

# How a Broadened View on Land Readjustment can Help Dealing with Future Spatial Challenges

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**Key words:** Spatial planning, Environmental policy, Legislation, Land use, Reallotment, Participation

## SUMMARY

The transition towards production of renewable energy and creating more sustainable environments have an enormous spatial impact on cities and rural areas. Cities and rural areas must be designed to be more climate adaptive (water management, heat stress). Rural areas can produce energy for consuming cities. And how about fitting in the infrastructure to move the produced electricity or perhaps store hydrogen energy?

Because every plot in Holland has an owner and a designated function it is a challenge to find enough space. At The Netherlands' Cadastre, Land Registry and Mapping Agency (Kadaster) we have learned that the combination of cadastral information, geo information and experience with different approaches on land readjustment can be helpful to government bodies and land/homeowners in multiple stages in area development and in the spatial planning process.

At this point in time the Dutch government is designing new legislation and policy regarding the environment. Creating space for the transition towards renewable energy and making rural area's more futureproof are two of four priorities in the new National Environmental Strategy. Participatory working methods during the planning process and deploying land policy instruments like land readjustment and land consolidation can contribute.

# **How a Broadened View on Land Readjustment can Help Dealing with Future Spatial Challenges**

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## **1. INTRODUCTION**

The Netherlands is a dense country. More than 17 million people live, work and recreate on 4,1 million hectares of land. It's easy to imagine that spatial planning is a puzzle with lots of competing functions and lots of ideas on what's best and what is most important.

Especially with the challenges of the future. As the theme of the working week states geospatial information helps achieving smarter life and environmental resilience. In case of land readjustment geospatial information it is essential for making well based plans. But is not just beneficial to the instruments of land readjustment, it is beneficial in the whole process of area development, from the phase of exploring the problem till exploitation of a solution.

With this paper I would like to illustrate how The Netherlands' Cadastre, Land Registry and Mapping Agency (Kadaster) has developed methods and tools to support area development in all phases. These methods and tools will help governments and citizens puzzle together and create a more futureproof environment.

I will start with giving an insight in current land use in chapter 2, and in relevant policy and legislation on the environment in The Netherlands in chapter 3. Throughout this paper, but especially in chapter 4, I will give examples of cases or ideas on how cadastral-, geospatial information and land readjustment can help in the different phases of area development. The cases and ideas will focus on the spatial challenges we see when transitioning towards the use and production of renewable energy and a more sustainable environment.

## **2. CHANGE IN LANDUSE IN URBAN AND RURAL AREAS**

As stated in the introduction, The Netherlands is a dense country and spatial planning is a puzzle. To give more insight I will present some facts and figures about urban and rural land use in The Netherlands.

### **2.1 Urbanization**

The Netherlands is a highly urbanized country. About half the land use is urban, three quarters of the population live in urban areas, and most people work there. See figure 1 on the next page.

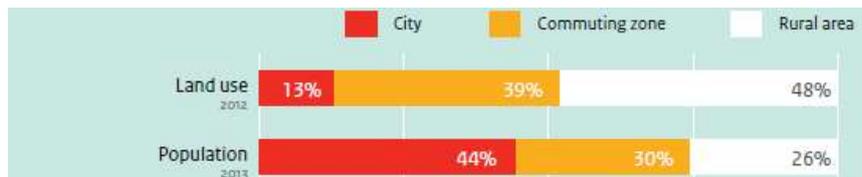


Figure 1: Characteristics of cities, Nabielek K. et al. (2016)

The largest metropolitan areas also show the strongest population growth. The outlook for the future is also favorable. Predicted is a strong concentration of population growth in urban municipalities, particularly in and around big cities (Nabielek, K. et al, 2016).

