

Innovative Techniques in Land Administration: Structural Allocation in Modern Land Development

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Key words: Allocation studies, land development, reconstruction and water management.

SUMMARY

In the European rural area, people have been faced with several disasters in the past years. Next to the yearly high river floods, there was pig pestilence in 1997, in 2001 there was foot and mouth-disease and till now there's fear for outbreak of BSE. In the Netherlands, farms will be deconcentrated by land consolidation to avoid new outbreaks of diseases. Between farms, corridors of nature have to be developed. Innovative land consolidation can also be a solution to avoid floods. For both, a strategy is to move farms to other areas. These plans have led to several new allocations in the Dutch rural area. Allocation studies made by a cadastre supported with innovative applications, are useful to get insight in the number of acres which has to be bought to get the objectives. It gives useful information to the politics, land development commissions and the Waterboard to choose the most optimal allocation. The author has developed a structural model for the Dutch cadastre to perform an optimal allocation plan.

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1. INTRODUCTION

In the European rural area, people have been faced with several disasters in the last years of the twentieth century. Next to the yearly high river floods, there was pig pestilence in 1997, in 2001 there was foot and mouth disease and till now there's fear for outbreak of BSE.

In the Netherlands, farms have to be deconcentrated to avoid new outbreaks of diseases. The new law "Reconstruction of the Rural Area" is a new instrument in this process. The main instrument to implement this law is active land consolidation. Farms will be concentrated and corridors of nature are developed.

Another important issue is the fight against floods. A new kind of strategy is "Capacity for the River", which has inspired the politics in Dutch water management. Of course, it's possible to raise the dikes; it's also possible to create some "areas of retention" for keeping water during high river periods. To make this reconstruction and innovative water management a success, farms have to be moved out to other areas. Innovative land consolidation can also be a solution to create these areas. The plans of reconstruction and those to avoid new floods have led to several new allocations in the Dutch rural area.



To implement these plans, two aspects are very important. First, it's important to get the main goals. First, no more wide spread animal diseases. Second, the protection of lives from those who are living beside the rivers. But the implementation has to be hurried up. During every year people, animals, land and objects can be destroyed again. If the politics have chosen definitely for the instrument of land development within a specified area, decisions have to be taken fastly. Here for, an allocation study can be a well instrument. These studies can give insight in the results of optional movements of land. In these studies, the pros and the cons of doing land consolidation in a specified rural area will be presented.

A cadastre is a well candidate to perform these allocation studies. A cadastre has the experience in making allocation plans and has stored all the needed data, like the rights of ownership of parcels. Second, a cadastre has often the expertise of using GIS-applications. These allocation studies are useful to get insight of the number of acres, which has to be bought to get the different objectives. This study gives useful information, for example to the

local and national politics and the Waterboard to choose the most optimal allocation. The author has developed a practical step model to make these allocation studies. Depending of the phase of development in an area and the objectives, well allocation studies can be made with this model.

In this paper, the contents of the step model of performing an allocation study will be described. In chapter two, the three elements of an allocation study have been enumerated. In the next chapter, an overview has been made of the upcoming reconstruction of land and the new art of water management. In chapter 4, the possible duty of a cadastre in the process of reconstruction and in the actual water management will be presented. There will be zoomed in how cadastres can support in this process of performing allocation studies, while making use of the author's step model.

2. AN ALLOCATION STUDY AS VALUABLE INSTRUMENT

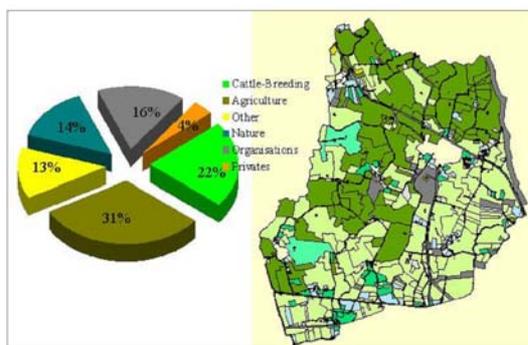
During the phase of planning, but also during a land development program, an allocation study can be performed by a cadastre. This study is showing possible bottlenecks that occur with the planned development measures in the consolidation situation. It also gives possible solutions for the decisions, which will be taken to solve the bottlenecks. An allocation study consists of three optional parts; the land use registration, the calculation of allocation models and making a parcel design. Which parts will be taken in the allocationstudy, depends on the phase of the specified land development project in the consolidation process.

