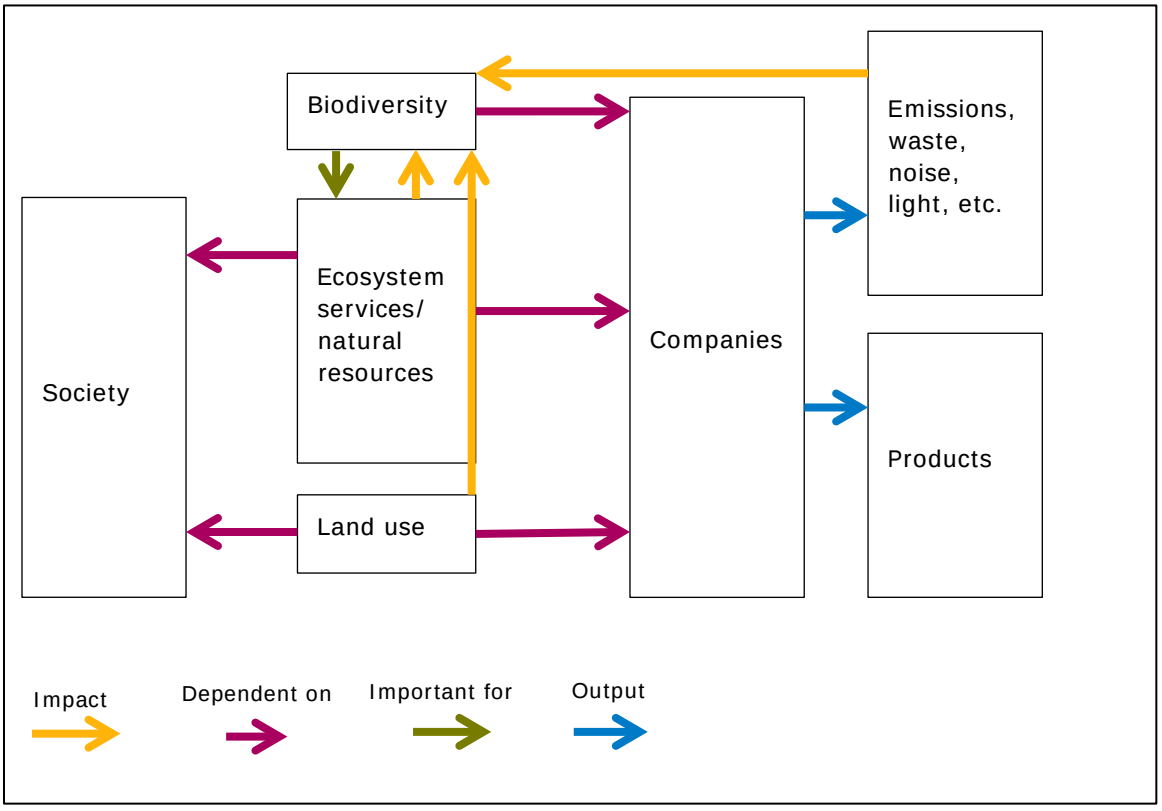

Figure 8 Adapted from AgentschapNL, 2014

An example of collaboration between a food company and farmers is Skylark Foundation (Stichting Veldleeuwerik): a unique collaboration between arable farmers and the processing agro and food companies. The goal is to encourage sustainable arable farming.

3.2.1. The particular (technological or social) innovation

A large part of our economy is based on biological products or processes, what makes a lot of companies dependent on ecosystems, diversity of species, raw materials etc. On the other hand biodiversity loss can be a result of corporate success (e.g. shortage of natural resources) (The Business and Biodiversity Campaign, 2014). Until recently, companies and farmers were hardly collaborating. The difficulty was how to translate ideas from scientists, NGOs and governmental organizations on sustainable production into practical tools that could be applied by companies. As the environment is under increased pressure, resources are becoming scarce and there is more attention for corporate social responsibility and sustainable production.

Different initiatives have been developed to tackle these issues, for example by Heineken (beer brewery) in 2002. They started to collaborate with the Agrarische Unie (Agricultural Union), working together with ten farmers in the province of Flevoland, in order to answer the question: What is sustainable agriculture? The focus was mainly on preventing damage to soil structure and the environment and at the same time increase the production. In 2002 the Skylark Foundation (Stichting Veldleeuwerik) was set up with the goal to improve sustainable arable farming. In 2014 around 500 (4%) arable farmers, advisors and chain actors were involved, among which: Suikerunie, Heineken, McCain, Unilever, Plus supermarkets and Coca Cola (Stichting Veldleeuwerik, 2014).

Skylark Foundation encourages farmers and food processors in their joint effort to improve sustainable farming. To enable this, a specific 'Skylark methodology' is developed with as main element that every farmer, supported by colleagues, writes and realizes his own sustainability plan. Building experience and actively exchange of information is key. The main focus is on biodiversity, crop protection and soil fertility. Collaboration between farmers and the industry is key to the approach. Sustainable farming is defined by the Skylark Foundation with the following indicators: Product Value, Soil Fertility, Soil Loss, Nutrients, Crop Protection, Water, Energy, Biodiversity, Human Capital and Local Economy.

As many farmers got involved, regional groups consisting of 10-12 farmers were established to share expertise and knowledge. These groups are supervised by 1 or 2 farmers and 1 or 2 advisors. The goal is "Promoting the sustainable production of crops like barley, sugar beets, onions, potatoes etc. by applying best practices systematically and controllable, in a joint effort of farmers, agricultural merchants and the food processing industry. Care for the soil has a central position when growing crops sustainable" (Stichting Veldleeuwerik, 2014).

Skylark Foundation was one of the pioneers in this field. The CoP Business and Biodiversity was organized in the beginning of 2012. The goal of the CoP was to demonstrate that growth and environmental impact can improve simultaneously. Collaboration and sharing knowledge was seen as a way to realize this. Thirteen companies were involved and shared their experiences and knowledge. The goal was that frontrunners share ideas and experiences and formulate general lessons that can be spread among other companies as well. A bottom up approach in which barriers were defined by the parties itself could help to increase system innovation (Bosman et al., 2013).

The number of projects or collaborating parties with the goal to improve biodiversity is increasing (Bosman et al., 2013). However, the implementation of biodiversity topics in business strategy and business is still underdeveloped. In times of uncertainties regarding financial and ecological resources and climate problems, pressure on the current way of production is increasing. That makes it interesting for companies to approach the way they produce in a different way.

The TEEB project tries to calculate the economic value of biodiversity and ecosystems as this knowledge would be helpful to value biodiversity. However, that is a difficult task as it is influencing other elements of the system in direct and indirect ways (KPMG, 2012).

3.2.2. Actors, social networks, strategies / actions

The Skylark Foundation is mentioned as one of the frontrunners. They developed a new way of incorporating biodiversity in management. But not only production companies but also for example health insurance companies are collaborating with nature conservation organisations.