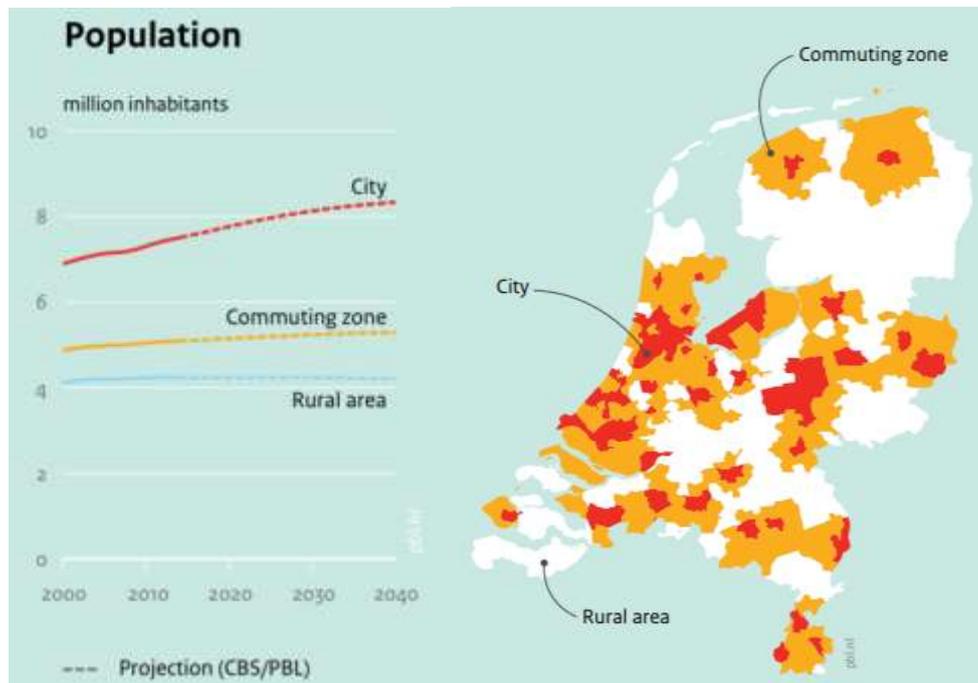


Figure 2: Nabielek K. et al. (2016)

Research of Kadaster and the latest information about the population from Statistics Netherlands (CBS) in 2018 shows that there is a shift in types of homeowners in the 4 biggest cities.

Evers et al. reported in 2015 that city centers in particular have enjoyed population growth, especially regarding families with children, between 2003 and 2015 (Evers et al., 2015). In 2018 the numbers seem to be different regarding the 4 biggest cities (Amsterdam, Rotterdam Utrecht and Den Haag). Growth in 2018 is mainly due to young people (under 35). Families with children and older people are actually leaving the city centers (HP/De Tijd, 2018). In the publication in 2015 the question is raised if the growth of the number of children living in city centers is because of a structural change in living preferences or due to the stand still on the housing market. It looks like that question is answered in favor of the latter.

## 2.2 Land use in rural area's

Between the year 2000 and 2018 the total amount of utilized agricultural area in The Netherlands has declined with 207.245 hectares which is a declination of 10%. Since the year 2000 the number of farm holdings decreased with 43.505 that's almost half (45%).

The two major types of farm holdings in the Netherlands are “grazing livestock” and “specialized field crops”. Together they represented in 2018 71% of the total farm holdings using 82 % of agricultural area. The biggest decline is seen in the number of farm holdings with grazing live stock (40%).

Farmholding type	Acreage (hectare)		Count #	
	2000	2018	2000	2018
Total all types of agriculture	1975504	1768259	95944	52439
Specialized field crops	481163	451793	14799	10928
Grazing live stock	1075496	999922	44786	26495

Table 1: Utilized agricultural area/number farm holdings in 2000 and 2018

## 2.3 Changing landuse

Between the year 2000 and 2015 the land that had no longer the function “utilized agricultural area” transformed into other functions. The most hectares were transformed in to “High density urban area” (yellow) and in second place is transformation into “recreation area” (orange).

