

Land Consolidation – The Fundamentals to Guide Practice

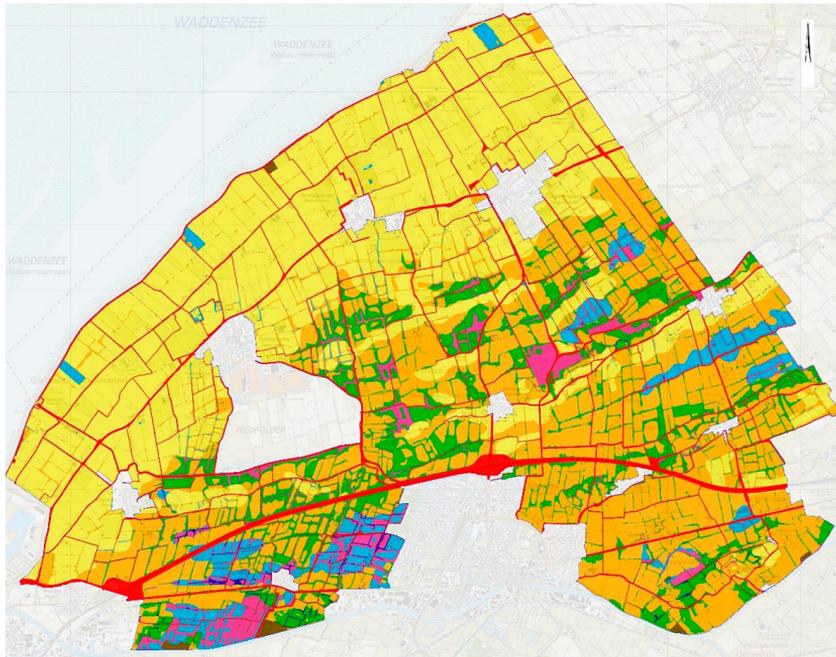


FIG Commission 8 – Spatial Planning and Development

Land Consolidation – The Fundamentals to Guide Practice

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Marije Louwsma
Walter de Vries
Morten Hartvigsen

INTERNATIONAL FEDERATION OF SURVEYORS (FIG)

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International Federation of Surveyors (FIG)
Kalvebod Brygge 31–33
DK-1780 Copenhagen V
DENMARK
Tel. + 45 38 86 10 81
E-mail: FIG@FIG.net
www.fig.net

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FOREWORD

Land consolidation is a specialised land policy instrument, which has already been on the agenda within the FIG community for a long time. Each year there are papers submitted about land consolidation at the FIG Working Week or Congress. Now, we decided to bundle the available international experiences, insights, and knowledge into a FIG publication. It is my great pleasure to present this land consolidation publication to you.

In view of climate change, sustainable land use and development is more urgent than ever. Land consolidation is a land policy instrument that can consider spatial developments in a coherent and comprehensive approach, integrating various sectoral policy domains. Water management, soil quality, environmental values, protected nature reserves, agricultural developments, infrastructure, cultural heritage, rural development can all be considered – at least their spatial component – in land consolidation projects.

This FIG publication aims to provide an overview of relevant topics for land consolidation practice, including different forms of land consolidation, public participation, valuation, developing the land consolidation plan, GIS tools and monitoring and evaluation of projects and programmes. It seeks to find a level of detail that provides insights for responsible agencies and professionals involved in land consolidation.

Hopefully, this publication of commission 8 will inspire and support government agencies, decision makers and professionals to implement land consolidation projects and programmes in a sustainable, inclusive, and participatory way. The expertise of the surveyor can guide the application to enhance an inclusive, just, and fair reallocation process in various tenure systems and land administration traditions. As such, it complements existing publications about land consolidation such as FAO's recent legal guide on land consolidation.

FIG would like to express its sincere thanks to all the authors and collaborating organisations who contributed to this publication and shared their experiences and insights for a larger audience.

Marije Louwsma

Chair of FIG Commission 8 – Spatial Planning and Development
2019–2022

SUMMARY

Land consolidation is a well proven land policy instrument. Some European countries have a land consolidation tradition that goes back hundred years or more. As a land policy instrument, land consolidation can be used for the implementation of government policies related to agriculture, rural development, nature conservation and environment. The traditional objective has been to facilitate agricultural development by reducing land fragmentation. Nowadays, the objectives have extended to a multi-purpose approach as well.

The underpinning principle of land consolidation is the exchange of land rights among right holders with the aim to improve effective and efficient land use in rural areas. The exchange and redistribution of land rights can be – and often is – combined with the construction of infrastructure, such as the extension or enhancement of roads, the development of basic services, the connection of ecological networks, the provision of water management or flood protection measures, or the arrangement of climate resilience structures in the area. In urban areas, land readjustment (on urban land parcels or construction land) is the equivalent of land consolidation in rural areas.

Due to international variations, a common understanding of the terminology related to land consolidation is missing. Different forms of land consolidation (voluntary land exchange, voluntary land consolidation, majority-based land consolidation, mandatory land consolidation) are further explained. Depending on the objectives a simpler small-scale form of land consolidation like voluntary land exchange can be chosen or a mandatory form can be followed whereby multiple objectives can be realised. The latter form is more suitable in an area with complex tasks with potentially conflicting interests of stakeholders. Since this form of land consolidation is mandatory it requires a legal framework that provides safeguards to secure the land rights of involved landowners and users.

Land consolidation directly affects the area, and in particular those who hold land rights. Therefore, it is recommended to involve the public in the process. Public participation offers the possibility of revealing different views, getting to know the local context, identifying potential conflicts, and supporting decision-making. The level of public engagement depends on the form of land consolidation, where the public's potential influence should be the primary consideration in designing participatory processes. Voluntary land exchange and voluntary land consolidation provide a high level of public participation, giving involved landowners and users a voice in the design of the reallocation plan. If the result does not meet their expectations, they can opt out since participation in the project is on a voluntary basis. Public participation in majority-based land consolidation and mandatory land consolidation has a more formalised character. Consequently, public participation is shaped differently. The selected tools for public participation need to meet the requirements of the land consolidation process.

The exchange of land rights requires the valuation of the exchanged land as to settle any differences in value between the right holders. It is one of the key principles to guarantee a fair and inclusive process upon the reallocation of land rights. In general, valuation in land consolidation relies on two approaches. The relative value approach classifies parcels in levels of value reflecting their respective productive capacity for agriculture or other land uses. The market-based approach aims to reflect the discrete

monetary value of parcels based on the estimated market value. This approach requires a mature land market, where sufficient land transactions take place to provide sufficient information about current land prices. The relative value and market-based approach are either employed based on mass appraisal or on individual appraisal of parcels.

Valuation may serve different roles based on the form of land consolidation. Apart from the financial arrangements to be made, the valuation can also guide individual decisions by right holders in a voluntary approach. An involved landowner weighs and assesses proposals for exchange based on the value of the land and its financial consequences. In majority-based and mandatory forms of land consolidation, valuation is essential to guarantee that right holders receive an equivalent size and quality of land (the 'at least as well off' principle).

The land consolidation plan includes the new layout of land parcels, related land rights and the right holders. The development of the land consolidation plan is usually seen as the task of a small multi-disciplinary team. Surveyors are indispensable members of the team, since they bring in tenure and land administration knowledge to guarantee legal certainty for all right holders involved and expertise concerning boundary and areas measurements and calculation. The extent to which the situation in the area changes depends on many aspects such as the objectives of the land consolidation project, the physical characteristics, the form of land consolidation, and the wishes and consent of involved stakeholders.

The implementation of a land consolidation project requires secure data handling of both geospatial data (e.g. cadastral map) and administrative data (e.g. land rights). Using GIS or other digital tools for the implementation of land consolidation enables the automation of processes, reduces the risk of human error – if well designed – and allows for greater efficiency. Most countries use their own set of GIS tools for lack of a standardised solution.

Land consolidation projects and programmes require sufficient funding for implementation. To ensure accountability and transparency, monitoring the progress of resources used, the outputs delivered, and impact of the activities upon implementation of a project or programme is important. A set of relevant indicators can measure to what extent a project or programme has been implemented according to the plan (monitoring) and achieved the desired result (evaluation).

In view of climate change, sustainable land use and development is more urgent than ever. Land consolidation is a land policy instrument that can consider spatial developments in a coherent and comprehensive approach, integrating various sectoral policy domains. The exchange of land rights between right holders remains the underpinning principle of land consolidation. Nevertheless, the guiding principles may change. Land may be valued differently for example based on changing perspectives on land as a commodity. Technical advancement of the instrument may provide one path, whereas socio-economic equity – i.e. access to land – can lead to other pathways. In the end, the puzzle still needs to be solved with all stakeholders involved, balancing current and future needs for a sustainable rural development.

1 A GENERAL INTRODUCTION TO LAND CONSOLIDATION

Authors: Marije Louwsma, Morten Hartvigsen, Walter de Vries

1.1 The unique character of land consolidation

Land consolidation is a well proven land management instrument. Some European countries have a land consolidation tradition that goes back hundred years or more. Land consolidation laws were adopted in Poland in 1923 and in the Netherlands and Denmark in 1924, while the German tradition is even older.

As a land management instrument, land consolidation has been and still is used for the implementation of government policies related to agriculture, rural development, nature conservation and environment. In the decades after WWII, land consolidation was mainly applied for the sake of agricultural development. The core outcome of a land consolidation process is that landowners have their agricultural land parcels consolidated in as few and as regular shaped parcels as close to the homestead as possible. Land consolidation addresses the structural problem of land fragmentation, which is often hindering an efficient and competitive agricultural production. Land consolidation is traditionally also used to facilitate enlargement of holdings and farms. Until the 1970s, and in some occasions even during the 1980s, land consolidation in many European countries was part of large-scale land reclamation projects.

From the 1980s onwards, land consolidation became in particular in Western European countries an important instrument to support the implementation of broader local rural development projects, which involved also nature restoration, environmental protection and construction of large-scale infrastructure. This development was similar in several other countries which made land consolidation increasingly a multi-purpose instrument, where different objectives are pursued simultaneously within a single regulatory tool. Even within the same land consolidation project there can be multiple development objectives in different parts of the project area, such as agricultural development (i.e. reduction of land fragmentation and enlargement farm sizes) whilst in other parts of the project area agricultural land is converted into land for nature restoration. In the latter case, the landowners and farmers are compensated in additional land through the land consolidation compensation mechanism.

Since the political changes in Central and Eastern Europe (CEE) in the early 1990s, land reforms have been high on the political agenda in most of these countries. The core issue concerns restitution of the land lost during the decades of collectivisation or distributed equally state-owned agricultural land to the rural population. Most CEE countries have structural problems with farm structures, such as excessive land fragmentation and small average farm sizes. To address these problems, from the mid-1990s and onwards, many CEE countries have introduced the land consolidation instrument.

Currently, one can observe that land consolidation has increasingly become a globally applied instrument. Though its origin lies in Europe, currently countries in most regions of the world are applying it, especially in Asian countries, but increasingly also in Africa. Sustainable land and water management and development is often a justification for this.

The 2030 Agenda for Sustainable Development was adopted by all United Nations member states in 2015 with 17 Sustainable Development Goals (SDGs) and its 169 associated targets (UN General Assembly, 2015). The implementation of land consolidation at country level can contribute to several SDGs and targets. The wider the regulatory objectives of the land consolidation instrument in a country's legal context, the more it can potentially contribute. Key SDG targets where land consolidation can make a significant difference include SDG target 2.3 on doubling the agricultural productivity and the incomes of small-scale food producers by 2030, SDG target 1.4 on ensuring that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources (...), ownership and control over land and other forms of property. A critical outcome of land consolidation projects is formalized and protected land rights, which directly contributes to target 1.4. Land consolidation should also contribute to SDG 5, which seeks to promote greater gender equality. Target 5.A urges to undertake reforms to give women equal rights to economic resources, as well as access to ownership and control over land and other forms of property. One way to achieve this through land consolidation is to ensure that the resulting property rights are registered in the name of both spouses. Land consolidation with a multi-purpose objective, e.g. agricultural development combined with infrastructure improvement and habitat management, also has a strong potential to contribute to achieving SDG target 15.1, namely to ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and SDG Target 15.3 on combatting desertification, restore degraded land and soil (...) by 2030.

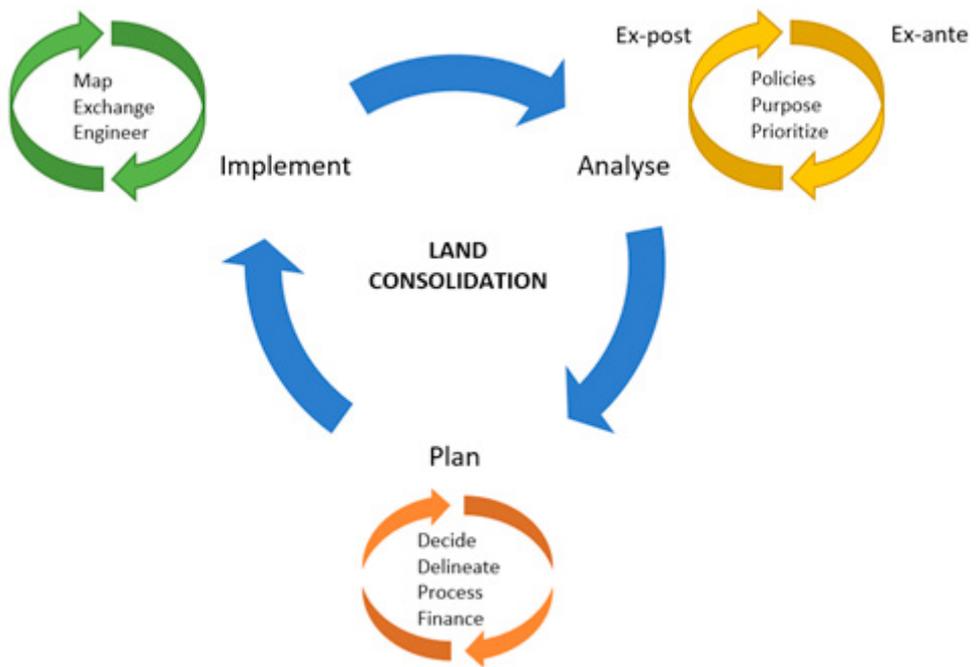


Figure 1: *The land consolidation process: Analyse, Plan, Implement.*

1.2 Land consolidation – its process and objectives

Analyse

Prior to any implementation of land consolidation activities, various preparations must already be in place (Figure 1.1). As a policy instrument, land consolidation operates within a broader set of rules, regulations and policies. Hence, opting for land consolidation implies that policy actors implicitly aim to foster and implement specific policies. Given this, the first step is to analyse what exactly land consolidation should aim for. Is it to increase agricultural revenues by reducing land fragmentation; does it primarily target rural development; should it address environmental concerns; or does it serve a combination of these and other purposes? It is therefore recommended to analyse existing policies (e.g. spatial policy, agricultural policy, environmental policy, rural policy, water policy, land use policy) and align the land consolidation plan with the objectives described in these policies. In addition, an ex-ante feasibility study can reveal information on the current situation (e.g. barriers for sustainable land use, volatility of the land market, land fragmentation, stakeholder needs), the potential results and costs of a proposed land consolidation project. Based on this analysis and the applicable policy framework the objectives for the land consolidation projects can be determined. An ex-post evaluation can shed light on the impact and effectiveness of the completed project or programme.

As land consolidation tends to adopt an area-based approach, land consolidation has the potential to function as a cross-sectoral instrument which combines objectives from different sectoral policies into a single project. Some objectives mutually reinforce each other, whereas other objectives can be spatially distributed once they do not go well together. Such considerations imply that a coherent and integral approach is necessary in order to balance the interests of diverse stakeholder groups – both private and public – in the region and beyond. Irrespective of such an integrative and coherent view, the outcome may nevertheless be that the specific land consolidation project primarily focuses on one main objective, in line with cater for the specific situational context and requirements. In other situations, the formulation of a more comprehensive land consolidation project – taking up multiple objectives – would be more suitable. As part of this discussion, any necessary preconditions should be seized in view of the context and local situation. For example, land consolidation has proven to effectively reduce land fragmentation for agricultural holdings. In areas with predominantly communal farming systems, where few individual parcels or holdings exist, it is less effective to reduce land fragmentation. Similarly, land consolidation will not be able to effectively address continuous land fragmentation caused by inheritance, which leads to subdivision of holdings within the family.

Plan

The planning phase refers to preparations for an individual project and/or a scheme for multiple projects, e.g. a national land consolidation programme. It includes delineating the project area, setting up an organisation structure (including roles, tasks, and responsibilities), allocating a budget, determining the scope and aim(s) of the project, and deciding on the process. Discussing and deciding on the objectives of land consolidation before the actual implementation also benefits an inclusive and transparent approach. Relevant stakeholder groups can be invited to join the dialogue about the need for and scope of land consolidation, before it is implemented. A participatory

approach (see Chapter 4) fosters the inclusion of local knowledge and brings various perspectives to the table. At the start of a project, it should also be discussed how the interests of relevant stakeholder groups is incorporated for the duration of the project. This includes how stakeholder groups will be involved, what the authority of their voice will be (e.g. consultative or decisive), and how this will be organised. The former strongly relates to the pursued objectives. The voices of stakeholder groups should reflect the objectives and sectors involved in the land consolidation project, whereby the overall public interest –to foster a social, ecological, and economical sustainable development – should always be considered and heard.