The increasing attention for biodiversity can be explained by the increasing awareness of companies of the direct economic stake of ecosystems and biodiversity and the influence if these systems on the quality of life. In fact humans, and companies, have an impact on biodiversity and ecosystems, but are also dependent on them (Bosman et al., 2013). Companies realize that they are not only making use of natural resources, but are also partly dependent on 'services' of nature, such as food, biochemical materials, water treatment, CO2 storage, climate regulation and pollination. The risks that natural resources become scarce and companies want to deal with their environment in a responsible way, make them more aware of the opportunities of dealing with biodiversity in a responsible way, such as becoming an attractive partner, a responsible company and creating an attractive environment to work, live and recreate (NL agency, 2014).

Difficulty is that the system is organized in a particular way and beliefs of actors are stringent. Resistance can be noticed both by nature organisations that only want to focus on 'real nature' and not on minor adaptations of current practices and by companies being afraid to lose their land when spatial plans change (Arnouts, 2014). Collaboration and mutual learning can help to solve these prejudices.

Learning

Learning is taking place in for example the Community of Practice (CoP) Business and Biodiversity. The CoP (in 2012) had thirteen members: Antropia, ASN Bank, Brabant Water, Consortium Biodiversity Future Industry, Eneco, Hortimare, Heijmans, Heineken, InterfaceFLOR, Jachthaven Het Anker, Kruidenier Groep, Landgoed Verwolde, Leven op Daken. The members vary from food processing companies, to banks and from water companies to a knowledge platform. They learn from each other how to incorporate biodiversity goals in their management, how to value biodiversity and how to deal with sustainability issues. We can call this is a niche as there is learning taking place between different initiatives at the local level (Bosman et al., 2013).

3.2.3. Institutions / governance

The European Union has the goal to stop the decrease of biodiversity reduction. In the Lisbon strategy biodiversity is one of the elements of the goals for environmental, social and economic affairs and the United Nations call the year 2010 the international year of the biodiversity. This issue was raised by the in 2005 conducted Millennium Ecosystem Assessment in which an analysis is made of the state of the ecosystems worldwide. The conclusion was that 60% of the ecosystems is under pressure or not used in a sustainable way (Bosman et al., 2013).

In 2007 biodiversity became part of the international policy agenda after a first study in series of TEEB studies (KPMG, 2012).

3.2.4. Summary statement

Techno-economic aspects:

The current production system of agro-food companies is hard to change because the pressure on production is large. The current economic and institutional conditions are mainly focussing on limiting the negative impact and not so much on creating a positive impact.

Socio-cognitive aspects:

As the care for the environment and its biodiversity is getting more attention, it is getting an important role in businesses' strategies. The niche innovations can only become a regime if there is a shared, fundamental cultural shift in companies, governments and

NGOs in which they are heading towards new economic and institutional conditions. The CoPs and green deals do help to create mutual learning and thereby help to develop the niche innovation.

Policy and governance:
There is hardly any policy support for urban farming. A connection between operational (CoP B&B) and strategic (governments, NGOs and businesses) is necessary to create a shared vision on the challenge and direction of the transition. Furthermore an internal company transition might be necessarily.

3.3. Renewable energy production and the landscape

As the scenarios in deliverable 1.1. (WP1) show, in order to decrease emissions, renewable energy can be one of the solutions. In order to decrease the CO2 emissions caused for example fossil fuel use, the demand for other energy resources becomes more important. The three main motives to choose for renewable energy are (Sijmons, Hugtenburg, Feddes, & Hoorn, 2014):

- Fossil fuels will become scarce in the future
- Fossil fuels lead to geopolitical instability: countries without fossil fuels are dependent on countries with fossil fuels, what can lead to conflicts and power issues.
- Fossil fuels increase the global warming.

Different ways of sustainable energy production are introduced over the last years, but these types of energy production do have an impact on land use as well. For the Dutch context, the most important sources of renewable energy will be wind energy, solar energy and biomass. New solutions are necessary to fit the energy production in the landscape and combine it with other types of land use, such as agricultural production, recreation, living space and nature- and water management (Van Muilwijk, 2012). The challenge is to ensure that sustainable energy will not become a hindering factor, but promotes spatial quality (Van Muilwijk, 2012) and even contribute to the protection and sustainable use of nature.

The energy production regime can overlap with agricultural production. Especially if by products from agriculture are used as biomass for energy production. Furthermore, different examples are known in which windmills or solar panels are located in agriculture or nature areas. There can also be an overlap between nature and renewable energy production as for example materials from nature areas (woody bio-fuels, straw, etc.) are used for energy production. The combination of energy production with agricultural production and nature conservation makes that land is used in a more efficient way. The effect on GHG emissions is dependent on the type of energy produced.

3.3.1. The particular (technological or social) innovation

Figure 9 shows the increasing market share of renewable energy. However, it is still a minor part of the total energy consumption. Currently, biomass is responsible for 75% of the renewable energy production (Van Muilwijk, 2012).

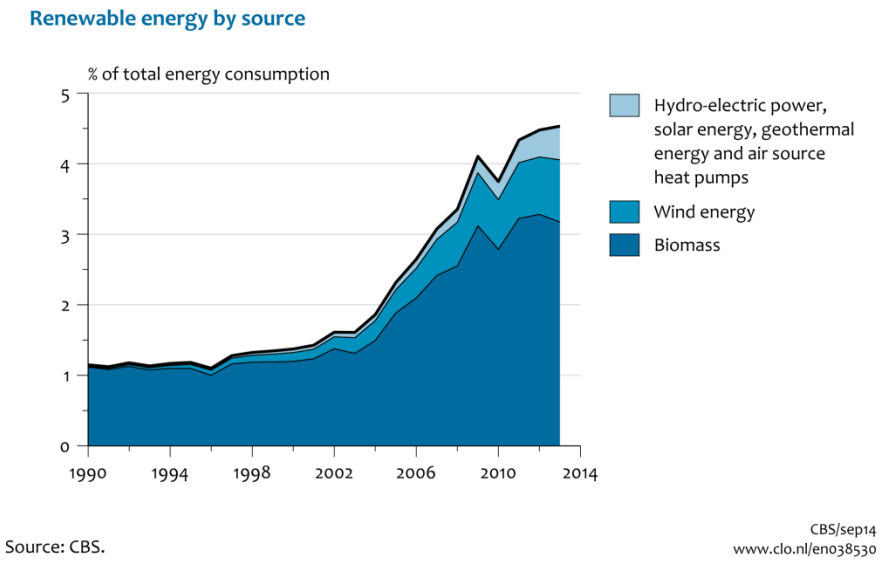

Figure 9 Renewable energy by source (CBS, PBL, & WageningenUR, 2014b)

Of the renewable energy sources, wind mills and biomass production do have the most visible impact on land use. Wind mills in itself do not need that much land, but in a wind

farm wind turbines cannot be placed too close to each other what makes the surface necessary is larger. Furthermore, some activities cannot take place close to wind mills so the indirect space necessary is much bigger (Van Muilwijk, 2012). The area used for biomass production in the Netherlands is very limited.

