



Land consolidation and land banking in Denmark - tradition, multi-purpose and perspectives

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ABSTRACT

The Danish land consolidation tradition has its roots in the land reform launched in the 1780s. The first “modern” land consolidation law was adopted in 1924. The land consolidation procedure is today basically the same as the system which was introduced in 1955. Until 1990, land consolidation was used as an instrument for agricultural development (i.e. mainly through reduction of land fragmentation and increase in agricultural holding sizes). In 1990, the objective of implementing land consolidation was broadened. It was explicitly included in the preamble of the land consolidation law that the objective is both to contribute to agricultural development and to the implementation of nature and environmental projects as well as to provide land as compensation for agricultural holdings affected by such projects. Since 1990, the land consolidation and land banking instruments have proven to be absolutely essential in the process of reaching voluntary agreements with the landowners affected by nature projects. Public funding of the traditional land consolidation projects with agricultural development as main objective was discontinued in 2006. At the same time, the land consolidation projects implemented in recent years (after a public initiative often in connection with the implementation of a nature project) may only include land transactions which contribute to the implementation of the public initiated project. Thus, the multi-purpose potential which could be expected after the amendment of the land consolidation law in 1990 has so far not been realized. The volume of the Danish land consolidation program has in the last years been reduced more than half compared to the previous decades.

Keywords:

Land consolidation, land banking, nature and environmental protection and restoration, Denmark

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1. Introduction

Land consolidation was in Denmark, like in many other Western European countries, used as one of the important instruments for agricultural development and hence supported shifting governments active land policy during the decades after WWII. Land consolidation projects were often initiated by local farmers in the villages and used to increase productivity and competitiveness of the participating agricultural holdings through reduction of fragmentation of land ownership and facilitation of the structural development by letting the active production holdings purchase additional

land. At the same time, land consolidation was used in connection with large state supported land reclamation and drainage projects, also with the objective of agricultural development. The implementation of land consolidation projects with the main objective to facilitate agricultural development ceased in 2006 after the finalization of the Rural Development Programme for 2000-2006 due to change in political priorities.

From the late 1980s, land consolidation has been applied as an important tool in the implementation of public initiated projects such as nature restoration and afforestation. Landowners

and farmers with agricultural land in designated project areas are offered other agricultural land in compensation instead of money and can continue their farm production or even increase it. It is expected that land consolidation in the coming years will be applied with an increased volume and will be funded under the Rural Development Programme for 2014-2020 (Ministry of Food, Agriculture and Fisheries 2013).

The *land consolidation law* was amended in 1990 where the objective of implementing land consolidation was broadened. Hence, it was explicitly included in the preamble of the law that the objective of the law is both i) to ensure a better commercial use of agricultural holdings through reduction of fragmentation and improved structure and ii) to contribute to the implementation of nature and environmental projects and rural development as well as to provide land as compensation for agricultural holdings affected of such projects (Klæsøe 1997, 804-805; Hartvigsen and Østergaard 1993). Before 1990, only the first part (agricultural development) was directly mentioned as the objective of the law.

Land consolidation in Denmark is with its voluntary approach and relative short duration of projects different from the land consolidation procedures and approaches in most other European countries. Very few papers on land consolidation in Denmark exist in English language and no recent ones. Therefore, it is the aim of this paper to make available comprehensive and updated information on the Danish land consolidation tradition and its development during recent decades.

Land consolidation is by nature a multi-purpose instrument. This means that it is possible to pursue different objectives in the same project, e.g. take land out of intensive agricultural production as part of nature restoration and at the same time improve productivity of the active production farms through reduction of fragmentation and enlargement of the agricultural holdings. The 1990 law amendment introduced the multi-purpose of the instrument into the law.

The land consolidation process and procedure in Denmark is today basically the same as it has been since amendment of the *land consolidation law*

in 1955. The same land consolidation procedures were used in the decades after WWII for land reclamations and are now-a-days being used to recreate the nature that was then lost. In addition to explaining the Danish land consolidation tradition, the paper will analyze to what extent the instrument in its practical application has achieved the objective to pursue different purposes in the same project. Based on this analysis, the paper will give perspectives and recommendations for the future.

2. Methodology

This paper is based on desk studies of available documents, journal papers, annual reports and the few existing books about the Danish land consolidation tradition from its offspring more than 230 years ago to the current situation. The paper draws, however, also extensively on more than 20 years practical working experience of the author as project manager of a large number of Danish land consolidation projects, first during 15 years of employment by the Land Consolidation Unit of the Ministry of Food, Agriculture and Fisheries and subsequently during 8 years in private consultancy.

3. The Danish land consolidation tradition

The Danish land consolidation tradition has its roots in the land reform which was launched in the 1780s, the so-called enclosure movement. During the land reform, the common use of the land was abolished and village by village land for individual use by each agricultural holding was distributed. The ideal was to amalgamate the land of one holding in one location as close to the homestead as possible. A typical situation before and after the land reform is displayed in figure 1. The purpose of the land reform was to achieve a more effective land use and to increase productivity. The land reform process took 30-40 years and in 1837, only one percent of the agricultural land had not been reformed (Boe, 1965, 361). Similar land reforms were conducted in other European countries.

The first “modern” *land consolidation law* was adopted in Denmark in 1924 and was only applied in the Southern part of Jutland where Denmark after WWI had got back territory lost to Germany



Figure 1: Oster Stilling village near Slagelse before (left) and after land reform (right). Agricultural land belonging in ownership to one agricultural holding enhanced. More than 40 parcels consolidated into one parcel. Source: Østergaard 1967, 2.

in the 1864-war. The background was that in the Duchy Schleswig land reforms were started earlier than in the rest of the country and resulted in a much poorer outcome (Østergaard 1967, 2). In addition, a substantial part of the agricultural land had become public owned due to the active purchase by the German state between 1864 and 1920 (Klæsøe, 1997, 803). The land consolidation instrument was together with the land banking system, introduced in 1919, part of an active land policy with the overall objective to develop commercial family farms. From 1941 onwards the land consolidation law was applied in the whole country. The law has been amended several times and already in 1949, the commission and judgment system, which is still in force, was introduced.

3.1 Agricultural development through land consolidation

After WWII, land consolidation was in Denmark used as an instrument for agricultural development as it was the case in most other countries in Western Europe (Jacoby 1959). The objectives of most of the projects were to reduce fragmentation of land ownership and facilitate increase of agricultural holdings. The *law on land reclamation* was adopted in 1940 providing extensive state funding for land reclamation projects. Already from the

1940s, land consolidation was used in connection with large land reclamation projects where shallow lakes and meadows were drained and turned into arable land or intensive grassland. This continued with heavy state subsidies until the end of the 1960s (see Box 1). Land consolidation was part of an active land policy in the decades after WWII and also, together with land banking (section 4.2), applied in connection with the establishment of state supported family farms, often with a size of 7–15 ha depending on soil quality (Priemé 1997; Haldrup 2004). The state acquired land from manors and larger estates and distributed the land in the process that established the new family farms. In the southern part of Jutland, land confiscated from the German state after the reunification in 1920 and again after WWII was included in the process as well.

From 1950 and onwards an enormous structural development has taken place in Danish agriculture despite the active land policy and establishment of new family farms which continued until the 1960s. In 1950, there were around 200,000 farms with an average size of around 15 ha. In 1990, this was reduced to around 90,000 farms with an average of 35 ha. In 2011, the number of farms had further dropped to around 40,000 with an average of 63 ha (Ministry of Food, Agriculture and Fisheries 2013,

16). Most of this structural development took place through individual transactions in the rural land market. Purchase of additional agricultural land in the local land market often leads to increased land fragmentation as the land purchased is often not adjacent to the land already belonging to the agricultural holding. The land consolidation instrument was in the decades after WWII used to reduce land fragmentation and to facilitate the structural development.

Already in 1950, a land consolidation unit was established under the Ministry of Agriculture. The ministry has since then been responsible for the management of the national land consolidation program. Also in 1950, 11 *land consolidation commissions* were established in line with the provisions of the 1949-law, each commission covering a certain geographical area (Sunesen 1987, 510). It was and still is the task of the commissions to approve the projects. The number of commissions and also the composition of the commissions have changed over the years. The commission has, however, always been chaired by a district judge. The commission was also given the authority to take decision on land ownership in

cases where the land register was not updated or mistakes had occurred.

Participation in land consolidation projects in Denmark has always been voluntary for the involved landowners. The *law on land consolidation* had, however, until the amendment of the law in 2005 provisions that could be used for compulsory exchange of agricultural land. The provisions were, however, not operational and only used very few times during the decades.

An obvious consequence of the voluntary approach has always been that not all landowners with agricultural land in the project area are participating in the project but only the land parcels where a specific agreement can be made between the owners. This is completely different from e.g. the classical German and Dutch compulsory approach where all land in the project area normally is included in the project when the majority of the landowners agree with the implementation of the project. In comparison, the classical land consolidation in Denmark can be described as a chain of land transactions implemented after a re-allotment planning that is seeking to involve as many landowners as possible.