Implement

The last phase encompasses the execution of the land consolidation project. After a final decision to go ahead, the implementation of the project can start. This involves obtaining an overview of the existing rights, responsibilities, and restrictions, starting the involvement of land right holders, requesting their wishes regarding the new allocation, exploring the spatial possibilities for reallocation, drawing up the reallocation plan, valuing the land, registering the new allocation, setting up grievance mechanisms and settling the financial aspects. In some cases, there may be additional requirements and associated activities. This publication focuses in particular on this implementation phase, with the aim to providing practitioners practical considerations and guidelines once a decision to implement a land consolidation project has been taken.

1.3 Explaining terminology

Internationally, there is not always a common understanding of the terminology related to land consolidation. Therefore, we first clarify our understanding of the used terminology. The underpinning principle of land consolidation is the exchange of land rights among right holders with the aim to improve effective and efficient land ownership and use in rural areas. The exchange and redistribution of land rights can be – and often is – combined with the construction of infrastructure, such as the extension or enhancement of roads, the development of basic services, the connection of ecological networks, the provision of water management or flood protection measures, or the arrangement of climate resilience structures in the area. In urban areas, land readjustment (or urban land parcels or construction land) is the equivalent of land consolidation in rural areas.

The establishment of agricultural cooperatives, either by (voluntarily) grouping land rights together or by collaboratively working the land together irrespective of the underlying distribution of land rights, is not considered to be land consolidation. However, shareholders of a cooperative can align the allocation of their land rights to gain benefits for agricultural production.

In this publication, the term ‘right holder’ is used to refer to all persons or entities that hold land rights in the designated area for consolidation. A ‘stakeholder’ refers to a person, a group of persons or an entity that represent an interest in the land consolidation project. In this guide three different stakeholder groups are distinguished (Figure 1.2): (1) right holders, (2) (direct) stakeholders, and (3) general public (indirect stakeholders). The right holders are the core stakeholder group, since they are directly affected by the land consolidation project due to the exchange of land rights. Apart from this,

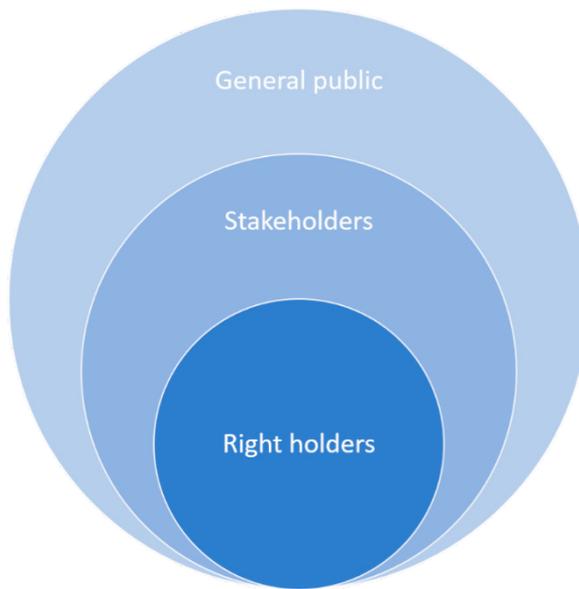


Figure 1.2: *Those involved in land consolidation.*

stakeholders may also concern government agencies, non-governmental organizations, interest groups, etc. Stakeholders are considered to have a direct interest in the area under consolidation, such as facilities and services for the community or in (semi-) public space. At last, the general public can have an interest in land consolidation. For example, interests for the general public can be rooted in the provision of eco-system services, food security, preservation of environmental values (biodiversity) or cultural heritage.

1.4 Tenure security and land consolidation

Across developing countries and countries in transition, it is estimated that roughly 70% of the land rights are not formally registered (UN-Habitat et al., 2012). Even in developed countries the recorded land rights may not reflect the complete or actual overview of registered rights, as these may be contested due to past tenure reforms, inheritance issues, gender and minority groups disadvantages, informality or abandoned land for example. Without reliable data about land rights, it remains impossible to provide tenure security via land consolidation projects. The administration of land rights should be perceived solid enough to consider land consolidation. In other words, a reliable and inclusive land administration has to be set up prior to consolidation efforts in order to guarantee tenure security for all (in particular for the vulnerable) during and after the land consolidation process.

Besides the condition of the land administration system, the existing or prevalent land tenure system influences the degree to which a land consolidation is feasible. Traditionally, land consolidation has mostly been implemented in tenure systems with formalized land rights. But increasingly, there are situations where simple forms of land consolidation are taking place in areas with informal or socially recognized lands. In

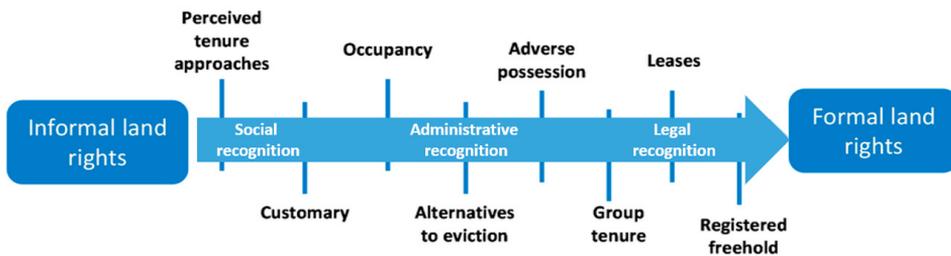


Figure 1.3: *Continuum of land rights.*
(Adapted after UN-Habitat, 2008 and Du Plessis et al., 2016)

these cases, one has to rely on a continuum of land rights. The continuum of land rights (Figure 1.3) posits that there is a variation in tenure systems, ranging from informal land rights to formal land rights and anything in between (UN-Habitat, 2008). The continuum is a simplified representation that does not always justify the complexity of the situation on the ground. Some critiques indicate that the linear character does not represent the plurality and multi-layered character of the various tenure systems and tenure forms that may co-exist (Du Plessis et al., 2016). Registered ownership may exist parallel to customary rights for example. And customary tenure can, for example, encompass both individual land rights and communal land rights, which each requires a different approach when implementing land consolidation. Other aspects that influence the implementation of land consolidation are irregularities in the administration of land rights, adverse possession, unknown or non-traceable right holders, informal transactions, etc. These are just a few examples of the complexity of the tenure systems and registrations of land rights encountered in the field. Nevertheless, the continuum showcases the diversity of tenure systems, land rights and their recognition that one can come across upon deploying land consolidation and should be taken into account when deciding on the form of land consolidation to be deployed. The form of land consolidation should fit the tenure system(s) in place and the level of maturity of the land administration system(s). Employing land consolidation in an area where customary rights prevail requires a different approach than in a region with fully registered freehold rights (Asiama et al., 2017).

Perhaps, land consolidation in a registered freehold system with private landownership is the most well-known, but land consolidation is also applied in countries with state-owned land where use rights are issued like in Vietnam, China or Mozambique. Such registered use rights can be alienated or leased out like ownership rights in a freehold system. Consequently, the process is technically similar to land consolidation with private landownership rights, albeit that ownership rights are substituted by tradable use rights.

In practice, several tenure systems may co-exist, which makes the implementation of land consolidation even more complex (see Chapter 2). A good preparation is key to analyse the feasibility and to manage such complexity upon implementation.

1.5 Reading guide

The publication highlights a diverse range of aspects related to land consolidation. The next – second – chapter starts with an overview of various forms of land consolidation

practiced across the world. As practice is diverse, we aim to capture a broad range of forms available to showcase distinctive approaches. It is beyond the scope and aim of this publication to extensively discuss all local variations that exist within this broad range of forms. The third chapter touches upon the participation of stakeholders and address the question how public participation is developed at various levels in the land consolidation process. This also entails constructing safeguards for those directly affected by land consolidation to guarantee legal certainty. Chapter four explains methodologies for the valuation of exchanged property as part of a land consolidation project. The subsequent chapter five elaborates on how to design a land consolidation plan and which deliberations are necessary when planning and optimising the various measures included in the project. Chapter six explains which type of GIS tools are available to support the land consolidation project from the beginning till the end. In the digital era where more and more data become digitally available, the role and potential of supportive geographical and administrative systems or 'tools' becomes acknowledged, although it also may raise concerns. Chapter seven focuses on evaluation methods, both ex-ante and ex-post, employed for land consolidation projects and programmes. Finally, the publication concludes with considerations about the way forward (chapter eight).

2 DIFFERENT FORMS OF LAND CONSOLIDATION

Authors: Marije Louwsma, Kwabena Asiama, Morten Hartvigsen, Adrianna Czarnecka

2.1 Introduction

Land consolidation takes different forms in terms of the nature of decision-making and the implementation approach. A land consolidation project comprises three generic phases; preparation phase (which may include feasibility), re-allotment phase, and registration and implementation phase. At the preparation stage, the contextual constraints of the project area in terms of political, social, economic, technical, and environmental considerations are assessed. The final consolidation project design is based on these forms of land consolidation. The forms of land consolidation described in this chapter are based on an aggregate of country cases as well as the FAO Legal Guide on Land Consolidation (Versinkas et al., 2020).

The forms of land consolidation are distinguished in terms of the nature of decision-making and the nature of participation. In this publication, four broad forms are distinguished to provide an overview and summarize contemporary practice, although variations across international practice of course do exist. Each form is briefly described and characterised based on a set of features.

The first form is the voluntary land exchange with only a few participants starting the exchange at own initiative (voluntary land exchange). The second form concerns the more structured voluntary approach with a larger number of participants, whereby the participants of a land consolidation projects join out of their own free will, with no compulsion (voluntary land consolidation). The third form is the majority-based approach, which requires the support of a qualified majority of right holders, or which relies on the amount of land that right holders represent, i.e. the majority of land in the area, or on a combination of both, i.e. a double majority (majority-based land consolidation). The fourth form refers to the mandatory approach where participants are enjoined to the land consolidation project (mandatory land consolidation).

The typology of land consolidation does not only rely on decision-making characteristics, but also on other variations in implementation. One of these concerns the objective(s) that a land consolidation project pursues. Traditionally, land consolidation focuses on agricultural development by reducing land fragmentation and facilitating on a voluntary basis enlargement of holdings and farms. Employing land consolidation for one single objective is indeed less complex than aiming to achieve multiple objectives. Complexity relates to dependencies between the various objectives. Some objectives go well together but there can also be circumstances where they impose preconditions or lead to land use type conflicts. In these cases, one requires a careful design of the allocation of both land use types and the underlying spatial (re-)arrangement of land rights.

As land consolidation rearranges land rights, the implementation of land consolidation depends a lot on the system of land rights within which it operates (formal or informal) as well as the land tenure forms (e.g. private, public, customary, communal, ownership, usufruct, lease) in the tenure system, and how these are captured in a land administration system. The form of land consolidation should fit the tenure system(s) in place and the level of maturity of the land administration system(s).

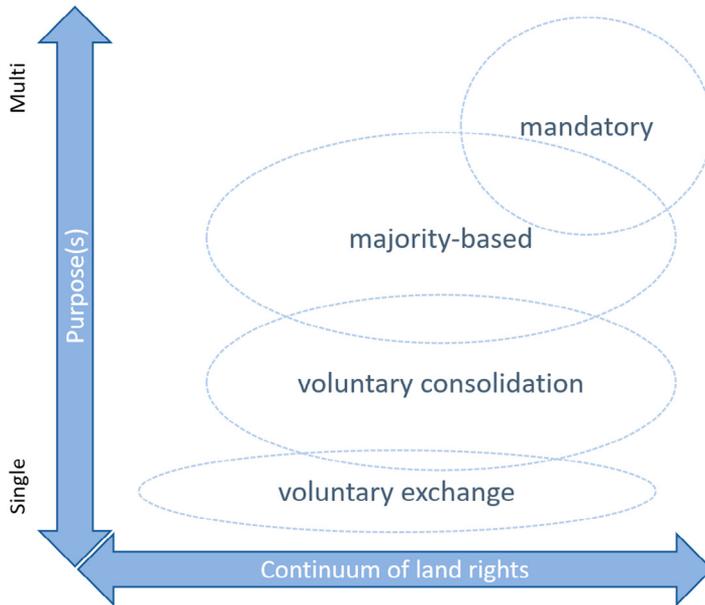


Figure 2.1: *Different forms of land consolidation in view of its objectives or purpose.*

Long standing traditions of land consolidation, particularly in Western Europe, have operated in a system of formally registered freehold, i.e. an exchange of land rights based on ownership. Nowadays, land consolidation is also applied in tenure systems, where state-owned land is leased out or allocated via registered use rights. In Africa, examples of land consolidation in tenure systems are characterised by their plurality, where customary rights, occupancy, group tenure and registered land rights co-exist. It is key to align the land consolidation procedure with the tenure system(s) in the area together with its objectives. In these environments, one has to decide which rights need to be taken into account, and how land consolidation can address the effectivity (e.g. to what extent is it meaningful to consolidate group tenure), timeliness (e.g. short term lease contracts expire before land consolidation has been finalised), and administration (e.g. to what extent is data available about recognized and legitimate land rights). The re-allotment planning may also facilitate on a voluntary basis the inclusion of sale – purchase agreements to allow also for enlargement of holdings and farms. Hence, the basis of consolidation is land rights that can be traded on a form of land market.

Figure 2.1 displays how these three aspects, namely (1) the nature of decision-making, (2) the objectives and (3) the tenure system(s) relate to each other. Voluntary land exchange and voluntary land consolidation can take place in a wide range of tenure systems, but due to their voluntary character it may be less suitable in situations where multiple – sometimes conflicting – objectives need to be achieved. This is especially true when the objectives are particularly bound to a specific location, such as the course of a water body. If one of the involved right holders does not want to exchange their parcel against another parcel elsewhere, then it is difficult to obtain the land for this purpose. The complexity and public interest of the objectives have to be in accordance with the level of decision-making. The same consideration applies to the tenure

system. Due to the authoritative and executive nature of land consolidation decisions, the more extensive forms of land consolidation are less suitable in contexts where tenure systems or tenure security is not legally or formally guaranteed.

2.2 Voluntary land exchange

Also known as land swapping or reallocation, voluntary land exchange is the swapping of land ownership or land use rights between three or more landowners or users for a specific purpose with or without the guidance of professionals. Here the shape, and size of the land parcels are not or hardly (re-)designed, which makes it one of the simplest forms of land consolidation, given its limited administrative requirement. This makes it furthermore one of the quickest, cheapest as well as least intrusive form of land consolidation. Land exchanges in most jurisdictions do not require a specific legislative backing as it takes the form of a normal market transaction. Since the size and shape of the parcels hardly changes, the largest share of the costs incurred are the professional fees of the surveyors and notaries, as well as the conveyancing and registration fees, all of which vary from country to country. Though this approach reflects a simple transaction, it may be attractive to landowners and users via special provisions and incentives, such as by providing a waiver of conveyancing or registration fees or transfer taxes. Land exchange is therefore best suited for a small area and when there is little difference in the agronomic qualities.

Land exchange tends to rely, due to its simple, less intrusive, as well as speed and costs involved, on a voluntary approach of joining. The supervision of the land consolidation project is either arranged by the landowners and users together or by hiring an expert to guide the process (such as a real estate agent, surveyor or independent advisor). This process may generate the division or conversion of farmland or the swapping of parcels between a few farmers.

2.3 Voluntary land consolidation

The voluntary land consolidation is similar in nature as the voluntary land exchange, yet scale is usually larger, the approach more systematic and usually there is the guidance of the project by expert professionals. Given the larger area, the larger number of right holders, the possibility to include multiple objectives, and the need to execute some constructions, a land consolidation authority can be the main manager of the project. Right holders' participation is on a voluntary basis. This also means that the outcome to a large extent depends on the willingness of involved owners/users/right holders to participate and cooperate. Depending on the nature of the land consolidation agreement, if one of the right holders withdraws in a late stage of the project, it can influence the chain of proposed land exchanges. The willingness of participating right holders to contribute to the voluntary land consolidation determines to a large extent the outcome. Procedures should be backed by institutional rules (formal or informal – socially accepted – rules) that are clear to all parties involved prior to the start of the project. It is recommended to explain which procedure needs to be followed and what is expected from right holders regarding their participation. This includes for example, under which conditions and with which implications a participant can 'opt out', how and when their consent is needed, how the exchanged parcels are valued and which other financial arrangements apply.