3.3.2. Actors, social networks, strategies / actions

The term “Energy Landscape” was coined in 2005 by among others the Dutch Gas Union, Stichting Natuur en Milieufederatie Groningen and Rijksuniversiteit Groningen (Noorman & De Roo, 2011). In that period it became widely acknowledged that in order to realise a low carbon energy system huge changes in the national energy and that it could have a huge influence on the Dutch landscape. An energy landscape is a landscape in which there is a clear effect visible of energy generation, energy extraction or the effect of this. The term is used as well by governments for planning and designing areas. Examples of new types of energy landscapes are wind parks, solar panel areas and biomass production areas.

Three types of energy landscapes can be distinguished (Mak, 2011):

First generation: the landscapes that are traditionally connected with energy extraction, such as extraction of peat or mines.

Second generation: the extraction of gas and exploitation of oil (in Drenthe and Groningen). This type of energy extraction is mainly subterranean, and not so clearly visible.

Third generation: Sustainable energy generation in close harmony with human environment and natural environment. Because this type of energy generation is more visible, for example wind turbines in the landscape, this leads in some cases to the NIMBY effect (Not in my backyard). According to De Roo (Mak, 2011) so far there is not much attention for the emotional effects on citizens. The ideas are approached from a technical perspective, in a top-down way, while the construction of wind farms can lead to resistance in society. This asks for a change in dealing with these kinds of problems.

New energy resources ask for a different way to deal with land. But the other way around the spatial characteristics of current landscapes determine the possibilities and impossibilities for energy resources. While the energy sector tends to address spatial questions as one of the factors to deal with in implementation, landscapes architects deal with energy supply as a technical issue not part of their design tasks (Sijmons et al., 2014).

The production of renewable energy is increasing. Some of the big energy producers are also producing renewable energy, but also new actors are entering the market. Especially in relation to local energy production, local energy cooperatives are gaining popularity (Arnouts et al., 2013). In the beginning of 2014 the Netherlands counted 110 energy cooperatives involved in the production of sustainable energy. However, only 4% of the Dutch wind energy capacity belongs to cooperatives (Boot, 2014; PBL, 2014b). Cooperatives (like Windvogel) produce their own renewable energy and the members of the cooperative (citizens, but in some cases schools, associations, etc.) ‘own’ a part of a windmill.

Local production of renewable energy lead on the longer term to strengthening of the local economy via employment and lower energy costs for citizens and local companies. The effect on the planet is only visible on a higher, national or even global, scale, as local renewable energy production will lead to less fossil fuel use. Regarding the people aspect, local energy cooperatives lead to higher community spirit and increasing quality of live. However, especially in the case of big wind farms, there is a potential negative effect on the experience of nature and landscape because of the amount of space used to produce renewable energy (Arnouts et al., 2013; De Vries, De Groot, & Boers, 2012).

Critical success factors of these local energy cooperatives are (Arnouts et al., 2013):

- The revenue capacity of the energy cooperatives
- Enough in-depth knowledge on decentralised generation of energy
- The way in which initiators are able to translate knowledge into a vision and a strategy and the realisation.
- The ability to gain enough seed money

Opposing actors
Local energy cooperatives are competing with the larger energy producers. The competition is difficult, as the revenue model is different. Furthermore renewable energy is also competing with fossil energy production.
Regarding the spatial aspects, opposing actors can be citizens that do not like for example the windmills in the landscape. The NIMBY effect is especially happening around locations that might get a wind farm. Off shore wind farms are possible as well. However they are more expensive and have other impacts on the environment/sea.

3.3.3. Institutions/governance

The Dutch government has made the agreement to realize 14 percent of the energy use to be from renewable sources in 2020. In the "Energieakkoord" (SER, 2013) the government, companies and societal organisations agreed that in 2023, 16% of the energy is renewable.
The policy instruments used are, among others, subsidies for the production or renewable energy (gas, heath and electricity), discount on energy tax for electricity produced by cooperatives or associations of owners (vereniging van eigenaren) and the obligation to use biofuels in road traffic (CBS, PBL, & WageningenUR, 2013).
In the case of energy cooperatives, there is role for both the local and provincial government. The local government can support the professionalization of the organisation. Provinces can provide more local space for small scale initiatives in energy generation (Arnouts et al., 2013).
Because local cooperatives deliver energy to the members of their collective, there are issues with for example energy taxes (members do not have to pay energy taxes when they are producers themselves). Furthermore regulations in spatial planning do not always fit to the developments, what makes it difficult to deal with new type of initiatives.

3.3.4. Summary statement

Techno-economic aspects: The market share of renewable energy is increasing since 2002. New types of organisations are set up to become self-supporting (as a farmer, a community or a municipality).
Socio-cognitive aspects: Renewable energy production asks for a different way of dealing with land as the change in energy landscapes shows. Especially wind mills have a prominent visibility in the landscape and do lead to NIMBY effects. Regarding cooperatives, there is more knowledge needed on economic models and ownership issues.
Policy-governance: New initiatives and ways of organising energy production ask for new regulations and rules. Furthermore as the debate on energy landscapes shows, the need for a different way to deal with spatial planning is changing.

3.4. Resilient landscapes: Room for the river

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).

In Room for the River, land has an integrated multi-functionality, as it integrates different goals (public safety and other land uses) simultaneously on the same piece of land. Hard infrastructure was no longer suitable to protect the Dutch against floods, so providing more room for the river for 'natural'/seasonal floods/higher flow the project will protect against extremes and lead to a 'water resistant, climate resilient landscape'.

Room for the river is mainly multifunctional as water and nature are overlapping, and can be considered as an example of rewilding in the Dutch context. The major part of land returned from agricultural land into nature in the Netherlands is in flood banks of rivers/small rivers, marshes - all wet nature. This is both a considerable % of the total land given back to nature, as well as for Dutch standards a large more or less connected area (14.000 ha according to the plans).

For example, river plains can be recreational natural areas that serve as potential water retention buffers at the same time as well. Therefore, the Room for the River project follows Pathway B (a broader regime transformation), that affects the multifunctional landscape. (Note: Pathway A = multifunctional land use / technical component substitution).

3.4.1. Innovation trajectory (techno-economic aspects)

The 'PKB' ('Spatial Planning Key Decision') Room for the River project started in 2001, and got € 2.2 billion governmental funding to implement its set of measures for public safety in the river delta and flood plains. This followed a cost-benefit analysis on the economic feasibility of investing in the implementation of measures, i.e. benefits regarding both safety and cost effectiveness (Wolfert, Koning, & Nijhof, 2006).

As precipitation increases in frequency and intensity, Dutch rivers have an increasing amount of water to process. Hard infrastructure (elevating dikes) is not enough and not a sustainable solution on the long term to protect the Netherlands against the river water. In addition, land behind the dikes gradually subsides. The water safety standards require that the Dutch river system should be able to safely process a peak discharge by the end of 2015. This design discharges have been established in 2001, being 16.000 m3/s at Lobith for the Rhine, 3.800 m3/s at Borgharen for the Meuse downstream of Hedikhuizen, and an increased combined flow of 250 m3/s from the tributaries of the IJssel. To meet the Rhine design discharge of 16,000 m3/s, Room for the River (RftR) has installed measures to in 34 places, primarily by creating more room for the river. Dike improvement was only included as measure where creating space proved to be impossible or too expensive (Ruimte voor de Rivier, 2013).