2.1 Three Optional Parts in the Allocation Study

2.1.1 Land use registration

First optional part of the allocation study is to perform a land use registration. Concrete results of this kind of registrations are different statistical numbers. The objectives of these land use registrations are:

- Clearness of the actual situation of the project area; for the description of the actual situation several kinds of statistical numbers are used; the average number of parcels per landowner, the use of land as a percentage of the total surface, the average surface of house parcels;
- Composing the input for the next part of an allocation study; the calculation of different allocation models.



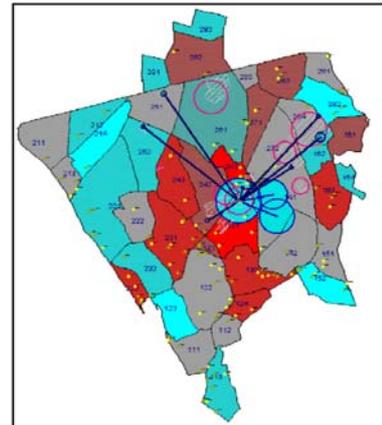
A first step of the land use registration is collecting the information, which is needed to calculate the statistical numbers. The ownership data can be taken from the Land Registry's own registers. Information of the use can be asked to the local people or the Land Development Commission. Data of the local policy concerning the area (plans and restrictions) are also collected.

Second step is the analysis of the information. One of the products to make clearness in the actual situation of the project area is a map of usage of parcels. But also other visualization techniques are used to give an impression, like diagrams and graphics. The Land Development Commission and the Land Registry have also to decide which parcels are taken in land development and which are not. To compose the input for the next part of an allocation study, the calculation of different allocation models, several data of the land use registration can be used. Examples are the user information with all their parcels, the topography and the constraints.

2.1.2 Calculation of allocation models

Instructors can have different kind of specified questions. Before making the final allocation, how much land has to be bought? And where? And if there is already a land development plan with guidelines, which one have the most success to be fulfilled? The calculation of allocation models will led to an allocation on the level of sub areas.

First, you need the information from the land use registration. Second, you can decide to make an inquiry of the wishes of the land-users. This makes the allocation study more realistic. The design of a high quality allocation needs unbiased decisions.



The Dutch cadastre uses the allocation software Transfer for this purpose. The input of Transfer consists of all users with all their parcels, infrastructure and the constraints for reallocation of parcels. The algorithm of Transfer is one which wants to make the distances between the house parcels and the others as short as possible. The algorithm is also trying to concentrate these parcels.

The software calculates on sub area level. With this software, it is possible to calculate different models, for example the 100-, 60/40- and 70/30-percent versions. A model of 100 percent means Transfer calculates a model with the purpose to allocate 100% land around the farmhouse. A model of 60/40 percent means transfer calculates a model with purpose to allocate 60% of land around the farmhouse and 40% somewhere else in the area. Transfer will as a result of calculation give an impression of the over- (in red) and under demand (in blue) of land in the sub areas. Also gives it an impression which farms can get land in which sub areas. A user can get the equilibrium manually, which will be visualized in gray.

2.1.3 Parcel design

In a later stadium of the land development project it is possible that some new bottlenecks appear. Otherwise, it is possible that after doing a calculation of different allocation models, some bottlenecks need more research. In this case it is possible to make a parcel design. For the parcel design it is possible to zoom in on a specified bottleneck in a specified sub area.



For these areas a sketch plan will be designed with the already known information from the land use. The new parcels are sketched in on topographical maps. These maps also show all the elements of the delimitation plan (roads, watercourses, countryside and leisure elements) that will remain outside the allocation. The results of the research can be a basis for all the following activities. To make these valuable allocation studies, different innovative instruments are used like MapInfo or Arcview.

2.2 A Structured Step Model of Making an Allocationstudy

2.2.1 The step model

The allocationstudy consists in three optional parts; land use registration, calculation of allocation models and parcel design. The choice to integrate one of these parts in an allocation study depends on the phase of the specified land development project within the whole process of land development.

The allocationstudy is a process with an input of data, a transformation and an output. The author has constructed a practical step model to streamline the whole process of making the allocation study. This step model can be practically used by an operator. Within this model, three types of making an allocationstudy will be distinguished.