Table 2.1: Characteristics of the four different forms of land consolidation

Type	Voluntary land exchange	Voluntary land consolidation	Majority-based land consolidation	Mandatory land consolidation
Description	A small number of right holders exchange land rights on a voluntary basis and at own initiative.	Land consolidation fully based on voluntary participation of right holders, but with a systematic approach.	Land consolidation based on consent of a majority (either in land or in numbers) of right holders, with a systematic approach.	Land consolidation based on a decision from a public authority, with a systematic approach and multiple aims.
Purpose	Private benefits – often related to improving conditions for agriculture.	Mostly agriculture (private benefits for holdings), sometimes combined with other – closely related – aims such as water management (irrigation/drainage/water bodies/retention basins), road and soil improvement.	Mostly agriculture in combination with a few public aims, such as water management, infrastructure.	A combination of public and private aims, such as nature conservation / restoration, water management, agriculture, rural development, infrastructure etc. Public aims tend to be dominant, hence the compulsory character.
Extent	Selected parcels and/or real estate from participating right holders.	Selected parcels from participating right holders.	All right holders and all parcels in the designated area are involved.	All right holders and all parcels in the designated area are involved.
Responsible entity	Individual right holders.	Individual right holders or third party, depending on the size of the area and number of right holders involved.	Third party (often a public entity). Right holders vote to decide on starting land consolidation project or to approve the reallocation plan.	Public party that holds decisive power and can approve the reallocation plan on behalf of the involved right holders.
Legal basis	Like a normal land transaction, although some countries do have legislation to distinguish it from a regular land transaction and to qualify for incentives (e.g. tax exemptions).	Like a normal land transaction, although some countries do have legislation to distinguish it from a regular land transaction and to qualify for incentives (e.g. tax exemptions) or ease the registration process.	Procedure rooted in formal rules and legislation.	Procedure rooted in formal rules and legislation. Safeguards for public participation and right holders involved.
Procedure	No specific procedure except for general rules that apply to all transactions.	No legally defined procedure. For sound project management and transparency, a simple procedure is often determined.	Procedure embedded in law. Majority needed either by number or by land.	Embedded in law. All land and right holders in delineated area are involved. Sufficient safeguards due to the compulsory nature.
Execution of works	No	No or limited amount of works	Yes	Yes
Results	Small-scale improvements	Small to medium-scale improvements, but results are highly variable due to the voluntary character and consequently the right of participants to withdraw.	Medium to large-scale improvements, but some uncertainties due to the voting system.	Substantial improvements at a large scale due to the fact that all parcels in the designated area are included.

2.4 Majority-based land consolidation

This form of land consolidation has many similarities with mandatory land consolidation (see section 2.5) except for the fact that the project right holders control and manage the project and can exert their voting right. Voting can take place at the start of a project and/or upon the publication of the reallocation plan. At these moments, right holders can vote respectively in favour or against starting a land consolidation project or they can approve the re-allotment plan. It is recommended to ensure that the voting procedure and land consolidation process is according to and adhering to legislation or regulations, so that decisions taken can be enforced. The voting system can be based on numbers, i.e. a qualified majority of right holders, or on the amount of land that right holders represent, i.e. the majority of land in the area, or a qualified majority of both, i.e. a double majority.

All right holders in the project area can be subject to the exchange of their rights. Since all land can be taken into consideration to optimize the allocation of land use types and land rights across space, it is eminently suitable when aiming for a multi-purpose approach of land development.

2.5 Mandatory land consolidation

Mandatory land consolidation is the most authoritative form of land consolidation since the decision to commence a project is taken by the government. All right holders in the project area are part of the project, although at the end not all right holders face the exchange of their land rights. This form is ideally suited for a multi-purpose approach, where alongside the land consolidation project one can take measures in line with sustainable development goals or and in line with interests of the public. Protected nature areas can be restored or enlarged, infrastructure can be improved, and facilities for outdoor recreation or social activities can be realised. A precondition for such investments is the availability of land to locate the facilities or services. Essentially, two options are open: (1) either the government acquires land upfront – by buying or land banking – or (2) a collective deduction is applied during the land consolidation process for which land right holders are financially compensated.

This form of land consolidation must be backed by legislation that underpins good governance principles, provides sufficient safeguards for all right holders and stakeholders involved, and holds the government accountable for the implementation. Transparency and participation are key principles to inform and engage right holders and stakeholders.

Just like majority-based land consolidation, mandatory land consolidation requires very strong safeguards for involved right holders to be in line with the principles of Voluntary Guidelines on the Governance of Responsible Tenure (CFS, 2012). These forms require reliable authorities, institutional framework, conforming to the principles of good governance, to ensure tenure rights.

2.6 Organising land consolidation

Similar as with the form of land consolidation, a land consolidation project organisation can vary (Figure 2.2). For voluntary land exchange with a few participants there is

no need for extensive support. Participating right holders can discuss and reallocate involved parcels themselves. If they prefer a third party to support them, it is often an agent familiar with the real estate and land market or surveyor. Regarding roles and responsibilities, the right holder are in charge of the project by approving the transaction.

When there is a larger number of participants in voluntary land consolidation, perhaps in combination with multiple aims, the situation becomes too complex to allocate the project management to the individual right holders. Project management has however a facilitating character and does not replace the authority of making decisions. The decision-making authority always remains with the participating right holders. This is to ensure the inclusion of their wishes, and to execute the proposed reallocation and the financial arrangements. Different supporting roles can be distinguished within a project management team. The chair is responsible for the overall project management, and can be assisted by a multidisciplinary team, which normally includes a surveyor – responsible for the reallocation process and securing land rights, an appraiser – responsible for valuation of the exchanged parcels, as well as and an agronomist – responsible for the agricultural aspect.

The last two forms of land consolidation, majority-based and compulsory, need a broader committee with both professionals and representatives of the various interests at stake. In addition to the three roles mentioned for voluntary land consolidation, it may include representatives from nature conservation organisations, the local government, farmers, water boards, heritage, or the like. The committee holds the responsibility to execute the project in compliance with formal rules and regulations and beyond. In some countries, the committee can sign the deed on behalf of the right holders to formalize the contract. The conditions for this are laid down in legislation. This shift in responsibilities from right holders to a project committee must ensure that the project can deliver the best possible results in terms of the pursued objectives. To protect the interest and rights of all right holders, the stakeholders and the public, sufficient safeguards should be built in the process. The committee is accountable to the govern-

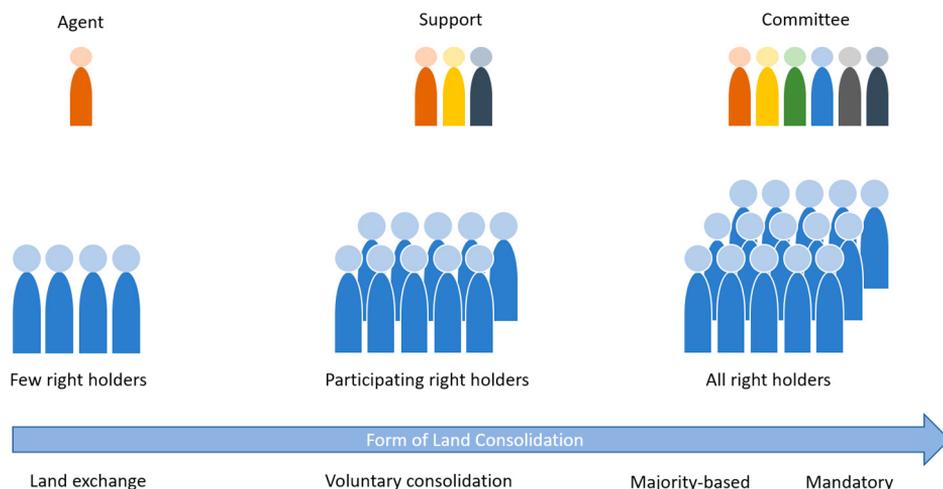


Figure 2.2: Organisation of various forms of land consolidation.

ment, the land consolidation programme entity, or another agency depending on how this is regulated in the governance structures.

In addition to the choice of project organisation, some countries have established a land consolidation programme. A programme typically requires a separate entity, e.g. a public institution, which can prioritize land consolidation projects based on policy, feasibility, available resources, and socio-economic and environmental needs. Land consolidation programmes can also be used to distribute the available resources and budgets. Though programmes can be established for all the forms of land consolidation, they are often established for the more coercive forms of land consolidation; majority-based and mandatory land consolidation.

2.7 General preconditions for land consolidation

As mentioned earlier, it is crucial to match the context and development objectives with the selected form of land consolidation. For all types of land consolidation, except for the voluntary land exchange, general preconditions apply.

If no reliable land administration exists, it should be considered whether this could be established in the initial phase of the project. Upon the finalization of the project, the output in the form of the re-allotment plan can deliver the updated and approved situation as is.

If many land rights are unclear, informal, missing or contested, it should be investigated whether these issues can be solved before starting the reallocation process. When this does not occur, the implementation of the land consolidation may suffer delay or complication and can even lead to loss of legitimate land rights, which is of course contrary to the original intentions. When right holders cannot be traced, there might be some options during the land consolidation process as well. Such land can join the allocation process by grouping the parcels together and lease them out to interested parties until the legitimate right holder is found or claims the right. Though in some cases, temporary representatives may be appointed to protect the rights of absent or unknown owners.

Without sufficient land available needed for the realisation of the objectives, it is recommended to postpone or cancel the project unless right holders are willing to sell land in the reallocation process of the project.

2.8 Other land policy instruments

Various other land policy instruments are in use to support similar objectives or purposes as land consolidation does. All these instruments can be used independent of land consolidation, although some are known to be employed in conjunction with land consolidation. Below are a few land policy instruments listed that are often mentioned in land consolidation literature, but according to our understanding are separate instruments.

Land Use Consolidation

Land use consolidation, though a form of land consolidation, does not fit within the sphere of the conventional land consolidation measures as described. Land use consol-

idation involves the unity of uses of contiguous parcels of land without the swapping of use or ownership rights among the land holders. Thus, only the land use as such is consolidated. It is worth noting that land use consolidation described here, is different from other forms of land consolidation with the same name, which rather seek swap the land use rights among land users, and not the users farming contiguous parcels as one, whilst keeping their ownership and/use rights intact. Much like the broader land consolidation measures, the application of land use consolidation ranges from a simple and single use to a more comprehensive and multipurpose land consolidation measure. However, due to its very nature of seeking to consolidate small individual land holdings into larger-scale farming operations, a voluntary approach is less than ideal, as holdouts manifest as pockets of land that hinder the operations. On the other hand, safeguards should be provided to prevent one person using the consolidated land. The benefits should be distributed equally over involved individual land holdings.

Land use consolidation has been touted as an approach that may suit a lot of Sub-Saharan African countries because it does not involve the swapping of land ownership and use rights. Though land mobility in the urban centres, as well as cash crop farming areas, is moderately high to allow the operations of a land market, in the less cosmopolitan rural area, land mobility is considerably lower outside the land-owning groups. This is due to the spiritual-psychic view of land based on the description of land ownership as “belonging to many who are dead, few who are living, and countless yet unborn”. With this in mind, most strive to keep lands even where they are not in the capacity to adequately exploit it. This has caused past attempts at land consolidation (based in the manipulation of land rights and swapping of land parcels) to fail. Two cases are most prominent in this regard – Malawi and Kenya.

In Malawi, land consolidation was attempted in the 1940s and the 1950s by the British colonial government. The process yielded promising results by 1959, with about 81,000ha of land consolidated, and each household receiving a consolidated land with an area equal to the total size of the pieces of land they had before. However, the programme collapsed in 1959, partly because of the view – with farmers returning to their previously held lands. In Kenya, where land consolidation was concentrated on the Kikuyu lands in the mid-1950s, resulted in the breakdown of the customary land tenure system, with several people never receiving their consolidated parcels. Hence land use consolidation can skirt the problem of low land mobility in land consolidation.

Rwanda’s Land Use Consolidation (LUC) has been described as a “home-grown” solution to the country’s peculiar problem of land fragmentation as well as food security goals. Rwanda remains the most densely populated country in the world, depending on agriculture as its main source of food, income, and living provisions. The dense population and agricultural dependence have increased the pressure exerted on the country’s farmlands which average 0.76ha. In 2006, the Government of Rwanda introduced a series of measures, including the LUC, meant to salvage the situation and provide the economic growth needed to fight against poverty and improve food security. As a result, three models of LUC were set up – the Facilitated Contract Farming, where a number of land owners could come to an agreement with a tenant who farms the land parcels together; the Cooperative Farming, where a number of cooperatives are established for the farmers to join voluntarily and merge their parcels to farm one selected crop; and the Farming Corporation, in which farmers join with investors in an arrangement where the later may contribute money in lieu of land to join the scheme, with the farmers and the investors alike being shareholders in the Land Consolidation Scheme.

Cooperatives

Similar to land use consolidation, farmers or other stakeholders can join efforts and create a cooperative by pooling land in the field to scale up activities, increase efficiency and hence maximise economic benefits. Cooperatives can take many forms, like land consolidation, and may refer to physically merging parcels in the field without altering the underlying distribution of land rights, to working the land together as to create larger entities, to creating a separate business entity where right holders can take a share in accordance with their land rights. There are also marketing cooperatives where land is farmed individually but the produce is marketed and sold jointly. Land consolidation and the establishment of cooperatives can also be combined, e.g. by first consolidating the land so that the landowners interested in joining a cooperative have their land consolidated next to each other.

Land Banking

Land banking means that a government agency can buy land and temporarily hold it into custody – perhaps temporary lease it to interested third parties – until it can be deployed in projects to optimise the spatial arrangement of land rights and its land use. This is particularly important when the land mobility is low in the project area (Hartvigsen, 2014b). Sufficient financial resources are needed since investments come before the benefits. Nevertheless, it can play an important role to ease land consolidation, particularly if land is needed to realise public facilities or services. Many countries in Western Europe including Germany, the Netherlands, Denmark, Portugal and Spain apply land banking instruments in combination with and support of the land consolidation programmes. In this way the land mobility is increased in the project area and better results can be achieved (FAO, 2022).

Expropriation

Expropriation (also referred to by the terms eminent domain or compulsory purchase) is a way to acquire land needed for public purposes against the market value. Expropriation can be employed, and is often done so, without land consolidation for example for construction of infrastructure. Some countries, however, have legislation to combine or use the instruments of expropriation and land consolidation in conjunction. Expropriation in combination with land consolidation can offer land as compensation – instead of a financial compensation – and allows for mitigation of the negative effects of expropriation for the agricultural holding. Expropriation without land consolidation often entails solely a financial compensation for the loss of land rights and – in some countries – any other losses imposed by the expropriation.

Pre-emption rights to the public

In the public interest, pre-emption rights can be imposed on land to be sure that the land is offered first to the government upon alienation. The government has the possibility to buy the land for the market value like a normal transaction. If the government does not want the land, then the land comes available on the land market without any restrictions. There are also private pre-emption rights established by agreement between the parties.

Other land related incentives

In some regions land is left abandoned, which might be beneficial for environmental values but is often less so from a socio-economic perspective. Therefore, some countries have developed rules or regulations to deal with abandoned parcels. Incentives seek to keep the land used by other people than the legitimate right holder, so that it does not hamper socio-economic development. Abandoned land may also be bought by a government agency for land banking.

Financial incentives may also lead to a more active land market, which enables – or rules out barriers – stakeholders to optimise their land position at own initiative.

3 PUBLIC PARTICIPATION

Authors: Anka Lisec, Marije Louwsma, Wioleta Krupowicz

3.1 Introduction to public participation

Participation is a prominent feature in many planning and decision-making processes. Among its proclaimed benefits is its potential to strengthen public support and involvement. Participation unavoidably involves (i) decisions about who should be involved and about the space for negotiation, (ii) about the issue at stake, and (iii) expectations about what the outcome of participation should be and how the participants are expected to behave (Turnhout et al., 2010). The degree of public involvement in spatial planning is most often illustrated by Arnstein's metaphor of a "ladder of citizen participation" (Arnstein, 1969), where she distinguished eight levels of public participation ranked according to the power given to the people, i.e. from "*non-participation*" to "citizen control". Shared decision-making is the highest level of public participation due to the full partnership between the authorities and citizens, which consists in transferring to the society some competences (but also responsibilities) concerning the actions and decisions taken. Thus, citizens have a real impact on decisions, which (directly or indirectly) concern them. The analysis of trends in European policies (such as Collective Awareness Platforms for Sustainability and Social Innovation (CAPS) projects) has revealed that active contribution of citizens to the decision-making process is both desirable and important. Public participation is essential in spatial planning as it is regarded as a good way to engage citizens and facilitate an open dialogue between citizens and spatial planners, who are often part of governmental bodies responsible for spatial planning.