The RftR redevelopment measures are also an opportunity to improve the spatial quality. Specifically, this means strengthening the economic, ecological and landscape features in the river areas. Condition for the improvement of spatial quality is that this cannot conflict with the main objective: a safer discharge of water, ice and sediment (Ruimte voor de Rivier, 2013). Hence, although nature conservation organizations feared otherwise, the designed outcomes of RftR don't focus on hard infrastructure only. In 2015 over 14.000 ha agricultural land, built-up areas and deep waters will be developed into natural pastures, river valley pasture, swamp, shallow waters and forest. This is similar to RftR plans, which seems to incorporate a good balance between technical and spatial measures (Wolfert et al., 2006).

The Room for the River project designed 9 measures in 30 projects (see Figure 10 below) to be implemented in one or more project locations.

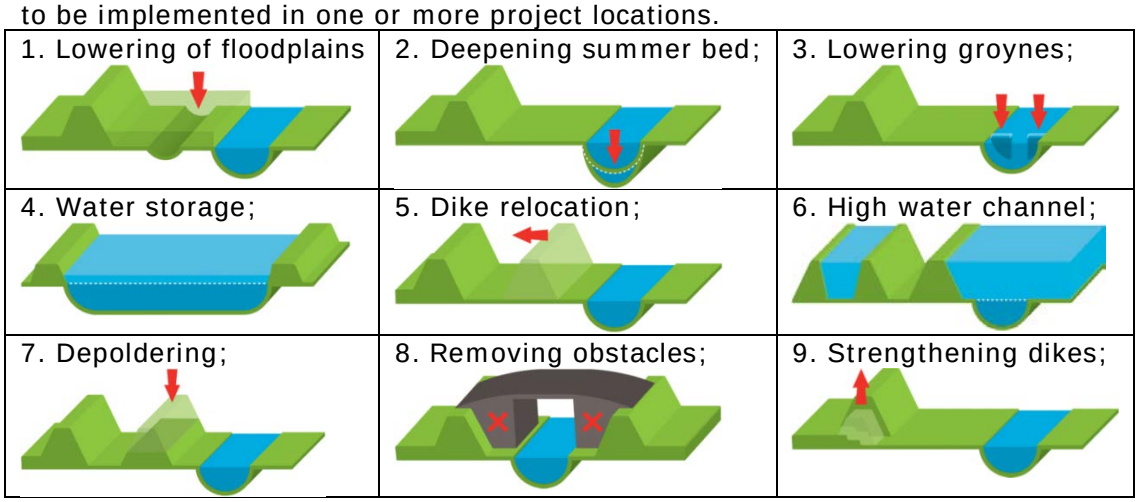

Figure 10 Measures room for the river (Ruimte voor de Rivier, 2014)

Every measure does not only influence the water level or capacity, but also can have an impact on people living in the near environment, agriculture and/or nature areas. Especially measure 1, 5, 7 and 8 for example create more space for nature development by expanding natural areas.

3.4.2. Actors, social networks, visions, learning (socio-cognitive)

The Room for the River program is carried out by the National government, which in practice means Rijkswaterstaat as executive and responsible actor, together with the Provinces, municipalities and water boards (Ruimte voor de Rivier, 2013). Private parties are involved in the role of contractors, sand extraction companies, and other aligning interests.

Initially, at the announcement of the RftR project, ecologists feared that the shifting media and political attention from nature development to public safety in the beginning of the nineties would continue itself in the new Room for the River (RftR) plan (Wolfert et al., 2006). Although that proved not to be the case (public safety and spatial development both incorporated in the RftR project), some nature conservation parties remain sceptical.

In some cases, farmers have been opposing certain measures that would result in agricultural land to be converted in other land uses. As result, adjustments of Room for the River in 2010 included the return of 'terpen' (elevated agro-polders).

Room for the River has to deal with the 16.000 m3/s Rhine outflow at Lobith in 2015 (as opposed to the 15.000 m3/s in 1996). However, according to the WB21 scenario, 18.000 m3/s is expected in 2100 (De Wit, Buiteveld, & Van Deursen, 2007). Neither climate change, nor this specific scenario, has been taken into account in the Room for the River design discharges. As follow-up of the Room for the River program, the government therefore continues to work towards a safer river area in programs such as the Flood Protection Program (HWBP) and the Delta Program (Ruimte voor de Rivier, 2013).

3.4.3. Institutions and governance

The innovation trajectory that resulted in integrating flood protection with other land uses by creating more room for rivers was born out of two consecutive movements:

Since the 80ies, lobby and initiatives aiming for (re-)development of nature area on the river floodplains started to emerge as reaction to the more technical focus on hard infrastructure by policy makers. The organization Stichting Ark wrote a plan, (Plan Ooievaar) followed by a similar WWF report, to lobby for 'living rivers', asking for political focus on nature conservation, nature development, natural rivers, etc.

In the beginning of the nineties however risky high water levels caught the country and perhaps even the experts by surprise. In 1993, the water rose disturbingly high and Limburg was surprised by the high water in the Meuse, flooding 7000 homes. The

damage amounted to approximately 100 million euros. In 1995 the threat of flooding was so high that 250.000 people and 1 million animals were evacuated (Ruimte voor de Rivier, 2013). These events called public and political attention for improved and innovative flood management.
These near-disasters were a reason for the Dutch government to examine how the four million inhabitants of the river areas can be better protection against flooding. It became clear that implementing only hard infrastructural measures (elevating dikes) would not suffice, i.e. taking up increasing amounts of space and money. Therefore, cost benefit studies were done to investigate if implementing alternative measures alongside the improvement of dike rings would be more feasible.
This led to a new approach to water management: give the river more space. This been elaborated in the Spatial Planning Key Decision (PKB) Room for the River, which was adopted by the two Houses of Parliament in December 2006. The mission of the Room for the River program is to achieve the required level of safety along the Rhine and the downstream portion of the Meuse by the end of 2015, and to enhance the spatial quality simultaneously (Ruimte voor de Rivier, 2013).

Room for the River, a governmental program consisting of 30 different projects, was the result. After high risk river water levels in 1993 and 1995, political focus has shifted from nature development to public safety. This shift also affected the targets that were set beginning of the 90s, regarding nature policy. The development of forest and other dense vegetation slows down outflow of water in flooded river plains, thereby increasing the water level during high water. River management has therefore become more cautious in the implementation of similar nature policy (Wolfert et al., 2006).
The quality team for room for the river was an independent organisation, appointed by the minister of infrastructure and environment, was providing advice in all phases of the planning and implementation phase, from an integral vision on design.