First, type AS1, which is the allocation study for areas where some changes in the landscape has been expected, due to problems like animal diseases or floods. For these areas, there is no concrete experience with methods to fulfill the objectives and goals like these. There are only some political and practical wishes about some developments, which have to be fulfilled within the specified area. In this phase there's no clarity about the best instrument to fulfill these political wishes. Expropriation or voluntary moving between some land users are potential instruments. The instructor of the allocation plan is often the national or regional politics. As a result of the allocation study, these politicians want to have a global overview about the expected goals and objectives if the instrument land development will be used in a specified area. As a main part of this allocation study, the operator has to give an objective advise about the sense of using the instrument of land development above other potentials.

The second variant (AS2) is the allocationstudy, which is in the phase of planning or which has just left this phase behind. In this phase, there are plans on macro level available. Further, there has been formed a land development commission already with local farmers and politicians. They have the duty to implement the land development plan. A cadastre can support these commissions by making the allocation plan. An allocation study of this type can make an overview of the pros and the cons of different chosen allocation plans. These plans are made for the whole area or a specified part of it. The output of this type is meant for local or regional politicians or specialists.

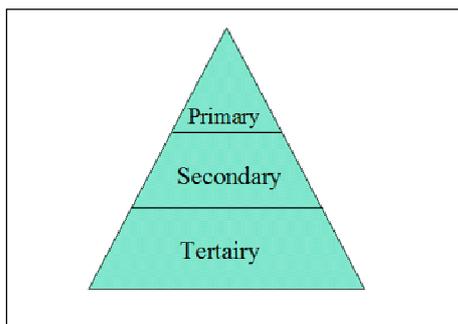
The last variant is the making of allocation plans for areas, which are already under construction. In this phase, the land development commission has already chosen a specified alternative. During the process some questions appear which has to be answered. Then, an allocation plan can give some support. The output is often an allocation plan, which has been made for a sub area on high detail level, especially meant for specialists.

As been described, there are three types of allocation studies. In paragraph 2.1, the three optional parts of an allocation study has been described. Which part has to be taken in which type will be described in the paragraph 2.2.2.

2.2.2 Model in practice

As been seen in paragraph 2.2.1, there are three types of allocation studies; AS1, AS2 and AS3. These studies have some activities in common. These are:

- Define the main objectives and goals of the measures which has to be taken in the specified rural area;
- Define the wishes of the people in the area itself and the instructors as well
- Define the objectives of the allocation study



These activities are step one in the model. In the second step there has been made a distinction between these three types. For Allocation study 1 (AS1), a primary data set is needed. This set consists of the area objectives, cartographical data, cadastral owner data and topographical data. With this primary set a global land use registration can be made. The output consists of a global usage map and some global statistical numbers, like the number parcels in a square kilometer.

If possible, for some sub areas a calculation of allocation models can be made. Of course, this is only meant for those AS1-areas, which are behind or in the planning phase.

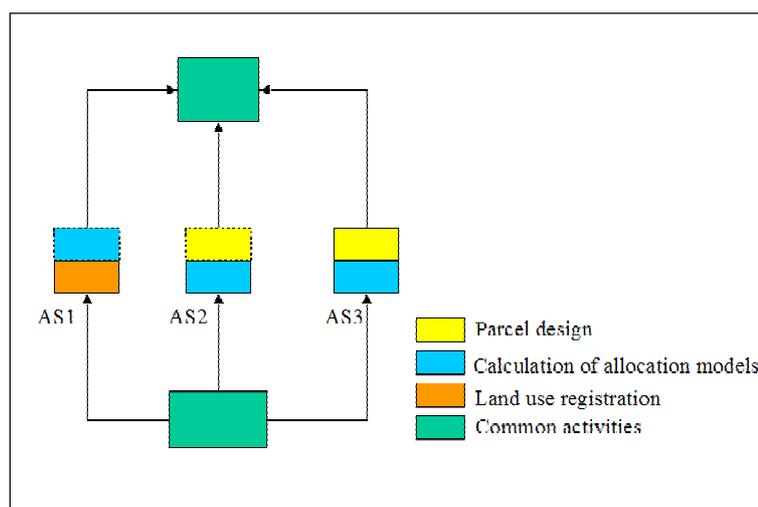
For AS2, the primary data set has to be filled up with a secondary data set. The main data of this secondary set is data about the users of land. In most countries, land registries don't have the availability of the ownership of usage data. That's why it has to be generated in an active way, like interpretation from photographs taken by airplanes or satellites. It can also be extracted to ask this information to the landowners themselves. Though this last method is expensive, it gives very useful information. The reader should notice that this information in the most case can be recycled, while the definitive allocation plan has been made. For this type, high detail land use registrations and calculations of different allocation models have to be made. The output consist of different maps and statistical information with a relative more highly level of detail than AS1.