	1950 - 1959	1960 - 1969	1970 - 1979	1950 - 1979
Number of land consolidation projects initiated	515	350	212	1,077
Number of land consolidation projects approved by land consolidation commission	239	303	380	922
Area in approved land consolidation projects (ha)	17,666 ha	29,195 ha	24,540 ha	71,401 ha
Area in average in approved project	74 ha	96 ha	65 ha	77 ha

Table 1: Land consolidation activity 1950 – 1979. Source: After Sunesen 1987.

	1980 - 1989	1950 - 1989
Number of land consolidation projects approved by land consolidation commission	212	1,234
Area in approved land consolidation projects (ha)	46,948 ha	118,349 ha
Number of agricultural holdings participating in land consolidation	10,078	-
Area in average project	221 ha	-
Average number of participating agricultural holdings	48	-

Table 2: Land consolidation activity 1950 – 1989. Source: Authors calculations based on Landbrugsministeriet (Ministry of Agriculture) 1982, annual reports from Jordbrugsdirektoratet 1980-89 and Sunesen 1987.

An expert (land consolidation planner), often a land surveyor, is facilitating the negotiation process between the involved landowners and farmers. The land consolidation planner can come from both the Land Consolidation Unit of the ministry, today the Ministry of Food, Agriculture and Fisheries, or from private surveying and consulting companies. In Denmark, private surveying companies have a monopoly of cadastral surveying and they are always dealing with the surveying and preparation of the registration of the new ownership, also in land consolidation projects.

In total during 1950 – 1979, 1,077 land consolidation projects were initiated, 922 projects were approved by the land consolidation commissions and 71,401 ha changed owner as part of a land consolidation project in the period. The land consolidation activity during the three decades is displayed in table 1. During the 1950s, many of the projects initiated towards the end of the decade were approved in the early 1960s. This explains the big difference between initiated and

approved projects in the 1950s. During the 1970s, the available funding was reduced which resulted in initiation of fewer new projects compared to the earlier decades. Many of the projects approved in the 1970 were initiated towards the end of the 1960s before the budget reduction. This explains why more projects were approved than projects initiated in the 1970s. In all three decades a few of the projects initiated were given up and hence never approved. No available data exists on this but it is estimated that 5-10 % of the initiated projects were for various reasons never finalized.

During the 1980s, the land consolidation activity increased again (table 2). The number of approved projects remained the same as in the 1970s (212 in each decade) but the average size of projects increased. In the 1980s, the average area participating in one project was 221 ha where it was only 77 ha in average for the period 1950 – 1979.

Land consolidation projects with the traditional objective of agricultural development continued

	1990 - 1999	2000 - 2009	2010 - 2013	1950 - 2013
Total number of land consolidation projects approved by land consolidation commission	208	189	38	1,669
Total area in approved land consolidation projects (ha)	39,182 ha	35,121 ha	4,592 ha	197,244 ha
Total number of agricultural holdings participating in land consolidation	6,654	5,724	4,592	197,244
Area in average project	188 ha	186 ha	121 ha	118 ha
Average number of participating agricultural holdings	32	30	20	-
Number of approved land consolidation projects with agricultural development objective	185	122	0	-
Total area in approved land consolidation projects with agricultural development objective	33,635 ha	22,309 ha	0 ha	-
Total number of agricultural holdings participating in land consolidation with agricultural development	5,855	3,711	0	-
Number of approved land consolidation projects with public objective (nature restoration, afforestation, infrastructure etc.)	23	67	38	-
Total area in approved land consolidation projects with public objective	5,547 ha	12,812 ha	4,592 ha	-
Total number of agricultural holdings participating in land consolidation with public objective	799	2013	773	-

Table 3: Land consolidation activity 1990 – 2013. Source: Authors calculations based on unpublished data from Ministry of Food, Agriculture and Fisheries 2014.

until 2006, from 1990 in parallel with public initiated land consolidation projects implemented in connection with e.g. nature restoration and afforestation projects (explained in section 4).

During the 1990s, 185 traditional projects were approved involving 5,855 agricultural holdings and the change of ownership of 33,635 ha (table 3). In the 1990s, 185 of in total 208 approved projects, as many as 89 % of all land consolidation projects, had the traditional objective of agricultural development while 11 % of the projects were implemented in connection with public initiated projects to improve or restore nature and environmental conditions. During 2000-09, in total 122 traditional projects were approved involving 3,711 agricultural holdings and the change of ownership of 22,309 ha before the last of the traditional projects were finalized in 2009. In the 2000s, 122 of in total 189 approved projects (65% of all projects) had the traditional objective of agricultural development.

In 2003, land consolidation was included as a measure under the Rural Development Programme 2000-2006. The reason was to benefit from the EU co-funding (FAO, 2008, 14-21). During 2004-2009, in total 36 approved land consolidation projects were supported with 1,408 participating agricultural holdings and 7,370 ha changing owner (Orbicon and Capacent-Epinion, 2008). In these projects, it was a conditions for support under the RDP that the projects had elements of improving the conditions for nature and environment, e.g. through consolidation of parcels in meadows with the purpose to make grazing more profitable and ensure that the meadows were not abandoned and subsequently overgrown by bushes.

The traditional land consolidation projects during 1950 – 2006 with the objectives to reduce land fragmentation and increase the sizes of the participating agricultural holdings were not geographically equally distributed over the country. Most of the projects were implemented in south Jutland, in north Jutland and to a lesser extent also in west Jutland. The need for land consolidation was higher in these regions, i.e. higher level of land fragmentation, and also knowledge of the benefits of the instrument was higher among

landowners and farmers from successful projects in neighboring communities. The “land consolidation regions” also had private surveying companies specialized in land consolidation. This was not the case in east Denmark where only very few projects were carried out (Sørensen, 1987a, 43-44). In this part of the country, the issue of land fragmentation has traditionally been of less importance because of better implemented land reforms in the decades after 1780 but also because the structural development since 1950 has been less significant in these regions compared to west Denmark where it has been driven by a high concentration of dairy and pig farms with need for additional land when increasing the meat and dairy production.

From the 1960s, land consolidation was increasingly applied in connection with construction of new motorways and highways (Østergaard 1987). Infrastructure land consolidation has been applied in two different approaches. One, following the procedures of the *land consolidation law* (see section 3.2) where the public agency responsible for the road construction project participates in the land consolidation project like the private landowners and purchases the “road parcel” as an outcome of the re-allotment planning. The private landowners have the opportunity to be compensated in land instead of in money and are hence allowed to continue their farming activities. Landowners who refuse to participate in the voluntary land consolidation process can be expropriated by the road authority according to the *law on public roads* (roads administrated by municipalities) or the *law on state expropriation* (roads administrated by the Ministry of Transport). In the second approach, normally used in connection with new state roads, a re-allotment plan is negotiated with the involved landowners. The outcome of the process is a draft re-allotment plan which is then integrated with the expropriation process in the *law on state expropriation*. After negotiations with the landowner’s, the State Expropriation Commission takes decision on the full or partial implementation of the land consolidation proposal. These projects are not included in the figures in tables 1-3.

As a result of the land consolidation instrument being applied in connection with construction of new

BOX 1: Skjern River Land Reclamation 1962 – 1969

The Skjern River Land Reclamation project was the last of the big land reclamation projects. The traditional agriculture in the river valley was to provide feed for livestock all year round, fresh grass in the summer and hay for the winter. Floods were always a danger after heavy rainfall and sometimes the year's supply of winter feed was lost. The local communities tried for centuries to regulate the river through the construction of drainage channels, dikes and attempts to straighten and clean the water courses in a number of small projects (Ministry of Environment 2005).

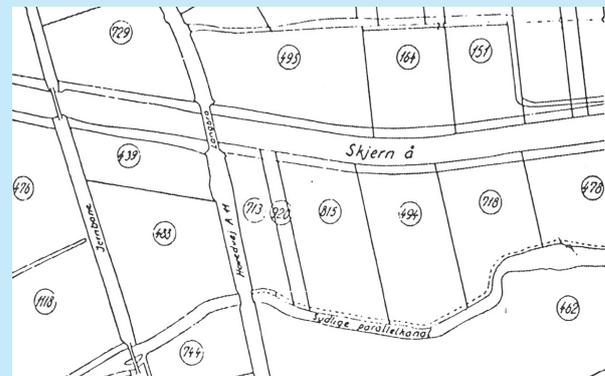
After WWII, increased mechanization and new production patterns reduced the traditional need for production of feed to livestock in the river valley and grain production had become more profitable than cattle farming. In 1961, the Ministry of Agriculture approved a large land reclamation project which was to turn 4,000 ha of meadows and wetlands into arable land through construction of a new straight

river, channels, dikes and pumping stations. The project included the lower section of the river from Borris to the Ringkøbing Fjord, almost 20 km of the river (Ministry of Environment 2005). A large minority of the landowners were against the land reclamation project.