3.4.4. Summary statement

Techno-economic aspects:
RftR was a huge project (€ 2.2 billion governmental funding, 30 projects) that had a large impact on the areas close to the river. The areas that are created close to the river, to provide more room for the river, are often nature areas (plans for nature around river banks are about 15.000 ha).
Socio-cognitive aspects:
RftR was a reaction to the high water levels in the 1990s. It was developed as a protection against floods, but with taken into account nature development goals along river banks.
Policy and governance aspects:
This development was executed by the Dutch government, but influenced by lobby organisations as well. The attention for RftR is decreasing, although the projects are not finished yet. According to the plans it will be finished in 2015. The momentum did decline, since the idea that creating more space for the river instead of building higher, hard dikes is incorporated in the plans.

3.5. Multifunctional agriculture: Agricultural nature conservation

Different types of nature areas are present in the Netherlands. In the report “Leren van het Energieke platteland” (Learning from the energetic rural areas”) (Arnouts et al., 2013) a distinction is made between two types of coalitions, focusing on different types of nature:

- Landscape coalitions: Taking care for agricultural areas with a high nature value and protecting the “Agricultural cultural landscapes”. This is about areas that are not part of the nature areas, but are owned by private owners or municipalities and often have an agricultural function.
- Nature coalitions: Taking care for “real nature” areas and taking care of nature conservation with taking into account the value of nature and landscape.

In the past agriculture and nature were two regimes, that were competing with each other. They had competing claims on for example land use. The distinction between the two regimes is changing. Agriculture and Nature Conservation are more and more combined for different reasons, among which idealistic reasons and money. This led to new ways or organizing and paying for nature conservation.

Although many types of nature conservation exist, we will focus in this study on activities performed on farms to protect nature and maintain biodiversity. As we are focusing in this report on multifunctional land use, we are mainly interested in agricultural nature conservation, as that type of nature conservation combines agriculture and nature.

This niche innovation is a combination of the agricultural and nature regime. However, often also the built environment and/or water are involved as well.

3.5.1. The particular (technological or social) innovation

The connection between nature conservation and farming already exists for a while, but the innovation is in the way this is organized and rewarded. In the past farmers were only paid for the products they produce, but with the introduction of nature conservation areas they can also receive money for providing this type of ‘services’.

The idea of agro-environmental schemes is widely adopted since the mid-1980s and nowadays wide spread throughout the developed world (Brouwer & Van der Heide, 2009). The main challenges are: the public good nature of benefits, the need to account the value of potential environmental improvements, asymmetry in information about costs of land management, the desire to coordinate land management at a landscape level, and how best to secure environmental gains into the future.

Solutions for these challenges will involve a mix of formal and informal institutions. There is a growing interest in more collective approaches towards agro-environmental schemes (Brouwer & Van der Heide, 2009). Collectives are interesting for farmers as they can share tasks and make agreements on how they deal with the regulations in their region (for example one farmer is focussing on a certain aspect to realize the goals, while the other is focusing on another aspect). Furthermore learning can take place among farmers. Citizens in agricultural nature conservation foundation can make sure the societal wishes are involved and develop a stronger relation between farmers and society.

The figure below (Figure 11) shows the development in the amount of land used for agricultural nature conservation. As the graph shows clearly, the amount of hectares used for agricultural nature conservation was decreasing, but since 2010 it is increasing again.

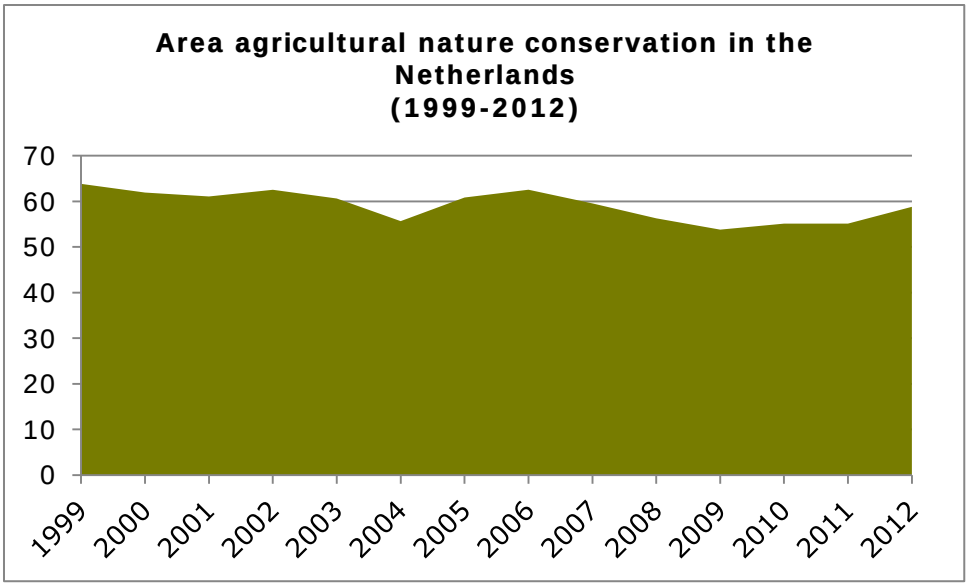

Figure 11 Total area agricultural nature conservation in the Netherlands (adapted from CBS, PBL, & Wageningen UR, 2014)

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 12).

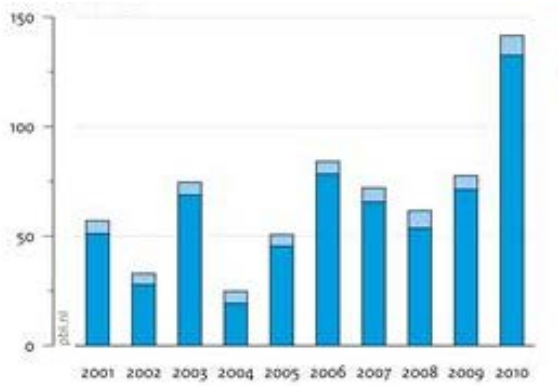

Figure 12 Income farmers (dark blue) and reward for nature conservation (light blue) in 1000 euros (Arnouts et al., 2013).