AS3 is the type of allocation study, which has an output with the most highly level of detail.

Next to the primary and secondary data, it can be worth to fill up these sets by a tertiary set. This set consists of data like demographical, geological and geomorphological

data. For AS3, a land use registration shall not be necessary. More useful information in this phase has been given by the calculation of different allocation models. For some models a parcel design have sketched. The output consists of different allocation

maps and different statistical data like the average number of parcels per landowner, the use of land as a percentage of the total surface, the average surface of house parcels.



Important for all the three types is a high quality analyze of the output by high-classified cadastral experts, which have an expertise in land development. Their conclusions have to be taken in a rapport and presented to the decision makers to choose the most optimal alternative.

3. ACTUAL DEVELOPMENTS IN DUTCH LAND MANAGEMENT

3.1 The reconstruction

3.1.1 History

In the last years the European rural area has been confronted with several outbreaks of animal diseases. First, there was pig pestilence in 1997. Later in 2001 there was an outbreak of foot and mouth-disease and till now there's fear for outbreak of BSE. But these diseases are not the only problem in the rural area. Also the legislation of manure, environment, house-building, industry, water, nature, recreation and other functions have an important influence on the rural country.



The new national strategy to solve the problems is called "reconstruction". The objectives of this reconstruction are to make the rural area safer for animals and people and give the recreation, landscape and infrastructure a new impulse of quality of living.

The intention of the reconstruction is to concentrate elements like agriculture, nature and house-building. First step of the reconstruction is to get the attention for a

specific area of the Minister of Agriculture. The Minister decides to establish an area as potential reconstruction area. Then, three special zones has to be created within this area:

- Zones of extensivation. Here, capacity for nature, habitat en extensive farming will be permitted;
- Mixed zones. Capacity for nature, habitat, landscape building, recreation AND agriculture;
- Agricultural zones. In these zones only agriculture will be permitted.

Between the different zones small areas of nature has to be created.

3.1.2 Reconstruction and land development in practice

To reach the objectives of reconstruction, the Dutch Government accepted the "Reconstruction of the Rural Area" in April 1st, 2002. With this law the reconstruction has become a real instrument. On this moment, in the Netherlands twelve areas are marked as "potential area of reconstruction".

In the first part of the contents of the law of Reconstruction it is obliged to make a Reconstruction plan for every marked area. This reconstruction plan will be made for twelve years and has made by a reconstruction commission. This commission consists of members of local departments, the local Water board, agriculture and nature. An engineer of the Dutch cadastre will support these commissions.

In this reconstruction plan, descriptions are made of the outside borders of the specified area and of the actual situation with the problems in the area. Of course, an overview about the reached objectives will be outlined. In the reconstruction plan, a rough grouping has been made of the area in featuring sectors of extensive, agriculture or mixed ones. Very important is also an estimation of the possible costs.

After making the reconstruction plan, the plan has to be accepted by the Minister. Then, the reconstruction can start. An allocation has to be made, alternatives have been chosen. Land and their owners have to be moved. Of course the law gives particulars the possibility to make objections against some movements. Opposed to the "old" Land development Law some old elements are integrated or deleted. This makes the new law more quick-witted.

On the actual moment there are in the Netherlands twelve reconstruction commissions installed. Three of them have already presented their reconstruction plan. To make these plans is not easy. Reconstruction is a new way of land development and there's no experience with this reconstruction and making these plans. On the other hand, there is not much time available to implement the made measures to avoid animal diseases like those in 2001. This is a very important reason why an instrument like an allocation study can give support by making optimal choices during the phase of planning or later during the allocation process as well.

3.2 Water Management

3.2.1 History

In 1993, 1995 and 1997 many high river floods captured the Netherlands. These floods led to a lot of casualties and enormous damage. In 1985, the Netherlands completed the famous Delta Works, which it's built as a protection against the sea. But the danger of high river floods has become a new dangerous phenomenon for the Dutch people.

The Dutch politics react to these floods with a new strategy, which is called "Capacity for Water". The intention of this is "the acceptance of water in the neighborhood". Of course, the dikes have to be raised up. But on long term, rising will make these dikes weaker. So, raising the dikes is only a short-time solution. That's why it is necessary to create also more long term solutions.



The strategy "Capacity for Water" has four main objectives:

- The implemented measures have to anticipate to the problems and are not only a reaction;
- It is a three-part strategy; keeping, hiding and carrying off the water;
- The implemented measures are a mix of technical solutions;
- And they have to anticipate to the regional and the main system as well.