Voluntary land consolidation was implemented in connection with the project in four sub-areas. The land consolidation was implemented on 1 October 1969 where the landowners took possession of their new land. In total 980 landowners participated in the process and 4,440 ha changed owner. In the project area, there were 840 landowners before the project. After the project this was reduced to 525 as more than 300 landowners used the land consolidation as an opportunity to sell their land in the project area, often small parcels. The number of parcels in the project area was in total reduced by a factor 4 (Hartmann 1981).



Part of cadaster map before land reclamation
Source: Hartmann 1981, 95.



Part of cadaster map after land reclamation
(same area)

motorways and highways, in both approaches, the public agency responsible for the road construction project (Ministry of Transport or municipality) will often save money for compensations of the landowners compared to traditional expropriations as many of the disadvantages imposed on the agricultural holdings by the road project disappear through the land consolidation exercise.

3.2 The land consolidation process

The formal beginning of a land consolidation project is the organization of a public meeting in the project area, the so-called “initial public meeting”. The meeting is organized by the Land Consolidation Unit of the Ministry of Food, Agriculture and Fisheries, often in cooperation with the initiators of the projects. Earlier this was

often the local farmers and their associations. Now-a-days this is often the local municipality or the Nature Agency under the Ministry of Environment. The landowners are invited to the meeting by letter or announcement in local newspapers. During the meeting the participants are informed about the land consolidation process and all procedures from beginning of the re-allotment planning till the final registration of the new land ownership. The “date of implementation” where land ownership will change is also agreed upon at the meeting. This is the same date for all land transactions included in the re-allotment plan. Before the meeting, the assigned land consolidation planner, either a public employed land professional from the ministry or from a private company, has prepared an ownership map of all agricultural land in the project area (called Plan 0). Furthermore, the participants in the meeting elect a *local committee of stakeholders* to represent the general interests of participating landowners and farmers (Elmstrøm and Nielsen 1987). The Danish land consolidation process is illustrated in figure 2.

In the first stage of the project, the land consolidation planner¹ meets individually with all the registered landowners in the project area. The purpose of this so-called “round of wishes” is to discuss the project with each stakeholder individually, inform them in details about the process and most important to discuss with them about their interest in and wishes for the project, i.e. if they want to participate, which parcels they want to sell, exchange or purchase from others. At this initial stage of the re-allotment planning, it is important to group the interested stakeholders in categories such as i) potential sellers, ii) those who want to exchange to land of similar value and iii) those who want to purchase additional land. Based on these initial negotiations with the landowners, the planner can assess the volume of the project (e.g. number of participants and area to change owner in the project), as well as the land mobility in the area and the balance between potential sellers and buyers (Hartvigsen 2014).

The next step is the valuation and to establish the market price in the area. Different methods have been used over the years to establish the

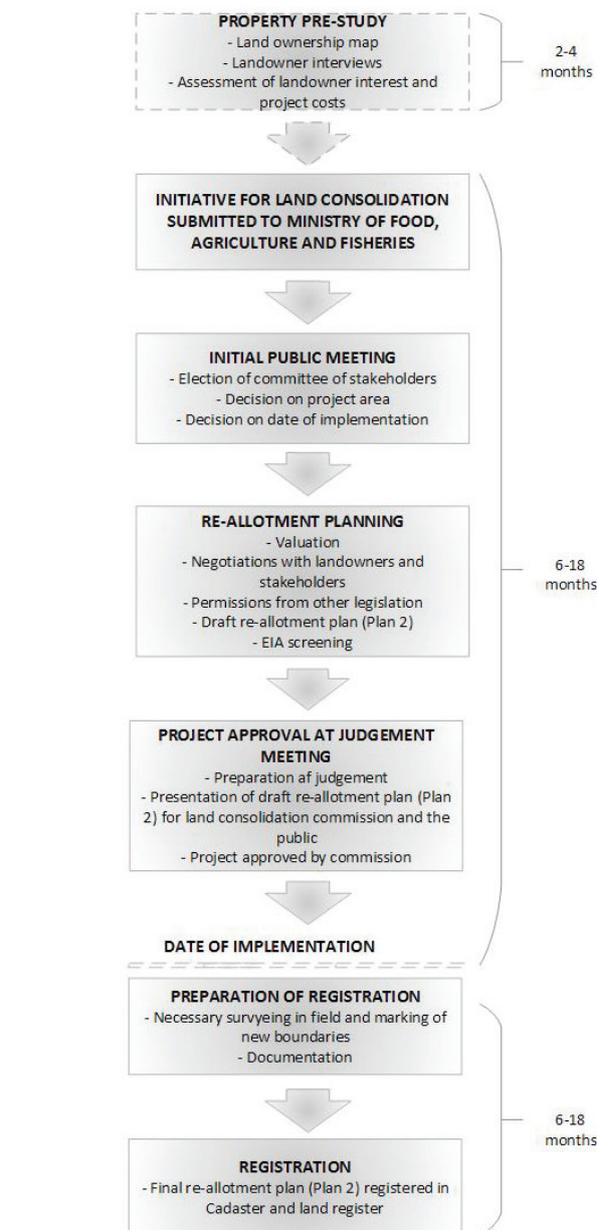


Figure 2: The Danish land consolidation process

value of the agricultural land in the project area. The classical approach is, however, to combine relative value with the market price. The valuation is carried out in the field by the local committee of stakeholders together with the land consolidation planner and one or two local agronomists with specific knowledge of soil quality and production value of the agricultural land in the project area. Each parcel (and sometimes parts of parcels) is allocated a relative value where the best land in the area is given the relative value 100, the second

best 95 etc. Afterwards, the planner produces a valuation map based on the notes from the field. Subsequently, the planner reaches an agreement with the committee and the agronomists about the market value of the best land in the area (relative value 100) and the market value of all other parcels can be found by simple multiplication. A number of issues are important when finding the relative value, such as soil quality, shape of parcel, size of parcel, location, drainage conditions etc.

After this preparation the re-allotment planning can really begin. First the planner will build up a “land pool”. The available land pool consists of agricultural land parcels in the project area which are available for the voluntary re-

allotment planning. The land pool can come from landowners who in the land consolidation process decide to sell all their agricultural land or part of it while gradually reducing their production as they become older. The land pool can also come from land parcels which have been marginalized based on the owner’s production system (e.g. meadows not used by pig farmers). Available public owned land, e.g. from the State Land Bank (see section 4.2), can as well contribute to the land pool. As agreements are reached with the sellers, the planner signs with these landowners a “land consolidation agreement” which legally is an offer from the landowner to sell the specified land on price and conditions stated in the document. The planner