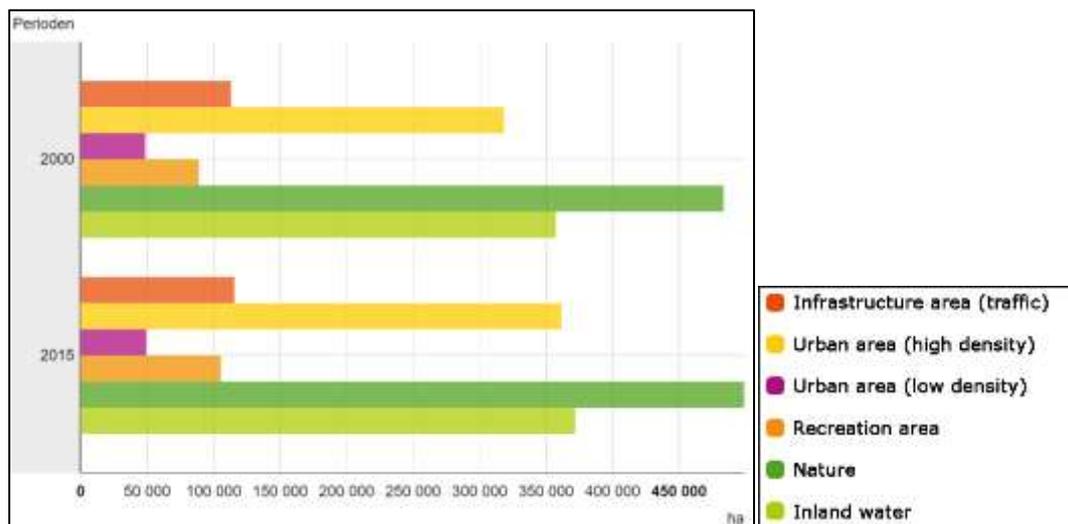


Figure 3: Amount of hectares per selected land use categories. Generated via Statline

The category “High density urban area” can be broken down into area's with the functions “residential”, “retail”, “public utilities”, “socio-cultural utilities and “business/industrial area”.

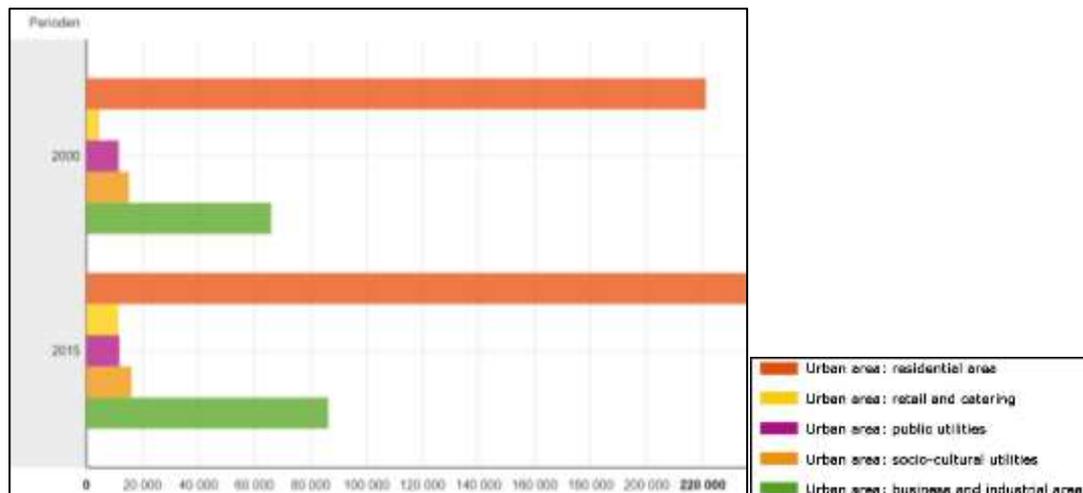


Figure 4: Amount of ha. per function within land use category “High density urban area”. Generated via Statline.

The most new hectares “High density urban area” were designated as “residential areas” and “business and industry”.

### 3. RELEVANT POLICY AND LEGISLATION REGARDING THE ENVIRONMENT

Statistics Netherlands (CBS) predicts a growth of the population to 18.4 million inhabitants in the year 2060. So, in the future there will be only more claims on land simply because there will be more people with rising demands for housing, transport, infrastructure etcetera. But it’s not just the autonomous growth of the population. Just like other countries The Netherlands’ environment has to be more sustainable, prepared for the consequences of climate change and the introduction of renewable energy sources.