Like spatial planning, land consolidation's complex and dynamic nature requires flexible and transparent decision-making that embraces a diversity of knowledge and values (Veršinskas et al., 2020). In the past, the so-called "top-down approach", where land consolidation projects were often enforced, where the landowners' involvement in decision-making was limited and where projects were paired with several negative impacts, caused a negative connotation of citizens to this essential rural development instrument. The active participation of landowners and other relevant stakeholders in land consolidation process obtained an essential place among rural policy instruments in Western Europe since the 1970s, and later on, since the 1990s additionally in CEE countries and beyond (Bullard, 2007; Hartvigsen, 2014a; Lisec et al., 2014; Thomas, 2011). This refers not only to the prominence of public participation, but the context of land consolidation has also changed significantly in these last decades (Haldrup, 2015; Hartvigsen, 2014a; Janus and Markuszewska, 2017; Pašakarnis and Maliene, 2010; van Dijk, 2003; Vitikainen, 2004). Besides the efforts aimed at making agriculture and forestry more competitive through a comprehensive reallocation process, improvement of roads (Krupowicz et al., 2017) and drainage networks (Stańczuk-Gałwiaczek et al., 2018), landscaping (Gu et al., 2008; Kupidura et al., 2014; Wilkowski and Puńcka, 2002), environmental management (Guo et al., 2020; Wójcik-Leń et al., 2018) and conservation projects (Lisec et al., 2005), other measures may be implemented as well through contemporary land consolidation. The role which land consolidation can play in sustainable rural development clearly originates from international legal acts and documents that define its respective goals and principles, such as the 2030 Agenda (UN, 2015) and

Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests – VGGT (FAO, 2012). Sustainability should be ensured both at the project and land consolidation programme level.

It is therefore clear that nowadays not only registered landowners and right holders should decide on the directions of development of rural areas where various economic, environmental, habitat or recreation and leisure-related interests collide, but also other persons and entities, such as local interest groups, farmers’ and women’s organisations, local governance bodies and specialised organisations can contribute and benefit. Ensuring inclusiveness in project consultation and participation is very important so that different rights and interests are safeguarded and represented by guaranteeing equal rights of women and men and gender equality (FAO, 2013; FAO 2018; see also CFS, 2012: VGGT – Paragraph 3B.4). One of the solutions promoting gender equality may be fixing minimum thresholds of the percentage of representatives of both genders that should be elected to bodies, of right holders, etc. (Veršinskas et al., 2020). For all these reasons, public participation in land consolidation decision-making has been increasingly sought and embedded in professional agendas and national policies.

3.2 The various natures of public participation

In the context of land consolidation, public participation has been frequently used for informing citizens and during public hearings at which the public comments on what the institutions propose could be voiced. The experiences in land consolidation have shown us that the participatory approach goes beyond this minimum standard. Public participation is a process which consists of a series of appropriate activities and actions over the full lifespan of a land consolidation project to inform, collect input from, and collaborate with the public (Figure 3.1).

The extent to which public participation in land consolidation is subject to rules and regulation varies from country to country and from project to project. In addition to participation required by land consolidation or related law, other non-statutory participatory techniques are also recommended. Departure from the statutory minimum,

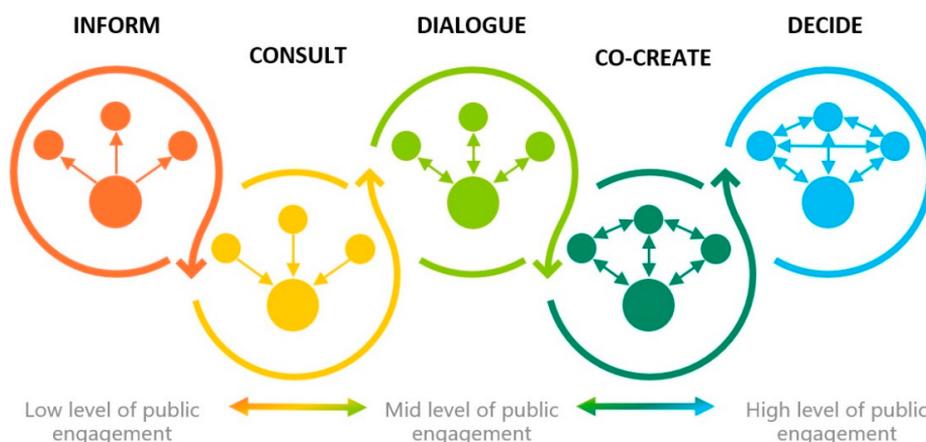


Figure 3.1: *The public participation spectrum.*
(Partly adopted from TompkinsCountyNY, 2020)

transitioning to a model of action based on genuine dialogue and participation seems to be the right direction for land consolidation. Such a direction enables the growth of social capital. If participants experience real interaction and exchange of values, interests and experiences, the level of their involvement increases (see also Public Participation in Europe, 2009; ECNL, 2016) and their sense of local identity and belonging becomes stronger (Krupowicz et al., 2020).

There are many tools available for public participation in land consolidation, which each offer the possibility of revealing different views, getting to know the local context, identifying potential conflicts, and supporting decision-making. Each of the tools derives data which can be applied for different purposes and allows the achievement of different goals, such as diagnosis of needs, exchange of knowledge and experience, problem-solving, decision-making, creating action plans, creating innovative solutions, project appraisal, conflict resolution, education. Comprehensive participation usually requires the use of several elicitation and analysis techniques. As emphasised already by Arnstein (1969), public participation is a spectrum, ranging from non-participation and low levels of engagement, e.g. informing the public, to high levels of engagement, e.g. collaborating with stakeholders on a decision. The appropriate choice of tools to employ depends on public engagement’s targeted level (Table 3.1). Other variables relate to the type of stakeholders, the form, and the phase of the land consolidation project (Table 3.2).

Table 3.1: Levels of public engagement, participation spectrum and toolkit.

Level of public engagement	Public participation spectrum	Toolkit – examples
Low level	Informing	Community education, peer-to-peer learning, websites, social media, printed materials, announcements, walk-in sessions, public meetings etc.
	Consulting	Questionnaire, open debate
Mid-level	Dialogue	individual or group meetings, interviews, public hearings
	Co-creating	Workshops, focus groups, study circles
	Decision-making	Negotiations, consensus workshops, voting, advisory boards
High level		

Besides the tools, it is important to identify the range of stakeholder perspectives that should be involved in the project, including who might be impacted, the various interests at stake, and what considerations they bring to the process in a particular phase.

3.3 Participatory techniques in land consolidation

Many different participation techniques are available, but to be fruitful, it is essential to consider which participation technique suits the situation and fits the legislative framework. Figure 3.2 provides an overview of techniques known from land consolidation practices across the world. The colour lines showcase some examples of the combined technique, means, level and form of participation. Technological development and social changes have brought new forms and practices of public participation that prom-

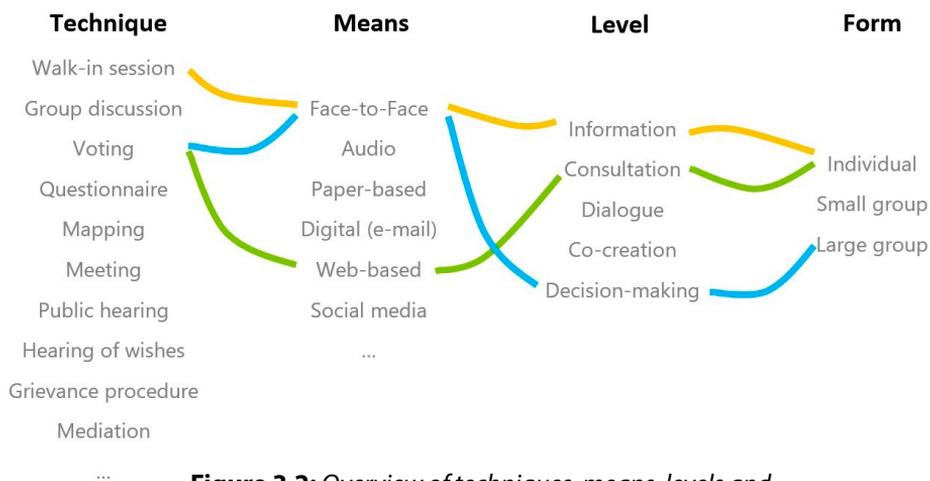


Figure 3.2: Overview of techniques, means, levels and forms of public participation in land consolidation.

ise to elevate the public discourse while providing an interactive, networked environment for participatory decision-making (Brown and Kyttä, 2014).

In addition to selecting an appropriate technique, other aspects, such as the selected means of communication (face-to-face, paper-based, or digital), the level of participation (informative, consultative or decisive) and the form (individual or group) can play a role as well. The configuration of all four aspects together shapes the public participation toolkit. In some situations, for example at the start of an initiative, it is good practice to organise a public meeting where a plenary introduction is given to all interested stakeholder groups and questions can be addressed. Whereas during the implementation phase, it would be more suitable, for example, to inform individual stakeholders in a face-to-face meeting concerning the individual impact of the reallocation and the financial consequences. One of the techniques is a group discussion, which consists of regular meetings of a working group of about ten persons, and a professionally moderated dialogue (Pijanowski and Zedler, 2015). The outcome of the group discussion is recommendations and solutions to a given issue related to rural development such as nature and landscape protection, cultural heritage, village renewal, agricultural infrastructure and agriculture. This is particularly valuable at the beginning of a land consolidation project (analysis or planning phase). Both the current status (“how it is”) and the desired status (“how it should be”) must be analysed. The diagnosed problems at this stage help to define the topics for action areas, with the moderator’s help, and then (if possible) to derive and formulate solutions to attain the desired objective. The results should be shared at meetings of the local community, during which they should be presented and put under discussion. It is a vital step for the transparency of the entire process (FAO, 2012: VGGT – Paragraph 3B.8).

Various combinations of techniques, means, levels and forms should be employed to ensure an inclusive, participatory process. Digital or online means, for example, may exclude stakeholder groups from participation due to lacking internet connection or digital devices. On the other hand, it has also been experienced that employing online tools increased online participation by a different group of stakeholders than by employing traditional communication means. All in all, the technique, chosen to fa-

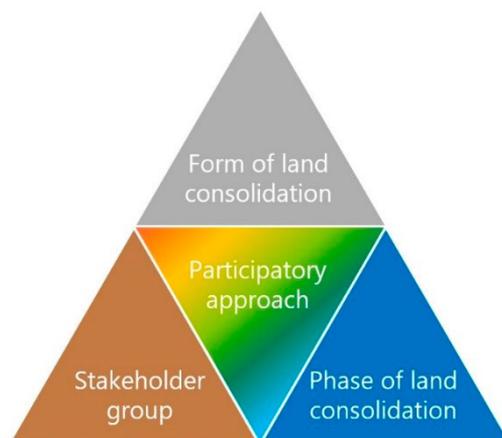


Figure 3.3: Three aspects influencing the participatory approach in land consolidation: the form, phase and stakeholder group.

Facilitate participation, is also shaped by the selected communication means, the aimed level of participation it facilitates, and the chosen form to engage stakeholders. Some techniques allow for more configurations than others. For example, a meeting can take place in many different configurations, ranging from a private face to face meeting to an open public meeting.

These deliberations show that a wide variety of combinations is possible, depending on the need and situation. In general, the participatory approach, i.e. the selected combination of participatory tools throughout the land consolidation project, is influenced by the form of land consolidation, the phase a project is in and the addressed stakeholder group (Figure 3.3).

The next sections elaborate considerations regarding participatory approaches with regard to the form (Figure 2.2) and the phases (Figure 1.1) of land consolidation.

3.4 Participation and form of land consolidation

The level of public engagement depends on the form of land consolidation, where the public's potential influence should be the primary consideration in designing participatory processes (Table 3.2).

Table 3.2: Land consolidation form and level of public engagement.

Land Consolidation form	Level of public engagement	Decision-making criteria
Voluntary land exchange	High level	100% consensus
Voluntary land consolidation	High level	100% consensus
Majority-based land consolidation	Mid to high-level	Majority consensus
Mandatory land consolidation	Low to mid-level	Formal decision, no consensus needed

When land consolidation involves all land right holders in a delimited area, and when those rights constitute the pool of redistribution rights, then there is not automatically

a process whereby all those land rights are exchanged. The requirement is that sufficient safeguards must be provided to all who are involved. Consequently, participation techniques should provide adequate and authoritative safeguards to ensure that all right holders are not negatively affected by or during the land consolidation process. Ultimately, each of the affected parties should at least maintain their current benefit or become better positioned. A more formal form of land consolidation is often safeguarded by supportive legislation to ensure a legitimate, fair, transparent, and inclusive process. Regulations regarding participation may entail the publication and public inspection of essential decisions, including the underlying documents.

In a land consolidation project where land right holders partake voluntarily, participation takes shape differently as ultimately, each right holder can withdraw at any moment until the exchange has been formalised. As the reallocation of land rights has a strong interdependent character, a late withdrawal of one participant affects other participants immediately. The withdrawal may lead to an alternative allocation plan at best or might even be cancelled at all. Therefore, it is still recommended to agree on the procedure and set some 'rules of the game' to align expectations and a professional attitude of all involved. It is therefore also recommended to assign an independent third party in case of the need for mediation or a second opinion. Participation in voluntary projects may be organised around a facilitator that talks individually to each participant or at the other end of the spectrum may be facilitated in a way that all participants together design (co-creation) the reallocation plan (Louwsma et al., 2014).

At three significant moments, a public review/inspection is organised:

- (1) the publication of the land use plan,
- (2) the publication of the reallocation plan and
- (3) the list of financial settlements.

Each publication is followed by a period for public inspection for six weeks. All involved stakeholders, of which the land right holders are the largest group, have the right to object and appeal. In legislation, it is regulated that each land right holder must be informed by a registered letter. Since not all addresses are known or up to date, there is an additional regulation that the public inspection must be announced in the local newspaper as well. The reason to organise a public review is rooted in need for transparency. It is necessary to provide stakeholders with the possibility to verify the work executed by the responsible authority. Any mistakes, errors or omissions can be checked and resolved. As such, it is a powerful safeguard that fits a more formal land consolidation form better than a project on an entirely voluntary basis.

Box 3.1: *Public inspection in the Netherlands.*

3.5 Participation and phase of land consolidation

How participation takes shape and who is involved, is related to the land consolidation phase. In preparation of a possible land consolidation project, a consultation with a broader group of stakeholders is recommended to seek opinions regarding the objectives and the willingness to employ land consolidation. This may include a dialogue with government agencies, private investors or holdings, interest groups, individual land right holders, local committees etc.

When a project starts, one narrows down the targeted stakeholder groups for participation to those involved, of which land right holders obviously are the largest group of stakeholders. It is the land right holders who are directly affected by any change in the allocation of land rights or the execution of engineering works. Therefore, there should be a minimum level of participation to balance the individual impact on land right holders against efforts and safeguards to ensure participation.

Participation in the implementation phase can furthermore be used to verify the current land administration and mapping of parcel boundaries. As a legacy of the past, not all land administration systems are up to date, reliable, or complete. Organising a public inspection of the existing registered rights at the start of the implementation of a project can give land right holders the possibility to claim or confirm their rights. At this point in time, additional concerns can be tackled upfront.

As defined in Chapter 1, land consolidation projects have three phases. Depending on the phase (Figure 1.1), various levels within the public participation spectrum are used depending on the purpose of participation (Table 3.3).

Table 3.3: *Land consolidation phase and participation spectrum.*

Land Consolidation phase	Public participation spectrum	Stakeholder group
Analytical	Inform	General public, stakeholder groups, right holders
	Consult	General public, stakeholder groups, right holders
Planning	Dialogue	General public, stakeholder groups, right holders
	Co-create	Stakeholder groups, right holders
Implementation	Consult	Primarily right holders
	Dialogue	Primarily right holders
	Co-create	Primarily right holders
	Decision-making	Primarily right holders

3.6 Participation and stakeholder group

The type of stakeholder group determines which participation tools are appropriate (Table 3.4). Right holders are directly affected by land consolidation. Therefore, land consolidator actors should involve this group of stakeholders on a personal level, besides including and informing them during general meetings. Apart from the general information, which is relevant to all stakeholder groups, right holders must have the right to be involved at the individual level due to their right for privacy. On the other hand, there is always a dependency with other right holders as it is about the exchange of land rights. So, if one right holder does not prefer a particular solution, it affects the possibilities for others. Therefore, it is crucial to balance the right for the privacy of individual right holders with the right for transparency of the entire consolidation process.

Another aspect of participation is that more generic means can be used to inform or consult the general public. Their interests are not necessarily affecting personal interests, but land consolidation processes may address more generic concerns in relation to sustainable development, which obviously affects society beyond the interest of individual right holders. This typically relates to the objectives of a land consolidation project and the location of the foreseen public facilities and services.

Table 3.4: Stakeholder group and public participation spectrum.

Stakeholder group	Public participation spectrum	Tool (examples)
General public	Inform	Public announcements, website
	Consult	Public meetings or online hearings
Stakeholders	Inform	Public announcements, website
	Consult	Public meetings or online hearings, individual contact
	Dialogue	Workshop, individual meetings
Right holders	Inform	Newsletter, public and personal announcements, website, app
	Consult	Public meetings or online hearings, individual contact
	Dialogue	Hearing of wishes, grievance mechanisms, mediation, public and individual meetings
	Co-create	Designing reallocation plan
	Decision-making	Voting, advisory board, representatives committee

In Bavaria, the body that helps to coordinate the implementation of rural development plans and investments is the Community of Participants which is created automatically when a decision on initiation of land consolidation procedure takes effect. The community is a body governed by public law (for the duration of the proceedings) consisting of all landowners and their heirs in the area subject to the proceedings. The Board of the Community is made up of the most active inhabitants (5–9 persons) – mainly the participants of working groups preparing the project. Its competencies cover the full public participation spectrum. The Board is in charge not only of the financial side of the consolidation procedure but also of informing the stakeholders of the progress of works, co-creating the plan, financing and construction of road, drainage and irrigation networks, land valuation, collection of fees from the participants, decision-making as regards the general project together with regulating legal relationships, dialogue, and mediation during appeal proceedings. Its activity ends when the consolidation process is completed, and all outstanding commitments are cleared.