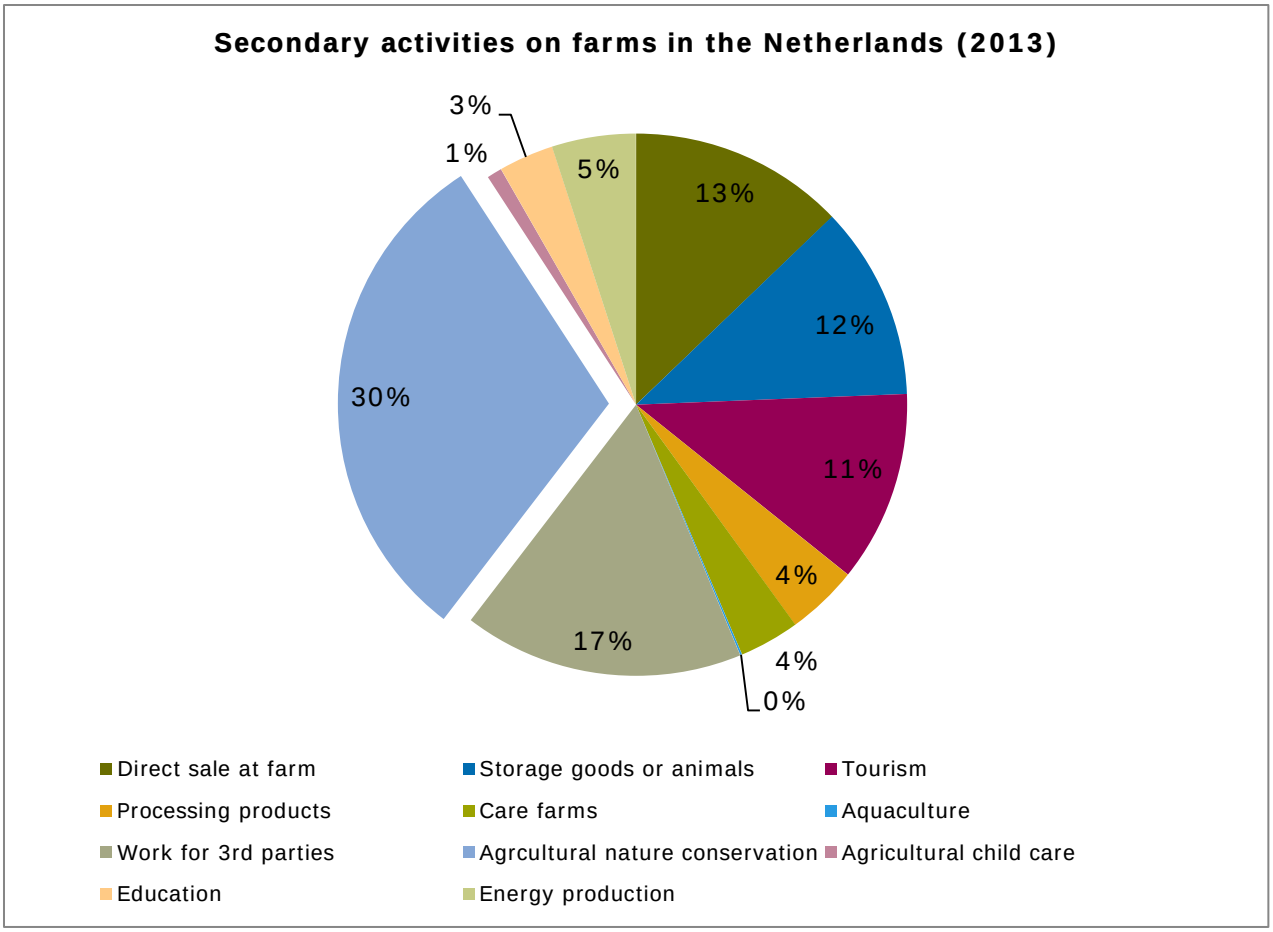

Figure 13 Secondary activities at farms in the Netherlands in 2013 (CBS, 2014b)

In 2013, 30% of all the arable farms performing secondary activities were involved in agricultural nature conservation, what makes it a quite prominent activity for farmers.

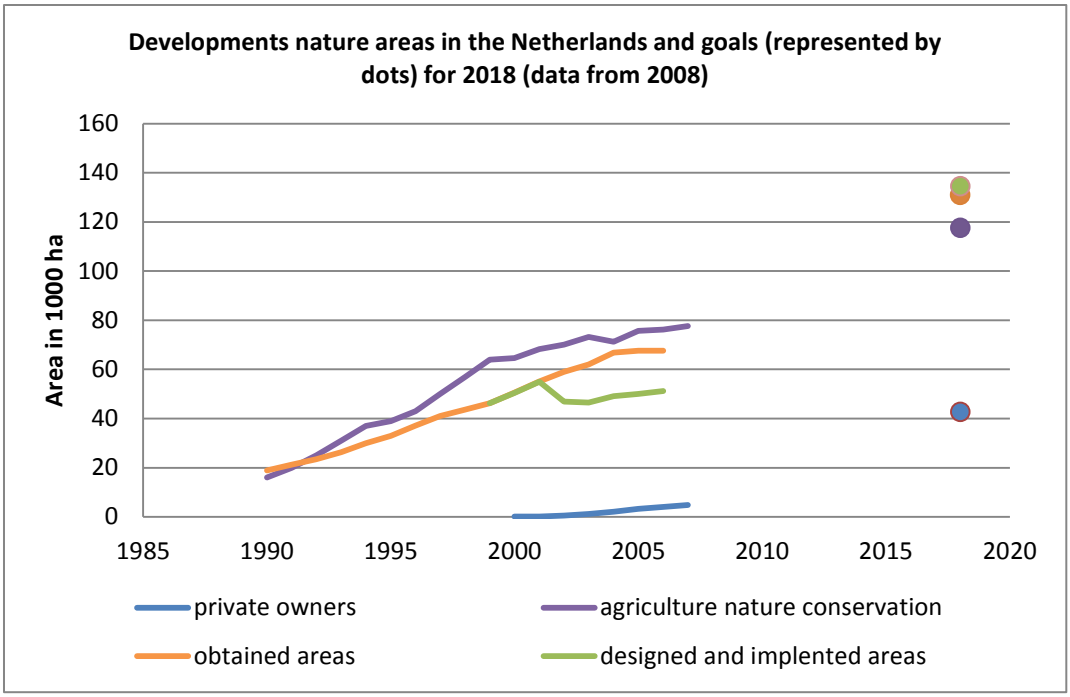

Figure 14 Realisation Ecological Main Structure in the Netherlands (adapted from PBL, 2009).

Although it seems there are only small changes within existing frameworks, for the people involved in nature conservation the changes occurring are of utmost importance. Furthermore, in nature conservation in rural areas, the influence urban dwellers is becoming more prominent as well.
The Common Agricultural Policy (CAP) has two 'pillars' with different amounts of money reserved for them and different purposes. Pillar 1 is the direct payments. The payments used to be dependent on the production until 2003. The more produced, the higher the payments. In 2003 the single farm payment entered, stimulating innovation. Diversifying and developing premium niche products lead to making more money.
Pillar 2 is for rural development and is more flexible. It can be targeted to areas that need a competitiveness and environmental management boost. It is used to improve competitiveness and rewarding environmental care[2].
The maintenance reimbursement farmers get for nature conservation activities are not attached to a delivered service, but to the extra effort (labour and costs) needed to provide the service (in this case nature conservation). This is a reimbursement not in accordance with the market, so the challenge is to develop a business model that is attractive to other farmers than the ones who join from an idealistic perspective or only realize a marginal effect.