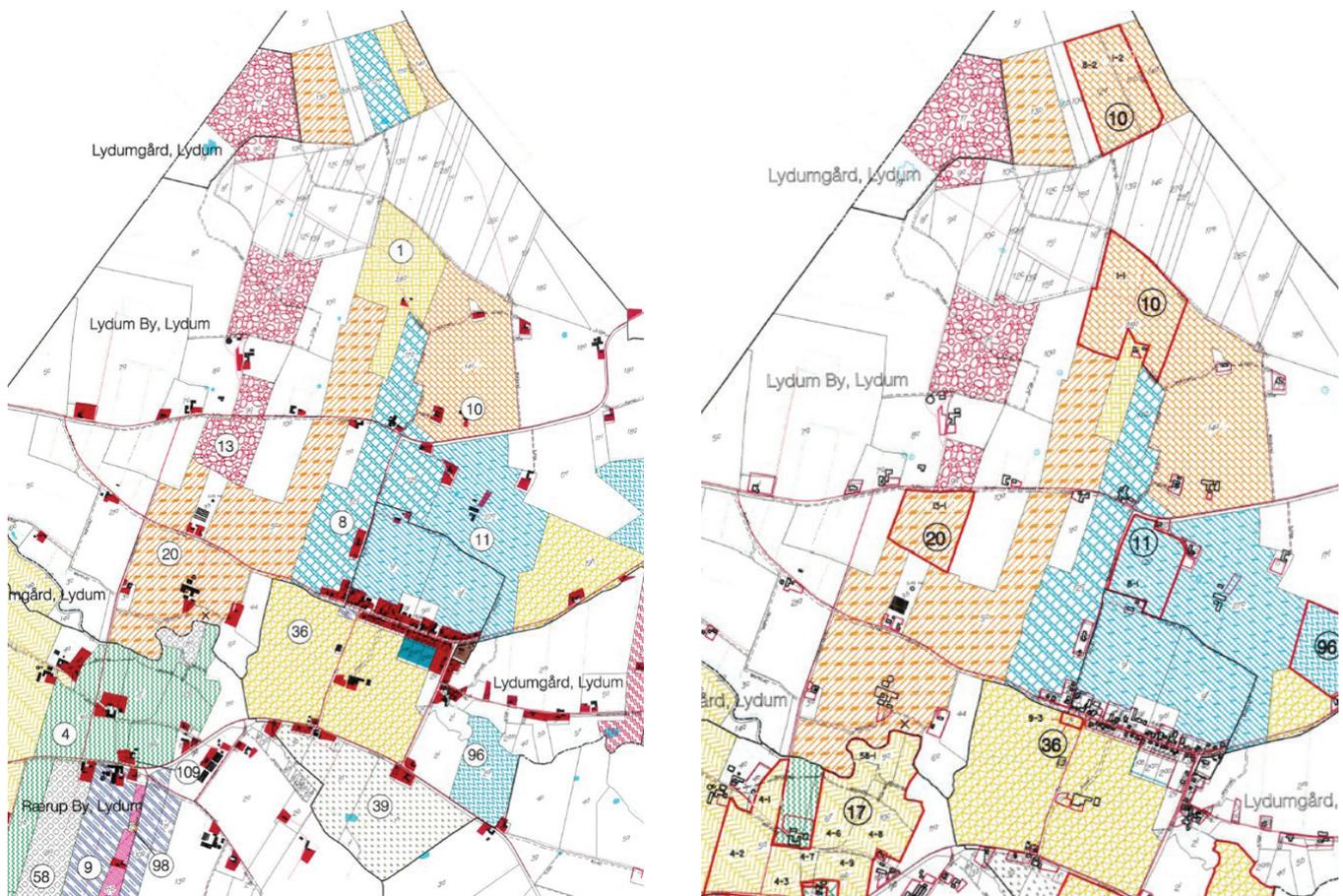


Figure 3: Land consolidation with an agricultural development objective. Part of “Lydum - Nr. Nebel” land consolidation project. Land ownership before project (Plan 1) left and after project (Plan 2) to the right. The project was approved and implemented in 1998. Each agricultural holding has a unique number and signature. Parcels that change owner are marked with a red frame. Notice for example the consolidation and enlargement of agricultural holdings with no. 10, 11, 20 and 36. The white parcels belong to those landowners who have chosen not to participate in the project.

can now begin the exchanges and the challenge is to sustain the land mobility for as long as possible in order to allow as many stakeholders to benefit from the project as possible. In practice it is often an iterative process of reaching agreement with sellers and those who want to exchange as some sellers will only decide about selling towards the end of the process. The re-allotment planning is always a balance between on one side signing agreement which fix the outcome and on the other side keeping the options open until the best possible solutions are found. Each land consolidation planner has to find his or her own style and the outcome of the project is very much dependent of the knowledge, experience and also the personal skills of the planner. The last stage in the re-allotment planning is to sell an eventual surplus of land to buyers who will increase the size of their agricultural holding. Buyers, defined as those buying land of a higher value than the value of the land they sell, are requested to submit to the planner a bank guarantee for the payments.

Three months before the date of implementation, which was agreed at the initial public meeting, the planner has to submit the draft re-allotment plan to the Land Consolidation Unit of the Ministry of Food, Agriculture and Fisheries. The submission consists of a map showing land ownership of the participating agricultural holdings before the project (called Plan 1) and a map of the new ownership situation (called Plan 2), legally binding offers from each of the participants, bank guarantees, decision on screening for environmental impact (EIA) and necessary permissions according to other legislation. Figure 3 shows an example of part of Plan 1 and Plan 2 in “Lydum – Nr. Nebel” land consolidation project.

Then the Land Consolidation Unit of the ministry as secretariat for the land consolidation commission prepares the judgment and checks that everything is settled and organizes a second public meeting. During the meeting, the so-called “judgment meeting”, the land consolidation planner presents the project to the commission and to the public. After the presentation, the public and the commission may ask questions and have the opportunity to complain if they feel something

has not been fair. The number of complaints is normally limited due to the voluntary nature of the projects.

The main task of the land consolidation commission is to approve the project by first approving the negotiated re-allotment plan (Plan 2) and second to ensure a simultaneous implementation, transfer of money between buyers and sellers, handling mortgage in relation to participating agricultural holdings and finally to authorize the Land Consolidation Unit to contract a private surveying company for the necessary cadastral surveying and finally to have the final re-allotment plan registered in the cadastre and the land register.

The normal duration from the initial meeting to the registration of the re-allotment plan is typically 2-4 years including a planning and negotiation process of 1 -1½ year. After the date of implementation, the cadastral surveying and final registration is technical work not involving the participating landowners. They are informed when the final registration has taken place.

All costs involved with the implementation of land consolidation projects were covered by the State budget until 2002 and from 2003 with co-funding from the EU under the Rural Development Programmes.

3.3 Multi-purpose in traditional land consolidation projects

Multi-purpose was, as mentioned in the introduction, explicitly included in the Danish land consolidation tradition through the amendment of the land consolidation law in 1990. Thus, it cannot be expected that projects before 1990 with the traditional objective of agricultural development would have multi-purpose. A study of the Danish land consolidation practice during the period 1979 – 1984 revealed, however, that several projects implemented in the period had multiple purposes besides the traditional objectives (Sørensen 1987a, 163-166). These elements included smaller initiatives and projects focused on improvement of nature and environmental conditions in the land consolidation area. This proves very well that land consolidation by nature is multi-functional with

the opportunity to pursue different objectives in the same land consolidation project.

The application of land consolidation in connection with land reclamation from the 1940s and road construction projects from the 1960s (discussed in section 3.1) are other examples of multi-purpose in the traditional land consolidation projects even though still within the overall objective of agricultural development.

As it was explained in section 3.1, land consolidation was in 2003 included as a measure under the Rural Development Programme 2000-2006 (RDP). In these projects, it was a condition for support under the RDP that the projects had elements of improving the conditions for nature and environment in addition to the traditional objectives of reducing land fragmentation and facilitation of enlargement of production farms. This attempt of increasing the multi-functionality of the projects was, however, not very successful as the focus continued to be on the traditional objectives (Orbicon and Capacent-Epinion, 2008, 38). The experience was also that it was difficult to secure funding for the additional project elements not related to agricultural development as the funding of the land consolidation projects only included funding of the re-allotment planning and the implementation and registration of the approved re-allotment plan and not of any construction works.

4. Nature restoration and improved environmental conditions through land consolidation

From the middle of the 1980s, an increasing political and public attention on nature and environment occurred after decades with loss of biodiversity and general environmental degradation. Specific problems with massive fish death in the coastal aquatic environment caused by emission of nitrate and phosphorus, especially from intensive agricultural production but also by wastewater from the cities, triggered a wave of nature restoration which is still on-going in Denmark today. The *first aquatic environment action plan*² was adopted by the Danish Parliament in 1987 with the aim of reducing the emission of nitrate and phosphorus to the water environment. This has since been followed up by a number of action plans and programs.

4.1 Nature restoration and afforestation

The *law on nature management* (today merged with the *law on nature protection*) was adopted by the Parliament in 1989 and followed up with earmarked funds on the state budget for nature restoration and afforestation projects. The basis for implementation of these nature projects was the voluntary participation of the involved landowners.

The land consolidation instrument was in two pilot projects (“Fjand Meadows” and “Legind Lake” restoration) during the late 1980s introduced as a main instrument for reaching agreements with the involved landowners. The pilots were implemented in cooperation between the Nature Agency under the Ministry of Environment and the Land Consolidation Unit under Ministry of Food, Agriculture and Fisheries (Østergaard 1989; Hartvigsen and Østergaard 1993). The pilots were successful and resulted in a more permanent cooperation between the two ministries where the Land Consolidation Unit assisted the Nature Agency with land consolidation in 23 nature restoration projects between 1990 and 1998 (table 3). The approach was that the Ministry of Environment offered to purchase the private land in the project area, either for the market price in money or in exchange with other land. In both cases the landowners participated in the land consolidation project and the ministry purchased the land through the land consolidation project as well. A flagship project was the “Skjern River restoration project” which was implemented during 1987 – 2003 and through seven land consolidation projects (see Box 2). The costs of these land consolidation projects with the objective to restore nature were covered from the annual budgets of the Ministry of Environment.

The new approach was inspired partly by a development in land consolidation practice throughout the 1980s where elements of nature restoration were included in traditional land consolidation projects with an objective of agricultural development and partly by new research drawing on Dutch experiences with land consolidation in relation to nature restoration, e.g. the 1984 Dutch land consolidation law (Sørensen

1987a; Sørensen 1987b). An inter-governmental committee proposed in 1988 the application of the land consolidation instrument in connection with nature projects (Landbrugsministeriet 1988, 109-131). The development of practice together with the proposals of the inter-governmental committee led in 1990, as discussed, to the explicit inclusion of multi-purpose of the instrument in the preamble of the Danish *land consolidation law*.

The process in land consolidation projects implemented in connection with nature and environmental projects is similar to those described above (section 3.2) with one important exception. In projects with a nature restoration objective, the initial contact and negotiations with the landowners with land in the nature project area is usually carried out as a “property pre-study” which is a separate exercise before the land consolidation project is launched. Since the nature projects in principle are voluntary for the landowners, it is important at an early stage to assess the interest of the landowners. With a few additions, the landowner contact in the property pre-study is similar to the “round of wishes” in the classical land consolidation process.