The process of land consolidation in Poland is implemented with the participation of the Consolidation Council, consisting of 3–12 persons, appointed, and dismissed by consolidation participants (who include owners, owner-like possessors, administrators and users of land located in the consolidation area). The Consolidation Council is elected at the meeting of consolidation participants which is convened by the district governor after the consolidation procedure is initiated. Unlike the Community of Participants in Bavaria, the Council acts only as a consultation body to the surveyor, the planner, and the district governor – it examines the objections submitted to the land valuation and provides consultation on objections to the plan raised by the participants. The Council's operations end with the completion of consolidation procedure. The role of the Consolidation Council is more passive and considerably smaller than that of the Bavarian Community of Participants. The important role belongs to the consolidation participants who adopt the principles of land valuation to correctly determine the value of land and then take part in the dialogue as to the future location of their parcels based on the new road network.

Box 3.2: Bavarian and Polish nature of public participation.

3.7 Considerations

Participatory land consolidation has clear advantages over traditional (top-down, state-driven) approaches. The first advantage is that local contextual knowledge can be accompanied by system-focused knowledge and methodologies to overcome the cognitive processing of complex challenges. Secondly, the participatory process contributes to the participants' understanding of land consolidation objectives and can, therefore, be readily translated into improved actions and decisions among planners, decision-makers, right holders, and other relevant stakeholders. The third benefit is that participants are more likely to understand the local context and promote land consolidation in the long term, beyond the initial participatory processes (Hassenforder et al., 2015). There are many approaches and techniques known to public participation in land consolidation, where various tools can be used for decision-making. Still, the focus should be given on participation as a process. It is essential that public participation is underpinned by a philosophy that emphasises empowerment, equity, trust, and learning.

Although there are many acclaimed arguments favouring active public participation in land consolidation, at the same time disillusionment amongst land consolidation practitioners and stakeholders is not uncommon, claiming that they felt let down, and left with unaddressed claims. It is indeed true that not all needs and wishes can be awarded when it comes to having to balance contrasting or conflicting interests in space. To overcome such inherent optimization limitations, public participation must be institutionalised, creating organisational cultures that can facilitate processes where goals are negotiated, and outcomes are necessarily uncertain. In this light, participatory processes may seem very risky, but there is growing evidence that if well designed, these perceived risks may be well worth taking (see also Reed, 2008). The institutional framework, i.e. legislation, has to define who, when and how should be involved, and the rules for decision-making. The minimum standard of public participation within a land consolidation process refers to safeguard principles to guarantee legal certainty for those land right holders involved and directly affected. However, the target audience, the power to influence the decisions, and consequently, techniques used for communication and decision-making vary concerning the form of land consolidation (see Chapter 2) and the land consolidation phase.

Based on good practices, public participation should be considered as early as possible and throughout the process, representing relevant stakeholders systematically. The process of public participation needs to have clear objectives and should be supported by highly skilled facilitation.

4 VALUATION

Authors: Marije Louwsma, Niels Otto Haldrup

4.1 Introduction

The exchange of land rights requires the valuation of the exchanged land as to settle any differences in value between the right holders. Valuation is understood as the process to determine the estimated value of land in land consolidation. It is one of the key principles to guarantee a fair and inclusive process upon the reallocation of land rights. The valuation process must determine the value of land and other assets in a transparent manner and must lead to fair and accurate values for, and acknowledged by, involved right holders.

Various valuation methodologies in land consolidation exist, from individual appraisal of parcels to systematic mass valuation. In some countries, the principles, process, procedure of valuation are embedded in legislation, whereas in others the procedure and methodology are decided by involved stakeholders. This chapter provides a background in valuation and valuation methods relevant for land consolidation and describes some examples. The last part of this chapter reflects on additional relevant aspects of valuation for land consolidation, such as assessing the effect of improvements in the field on the value of land, and the individual improvement of holdings after land consolidation – often referred to as evaluation.

4.2 Approaches and methodologies

The two most principal approaches in valuation constitute the relative value approach and the market-based approach.

The *relative value approach* classifies parcels in levels of value reflecting their respective productive capacity for agriculture or other land uses. This includes the type of soils, the soil quality, the situation of drainage, possibility of irrigation, crop rotation scheme and type of landscape among many other features that collectively determine the productive value. Land of comparable quality or relative value is classified into the same class. The result of this classification process is a map (or geodatabase) visualizing (or listing) the classified relative values for each parcel. The principle is similar to a banded property valuation system, where properties with similar values are grouped into classes or bands based on their relative value associated with different land uses and their aspects (FIG, 2016). The relative value can be based for example on agronomic production factors of the land (Versinkas et al., 2020; Tezcan et al., 2020; Demetriou, 2016) or people's perception and understanding of land value (Asiama et al., 2018). The latter can be relevant in a situation with little information available due to a deficient land market. Figure 4.1 and 4.2 both show a land valuation map based on relative values for respectively a land consolidation project in Bosnia-Herzegovina and the Netherlands. It shows that the level of detail varies, both spatially and thematically (number of classes).

The *market-based approach* aims to reflect the discrete monetary value of parcels based on the estimated market value. This approach requires a mature land market, where sufficient land transactions take place to provide sufficient information about current land prices.

The whole valuation process poses challenges regarding the availability of information. Sufficient information must be available to determine the relative value or the market value. Without reliable information about either the indicators determining the relative value or the up-to-date market prices, it is difficult to set up a robust valuation system for land consolidation. For the market-based approach, it must be possible to assess whether the land transactions in the region are suitable to act as a reference for the valuation process in land consolidation. Some countries have high quality and up to date information available, which enables a high-end valuation methodology. However, sometimes it is required to acquire additional information, based on observations or measurements in the field. Typical data needed for land valuation in land consolidation consist of soil maps, groundwater level, topography, land cover, land use, regulations or restrictions, cultural heritage, elevation, landscape features etc. Apart from valuation of land, it is sometimes needed to assess the value of buildings as well, e.g. in the case of farm relocation or modernization, either for residential or agricultural purposes. For the valuation of buildings other information is often required, such as the size, volume, location, character, use, state, maintenance level etc.

The relative value and market-based approach are either employed based on mass appraisal or on individual appraisal. Mass appraisal of parcel values can be applied both

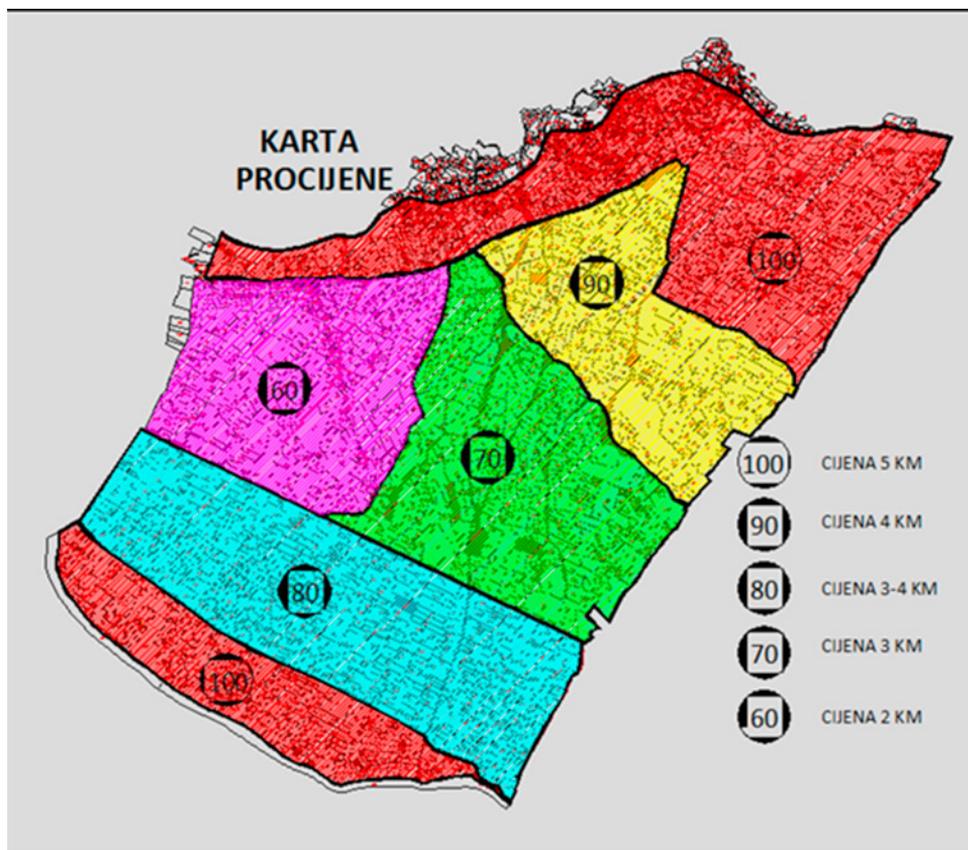


Figure 4.1: Valuation map with relative values – prepared for the FAO land consolidation pilot project in Dracevo Village, Bosnia and Herzegovina (TCP/BIH/3402). The best land gains a relative value of 100, the second-best 90 etc.

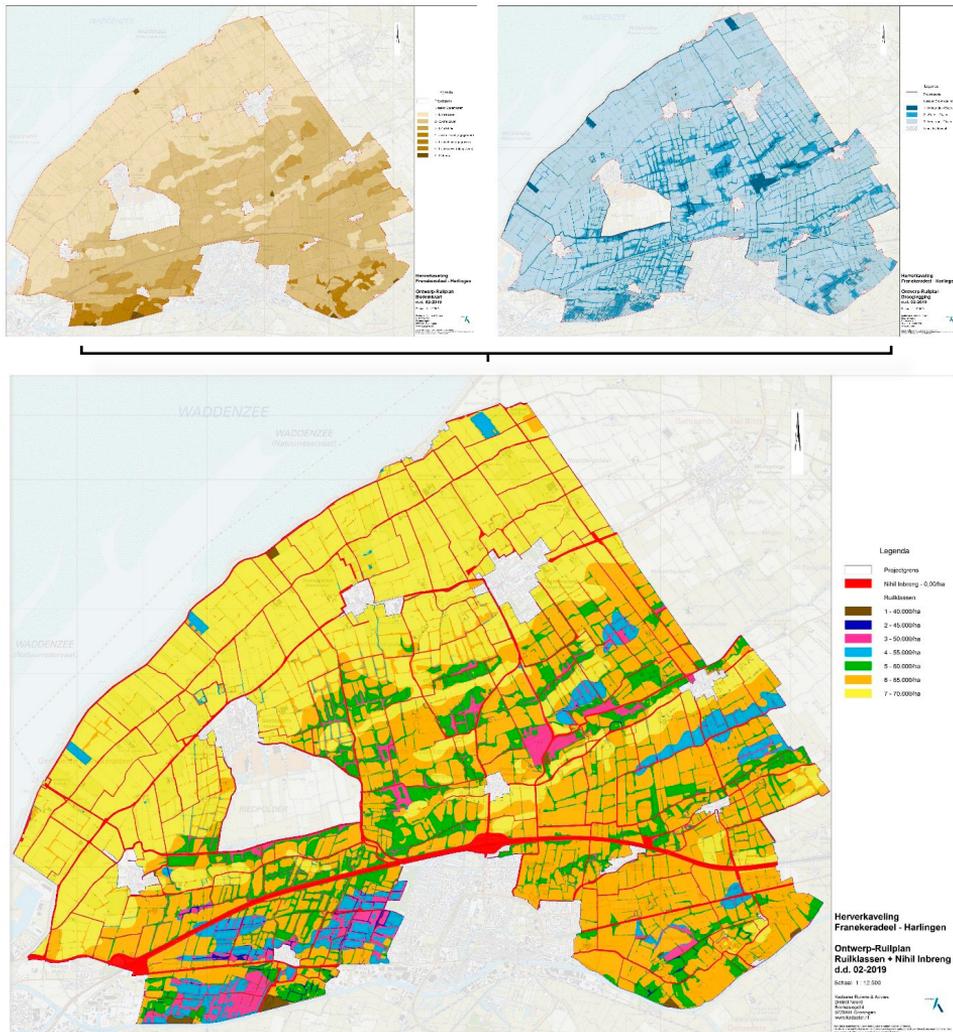


Figure 4.2: Valuation map, based on soil (upper left) and groundwater level (upper right) maps, with relative values for project Franekeradeel – Harlingen in the Netherlands.
(Source: Reydon and Louwsma, 2021)

for the relative value approach and the market-based approach. Precondition for mass appraisal techniques is again the availability of sufficient and qualitative data about the land market, particularly regarding land transactions, prices, and parcel characteristics. With sufficient representative data available, it is possible to apply mass appraisal techniques to determine the relative or market value. In a GIS system mass appraisal can be semi-automated or automated by calculating parcel values, based on a set of selected land valuation factors or indicators (Demetriou, 2018).

The individual appraisal is based on an individual assessment of parcels. It can be systematically applied to all parcels involved in a land consolidation project or solely to the reallocated or exchanged parcels. Valuation takes most often place through a qualitative assessment by experts in relation to the features of the parcel. In these cases, it

In the Netherlands market prices for agricultural land are monitored and published regularly. Based on transactions of agricultural land, which are registered in the national cadastral register, the average prices per region and per quarter are determined. This monitoring is a cooperation between private, public, and academic parties, and fulfils various functions regarding the issuing of mortgages, lease prices, and overall indicates trends on the agricultural land market (ASR Real Estate, 2020).

In Denmark the agency “Finansiel stabilitet” regularly publishes price levels per hectare for various regions. These are messages to the banks on ceilings for lending, thereby indicating the prospects for lending to potential buyers of land. This is to avoid excessive lending as happened up to the financial crisis in 2008.

Box 4.1: *Monitoring agricultural land prices.*

can be converted into an estimated market value of the parcel. This method is very similar to a pre-valuation to determine the price for a parcel which is offered for sale on the land market.

In some countries, aspects of mass appraisal and individual appraisal are combined. In Cyprus, for example, the market is defined through an empirical process based on visual inspection of all parcels and hence it constitutes a type of mass land appraisal (Demetriou, 2016).

4.3 Valuation and form of land consolidation

How to use valuation and which method to choose depends among others on the type of land consolidation. Valuation may serve different roles based on the form of land consolidation. Apart from the financial arrangements to be made, the valuation can also guide individual decisions by right holders in a voluntary approach. An involved landowner weighs and assesses proposals for exchange based on the value of the land and its financial consequences, in addition to other aspects such as location, accessibility, physical characteristics or use restrictions.

In majority-based and mandatory forms of land consolidation, valuation is essential to guarantee that right holders receive an equivalent size and quality of land (the ‘at least as well off’ principle) by keeping track of the value of exchanged land before and after values of involved land. As such, valuation plays an important role in the reallocation process as well as in determining the financial arrangements between right holders to compensate for differences in size or quality of the land, which is reflected in the value.

A majority-based and a mandatory land consolidation typically use the method of relative value of land, since re-allotment planning aims to ensure that landowners are allocated parcels of an equivalent value, quality or size compared to the situation before reallocation. Both forms of land consolidation usually have legal regulations for under and over allocation as well as a deduction of a few percent for implementation of public facilities. However, to facilitate enlargement of farms, voluntary sales-purchase agreements can also be facilitated in the reallocation process. In such a situation, the relative value can be converted to a monetary value reflecting the market value. This approach may consist of two steps. First, the relative values derive from the agronomic

All market transactions in a set period in the area (3–5 years) will be collected before a reallocation starts. Any outliers, for example due to family transactions, is checked and if necessary, eliminated from the set of transactions. The cleaned set of transactions are used to calculate the average price per hectare and the price range between the highest and lowest values, which functions as reference for the relative land value. The average value relates to the average class (always use an uneven number of classes), the highest price relates to the class with the highest relative value, and the lowest price relates to the class with the lowest relative value.

<i>Market transactions (EUR/ha)</i>		<i>Class relative value (EUR/ha)</i>	
Lowest price	€ 41,000	1	€ 40,000
Average price	€ 55,000	2	€ 45,000
Highest price	€ 72,000	3	€ 50,000
		4	€ 55,000
		5	€ 60,000
Price interval between classes must be equal: 5,000 EUR/ha.		6	€ 65,000
		7	€ 70,000

Box 4.2: *Converting relative values to market prices – example Netherlands.*
(Source: Kadaster)

productivity or other agreed relative assets. Second, these relative values are related to actual market prices for agricultural land based on comparable land transactions in the region that act as reference. The result can be a map with the relative values, which can be linked to the market prices for agricultural land in the area. Land, which is not agricultural land, can be appraised differently, namely in relation to its land use. In the Netherlands for example, the value of nature and forest land gets a fixed value of about 10.000 Euro/hectare, and infrastructure is set on 0 Euro/hectare. Typically, these lands are not exchanged, and if so, it often involves government agencies since these land uses hold a public function.