3.5.2. Actors, social networks, strategies / actions

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

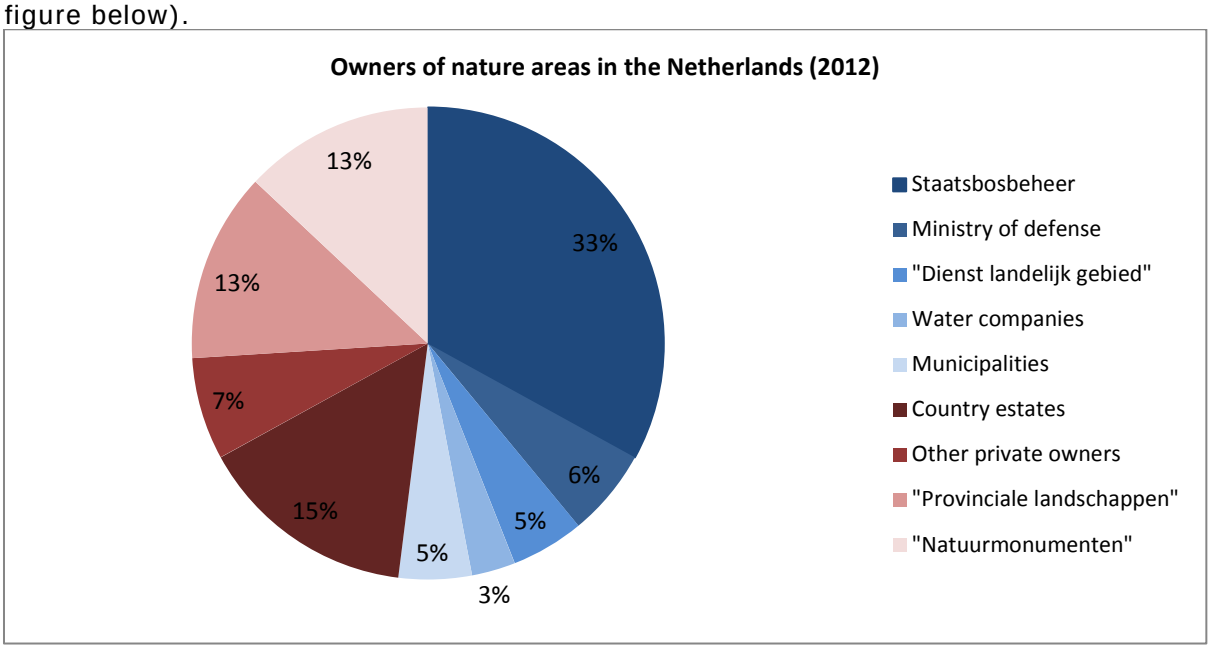

Figure 15 Owners of nature areas in the Netherlands in 2012. The blue categories are governmental organisations and the red categories are other types of owners. (Translated from Arnouts et al., 2013)

An investigation of the amount of farmers involved in agricultural nature conservation showed that around 10.000 farmers in the Netherlands are involved in agricultural nature conservation, spread over 125 to 150 agricultural nature associations (ANVs) at local or regional level (Joldersma, Guldemond, Vliet, & Van Well, 2009; Prins & Smit, 2011) The associations are mainly present in the northern and western part of the Netherlands.
Besides farmers, around 60.000 volunteers (mainly citizens) are involved and around 170.000 households in rural areas (Le Rutte, Van Herwaarden, & Boers, 2005).
The ANVs (Agricultural Nature Associations) consist of people collaborating in the coordination and implementation of the policy introduced by the government. Most of them were established in the 1990s.

[2] more info: http://europa.eu/rapid/press-release_MEMO-13-621_en.htm

The main motivations for farmers to become involved in agricultural nature conservation are: increase of income (Arnouts et al., 2013) and/or idealistic reasons to make it possible to combine agricultural production and nature and interest in nature (Leneman & Graveland, 2004).

Table 4 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

3.5.3. Governance and policy

Just as all the EU Member States and the EU itself, the Netherlands has ratified the Convention on Biological Diversity (CBD) of the United Nations, which aims to slow down the decrease in biodiversity needs. 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 (PBL, 2014a).

Since 1990s the focus of policy was on: “sustainable preservation, recovery and development of nature and landscape values”. In order to reach that the Ecological Main Structure (Ecologische Hoofdstructuur, EHS) was developed in which different nature areas will be connected on a national and international level.

In 2010 the Cabinet started decentralisation the task focussing on nature by transmitting tasks from the national government to the provinces. The landscape policy was unleashed (deregulation).

In 2013 a “Nature Alliance” (Natuurpact) was set up, in which provinces and the national government set goals and ambitions until 2027. The focus was mainly on international nature goals. The National Government was responsible for reaching the goals, and the provinces had a role in the implementation and development of the areas.

In the “National nature vision 2014” (Rijksnatuurvisie 2014) the national government presented its vision on the nature policy for the next 10 years. The focus is on a change of thinking: Nature needs a place in society. The government is looking for solutions to deal with this challenge in the combinations of nature in which both economy and biodiversity are increasing (PBL, 2014a).

Although things are changing, the financial reward from the government for farmers is still an important basis for the farmers. It is expected that without the subsidies, only a quarter of the farmers would keep on managing the nature and landscape around their farms (PBL, 2013). The amount of money available for nature conservation is decreasing, what makes it necessary to find other ways to collect money or organise the nature conservation in another way. The government wants to develop an integral environmental management in which multifunctional land use is key and management is organised in regions or with groups of farmers.

3.5.4. Summary statement

Techno-economic aspects:

Rewards for nature management activities are based on extra labour that has to be done compared to the usual agricultural activities. The money is a compensation for labour. The challenge is to develop a business model to make nature conservation more attractive for every farmer (not only the ones acting from an idealistic perspective.

Socio-cognitive aspects:

Combinations of functions in the rural areas, such as nature, production and recreation (see next chapter) can lead to new ways to deal with nature conservation. However, this asks for a different way of managing the land or creating a connection between the rural areas and the cities. By making citizens aware of nature and the value of it, the connection might become stronger, leading to different rewarding of nature conservation.

Policy:

Subsidies do still influence nature conservation a lot, what makes it dependent on policy. The current policy seems to be not very effective and there is a need for more collective action on a regional level. If policy changes and subsidies will be reduced, the amount of nature could be expected to decrease.

3.6. Natural heritage landscape: tourism / recreation in nature areas

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, 2014c), 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).

In this section we are describing the innovation that 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.

Recreation and nature are sometimes also combined with the water regime. For example there was a project in the surroundings of Breda increasing the "water bergings capaciteit", nature value and recreation function. However, combining different functions can lead to pressure on the system (PBL, 2013).

This niche innovation differs from agricultural nature conservation (section 3.5) as the focus of this niche innovation is on the role the public gets in nature conservation, by for example paying fees to maintain the landscape.

3.6.1. The particular (technological or social) innovation

The idea is that recreation and nature can be combined in order to make citizens aware of nature conservation. For example Stichting Struinen and Vorsen is promoting small scale recreation activities in a part of "Het Groene Hart" in order to create awareness and appreciation for the agricultural landscape and market the area in a sustainable way. They are also together with governments investing in a recreation infrastructure consisting of for example rest places and routes for cyclists (PBL, 2013).

Supporting recreation in rural areas is partly used to increase the appreciation and awareness of the agricultural cultural landscape and market the area in a sustainable way. This has an indirect effect on biodiversity. Awareness raises the attention for the region, what helps to maintain it.