In the Netherlands there is already started with the implementation of this strategy. The whole process is divided in three parts. First plan is for the 2000–2005 period, second for 2005-2015 and the last one for after 2015.

3.2.2 Water management and land development in practice

The "Capacity for water" strategy is divided in three parts. First step is to make a short-term solution to raise the dikes. Objective is to carrying off 15.000-m³ of water in a second to the sea. Important is to integrate the development of nature in this process. On this moment, many dikes in the Netherlands are already raised or there will be worked on it.

For the next part in this process, there will be started with the strategy for the period of 2005-2015. For this period, the objective is to make the discharge to 16.000-m³ of water in a second to the sea. This will not be reached with raising dikes only, but in combination with other kind of measures. One measure is to make the forelands prepared for more capacity of water. The risk with creating these areas of retention is the acquaintance of farmhouses and villages. These buildings and land have to be protected against high river floods or have moved out to other more safe areas.



In the last period of the strategy, measures will be taken for after 2015. There will be anticipated at the risks of the futuring rising of the river- and sea level. Here for, some existing dikes shall be moved to another place to make more retention areas and emergency areas. Also new small rivers can be digged, to disembogue the main rivers like the Rhine and the Maas. Important again is to integrate objectives of nature, landscape building and recreation in this new “green” rivers.

To implement all these measures, land has to be bought, transformed and moved out to other locations. Possibilities are expropriation, the acquisition of land by the government, voluntary exchange and of course land development. For some high-risk areas, expropriation is the most suitable strategy. For other areas the voluntary participation of landowners has the preference. There are also areas, which the most suitable solution is unknown. In these areas an allocation study can help to give insight to participators in the results of a chosen alternative. This will led to faster decisions, which is important even like the in chapter 3.1 described reconstructions. A well known decision can help to safe people’s life’s in the nearly future. An allocation study can be a support in this process.

4. THE MODEL OF AN ALLOCATIONSTUDY USED IN MODERN LAND DEVELOPMENT

4.1 Land Registries and Modern Land Development

4.1.1 The role of the land registry

As been described, for the reconstruction and the new water management a new kind of plans has to be made with new kind of features in it. The features of these plans are:

- Drastic change of functions within the specified rural area;
- A mix of different functions are very important; for example the combination of recreation, nature, active landscape building, safety, infrastructure and agriculture in one area;
- Politics prefer structural land development by law. This because the common importance will be protected and the rights of the individual landowners as well.

Expropriation is a drastic instrument to move land to another place to fulfill the objectives of reconstruction and retentions. Land development is more cooperative. The pros of land development by law are:

- Relative less costs compared to the instrument expropriation
- More bearing surface
- It's possible to allocate a relative large surface

During the process, a land registry can support the process of land development with a high quality. Most cadastres in the Europe have a lot of expertise and experience with supporting in land development. Further, a land registry has the availability of the whole primary data set (paragraph 2.2). And a land registry takes care of the legal security on a direct or indirect way. A land registry can support in innovative projects with supporting during the whole phase of planning, making the allocation plan, managing the implementation process of the different plans and the allocation studies.

4.2 The Cadastral Allocation Study in Land Development

A cadastre can give some support during the phase of planning by making allocation studies for the different land development commissions and politicians. At this moment, this expertise is not well known by most of the politics and the land development commissions. A well marketing strategy is then very important for land registries, which want to tender these kinds of services. Next to the employee's expertises and experiences, most of the modern European land registries have GIS-programs (ArcMap, MapInfo) in possession. These applications can be used during the manufacturing of these allocation studies. Some Land Registries (for example the Finnish and the Dutch Cadastre) has the availability of special GIS-land development applications. With these GIS-applications, different calculations of allocation models can be generated automatically.

The model, as been showed in chapter 2.2, can guide the operator through the manufacturing of the allocation plan. With this plan, all necessary questions will be asked and all necessary elements will be taken in the process of making the allocationstudy. Depending on the art of the specified area, the goals and the objectives and the phase of the area in a land development process, one of the types AS1, AS2 or AS3 will performed. More detail information about this model can be found in "Allocation study in the pre-phase of land development", 1999.

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BIOGRAPHICAL NOTES

Martijn J. Rijsdijk (27) studied Geodesy at the Delft University of Technology. After his final practice "Allocation study in the pre-phase of land development" in 1999 he came to work at the Dutch Cadastre (Kadaster), division Land Management. He is working now as advisor of the Kadaster's Executive Board.

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