In voluntary land consolidation projects, the valuation supports the negotiations between landowners in reaching decisions on what to sell or buy. Market-based monetary values provide information for involved landowners to assess the affordability before they decide on signing a binding agreement on some combination of exchange, sale, and purchase. Essentially, a voluntary land consolidation consists of buying and selling land, and the value of properties need not necessarily be the same before and after. Some owners may sell more than they buy or just sell, and others buy more than they sell – dependent on what they can agree on and what they can afford. This facilitates a change of the property structure. Those planning to enlarge their holding must secure the financing, and those willing to net sell need to evaluate the financial consequence too.

4.4 How to organize valuation

The valuation process needs a combination of expert knowledge and local knowledge. In most countries the responsible authority organizes the process of valuation and mobilizes the needed expertise, which is mostly a combination of representatives of the



Figure 4.3: *Land valuation team in the Danish land consolidation project “Ribe Bjerreskov” (March 2016): The land consolidation planner in the middle, one local agronomist and three of the elected Committee of Stakeholders ©Niels Otto Haldrup*

right holders, land valuers and one or more agricultural experts guided by the land consolidation planner or surveyor. In some countries these experts are officially installed as a sub-commission responsible for valuation. Sometimes other property than land needs to be valued, such as irrigation systems, buildings, perennial vegetation (e.g. forest or orchard) or water wells. In such cases, it is advised to delegate the valuation to a specialized appraiser with knowledge in the respective field. The roles and responsibilities in valuation can be part of the legal framework for land consolidation.

The different organizational setup for valuation in various countries reflect that they have developed each their way to cope with the knowledge requirements. Apart from experts, such as professional appraisers and surveyors, most countries also draw on local knowledge by involving the landowners actively in the valuation. Working on and living from the land, landowners and users have detailed knowledge about the characteristics of the land, often with more detail than standardized data can reveal.

In Finland, valuation is carried out by a surveying engineer and two trustees, typically representatives from the municipalities. In Lithuania, the land consolidation planner is responsible for the valuation process, but the work is carried out by a qualified property valuer, employed or sub-contracted by the land consolidation planner. In Serbia, valuation is carried out by a sub-commission comprised of an agricultural engineer responsible for land valuation and land classification and, at least two representatives of the landowners participating in the land consolidation project. In Türkiye, it is performed by three representatives of the Ministry of Agriculture and Forestry, one person representing the landowners and one representing the head of the village or town, five in total.

The different approaches to valuation serve to protect all ownership rights and provide an objective basis to ensure fairness by following the ‘at least as well off’ principle. In the majority-based land consolidation all landowners participate until the land consoli-

dation plan is adopted regardless of whether they have voted in favour or against the project. Therefore, the productive capacity of the land is a crucial parameter, because it influences and changes specific features, such as existing accessibility, shape and size of parcels. The valuation provides the basis for the detailed re-allotment planning, so each owner comes out with at least as valuable land as they had before.

The 'at least as well off' principle from VGGT is observed differently in a voluntary land consolidation. Here, the task of the surveyor is to ensure that each owner achieves a possible solution that matches his or her preferences, that the owner is fully aware of the consequences and meets the pre-conditions. For example, a farmer who considers selling land or the whole farm in the land consolidation needs a realistic price expectation based on the valuation. Negotiations with other participants reveal what they are willing and able to pay. Based on this information, the landowner can make up his or her mind and decide whether to accept, to refuse and continue to find a better solution, or to withdraw.

4.5 Financial aspects related to valuation

4.5.1 Financially settle items between landowners

In addition to the value of land, other aspects might hold a value – either positive or negative – for right holders that need to be settled between exchanging right holders. This might encompass physical elements in the field, such as irrigation or drainage systems, wells, or sheds. It may also encompass rights or restrictions, such as easements or hunting rights. Access to each parcel is a particularly important issue. In principle, the aim in land consolidation is to make all parcels accessible from public roads. This minimizes the need for easements and consequently limits the nuisance for involved landowners. The lifting of easements benefits landowners of parcels, who facilitate an easement for a third party, which in turn might increase the value of the parcel.

Apart from elements that increase the value of land, elements can also impose limitations to the use of the land. This applies for example to solitary trees (shadow affects the yield) or the poles of overhead power lines. The impediment caused by such elements should be compensated or settled between right holders. Those who get land allocated with such elements but did not have such land in the original situation, should receive financial compensation. Conversely, those who had elements on the land but received land without such elements should financially contribute because of the improvement. In principle, it is a financial settlement between right holders to compensate for the negative impact or benefit that comes with the exchange of land with such elements. Overall, this type of financial settlement does not influence the budget size of a given land consolidation project since the total compensation paid and received per type of element is equal (assuming the number of elements does not change, as in the case of lifting easements in the new allocation).

For transparency, it is recommended to decide what type of elements are incorporated in the financial settlements, assess their value in a systematic way and calculate the financial compensation or contribution per right holder involved.

In the Netherlands there are two forms of land consolidation: voluntary and mandatory land consolidation. For both forms different procedures and methodologies for valuation exist.

In voluntary projects no valuation of the parcels takes place before starting the reallocation process. Underpinning idea is that the whole process is based on a voluntary basis, so if a landowner does consider the allocated parcel not suitable – for whatever reason – he or she can propose another option or withdraw. Of course, this only works when landowners are closely involved in drawing the reallocation plan, which is supervised and guided by professionals, e.g. surveyors. Once the landowners in principle agree on the reallocation of parcels, valuation of the exchanged parcels commences. Two independent valuers determine the market value of the parcels expected to be exchanged. Based on this information, landowners can assess the financial consequences of the reallocation. Any differences in market value of the exchanged parcels must be settled between the old and the new owner. Landowners that receive a larger amount of land or of higher quality – both reflected in higher market prices – compared to the original situation have to pay the difference. Vice versa, those landowners getting back parcels with a lower value than handed in, receive money.

In mandatory land consolidation projects valuation takes place at two moments in time. These are referred to as the first valuation and the second valuation. During the first valuation all the parcels within the delimited project area are appraised. The valuation is based on the agricultural productive capacity, which is largely based on soil characteristics, its fertility, and the availability of groundwater. Fortunately, soil maps including information on ground water tables are available for the whole country. So, in most cases it is not difficult to convert these soil maps into a map with relative values based on the agricultural productive capacity. In some cases, field samples are taken to verify the quality of the soil map or update on any changes since the map has been published (the latter mainly concerns measures to manage ground water levels). Last step of this first valuation is to classify soils of similar quality into classes and assign a relative value to each class.

When the reallocation plan has been published, a second valuation takes place. The second valuation only applies to land where physical measures have been taken, e.g. to improve the land. Due to such improvements the land may be reclassified into a higher class. The new value is used for the allocated landowner, whereas the old value is used for the old landowner handing in the parcel.

Box 4.3: *Valuation practice in the Netherlands.*

Danish land consolidation is “voluntary” in the sense that owners participate only by agreements. The project is formally started at a public meeting attended by the interested landowners. Here the background for the project and procedure in land consolidation are explained. One issue is election of representatives to the committee of stakeholders that represent the landowner’s interest and work closely with the land consolidation planner. It is explained to the audience that one of the first activities for the representatives is to participate in the land valuation.

The valuation is performed by the committee of stakeholders and two specialists: one proposed by the committee and one from the land consolidation authority. The land consolidation planner organizes the event: Meeting place, transport, and supplies for the day. The first issue is always to identify the best field – possibly the perfect field – in the project area or close by. This field is given the relative value 100. This serves as benchmark for comparison with the other fields.

The team then walks over the entire area and considers each field and awards them each an index from 100 and downwards. In the lower end of the scale, parcels with no agricultural potential like wet areas and bushes are typically set at value 10 or 15 reflecting hunting and or fishing and basically the value of just owning that land. All land has some value. The finer distinctions consider the actual state of cultivation of a field, type of soil, drainage, and generally the fields reliability under various weather conditions. Equally important are the subsidies that the fields can fetch, and whether the parcels are under regime of ecological production. In some areas, the hunting is attractive and fields adjacent to rivers with trout fishing can fetch a high basic value in addition to their agricultural value. As the day proceeds the team grasps a systematic consideration of these aspects. Typically, an iterative consideration evolves when some early values are revised. The land consolidation planner records the relative values on an orthophoto with an overlay of the cadastral map. This so-called “valuation map” is the concrete result of the valuation.

Translation to current market prices happens at the end of the day by asking the team: What would be the hectare price for the best field if sold today? This always sparks an intense discussion that triggers all their combined knowledge of recent sales and foreclosures, scope for credit, prospects of farming in the area and potential buyers. Once they agree on the “level 100” hectare price, this sets the hectare process for the other levels.

Box 4.4: *Valuation practice in Denmark.*

4.5.2 Assess improvement per holding

In some practices, it is also commonly accepted to evaluate the improvement for right holders. Apart from general evaluations to assess the effectiveness of a land consolidation project, the evaluation can also be done at the individual level of right holders or agricultural holdings. Such individual evaluations determine the benefit for each involved right holder. Consequently, it may also serve a request for a financial contribution from the right holders – related to gained benefit – to pay their share of the project. The choice to do so is a political one and depends on the degree to which a project has spatial political priority. In most cases, land consolidation projects are fully financed by public means.

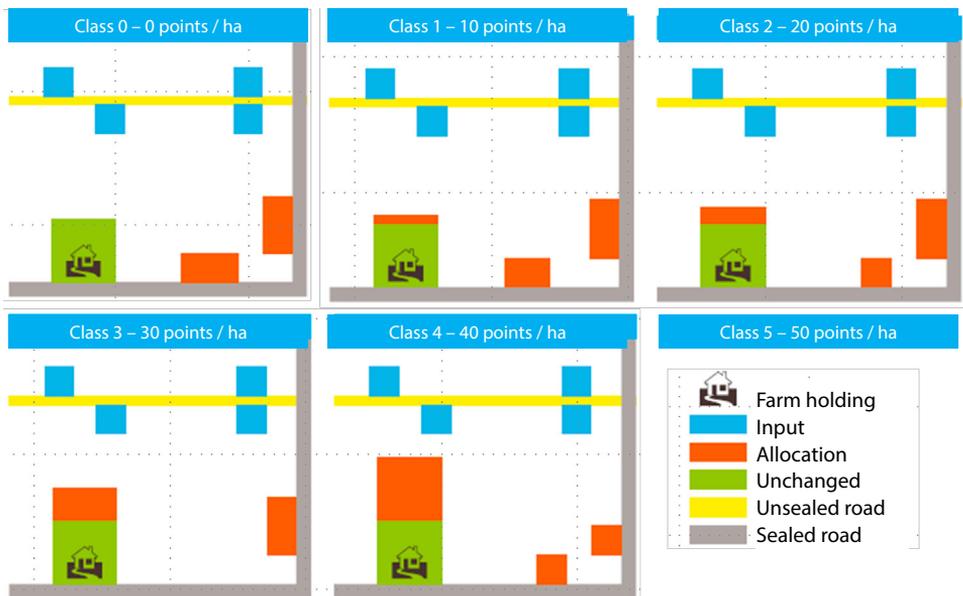


Figure 4.4: Visual assessment of improvement per holding ©Kadaster.

Basically, two methods exist to assess the improvement for individual right holders. The first method consists of a *calculated evaluation* based on a set of selected criteria reflecting the aims of the project, such as reduction of land fragmentation and accessibility from public roads. This is very similar to a regular feasibility or evaluation study at project level, where based on selected criteria either the expected improvements or the realised improvements are assessed. Indicators are often related to the aim of the land consolidation project. How much of the public facilities, nature conservation and water management measures can be or were achieved? From an agronomic perspective, frequently used criteria relate to parcel concentration, distance to field parcels (from the farm), number of distant parcels, average size of the parcels etc. With the help of one or more digital land consolidation plans it is relatively easy to perform such analyses in a GIS system.

The second method consists of a *visual evaluation* of the improvement for individual right holders or agricultural holdings. Based on a set of reference situations, each representing a different level or class of improvement, all right holders or holdings are classified based on their similarity with the most comparable reference situation (see Figure 4.4). When limiting the number of classes, it is relatively simple to obtain results. Such a method can also be applied without having access to detailed and digitally available information. The criteria are often the same as the previous method, and include parcel concentration, number of field parcels, distance to the farm, and average size.

4.5.3 Local knowledge and context

Any valuation methodology should be tailored to the local or national context. Issues that might hamper valuation are a lack of representative transactions, opaque land prices, insecure tenure systems, informal transactions, an immature land market or a general lack of information about the land and land market. In addition to rules and regulations which arrange the valuation process, it is recommended to include lo-

cal knowledge and assess whether additional measures are needed to develop a fair and just valuation methodology for the project. Local knowledge may also overcome some of the mentioned issues by filling information gaps and by verifying the valuation methodology to enhance a fair and transparent procedure. This also applies when introducing land consolidation in a country. Established valuation methodologies in other countries can act as a reference but should be adapted to a country's context. Overall, it is important to evaluate existing valuation methodologies in order to assess whether the methodology should be adapted.

5 DEVELOPING THE LAND CONSOLIDATION PLAN

Authors: Morten Hartvigsen, Marije Louwsma, Walter de Vries

5.1 What does a land consolidation plan entail?

A land consolidation plan is the main outcome of a land consolidation project. The FAO Legal Guide on Land Consolidation (Veršinskas et al., 2020, p. 16) defines a land consolidation plan as:

“... a set of interrelated documents defining the re-allotment for the land consolidation project area, approved by either all (in case of voluntary land consolidation) or a legally defined qualified majority (in case of majority-based land consolidation) of landowners and adopted by the competent public institution. The land consolidation plan serves as single basis for the registration of re-allotted property rights.”

Due to variations in legislative and governance frameworks across countries, different terms are used to describe the land consolidation plan, such as re-allotment plan, reallocation plan, parcelling or re-parcelling plan, development plan etc. These terms may not necessarily be synonyms, as this would deny the existence of variations of legal constructs in each country. In this publication the term ‘land consolidation plan’ is used as the physical or digital artefact with the administrative and geographical description of the parcels, land rights and right holders before and after the reallocation process. In a broader understanding this also encompasses related documents underpinning the reallocation plan, such as documentation about the quality of the land to guarantee that right holders receive a similar allocation compared to the situation before reallocation. However, in some country practices several of these related documents might entail a separate step in the land consolidation procedure – with a separate public inspection –, not necessarily combined with the land consolidation plan.

The land consolidation plan is the outcome of a participatory planning process and displays the new layout of land parcels and the connected land rights after the land consolidation project (Hartvigsen, 2015, p. 9). It is typically published by the responsible authority, reviewed by the public, approved by the landowners and adopted by the responsible public institution. The land consolidation plan serves as the basis for describing and establishing a new legal situation captured in the land administration system, either by a deed or by titles. Thereby, it supersedes the current registration of land rights in a land consolidation area.

The nature of the land consolidation plan can range from a complete makeover of the parcel structure in the area to an exchange of parcels with limited changes in the field. In the first situation, land consolidation may include a technical project such as improvement of local agricultural infrastructure (irrigation, roads, drainage etc.), public infrastructure, or other land use changes such as nature restoration, measures for environmental protection, climate change adaptation or mitigation. Consequently, the aim and character of the land consolidation project will also affect the nature of the reallocation plan. A project without any interventions in the field, will only require the administrative swapping of land rights, whereas a project with a completely new parcel structure requires surveying and updating the cadastral map as well.

In the Netherlands, there is not just one plan but there are two plans: the land use plan and the reallocation or land consolidation plan. The land use plan describes the goals to be achieved, the instruments employed (typically land consolidation, but it could also be expropriation, voluntary exchange of parcels, land banking and the like), the location of public functions and facilities (e.g. infrastructure, landscape elements, improvements for water management, environmental corridors), proposed measures and financial resources for the project. The reallocation plan refers to the technical plan that, geographically and administratively, describes both the current and new allocation of parcels, their respective right holders, and parcel boundaries. The reason to have two separate planning documents is rooted in the procedure. Within the spatial planning system, stakeholders first need to have the possibility to express their view from a planning perspective on the proposed project and any changes in land use before the implementation starts. Therefore, first the land use plan is published for public inspection together with a grievance mechanism. Only after finalization of all court rulings related to the land use plan, the reallocation plan may be published. Altogether this procedure provides safeguards for involved stakeholders. The land consolidation project may not be implemented if an objection is raised against, for example, the assignment of a new nature conservation area to protect environmental values or the development of a new road. Only after all objections are settled, the land consolidation can proceed with the next phase of drafting and publishing the reallocation plan. The argumentation for this chronological order is that if the public facilities and measures would be integrated in the reallocation plan, any adjustment in the plan has a big impact on the reallocation process. Therefore, the procedure has been split in two phases whereby in the first phase considerations and objections from a spatial planning perspective can be addressed (land use plan), and secondly the reallocation can be addressed (reallocation plan).