Nature can be framed as public good: everyone can make use of the public spaces. Therefore one argues it is not strange that taxes paid by the citizens are used to maintain nature. However, the way nature is perceived varies per person, what makes it 'social product'. That plea for making use of other money sources to maintain nature. Citizens and companies can provide money to help developing and maintaining nature as well (PBL, 2013).

3.6.2. Actors, social network, strategies / actions

The innovation is mainly in the change in type of collaboration. The defeat and considerations of different stakes is no longer only an issue for the government, but different parties are going to collaborate in local or regional coalitions. For example citizens or companies are paying for nature. Nature areas are seen as 'social goods' (PBL, 2013).

Recreation can also have a negative side effect on nature, for example disturbing the area. It is difficult to measure to what extent recreation is disturbing nature and who is causing the disturbance: the citizens living close the city and recreating in the area or the pancake restaurant attracting people (Henkens, Broekmeyer, Schotman, Goossen, & Pouwels, 2012).

The main actors involved are:

- Governments (mainly province and municipality, some of the bigger projects (e.g. Natura 2000) are part of national government policy)
- Farmers
- Land owners (private parties, companies)
- Recreation entrepreneurs
- Citizens

3.6.3. Institutions/governance

There are also risks involved in combining nature and recreation: Public and private money may vary over time because of conjuncture or because supporters prefer to donate once in a while instead of paying every year a fixed amount (Henkens et al., 2012).
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 new ways of government and culture are difficult to develop and maintain within the existing rules and regulations, methods and interests of existing networks and institutions (PBL, 2013)

3.6.4. Summary statement

Techno-economic aspects: For example air and water belongs to everyone and no-one, what makes it difficult to charge people for it. Nature is a 'social good' what makes it sometimes difficult to reward it as well.
Socio-cognitive aspects: When citizens can spend their leisure time in nature, they will become more aware of it, and probably become also willing to pay for it. Recreation as a secondary activity for farmers has a relatively stable market share (in relation to other activities). Although there are many initiatives on combining tourism and nature conservation, it seems that they are not really combining efforts, but keep separate worlds.
Policy aspects: New collaborations in the field of recreation and nature are sometimes difficult to fit in the regulations. However, recreation can become a source of income helping to keep the area protected, even when subsidies are declining.

4. Conclusion

4.1. Overall assessment of momentum

Ranking niche innovations (high to low) is presented in the table below.

Table 5 Assessment of momentum

Niche innovation	Main drivers of momentum	Path	Overall momentum
1) Business and biodiversity	Techno-economic: - Number of participants in projects is rising (e.g. in 2014 around 500 (4%) arable farmers was part of the Skylark foundation) - But dependent on the financial situation of the business	B	Medium
	Socio-cognitive: - Social network is increasing: new actors entering the market; big industrial players involved as well - Commitment is increasing: Biodiversity is becoming a more important part of companies' strategies as they are becoming more aware of their dependency on biodiversity and the risks and opportunities that are associated with biodiversity for their business. They are aware they need to deal with biodiversity - Learning is increasing: Community of Practice (CoP) to exchange ideas and knowledge		
	Governance and policy: - Policy support is increasing: e.g. projects like The Economics of Ecosystems and Biodiversity (TEEB) are gaining attention and biodiversity is increasingly linked to economy.		
2) Agricultural nature conservation	Techno-economic: - The number of initiatives (and farmers participating) is still increasing - Is about a new way of generating income - As it is about maintaining areas, money should be available during a longer period (it is not about an investment once) - The amount of land used for agricultural nature conservation is increasing	B	Medium
	Socio-cognitive: - The network of people involved in urban farming is growing as more people are participating - The idea is that the amount of land used for agricultural nature conservation will further increase until 2020.		
	Governance and policy: - It can be expected that only 25% of the farmers will apply agricultural nature conservation without subsidies, so farmers are still depending on policy support via subsidies. - Policy is changing: agricultural nature conservation will be organised in a collective way		
3) Resilient landscapes: Room for the River	Techno-economic: - Different options are available to develop more room for the river (it is technically feasible)	B	Medium
	Socio-cognitive: - NGOs, Rijkswaterstaat and land owners were able to connect to each other and realize their own goals		

	leading to collaborative actions. - Windows of opportunity for several policy domains came together (biodiversity goals, protection population against floods, creating nature)		
	Governance and policy: - A lot of policy support as a result of floods in the 1990s leading to a budget of 2.2 billion euros for Room for the River projects.		
4) Local renewable energy production in the landscape	Techno-economic: - Number of projects is increasing: wind farms, biomass production, use of biomass from nature areas - New models are developed to pay investments in local cooperatives	B	Medium
	Socio-cognitive: - Need for renewable energy as fossil fuels will become scarce in the future, lead to geopolitical instability and contribute to global warming. - Social network is increasing as new type of organisations are entering the market: e.g. local energy cooperatives - NIMBY (Not In My Back Yard) effects of wind farms/mills - Competition with existing incumbent parties		
	Governance and policy: - Regulations need to be adapted to new ways of organising energy production (e.g. taxes, etc.) - New ways to deal with spatial planning necessary		
5) Urban Farming	Techno-economic: - No business models available for the long term, and economic figures are not available - Number of initiatives is increasing	B	Low
	Socio-cognitive: - Social network is increasing as many initiatives are popping up - Visions: A lot of promises for sustainability, however also a lot of uncertainties regarding the effects on sustainability - Related to health effects as well		
	Governance and policy: - No active policy support - Spatial planning causes difficulties		
6) Tourism (combining agro and tourism and nature and tourism)	Techno-economic: - Nature is a 'social good' (belongs to everyone and no-one), what makes it hard to reward it - Relatively stable market share in relation to other secondary activities of farmers	B	Low
	Socio-cognitive: - The idea is that if people spend their spare time in nature, they will become aware of it and willing to help protecting the area - Tourism and nature conservation are separate worlds, hardly combined		
	Governance and policy: - New collaborations often difficult to fit in regulations		

The overall momentum in the land use domain is medium. Many activities have started. A lot of these niche innovations focus on delivering public goods. Therefore the government is a major source of money for nature conservation, making the

developments dependent on policy support. In general the amount of public money available is decreasing, and this means people are looking for other ways of combining practices leading to different functions in one area to increase possibilities and make efficient use of resources.
A distinction can be made between maintaining 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.

Niche-innovation in multifunctional land use seems to be examples of reconfiguration of the regime. Multifunctional land use combines functions and therefore is especially happening on the margins/edges of the existing systems. Rules and regulations do not always accept the combination what makes it for example difficult to implement new initiatives in existing spatial planning.

Breakthroughs are often caused by crises (e.g. floods of the 1990s, oil crises).

In the Dutch land use domain, all innovations are in Pathway B. Most innovations are about wider societal change 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).

4.2. Conclusion about transition pathways

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

Table 6 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

In the land use domain, all innovations are in Pathway B. Most innovations are about wider societal change 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).

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