In 1998, the Parliament adopted the *second aquatic environment action plan*³. The plan was part of the implementation of the Nitrates Directive of the European Commission (Munk Mouritsen 2004). Among the tools for the reduction of emission of nitrate and phosphorus to the water environment was the establishment of 16,000 ha new wetlands and nature restoration. This target figure was later reduced to 10,000 ha. The projects were implemented in cooperation between the Land Consolidation Unit of the Ministry of Food, Agriculture and Fisheries, the Nature Agency of the Ministry of Environment and the County Administrations with the latter being responsible for the direct project implementation. The Land Consolidation Unit provided land consolidation experts funded over the annual state budget. This time the approach was a bit different from the earlier nature restoration projects as continued private land ownership was allowed in the nature area. The landowners were compensated for the loss in market value and a servitude defining

restrictions on the land use was registered on the property in the land register (e.g. the land was taken out of normal production with only grazing and hay production allowed, ban on use of fertilizers and pesticides etc.).

The landowners were offered various ways of compensation and entering into an agreement on the project implementation: i) they could sell their land (often in a land consolidation project), ii) they could exchange their land in the project area with other land outside the restricted area, iii) they could exchange with land in the project area (purchased at reduced price reflecting the value after the implementation of the nature project), iv) they could maintain their land and receive a compensation of the loss in market value or v) they could maintain their land and use the compensation to purchase additional land inside or outside the project area. In figure 4 is displayed an example of a Plan 1 (land ownership before the land consolidation project) in “Rodding Lake Restoration Project”, a small wetlands project implemented under the *second aquatic environment action plan*. Plan 2 (landownership after the project) from the same land consolidation project is displayed in figure 5. The lake was physically restored in 2004.

During the 1990s, in total 23 land consolidation projects were approved in connection with public initiated nature and environmental projects (table 3). In total 799 agricultural holdings participated and 5,547 ha changed owner as part of the projects (table 3).

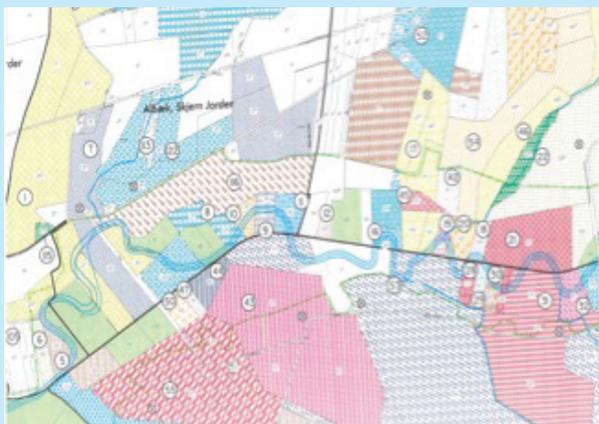
In 2007, a new government program, the *Specific Water and Nature Measure*⁴, began with 45 project opportunities identified in 11 geographical focus areas. Again land consolidation was an important instrument for the implementation of the projects. The concept was the same as applied for the projects under the *second aquatic environment action plan* with the modification that the re-allotment planning was not monopolized by the ministry but also open for private companies through a tendering process. The political intention was to implement the projects during 2007-2009 including the time for the land consolidation works. This was, however, not possible and a few of these projects are still on-going (2014).

BOX 2: Skjern River Nature Restoration Project 1987 – 2003

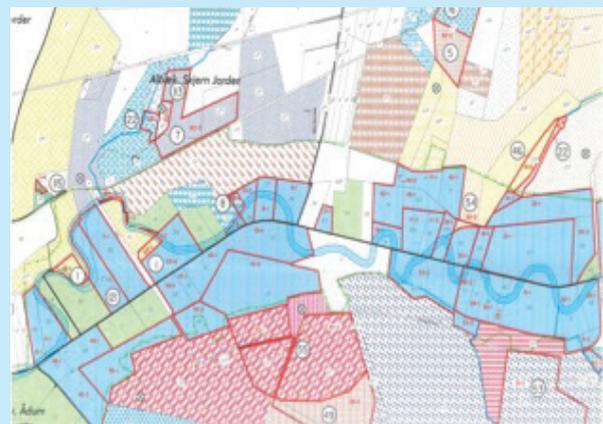
The Skjern River Land Reclamation project (Box 1) was in the beginning successful from the perspective of agricultural development. However, some serious side effects for nature and environment occurred soon after its finalization including for the environment in Ringkøbing Fjord caused by leaching of nitrate and ochre. The land reclamation project had also resulted in loss of biodiversity in the river valley. Soon also problems for the agricultural utilization of the river valley began. Drainage and cultivation of the peat-rich soil resulted in sinking of the terrain – often with more than one meter. A new drainage project was needed if cultivation of the fields was to continue (Ministry of Environment 2005). In 1987, only 19 years after the finalization of the land reclamation project, the Danish Parliament took the decision to restore the natural environment in the lower section of the river valley.

Land acquisition and land consolidation began in 1991. The initial plan was to carry out land consolidation in three stages during 1991-94, first in the Western part of the river, second in the Eastern part and finally a third stage to finalize everything. The Ministry of Environment was responsible for the nature restoration project and the Ministry of Food, Agriculture and Fisheries for the land consolidation works. Most of the local landowners, farmers and their associations were in the beginning very much against the restoration project which they felt was decided by politicians and technocrats in the capital without understanding of the local situation.

The land consolidation was implemented in seven stages instead of the planned three. In total, 358 agricultural holdings participated in the voluntary land consolidation and 2,977 ha changed owner. Most of the land consolidation works were carried out without clear knowledge of the technical restoration projects (e.g. exactly which parcels would be included and which would not). The technical project was only approved in July 1998 by the Parliament adoption of the law on Skjern River Nature Restoration project. The restoration project included 2,200 ha of the 4,000 ha that were drained in the 1960s. In addition the law gave specific access for the Ministry of Environment to expropriate private agricultural land if voluntary agreements could not be reached. However, only around 20 ha were actually expropriated and voluntary solutions with the landowners were reached for more than 99% of the project area. Many of the landowners benefitted highly from the land consolidation solutions as they were often able to exchange relative small parcels with drainage problems, sometimes more than 10 km from the homestead with arable land without drainage problems much closer to the homestead. Often they also had the opportunity to purchase additional land. Many landowners used the opportunity to sell their parcels in the river valley. The project contributed to reduction of land fragmentation and enlargement of farm sizes at the same time as the nature restoration project took 2,200 ha out of agricultural production.



Landownership (part of Plan 1) before final stage of land consolidation ("Borris") implemented 1 April 2000



Landownership (part of Plan 2) after final stage of land consolidation ("Borris"). Blue and green parcels owned by state.

During the 2000s, in total 67 land consolidation projects were approved in connection with public initiated nature and environmental projects (table 3). In total 2,013 agricultural holdings participated and 12,812 ha changed owner as part of the projects.

Finally in 2010, the Parliament adopted the *Green Growth Program* under which a number of initiatives are planned during 2010 - 2015 including the implementation of additional up to 13,000 ha of new wetlands under the project management of the municipalities and 1,600 ha managed by the Nature Agency of the Ministry of Environment. The new program is directly linked to the implementation of the EC Water Framework

Directive. The organizational and institutional set-up is almost the same as during the *second aquatic environment action plan*. Ministry of Environment is overall responsible for the implementation of the program and the Land Consolidation Unit under the Ministry of Food, Agriculture and Fisheries responsible for land consolidation and land banking in connection with the projects. The funding of both the wetlands projects and of the connected land consolidation works were in 2010 included as a measure under the RDP.

In the first stage of the projects, the authority responsible for the project implementation, respectively the municipalities and the Nature Agency of the Ministry of Environment apply