Box 5.1: *Two plans in the Netherlands: the land use plan and the reallocation plan.*

5.2 The process of developing the land consolidation plan

The development of a land consolidation plan can be broken down into several steps (Figure 5.2). It starts with the collection of wishes of involved right holders and defining the rules for allocation. Some of these rules for allocation might be embedded in legislation or regulations. Others can be defined by involved stakeholders, the lead agency or the land consolidation committee, all depending on the institutional setting and project management set up. The wishes are based on existing land rights, which are ideally described in the land registry and cadastre, and captured in a land administration system. The existing land administration data must be validated and in case of omissions in the registration, must be complemented. In case of severe omissions or contested information, it is advised to develop a procedure to collect the legitimate land rights as to get a complete overview of land rights in the existing situation.

Furthermore, additional information is needed about the value of the parcels (see previous chapter about valuation), the condition of the parcels (land use, drainage, size, shape, elevation, exposure etc.), the boundaries that will or cannot be exchanged or adjusted (such as roads, villages, watercourses, forests, graveyards), and location-bound aims that require land use change (such as new areas for nature conservation or water retention).

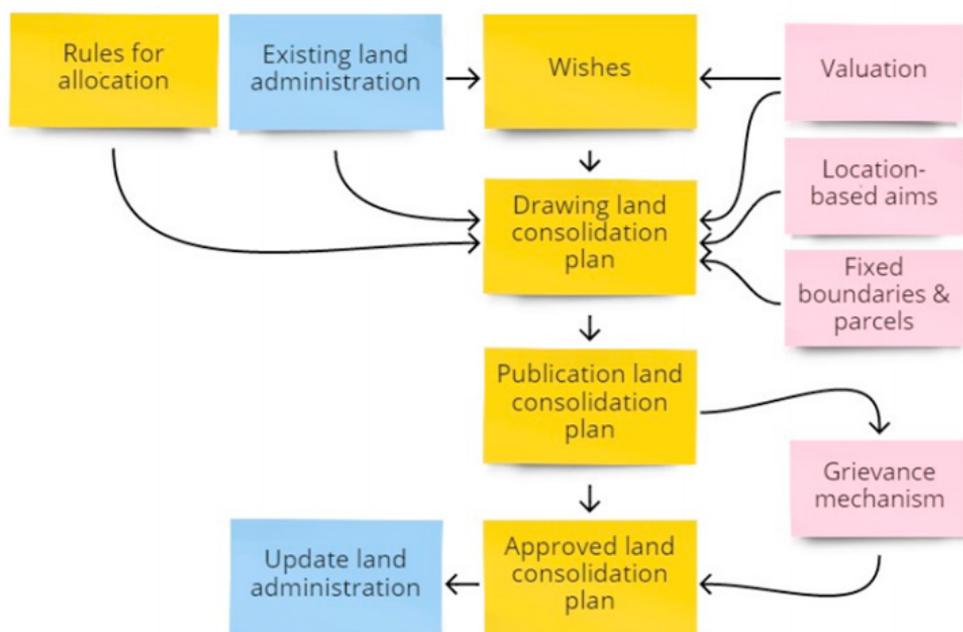


Figure 5.1: *Developing the land consolidation plan.*

The development of a land consolidation plan can be supported by model-based analyses – based on automated optimization algorithms (see chapter 6) – about possible reallocation options or a feasibility study that has explored such options. The results of such analyses provide valuable information for the reallocation process.

With information about the existing land rights, parcels, wishes from involved right holders, and spatial restrictions, options for the reallocation of land can be explored and drawn together to create the land consolidation plan in a rightful and equitable manner. To which extent right holders and other stakeholders are involved in this process depends on the type of project and how participation takes shape (see chapter 3). The next sections will elaborate on the rules for allocation, collecting wishes, drawing the land consolidation plan, and the publication of the land consolidation plan.

Rules for allocation

Upon drawing the reallocation plan, many considerations play a role. The establishment of rules ensures transparency and guide a fair allocation process. These rules function as a guideline for the surveyor during the reallocation and provide further safeguards for title holders involved. In line with the purpose of the land consolidation project, rules should determine who gets priority over others in case a parcel can be allocated to several holdings. Such reallocation rules could prioritize the allocation of land to particular groups of right holders such as young farmers over older farmers, to full-time farmers over part-time farmers or to specific types of farming, for example dairy farms over arable farms. It is however crucial and in line with VGGT (CFS, 2012), that all participants are at least as well off after the project compared with before. In the Netherlands for example, parcels used for perennial agriculture will not be exchanged, land for dairy farming has priority over arable farming. The rules for allocation can also hold safeguards for involved right holders, such as maintaining or improving the quality of

the soil quality. All in all, the rules for allocation provide a framework for those drawing the land consolidation plan and involved in the reallocation of parcels to ensure a fair and just process for which responsible entities can be held accountable.

Collecting wishes

The collection of preferences of involved right holders occurs in different ways. In a systematic manner all right holders are formally invited to share their preferences regarding the location of their land in the new situation. In case the land administration shows some issues regarding quality or quantity, this phase can also be employed to verify the existing administration of land rights. This may both involve administrative issues related to land rights, as well as geographical issues related to the parcel boundaries. Deviations between the situation in the field and the registration in the land administration should ideally be solved first before the reallocation of land rights starts. It is important to have a reliable description of the existing situation because these determine the rights for allocation in the new situation.

If all landowners and farmers in the project area are individually interviewed during the feasibility phase, the project team can have an initial understanding of the wishes of the participants, e.g. about sale, exchange and purchase and also on preferred location of consolidated land. However, the process is dynamic, and the preferences of the participants may change during the process as the re-allotment planning develops and they need to be regularly consulted throughout the process.

An important step in the re-allotment planning process is land valuation (see chapter 4). With the land valuation, those landowners who consider selling some or all their land in the project area can be informed about the market price corresponding with the outcome of the land valuation. It is important that the planning team has an overview of the available “land pool” and the land mobility in the project area (Hartvigsen, 2014b). In addition to land sold by involved landowners during the land consolidation process, it is also possible to buy land on the market before the start of the land consolidation project or privatize available state land. All three means can be used to create a land pool to ease the reallocation process in land consolidation. This allows, in addition to consolidation of fragmented into larger regular shaped parcels, also for increase of holding and farm sizes for those interested to enlarge their business or to realize location-bound public aims that require the conversion of land use. The latter mostly involves agricultural land that is taken out of production for the improvement of the area or in the overall general interest such as for example the protection of biodiversity or sustainable water management.

Drawing the land consolidation plan

Drawing a new allocation plan is a big optimization puzzle. How to incorporate the wishes from involved title holders and other stakeholders, the planned public works, and other land use interventions? The following general strategy for the reallocation plan could act as guideline, although it also depends on the form of land consolidation chosen:

- Within the area under reallocation, first draw or copy all parcel boundaries that will not change, such as infrastructure, water bodies, buildings and so on. The parcel boundaries are often based on topographical boundaries in the field. Similarly, all parcels not eligible for exchange can be marked. We refer to these as fixed parcels and boundaries. Together they provide a skeleton for further reallocation.

- Then map the location of new public facilities, insofar this has not yet been determined, and delineate the parcel boundaries for these.
- Lastly, optimize the parcellation for the involved right holders. For agriculture, first consider the parcels that belong to a holding and then narrow it down to individual shares or rights within the holding.
- Check and balance the current land allocation against the allocated land for each individual right holder. Make sure that the at least as well-off principle is applied. Value, size, and condition of the parcel are all relevant indicators to assess this.

In a voluntary land consolidation, the involvement of right holders might be more profound. The draft land consolidation plan is then built up in continuous consultation and through facilitated negotiations with the participating right holders, where one land exchange leads to the next in a chain of exchanges. The re-allotment process must be transparent and can be guided by pre-established “rules of the game”.

Publication of the land consolidation plan

The draft land consolidation plan is usually published for public inspection where comments and objections are collected. Based on these, the plan is typically revised one or more times based on the filed comments and objections from the participants. Not only the person who uttered the comment or objection is heard, also involved right holders have the opportunity to be heard. Especially in this phase any objection against the proposed reallocation will in most cases inevitably involve also other right holders, since land rights are exchanged. All potentially involved right holders should be heard in case an objection is filed. Based on this input and the rules for allocation it is possible to make a final decision on whether to adjust the land consolidation plan. In a voluntary land consolidation approach, only those right holders who provide written consent with the plan are included, while in majority-based or mandatory land consolidation, the plan is approved by respectively a qualified majority or responsible authority. The approved plan in majority-based land consolidation can then also be adopted by the public authority responsible for the land consolidation program.

5.3 *The role of land tenure professionals in developing the land consolidation plan*

Land surveyors have an active a role throughout all the phases of a land consolidation project, despite the fact that their role is perhaps only apparent during the development of the land consolidation plan. The development of the land consolidation plan is usually seen as the task of a small multi-disciplinary team. Land tenure specialists or land surveyors are indispensable members of the team, since they bring in tenure and land administration knowledge to guarantee legal certainty for all right holders involved and their expertise concerning boundary and areas measurements and calculation. Surveyors typically have an independent position in the project team, since they are not administratively responsible as the government agencies conducting the land consolidation projects are, and they are not involved as right holder. Some claim that the ideal land consolidation planner is one-third land surveyor, one-third agronomist, and one-third lawyer.

From a practical perspective, the land surveyor assists the responsible authority in setting up a project database to manage all administrative and geographic data related to land administration within the land consolidation project. The land consolidation project runs parallel to the normal land administration system to avoid any interdependencies and

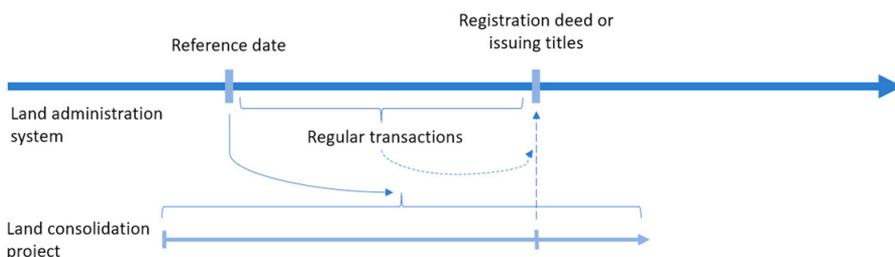


Figure 5.2: *Setting up the land consolidation project database.*

unwanted interaction between the two processes (the regular land administration process and the land consolidation process). There must be a fixed point in time at which the spatial and ownership data are frozen or fixed, the so-called reference date. A copy of the information from the land administration system can be loaded into the project database (Figure 5.1). The project database holds all project related information and does not affect the land administration system. The reallocation plan is drafted based on the information on the reference date and will also describe the new allocation on this date. Once the reallocation plan is approved, a new formal situation arises by either the registration of the land consolidation deed in the system, or by issuing new titles for the involved right holders (this depends on the type of tenure system, i.e. deed-based or title-based). During the project, regular transactions are registered in the land administration system. Since the reallocation plan describes the old and new situation on the reference date, regular transactions on the land market – that were recorded in the land administration system – have to be taken into account administratively in order to update the reallocation plan with all changes caused by these regular transactions in between the reference date and the registration of the deed or issuing of titles. All regular land transactions before the reference date have to be included in the reallocation plan. All regular land transactions recorded in the land administration system after the reference date, if applicable, have to be included in the land consolidation plan.

To ease this process and prevent the registration of land transactions that cannot be implemented, communication with stakeholders in the region and with key partners in the real estate sector such as notaries, is essential. Both right holders and other parties involved in land transactions should be aware of the consequences of transactions and inform the potential buyer. Especially the period between the reference date and the drafting of the reallocation plan is important, since in this situation it is not yet clear if the land rights will be reallocated and if so, where the location of the new parcel is. The potential buyer buys the 'right to be allocated' whereby the location of the allocated land is uncertain until the reallocation plan has been published and approved. Some countries have attached a specific notification to all parcels involved in a land consolidation project to automatically warn professionals when the information is retrieved from the land administration system.

A systematic process for keeping track of the land administration component in the project is essential for land consolidation projects covering a large area, incorporating multiple aims, or involving many right holders. Given the complexity of this, it is necessary to follow a structured approach with a reference date based on which situation the land consolidation plan can be developed, a procedure to handle regular transactions and a procedure to feed the new allocation back into the land administration system. For simple voluntary projects with few participants and a short implementation time, it might be possible to keep the overview manually.

6 GIS TOOLS

Authors: Marije Louwsma, Kalle Konttinen, Maxim Gorgan, Walter de Vries

6.1 *The current situation*

Land consolidation is a complex process to manage. To facilitate the implementation of a land consolidation project, countries with a tradition in land consolidation use GIS tools to support data management during the project. Since there was no standard ready-to-use software solution available each country had to develop its own customized software for land consolidation. The advantage of customized software is that it is tailored to the needs and situation in the country or region. However, it equally comes with some drawbacks. Often it is a lengthy and costly process to develop customized software. Maintenance and updating is another point of concern. Most of these considerations relate back to the number of customers that use the software, which is relatively low for customized software compared to generic software such as a GIS package. For countries who aspire to introduce land consolidation or need to revise their land consolidation software, a standardized ready-to-use software solution can be beneficial. However, such a solution is not yet available.

In this publication a GIS tool refers to all software and ICT systems to capture and handle the data – both geographical and administrative – needed to support land consolidation projects. So, the term GIS tools is broadly interpreted in the context of this publication. It encompasses the information architecture, the associated databases, software packages and applications supporting the implementation of land consolidation projects. However, the scope of this chapter lies on the application of GIS tools and not on the technology or infrastructure design.

This chapter focuses on the implementation phase of land consolidation (see Figure 1.1 in the first chapter). Other phases, like the analysis phase or planning phase, are expected to match better with existing functionality from standard GIS packages. Especially, functionality to execute ex-ante or ex-post evaluations or monitoring respectively the expected gains or effectivity of the land consolidation project (see Chapter 7). The next sections further elaborate on the preconditions to use GIS tools in land consolidation projects (section 6.2), discusses chosen solutions in a couple of countries (section 6.3), and concludes with the way forward (section 6.4).

6.2 *Preconditions to use GIS tools in land consolidation*

It is nowadays common to employ GIS tools to implement land consolidation projects in a large area, with many parcels or multiple right holders. Throughout the entire land consolidation process, there exists a recurrent need for mapping and handling data needed to execute the project. First, the project database is filled with cadaster and land registration data. During the project, new data are generated and added, resulting in overviews and mapping products such as an ownership map, list of right holders, rights and restrictions, valuation map, land consolidation plan.

GIS tools are indispensable for data management during a project. However, data management also requires knowledge about how to handle the data, available metadata, authoritative data sets, and applicable data policies and regulations. In Europe for ex-

ample, The General Data Protection Regulation, the Data Protection Law Enforcement Directive and other rules concerning the protection of personal data do apply. This means that in principle no personal data may be published publicly. Another important set of regulations relate to the use and re-use of available public data. Re-use of data requires the cooperation of involved authorities. Furthermore, specific conditions for use may apply. Since the implementation of land consolidation projects often requires data from multiple authorities, securing privacy and handling sensitive data with appropriate care is a point for consideration and a potential concern.

Apart from such general rules and regulations related to data management, other pre-conditions for the use of GIS tools in land consolidation may apply, which include:

- The existence of a critical mass of land consolidation projects, in order to justify the investment needed to develop and maintain GIS tools and IT systems and to build up sufficient capacity among professionals to use these GIS tools.
- Cooperation between responsible authorities to decide on standardization, data sharing protocols and implementation of system architecture. These requirements are very similar to spatial data infrastructure guidelines like the INSPIRE Directive in Europe (European Union, 2007). It aims to enhance the interoperability, usability, and exchangeability of available data.
- The availability of digital geographical data – fit for use – as needed for land consolidation.
- Reliable digital land administration data, both cadaster and land registry. Reliable refers to the quality, completeness, and accuracy of the data as well as to the legal certainty of registered rights. In some countries the land administration system does not reflect the situation on the ground regarding unregistered rights, informal rights, unknown right holders, or disputed land rights for example. Additional data acquisition may be needed.
- A set of rules and regulations for the land consolidation software, which ensure a transparent, fair and just process.
- A sufficient level of digital literacy and access to internet to exploit the potential of GIS tools and IT systems for supporting the implementation of land consolidation, including public consultations, awareness raising and other participatory activities in land consolidation¹.

Land consolidation, as an instrument dealing with tenure rights, requires legal clarity. The rule of 'rubbish in, rubbish out' also applies for any GIS tool. However, it is possible to improve the data during the land consolidation project in the GIS system. Adjudication of land-related rights and correction of errors can be a vital part of the land consolidation process, either integrated into it or carried out in parallel. For the non-exhaustive list of legal and registration problems and the possible solutions see Versinskas et al. 2020 (pp. 103–108).

¹ WB indicator of individuals using internet could be used to access the situation in a specific country <https://data.worldbank.org/indicator/IT.NET.USER.ZS?locations=AM>.

Table 6.1: Aspects needed for development of GIS tooling for land consolidation.