Because land is scarce it’s essential that, when designing and planning, spatial themes as mentioned above are not seen as independent themes but as one integral assignment. The new Environment and Planning Act, to be introduced in 2022, is one act that will combine all current acts that are applicable for different themes and stimulate a coherent approach towards the physical environment instead of a sectoral one.

#### 3.1 The Environmental and Planning Act at a glance

Through the new Environment and Planning Act the government wants to combine and simplify the regulations for spatial projects. The act aims to modernize, harmonize and simplify current rules on different, now all independent Acts on for example land use planning, environmental protection, nature conservation, water management and urban and rural redevelopment. The Act integrates these rules into one legal framework (see also 3.3.2). The aim is to make it easier to start up projects because there are fewer rules, a reduced burden of administration and improved links between different projects and activities. Decision making on projects and activities will be easier, better and more quickly (see also 3.3.1). One other important aim of the new regulation is to empower citizens to take responsibility for their own environment and

neighborhood. For a few years now citizens are invoked to participate, co-create and take initiative to do so (Louwsma, M., Beek, M. van, Hoeve, B., 2014) but the current rules are not sufficient enough to involve them early on in the process. In the new legislation government bodies are obliged to, when making policy or programs, show how they will ensure participation and involve all stakeholders (see also 3.3.3)

### **3.2 The National Environmental Strategy “NOVI” at a glance**

Part of the Act is that government bodies are obligated to make a coherent strategic plan relating to the physical environment known as the instrument “environmental strategy”. This is a policy document containing the broad outline of the proposed development, use, management, protection and preservation of the territory of an administrative body and the principal aspects of the entire policy to be pursued in relation to the physical environment (Ministry for Infrastructure and Environment, 2017). Although the act is planned to be implemented in 2022, national government, provinces and municipalities are stimulated to work as if the act was already implemented. For example there are pilot projects in which they will examine all aspects of spatial planning and almost all government bodies are already working on their new “environmental strategies”.

The national environmental strategy is a long term policy plan and can be summarized with these four priorities:

- 1 Sustainable economic growth potential in the Netherlands
- 2 Space for measures coping with climate change and sustainable energy
- 3 Strong climate adaptive cities and regions with focus on liveability
- 4 Futureproof rural development

The national strategy gives other government bodies directions, values and scope on these priorities but planning and execution still is the responsibility of provinces and municipalities. Focusing on the energy transition for example, energy transition will largely take place at regional and local level. There are different reasons why the energy transition is a process taking place at regional level. The transition has a spatial aspect and there are regional differences in housing stock and available energy options. The transition also has major consequences for the immediate living environment of citizens, this also emphasizes the importance of local consultation (Ministry of Economic Affairs, 2017).

The parties at regional level have the task to execute spatial policy programs in a coherent way. This also means thinking in more and new collaborations. Specific for the spatial aspect of the energy transition there are so called “RES” created. RES stand for Regional Energy Strategy and is a collaboration between diverse parties as government bodies, civil society organizations, grid operators, companies, landowners etcetera.

### **3.3 The Netherlands' Cadastre and the new legislation and policy regarding the environment**

Because of Kadasters task protecting legal certainty and the responsibility for national mapping Kadaster has collected lots of administrative and spatial data on property and the rights involved. This we do in service of society. With this in mind, Kadaster contributes on several ways in this legislative- and policymaking process.

#### 3.3.1 Helping decision making and planning easier, better and more quickly

Data out of the cadastral administration and other available geo information can help reducing the burden of administration (see 2.1). Very recently Kadaster has been appointed to take care of the tactical information management regarding data with are essential for implementing the environmental and planning act. This information fundament is called the “Digitaal Stelsel Omgevingswet” (DSO). Access to information will so be made easier for everyone involved.