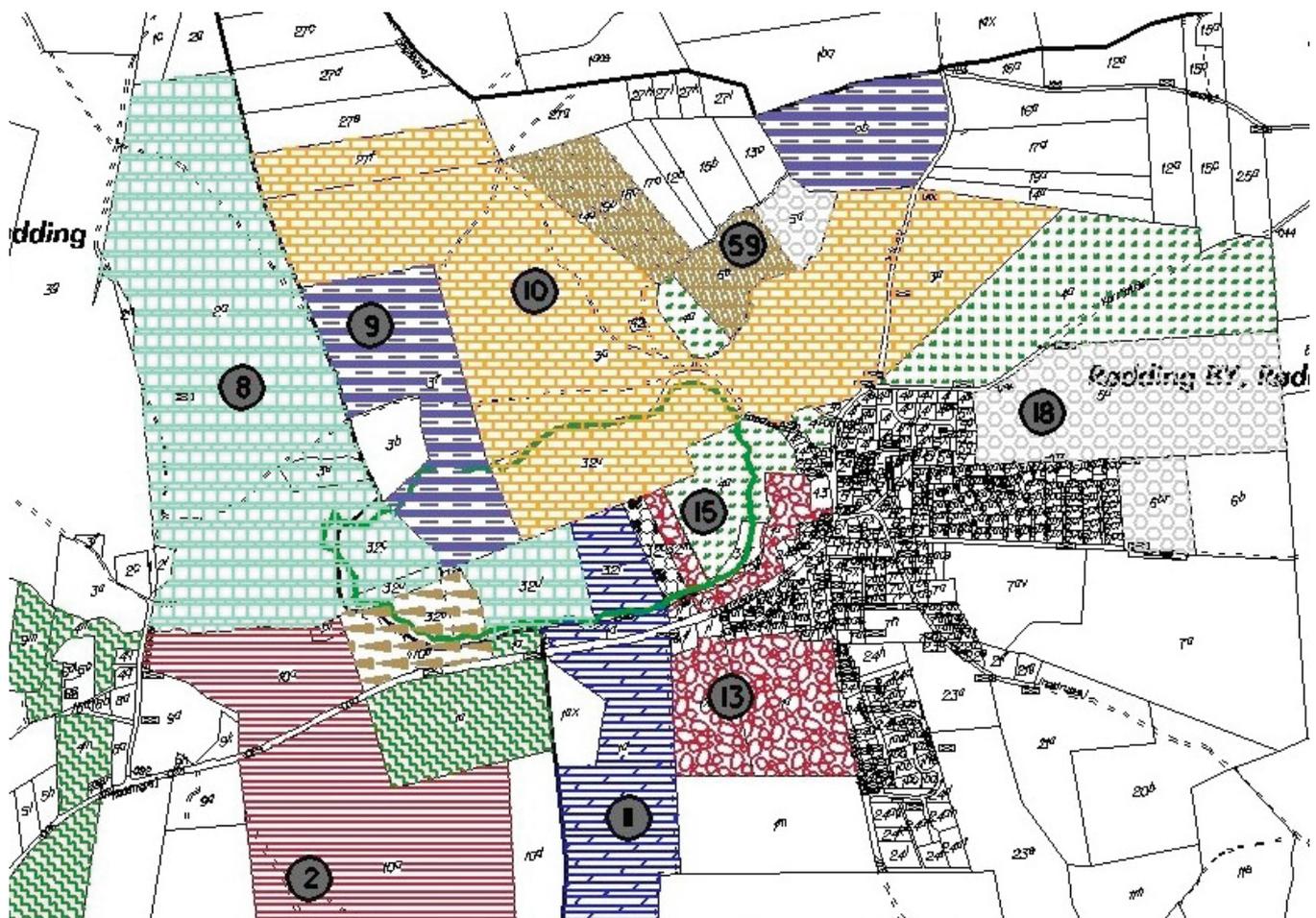


Figure 4: Land consolidation with the objective of nature restoration (wetlands project). “Rodding Lake” restoration land consolidation implemented under the second aquatic environment action plan. Land ownership before the project (Plan 1). Technical investigations showed that the area within the green frame would be affected by the restoration project. The two land parcels marked as serial number 9 were acquired by the State Land Bank after the property pre-study and before the launch of the land consolidation project.

for funding of i) a technical and biological pre-study and ii) a property pre-study. Most these pre-studies are carried out by private consulting companies. During the property pre-study, the first contact is taken with the landowners affected by the planned change of land use, often from arable land or grazing meadows to lake, swamp or wet meadows. Outcome of the property pre-study is an assessment of the interest of the landowners, the need for land consolidation and an estimate of costs of the compensation to the landowners. The support of the landowners is absolutely essential since their participation in the projects to a large extent is voluntary.⁵ Normally, the procedure in the on-going wetlands projects is that the property

pre-study is carried out by a private consultant and the subsequent land consolidation negotiated by a staff member of the Land Consolidation Unit of the ministry. As the property pre-study is leading straight into the land consolidation project (figure 2), it is not suitable that one team is conducting the pre-study and another handling the land consolidation. The professionals dealing with the property pre-study and the subsequent land consolidation project must build up relations of trust with the landowners and this often difficult process is interrupted when new professionals take over in the middle of the process.

The experiences in Denmark since 2010 with funding of wetlands projects and the connected



Figure 5: Land consolidation with the objective of nature restoration (wetlands project). “Rodding Lake” restoration land consolidation. Land ownership after the project (Plan 2). Parcels with red frame change owner as a result of the planning process. As part of the agreement with the private landowners they accepted that the municipality had the right to construct a path around the restored lake. The parcels acquired by the State Land Bank were sold again to private landowners in the land consolidation project.

land consolidation projects under the RDP are that its implementation is difficult in practice. The project holder (municipality or local unit of Ministry of Environment) apply to the Ministry of Food, Agriculture and Fisheries for funding of the projects from the RDP based on the pre-studies and receive an approval with a budget. In principle, the budget cannot be increased during the subsequent implementation of the project and the land consolidation. It is, however, often very difficult beforehand to estimate the exact costs of a wetlands project on the basis of only the technical pre-study and it is also often difficult to estimate the costs of a land consolidation project before a proper land valuation is carried out only based on the initial indications of the landowners. When the land consolidation process begins, experience shows that land consolidation projects may include more agricultural holdings than expected causing increased costs.

Since the amendment of the land consolidation law in 1990, formally allowing land consolidation to be used also as a tool for nature restoration and similar public initiated projects, the land consolidation instrument has each year been used in connection with a relative small number of projects (5-10) where the initiator of the land consolidation project is funding all the costs (property pre-study, re-allotment planning and registration of new land ownership). In recent years initiators of these land consolidation projects have typically been large public owned water supply companies and municipalities seeking to implement afforestation projects on private owned agricultural land with vulnerable ground water resource. In Denmark, almost all drinking water comes from ground water and protection of the ground water resource, i.e. the future drinking water, is essential. Afforestation with broad-leaved trees provides an effective protection of the ground water, also because of termination of the use of fertilizers and pesticides in the afforested area. The private land is either bought up by the state, municipality or water supply company and afforested or the private owners are compensated for planting a private forest. An example of the application of land consolidation in connection

with afforestation and ground water protection is provided in Box 3.

During the 2010-2013, in total 38 land consolidation projects were approved in connection with public initiated nature and environmental projects (table 3). In total 773 agricultural holdings participated and 4,592 ha changed owner as part of the projects.

After the funding of the traditional land consolidation projects with the objective of agricultural development ceased after 2006, the total volume of the Danish land consolidation program has in the last years more than been reduced by half compared to the previous decades (figure 6). Furthermore, the average size of projects (i.e. number of participating agricultural holdings and area changing owner) is significantly reduced in the last years compared to the period 1980-2010 (table 3).

4.2 The Danish Land Bank system

The Danish land bank system was established in 1919 as a tool for an active land policy with the main objective to support the establishment of new commercial family farms (Jørgensen et al. 1997, 51-52). As explained in section 3.1, the state land bank acquired land from manors and larger estates and distributed the land in the process that established the new family farms. During the world crisis in the 1930s, it was possible for the land bank to acquire a considerable amount of land (Meier Andersen 2004). In the southern part of Jutland, land confiscated from the German state after the reunification in 1920 and again after WWII was included in the process as well. The establishment of new family farms was discontinued around 1960 which also included the discontinuation of financial instruments such as state loans and state guaranteed loans to the newly established farmers.

The tradition for combining land consolidation with land banking in the traditional land consolidation work during 1950 - 1990 was especially strong in the southern part of Jutland (Thomsen 1995). Here land consolidation projects were planned some years before they began in the field. During the planning period, the land bank acquired agricultural land from private landowners which was then together with

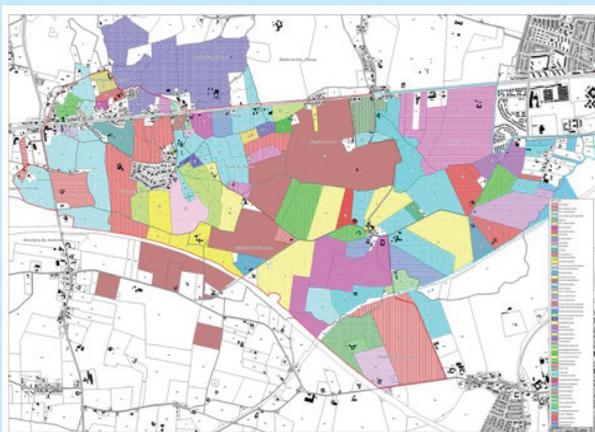
BOX 3: Elmelund Afforestation and Ground Water Protection Project 2008 - 2010

The drinking water supply for Odense city, the third largest city in Denmark with 172,000 inhabitants (2014), is provided by VandCenter Syd (VCS), the water supply company in Odense, owned by the local municipality. VCS operates seven waterworks supplied from 45 production wells. In total, 9,300 million litres of groundwater is pumped up per year and distributed as drinking water to the consumers (VCS Denmark 2014). The Elmelund area is in the catchment area of two of the waterworks supplying 25% of the water for the city.