#### 3.3.2 Incorporating the Rural Areas Development Act

Another development is that the new act will incorporate the Rural Areas Development Act. The Cadasters department of spatial planning has been involved in land consolidation since the first land consolidation was executed in 1916. This involvement is directly derived from the Rural Areas development act. The small-scale re-allocation of agricultural land holdings of earlier times developed into multifunctional land consolidation programs. The map below shows the location of all land consolidation and land readjustment projects until now. The red areas are more recent projects then the light blue areas.



Figure 5: Land readjustment projects in the Netherlands, Kadaster 2018

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### 3.3.3 Participation of stakeholders requires tools and methods to do so

The new goals and priorities set in the National Strategy and goals set in the Regional Energy Strategies will have an enormous spatial impact on urban and rural areas. In case of priority number 2 for example, where is the best location to produce renewable energy? Where to fit in the infrastructure to move the produced electricity? This is not just a question of the availability of hectares for solar panels or windmills but also if there is support of the community for placing them. Governments can follow several land policy strategies to realize location-bound aims as described in spatial policy. Expropriation, land consolidation and land purchase can be very effective instruments. The complexity of the playing field however does make it very important to use the right instrument at the right place at the right time. A suitable instrument for area developments with such great need for land acreage could be land consolidation. In the past big, less popular (for farmers) aims, like nature reserves and water retention areas were achieved.

But the complex and formal instrument of mandatory land consolidation has been declining in popularity since the nineties. It's mandatory character, the long duration and the negative public opinion on regulative and imposed plans made the instrument less favorable than for example voluntary land consolidation. Cadastre's department of spatial planning therefore developed more participatory methods (Louwsma, M., 2014) and it's role shifted from a more executive role in the formal land consolidations towards a more all-round expert advising role in all phases in area development. The expert-advising role is based on land administration, geo information and of securing land rights.

These more participatory methods and the development of tools to specifically support participation will be helpful in achieving results on the "NOVI" priorities and the aims in the Regional Energy Strategies. Later on I will illustrate this with the interactive workshop and the area development in Goeree (4.1.2).

Next to developing expertise in the different phases in area development, land readjustment in **urban** areas have been developed. In 2016 a pilot program was started to experiment with this. Lara Brand and Bert Hoeve wrote a paper about the outcomes of these pilot project. The paper "A coalition of the willing: urban land readjustment as a novel approach for sustainable area development, 2019" will be presented as the FIG working week in Hanoi.

Although the dynamics in rural and urban areas differ from each other, the basics principles of (voluntary) land readjustment and participation are interchangeable. The lessons learned about these dynamics can help us dealing with challenges in the future.

## **4. IDEAS FOR WORKINGMETHODS AND TOOLING**

In this chapter I will give examples of cases or ideas on how cadastral-, geospatial information, tools, and methods of land readjustment can help in the different phases of area development.

The cases and ideas will focus on participation and/or the spatial challenges we see when transitioning towards the use and production of renewable energy and a more sustainable environment.

## **4.1 Initiative and exploration phase**

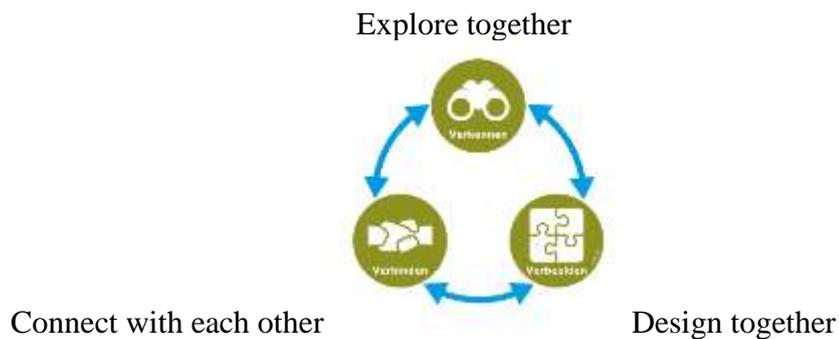
### 4.1.1 Feasibility studies

Which plans and goals for making districts more sustainable are achievable where? A good starting point is data derived from the administrative and spatial data on property. What are the characteristics of the buildings? When were they built, how big are they, what type of housing? And what are the characteristics of the owners? Is the majority privately owned or is it ownership to let? Are they likely to move soon or not? Answers to these kind of questions helps exploring the playing field and design actions that will be effective.