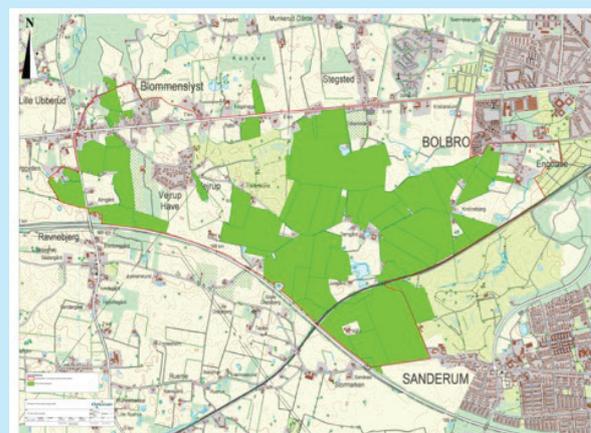
In 2001, VCS signed a cooperation agreement on afforestation with the Nature Agency of the Ministry of Environment and Odense Municipality. The long term perspective is afforestation of 2,000 ha in the interest area of VCS in areas around Odense. First phase is the afforestation of 650 ha in the Elmelund area west of Odense (Bjerre 2010). During 2001-07, in total 50 ha were purchased from private owners of agricultural land in the area. In 2008, VCS contracted Orbicon, a Danish consultancy company, to speed up the acquisition of private agricultural land for the project.

As a first phase, a property pre-study was conducted in the winter 2008-09 among the 58 private owners of agricultural land in the area. The study showed an interest among the landowners to participate in the project, either by selling their land in the project area to the project or in exchanging their land in the project area for other agricultural land outside the project area with no or little need for groundwater production. It was the assessment based on interviews and negotiations with the landowners that it would be possible to acquire in total around 255 ha of which 120 ha would only be available through exchange agreements (Orbicon 2009). The property pre-study recommended to carry out a land consolidation project in connection with the afforestation project.

The land consolidation project was planned in less than one year with the date of implementation on 1 February 2010. In total 316 ha was acquired for afforestation in the Elmelund area including two pig farms in full production (respectively 58 ha and 39 ha). After acquisition VCS closed down the pig production.



Landownership in the Elmelund area in 2008 at the beginning of the property pre-study. The 650 ha in the project area was owned by 58 private landowners.



320 ha purchased for afforestation during 2009-10.

land already owned by the land bank and additional land purchased during the land consolidation project used to increase the land mobility in the project area and subsequently develop better re-allotment plans (Hartvigsen 2014). In the rest of the country, most of the traditional land consolidation projects during the period were implemented without the involvement of the land bank and instead building up the land pool during the re-allotment planning.

The available funds in the state land bank were cut to almost nothing in 1990 (Thomsen 1995). Since then, the land banking activities have been funded by earmarked funds in the yearly state budget as part of the funding of the nature restoration programs such as the *second aquatic environment action plan* and the current *green growth program*. This means that the land bank currently only can be used for the implementation of the specific projects under these programs.

In 2005, the *land acquisition act* was merged with the *land consolidation law* and today the legal provisions regulating the land bank system are included as chapter 3 in the law. The state land bank is managed by the Land Consolidation Unit of the Ministry of Food, Agriculture and Fisheries. The land bank provisions in the land consolidation law allow the ministry to act in the land market as private stakeholders. The land is purchased on normal market conditions. Often, the conducted property re-study (section 4.1) indicates which parcels or agricultural holdings it would be suitable for the land bank to acquire as part of the preparation of the land consolidation project in connection with a nature restoration project. Then the representatives of the Land Consolidation Unit negotiate with the identified landowners with an interest in selling land. The legal document is an offer from the landowner to

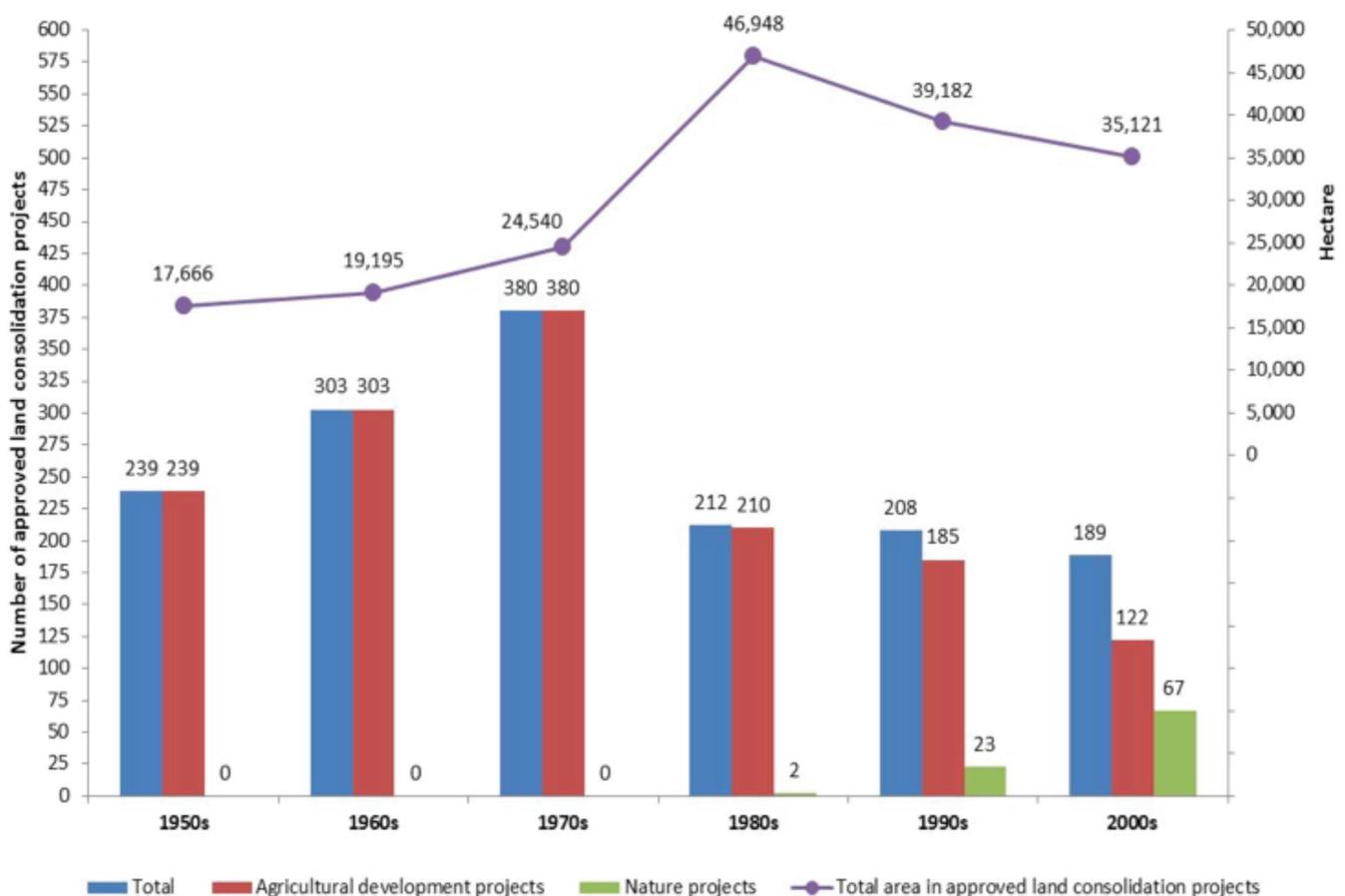


Figure 6: Danish land consolidation activity 1950-2010. Source: Table 1-3.

the land bank in which he/she offers to sell the land at the negotiated conditions. When the offer is accepted by the head of the Land Consolidation Unit, an agreement is made. The head of the unit is by the law empowered to act on behalf of the minister (Haldrup 2004, 7-8). This construction allows for a fast procedure opposed to the normal procedures when public authorities purchase agricultural land from private owners.

The land purchased by the land bank is often leased out for one or two seasons and then in the land consolidation project sold to private landowners in exchange for their land in the planned nature project area. The selling price goes back in to the land bank and is subsequently used to acquire land for other land consolidations in connection with nature projects. During the implementation of wetlands projects under the *second aquatic environment action plan* during 1999-2008, the state land bank in average acquired 456 ha per year⁶. Most land was acquired in 2003 with 979 ha and least in 2008 with 127 ha when the program was about to finalize. The Rodding lake restoration case (figure 4 and 5) illustrates very well the interaction between land consolidation and land banking in Denmark.

The experiences from 25 years of implementing nature restoration projects on a voluntary basis using the land consolidation and land bank instruments are that both instruments are absolutely essential for reaching voluntary agreements with the affected landowners. Active production farmers affected by planned nature projects will often not be able to sacrifice their land in the project area unless they are offered other land in compensation of at least the same soil quality and location. Sometimes it is possible to acquire land for compensation purposes directly during the re-allotment planning in the land consolidation project but often it takes more time to ensure a level of land mobility in the land consolidation area which makes the voluntary re-allotment planning successful in terms of reaching agreements with all landowners affected by the nature project. In such situations it is essential to be able to supplement the land consolidation instrument with land banking.

4.3 Multi-purpose in current Danish land consolidation projects

We will now analyze the application of multi-purpose in Danish land consolidation projects after multi-purpose of the land consolidation instrument was included in the preamble of the land consolidation law in 1990. In section 3.3, we already concluded that the traditional land consolidation projects, which continued until 2006, only included few other objectives than agricultural development.

The land consolidation projects implemented since 1990 in connection with nature restoration projects under various programs have all been limited in scope as they could in principle only include land transactions which directly or indirectly contributed to the implementation of the nature project. In this sense the projects are only “open” for participation of the landowners who are either affected directly by the project or may contribute to land consolidation solutions by providing land (through sale or exchange) which is then used to compensate the directly affected landowners. Land consolidation has become a tool for conflict solutions in area related public interventions (Haldrup 2011).

Despite of this basic condition, there are, however, very good examples of land consolidation projects implemented in connection with large nature restoration projects which at the same time have improved the farm structures (through reduction of land fragmentation and enlargement of production farms) and ensured the implementation of the nature project. The land consolidation work in connection with the Skjern River Nature Restoration Project (Box 2) is a very good example of this. There are however other good examples of multi-purpose in land consolidation projects under the *second aquatic environment action plan* (e.g. Vilsted Lake restoration, Aarslev Meadow Lake Restoration and Sliv Lake Restoration) (Damgaard and Foged 2006).

In the on-going land consolidation projects under the current *green growth program*, the funding under the Rural Development Programme is further limiting multi-purpose compared to the earlier projects funded with 100 percent Danish funds. As explained (section 4.1), the inflexible budget

system, where the budget cannot be increased during the implementation of the nature project and the land consolidation project, is restricting the outcome of the land consolidation projects. It is, however, worth to notice that this is not due to the EC regulation but mainly due to the limited scope in the design of the support measures in the Danish RDP.

We can conclude that the potential for pursuing multiple purposes in the same project with the Danish land consolidation instrument has not been realized. An important explanation relates to the funding sources of land consolidation projects. Funding under the various nature restoration programs have only been available for land transactions directly related to the nature projects. In the land consolidation projects fully funded by the initiator, typically large water supply companies or municipalities, these initiators are not willing or even allowed to fund land transactions which are not directly or indirectly related to their afforestation projects.

5. Perspectives and recommendations for the future

The further development of the Danish land consolidation and land banking instruments has in recent years been discussed among land consolidation professionals and members of academia (Haldrup 2011).

In 2012, the new Danish government formed an independent and fast working nature and agriculture commission to give recommendations for solving structural, financial and environmental challenges including proposals for how Danish agriculture can contribute to actions against climate change as well as improved conditions for nature and environment. In April 2013, the commission presented 44 detailed recommendations (Natur- og Landbrugskommissionen 2013).

Three of the recommendations of the commission relate directly to the land consolidation and land banking practice. It is proposed to strengthen the existing land consolidation instrument and to establish a *national nature fund* funded in a public-private partnership. The nature fund shall have the opportunity to acquire not only private

land in planned project areas but also private agricultural land to be used for compensation in land consolidation projects. Furthermore, the commission stresses the need to re-introduce land consolidation projects with the traditional objective of agricultural development and propose to exempt land transactions in such projects from the normal land registration fee of 0.6 % of the value of the land transferred.

The government has received well the recommendations of the commission and in December 2013 it was politically agreed to establish a *national nature fund* from 2015. It is not yet clear (November 2014) how the recommendation of strengthening the land consolidation instrument will be carried out. Furthermore, the government launched in October 2014 *Nature Plan Denmark*, in which the land consolidation instrument also is mentioned as an important tool for the establishment of a contiguous nature network. These new initiatives are golden opportunities to develop and future-proof the Danish land consolidation and land banking instruments.

The new national nature fund, which from the start in 2015 is expected to have a startup capital of 130 million Euros, will have the opportunity to function in the same way as the state land bank managed by the Ministry of Food, Agriculture and Fisheries. Thus, it will add extra funds and volume to the well-functioning Danish land bank system. A precondition is, however, that the management of the national nature fund will be able to act under the existing fast and flexible land bank provisions in the land consolidation law. To do so it needs to be empowered to act on behalf of the minister as it functions for the state land bank (section 4.2).

The recommendation of the *nature and agriculture commission* to re-start the traditional land consolidation projects with the objective of agricultural development through an exemption from the normal land registration fee is a small step in the right direction. This will, however, not solve the fundamental problem which is that since 2006 there has been no financial support for this type of land consolidation. All experience show that the local landowners and farmers with need and interest in traditional land consolidation will not by

them self initiate and organize land consolidation projects. An exemption from registration fee will not fundamentally change this.

What is really needed is to establish a new broad subsidy scheme where the objectives of agricultural development, nature restoration, improved biodiversity and landscape values as well as recreational initiatives all are given the same priority and where the specific objectives will vary from land consolidation project to project. It would be an option to fund the new support scheme under Rural Development Programme 2014-2020 but it would be even better to secure the funding only from the State budget because of the mentioned restrictions when using RDP funds. This would allow for realization of the potential for multi-purpose use of the Danish land consolidation instrument which, as discussed in section 3.3 and 4.3, so far has not been realized. Multi-purpose in the projects under a new subsidy scheme could be further strengthened if the *property pre-study*, normally carried out in land consolidation projects with nature restoration purpose, is expanded to the preparation of what could be called a *local development plan*. The plan should be prepared through a participatory process involving all relevant and interested stakeholders such as the local landowners, farmers and their local associations, the village population, local NGOs as well as the local municipality and the local unit of the Ministry of Environment. The subsequent land consolidation project will then seek to implement the elements of the plan where the change in land ownership is relevant while other elements can be implemented outside the frame of the land consolidation.

Re-opening of land consolidation projects with the traditional purpose of reduction of land fragmentation and enlargement of the production farms under a new broad subsidy scheme will, as it has always been the outcome of the traditional land consolidation projects, increase productivity and competitiveness of the production farms. The agricultural structure in Denmark has, as explained in section 3.1, changed rapidly during the last decades. From around 1990, the *land law* has been gradually liberalized lifting almost all

the restrictions on acquisition of agricultural land. This has resulted in a farm structure where large production farms often own and rent agricultural land in a very long distance (20-30 km) from the homestead which again leads to loss in income and productivity for the farmer. The rapid structural development has, however, also other negative effects, not only for the farmer. A recent study from Finland shows that the structural development causes fragmentation of the ownership structure and that the climate impact through increased emission of greenhouse gases due to increased agricultural transportation will be remarkable especially in the long run if the changes in the property structure are not prevented (Hiironen and Niukkanen 2013). Hence, the land consolidation instrument can in the future also play an important role as part of government policy on combatting climate change. Furthermore, the nature restoration and afforestation projects implemented during the last 25 years, also have had a positive contribution to reducing emission of greenhouse gases.

6. Conclusions

Denmark has a long lasting land consolidation tradition. From the 1920s until the 1980s, the land consolidation and land banking instruments were used as tools for agricultural development mainly through reduction of land fragmentation and facilitation of the structural development as it was the case also in other European countries in the period. Public funding (national as well as EU co-funding) of these traditional projects was discontinued in 2006.

From 1990, the land consolidation instrument has been used for the implementation of nature restoration projects under various government programs. In this framework, the land consolidation and land banking instruments have proven to be absolutely essential in the process of reaching voluntary agreements with the affected landowners. Participation in land consolidation projects is voluntary in Denmark. This means that the project must have something to offer to the potential participants. The offer which is acceptable for the participants is often other land in compensation and land consolidation solutions which cannot be nego-

tiated by the participants bilaterally but only as part of a planned and facilitated re-allotment planning process.

The Danish land consolidation procedure is today basically the same as the system which was introduced with the amendment of the law in 1955. The procedure has proven to be robust and so flexible that the objectives of the projects have been able to shift from agricultural development including land reclamation to giving the land back to nature in nature restoration projects without any need for amendment of the land consolidation procedure.

The multi-purpose potential in the Danish land consolidation instrument has not been realized and there is a need for further development of the instrument in this direction. It is the recommendation to establish a new broad subsidy scheme where the objectives could vary from project to project depending on the local needs. This can be done within the existing legal framework and procedures.

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Notes

- ¹ In larger projects, the re-allotment planning is often conducted by two planners.
- ² In Danish: *Vandmiljøplan I*
- ³ In Danish: *Vandmiljøplan II (VMPII)*
- ⁴ In Danish: *Den særlige vand- og naturindsats - Miljømilliarden*
- ⁵ According to article 60 in the law on nature protection, the project owner (ministry or municipality) can expropriate one or a few parcels in the project area when the large majority of landowners voluntarily have agreed with the implementation of the project. The extent of the article has so far not been defined by the courts.
- ⁶ Unpublished data from Land Consolidation Unit under the Ministry of Food, Agriculture and Fisheries (2014).

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