For example: research shows that property of private home owners more often than properties of companies or housing corporations score low on their energy label which is registered at Kadaster. The age of the homeowner and the duration of ownership are factors which can help predict if they are likely to move. New home owners are more likely to invest in their new property (Kadaster, march 2019).

### 4.1.2. Interactive workshops

One participatory method to specifically support initiative takers and stakeholders is the participatory planning and design workshop.



This workshop is meant to inspire participants to be creative, to discuss new options together and eventually gain support for the outcomes. Important elements of the workshop are visualizations and the interactivity with GIS. To support these workshops an interactive workspace is created. This workspace is also functional on a touch table where participants can actively select, draw and analyze.



Figure 6: Screenshot of the workspace

## 4.2 Planning phase

### 4.2.1. Optimizing (electrical) grid routes

The switch to an alternative, low carbon energy supply also raises new questions on the best way and routes for transportation of (mainly) electricity. Today electricity is still mostly induced in powerplants or imported. Transportation of this electricity from the producer (the powerplant) or point of entry towards the customer is following the main routes of the existing electricity network. Supply and demand is predictable.

At this time and in the future there is a growing amount of electricity coming from rooftop solar panels and solar fields. At (sunny) times the (regional) networks are overloaded with electricity because there is more being offered than demanded. Until now there is insufficient coordination on where production is located and how transportation will take place. Local initiatives now sometimes are being paused or rejected because the transportation network is lacking capacity. You can imagine this is not encouraging others on taking initiative and reaching the targets on renewable energy. Voluntary reallocation can help create enough space at the right location (see 4.3.1.). And although not yet tested, maybe the “Routeplanner” (Tracéplanner) can help analyzing transportation routes and help optimize power grids.

The routeplanner is a tool developed for analyzing routes on all kinds of different variables. In the past governments have used it to help plan locations and routes for roads or pipelines for water distribution.

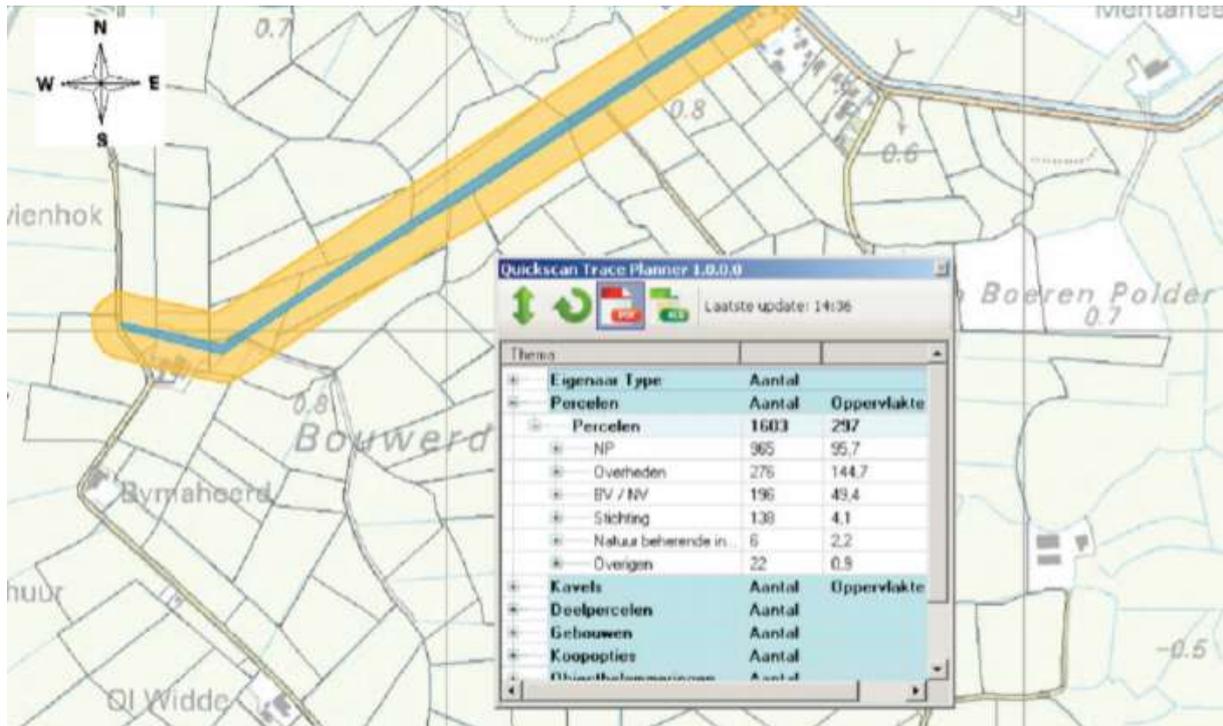


Figure 7: Screenshot of the “Routeplanner”

When incorporating datasets on electricity use, electricity production and distribution points it must be possible to help coordinate transport.

### 4.3 Execution phase

#### 4.3.1 Voluntary reallocation as an instrument for coordination on locations

On Goeree-Overflakkee, the municipality, province, landowners and other stakeholders together achieved their objectives for sustainable area development. With attention for each other's interests and mutual trust. An approach that also fits in well with the Environmental Act that takes effect in 2022.

The area where reallocation took place is mainly agricultural. For the past 10 years there were plans for a nature reserve and in 2014 the area was designated to produce wind on land (Ministry for Infrastructure and Environment and Ministry of Economic Affairs, 2014). When funds for the development of the nature reserve became available the area development boosted but that did not always make relations between all stakeholders easier. In this process it was very important that all parties would meet each other. An optimal result could only be achieved working together. Kadaster sought contact with all parties and gained their trust. Surprisingly mutual trust was created rapidly which is essential. The availability of land and trust between stakeholders was key. Research on (urban) land readjustment processes concludes that trust is

the critical factor in any deal making process and interpersonal trust relationships are dominant (Druif, 2018).

The farmers together have been able to buy 167 hectares for business expansion and designed rules for the installation of wind turbines and the financial arrangements. With voluntary reallocation a more future proof environment was created. The province and the municipality thus realize their wind energy assignment. Natuurmonumenten has been able to purchase 70 hectares of land to construct nature reserves.

#### **4.4 Phase of exploitation**

##### 4.4.1 Monitoring energy labels

The province of Overijssel has the objective that 45% of the private housing stock in 2020 has at least an energy label B and in 2030 this must be 90%. To monitor if the province Overijssel is reaching their objective a monitoring system can be developed where the information over a longer period of time can be displayed. Policy can then be evaluated and/or adjusted with this information.

As a starting point, the province wanted to know: how are we actually doing? Kadaster presented the state of energy labels. Based on the registered energy labels, 91,483 homes currently have a calculated energy label B or better within the province. That is 29.6% of the current housing stock. The year of construction of the house appears to be more influential than the type of housing. Homes built in 2000 or later all have, with a few exceptions, an energy label B or better. For homes built between 1975 and 1999 mainly energy labels B and C are registered. The energy performance of homes built before 1975 varies greatly.

The necessary measures to make these residential market more sustainable requires per housing type a different approach. With the results, the province can facilitate municipalities and make them more aware. Municipalities can see which actions are needed per neighborhood.



Figure 8: Indication of difficulty to reach label B (green is easy, red is more difficult), Kadaster, 2017

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## **BIOGRAPHICAL NOTES**

Nyncke Emmens is senior advisor in the department of spatial planning at the Netherlands’ Cadastre, Land Registry and Mapping Agency. After graduating her bachelor in public administration and law she assisted committees in formal land consolidation procedures. In 2011 she successfully graduated from the university of Groningen and holds a Master in public administration and law. Currently, she works on product and process innovations in the domain of land management and spatial planning and has also the role of advisor about participatory land consolidation for the northern provinces in the Netherlands.

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