Aspect GIS tool	Explanation
Functional requirements	<p>Calculate difference in areas per stakeholder from new and old parcel boundaries</p> <p>Calculate values for old and new parcels</p> <p>Calculate distances to homestead before and after</p> <p>Map new and old situation</p> <p>What should the software be able to do?</p> <p>What kind of results should it yield?</p>
Input requirements	<p>Cadastral and land register data</p> <p>Topographic data</p> <p>Land cover data</p> <p>Soil, water, agriculture data</p> <p>What kind of (combinations of) data should be available to start processing the data?</p>
Output requirements	<p>Land consolidation plan/map</p> <p>List of new owners, new land rights, cadastral maps</p> <p>Values per parcel, overall value</p> <p>List of new roads, water ways, infrastructure elements</p> <p>Cost of all infrastructure</p> <p>Areas of new agricultural area</p> <p>What kind of data should one have at the end of the processing? What should be presented and how?</p>
Analytical requirements	<p>Generate different spatial and legal land consolidation scenarios</p> <p>Calculate fragmentation indices / indicators (before and after)</p> <p>Calculate before and after values</p> <p>Calculate cost/benefits of different scenarios of land consolidation plan</p> <p>Calculate length of new roads, infrastructure, new areas of green, new areas of protected areas, restrictions</p> <p>Total area of land ownership, land use allocations, total area of private versus public property (infrastructure)</p> <p>What sort of calculations, processing steps, combinations, overlays, intersections, updates should be enabled and developed in algorithms, software, apps?</p>
Interoperability requirements	<p>Each software modular component needs to be interoperable / connectable with other modular component and needs to be interoperable with:</p> <ul style="list-style-type: none"> • Authentic and other government GeoDatabases / Authentic registers • Different platforms (mobile (Android/iOS), internet, etc.) • Spatial plans (at all scales) • Maps and databases of environmental restrictions, • Standard models (LADM) and open-source models and requirements (GML, etc.) <p>With which kind of other software packages should the software be able to communicate and exchange or combine data?</p> <p>Which type of platforms and operating systems should be communicated?</p>
Usage of existing apps or information services	<p>Which (type of) existing apps, software packages, platforms could be used?</p>

6.3 Existing GIS tools

Countries with a history in land consolidation have experience with manually drawing the land consolidation plan, creating lists of right holders, rights and restrictions, and mapping parcels. However, the analogue to digital transformation converted land administration practices from relying on analogue to digital systems. This created the possibility for digital support in land consolidation as well. Using digital tools for the implementation of land consolidation enables the automation of processes, reduces the risk of human error – if well designed – and allows for greater efficiency, which are major advantages.

The complexity of the applied tools varies from standard GIS software and customized tools to assist land consolidation tasks and activities, to integrated solutions aiming to manage the entire land consolidation project workflow. Most western European countries implementing land consolidation have such GIS tools, customized to the country context, available. China and Türkiye are countries with the biggest land consolidation programs in the world, and are also known to have developed GIS tools for this purpose.

The design of the land consolidation plan is the heart of a land consolidation project. It is divided into two parts: (1) an administrative component, and (2) a geographical component. Optimization algorithms were introduced to help the surveyor drawing the land consolidation plan by optimizing the allocation for involved right holders (Demetriou et al., 2012; Lemmen et al., 2012). The development of GIS tools requires knowledge about land consolidation, so that functional requirements can be converted into technical requirements (Table 6.1).

The present-day practice regarding the employment of GIS tools to support land consolidation is exemplified by case studies from Finland, the Netherlands, and Türkiye. The aim is not to provide a complete overview of all customized software used globally, but to describe a few examples to address variations that do exist.

6.4 Country cases

6.4.1 Finland

Finland has all necessary preconditions to carry out land consolidation. All land administration registers are publicly maintained and trusted, and therefore provide a solid basis for land consolidation projects. In Finland, land consolidation can start directly after preparations have been finalized, without any preliminary information gathering or surveys needed, except for landowners' interviews. The National Land Survey (NLS) of Finland is responsible for both the land administration (cadaster and land register) and land consolidation. NLS also maintains a public land sales register, where all land transactions are registered. Having all information and knowledge available within one organization eases the implementation of land consolidation and valuation of agricultural land. Additionally, agricultural administrations data is available for survey purposes, and it is well maintained because of EU obligations related to the common agricultural policy. It is regularly used to analyze the potential of land consolidation for particular areas.

In 1997, the Jako-system (Jako literally means 'deal' or 'partitioning' in Finnish) was developed to support the cadastral surveying and maintaining the national cadaster. It was custom-made by NLS experts to serve the Finnish surveyors. During 1990's NLS used several separate programs (e.g. FinGis and MaaGis) to execute land consolidation and the land administration data after land reallocation was fed back into the Jako-system. In 2002, a land consolidation module was integrated in the Jako-system, which enabled the implementation of land consolidation in one software package. The land consolidation module facilitates the demarcation of the land consolidation area, adding land values to the parcels, and drawing new parcels to create the land consolidation plan (Figure 6.1) and calculating the compensations. Registration of the new allocation into the Finnish cadaster uses the same program. Cadastral overviews needed

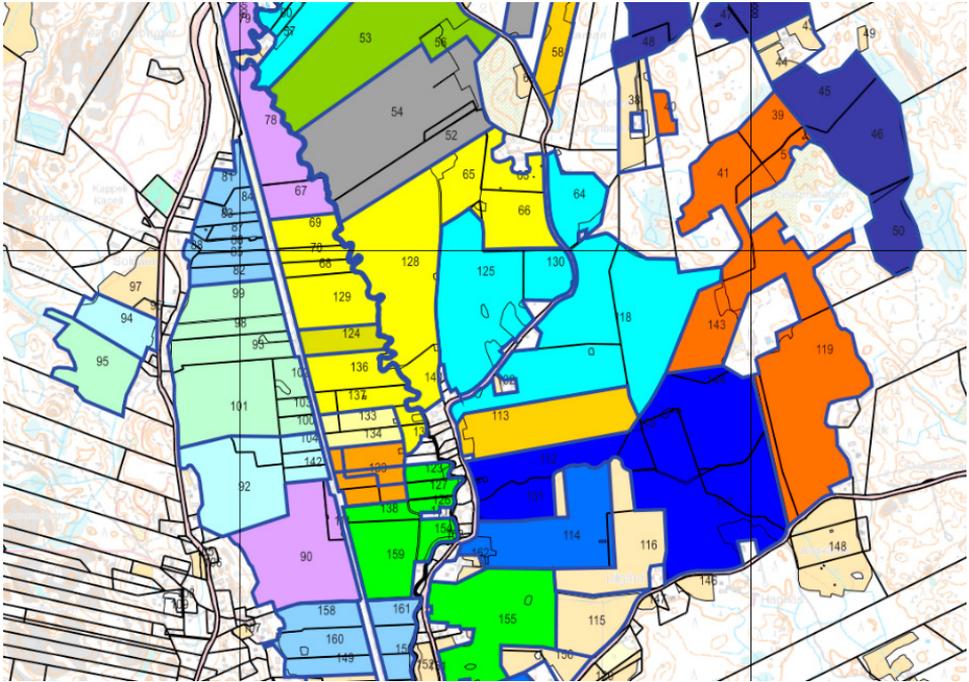


Figure 6.1: Land consolidation plan made in Jako-system at Southern Finland scale 1:25,000.

for financial compensation of involved right holders are easy to produce. Additionally, it is possible to make thematic maps from the land consolidation plan and from agricultural administrations information. Another nice feature is the automatic mass distance calculation from field parcel to farmhouse for which the road network is used.

Although the Jako-system has reached a certain overdue maturity from an IT perspective, it is still in use in Finland and this will most likely not change in the near future.

6.4.2 The Netherlands

Land consolidation in the Netherlands relies on various software tools (Figure 6.2). Each has its own role and function, and they operate separately from the regular cadastral system. Two aspects are important: (1) the tools have to complement each other, and (2) it must support the process of land consolidation. The former refers to the interoperability between the individual tools. The latter refers to the fact that a tool should be tailored to the process it supports, and not the other way around, i.e. such that a tool limits the possibilities and flexibilities needed within any land consolidation project.

SHW is the key software tool used for land consolidation providing a database per project that holds both administrative and geographical information. The land consolidation project database in SHW is filled with a copy of the land administration information in the area from KOERS. KOERS is the land administration system in the Netherlands, supporting the cadaster and land registry. In SHW all functionality needed to implement a land consolidation project is present. It can create administrative and geographical overviews of the existing parcels, land rights and restrictions, and right holders, as well as the new situation after reallocation. Valuation information can be

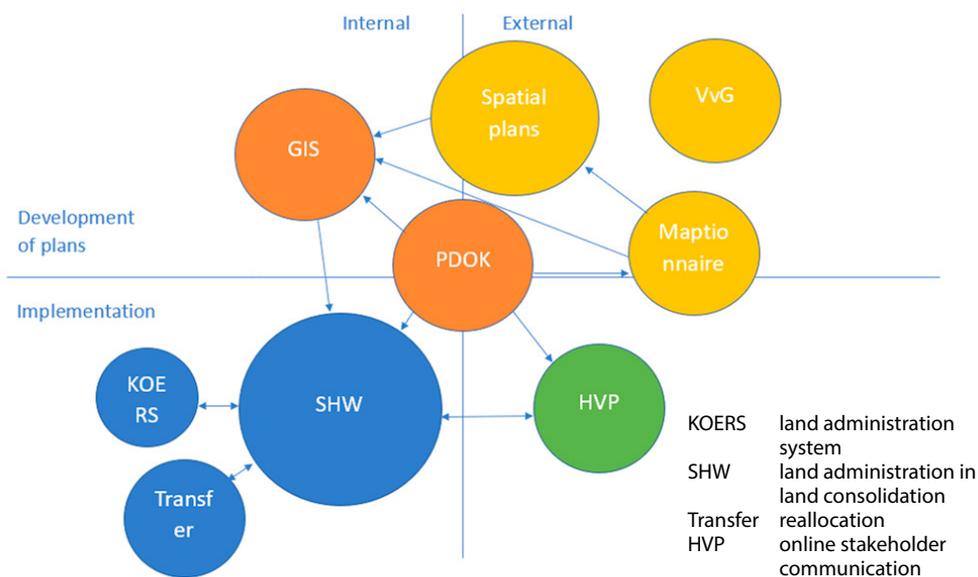


Figure 6.2: GIS tools used for land consolidation in the Netherlands.

added, just like other relevant geographical data. It is possible to design and draw the new allocation plan based on the rights of all right holders in the existing situation. Boundaries that will not change can be fixed, rights can be exchanged between parcels and title holders, and new parcel boundaries can be created. Several safeguards are provided to guide this reallocation process. A small dashboard in the screen shows instantly the progress and status of reallocation during the drawing process. It will warn when too much or too little land is allocated to a right holder. This is extremely helpful to make a fair land consolidation plan that justifies the 'at least as well off' principle and other rules that might apply. SHW also creates the land consolidation deed and accompanying cadastral map that will be registered in KOERS. At last, it also delivers information to create the financial list of settlements per title holder or agricultural holding.

Besides SHW, several other software tools perform specific tasks. The valuation map for example, is often derived from a standard GIS software. SHW then imports the resulting values into the project database. Likewise, other types of geospatial information, such as topographic maps, aerial imagery, or digital elevation models can be imported and/or accessed by using online services (e.g. from the national spatial data infrastructure repository) and then used as reference layer in SHW.

There are several additional functionalities in the SHW. For the handling of objections, customized templates in regular software packages are used to support the process. These are linked to SHW through a unique ID, which is coupled to the ID of title holders in the project administration in SHW.

Alongside SHW, an online programme (HVP) has been developed to support the communication with right holders. This programme acts as an intermediary between the SHW system and the title holders. It can generate overviews and other information products delivered by SHW online for those involved in the land consolidation. Additionally, it gives right holders the possibility to share information, such as indications of their preferences (which can be drawn on the map, and a dashboard indicates the

amount already wished) regarding the new allocation and other specific relevant local knowledge, e.g. for the valuation of land. HVP both has a public part and a customized part that requires right holders to log in before they can access their own data. Data from other participants are not accessible through the system, given privacy protection regulations.

A special tool supporting land consolidation projects is Transfer. Transfer is a tool that creates the new allocation based on the existing situation, rules for allocation, and wishes. By means of an algorithm it optimizes the allocation for all right holders. With the latest update of the tool, it is now also possible to automatically create a new boundary to adjust the size of the allocated parcel. Transfer can also be employed for ex-ante analyses to explore the potential allocations and benefits in different scenarios. A standardized distribution model (e.g. 60% land allocated near homestead and 40% at a distance) for allocation underpins such analyses, instead of wishes of right holders.

KRAPP is a separate tool, specifically developed for voluntary land consolidation and land exchange. Basically, it consists of some pre-created customized extensions in a regular GIS programme. These extensions ease and safeguard the reallocation process, the data management and the production of individual overviews – both geographically and administratively. Advantage of this tool is that it can be used in highly participative processes in the field, where the right holders together create the reallocation process based on their wishes and the possibilities.

6.4.3 Türkiye

Land consolidation was introduced in Türkiye in 1961. Work has scaled up significantly since 2009, when setting the aim to consolidate 1 million hectares per year. To support this ambitious upscaling, GIS software was needed to support the implementation of land consolidation projects. Until 2012, land consolidation projects in Türkiye were predominantly carried out using a CAD-based software called NetCAD with a specific land consolidation module NetTOP. The main disadvantage of the NetTOP was that it consisted of various modules and each of the modules produces a standalone product, not integrated into the whole process. Hence, a software package that would manage the entire land consolidation project from start to finish was missing (Kusek, 2014).

In 2012 a new software called LiTOP was developed². Similar to NetCAD, LiTOP is a CAD-based software. Nonetheless, it is an integrated software, using a relational database on a server, which enables a multi-user environment and provides the advantages of relational databases. LiTOP supports the entire land consolidation workflow, including interviewing of right holders (collection of preferences and data entry), land valuation following the specific requirements of the DSI and GDAR, preparation of the land consolidation plan handling both its administrative and geographical components, and finally, generate registration data following applicable standards. The software has the ability to receive and update land registry records from TAKBIS (land registry and cadastre information system), extended data exchange and reporting possibilities. At present, about 90% of land consolidation projects in Türkiye are implemented based on the LiTOP software.

2 Based on the interview with İlker KESEN, representative of the Lider Yazılım and Önder Karagöz, GIS Manager / Geodetic and Geomatic Engineer, DSI.

To strengthen management and administration of the land consolidation programme, since 2013 the General Directorate for Agrarian Reform under the Ministry of Agriculture and Forestry of Türkiye (GDAR) is using a web portal called TVK (General Directorate of Agricultural Reform, 2020). The system combines all land consolidation activities into a single database, supports projects' workflow management, monitoring, and evaluation purposes. For each land consolidation project, construction drawings, ownership data, maps, as well as administrative data such as correspondences, payments, and billings, have to be systematically uploaded and stored.

TVK is developed in open source based on international standards. With TVK, the land consolidation data standards for Türkiye were formulated, which greatly enhances the interoperability, usability, and exchangeability of available data between different institutions and stakeholders.

6.5 Future developments – generic land consolidation software

Given that land consolidation requirements differ per country, it would be advisable to rely on modular software components which can operate both separately in an interconnected manner, in order to allow for customization. Explorations have started to seek a solution for the current lack of a standard tool to facilitate land consolidation and its data administration. As new technical possibilities open up, it may become feasible to develop a generic solution that can be configured to the local needs. The latter is a precondition to adjust the settings to the situational context of a project, such as the tenure system, legislation and regulations, procedure, involved stakeholders or preferred level of participation. The concept of a configurable software system is explained in Figure 6.3. Building a house, requires you to make decisions about the material to use, the windows, the type of door and form of the roof. Configuring the individual components together create the house to accommodate the needs of the user and requirements of the location. For example, house A consists of bricks, has a pointy roof, a sliding door, but no window.

Similarly, this concept of generic configurable software can be applied to a tool for land consolidation. Despite the different practices across countries and continents, land consolidation has some key elements in common in terms of functional, input/output and analytical requirements. Functionally the software should be able to (1) map and make an inventory the current situation (in terms of location and rights), (1a) to collect and qualify expressed wishes and needs of stakeholders (in terms of preferred location, shape, size,); (2) qualify, quantify and execute the reallocation of land rights and shapes of new parcels and (3) list, present and visualize a specific output artefact, namely a land consolidation plan / map (Louwsma et al., 2020). The first functional requirement refers to automated / digitized listing and qualifying the currently registered and expressed land rights, land right holders, public and private restrictions, shape, size and values of parcels, the present infrastructural elements (such as roads, rivers, canals, dams, etc.) as well as the social tenure relations which exist between the right holders / land tenants and the physical objects. Likewise, the third key element describes the revised / new land rights, right holders, restrictions, and parcels after reallocation. The second key element describes how land rights are redistributed upon reallocation. This may involve for example the rules for reallocation, the process of determining the rights of each holder used for allocation etc.

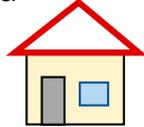
Material	Window	Roof	Door	House
Bricks 	No Window	Pointy 	Sliding 	A. 
Wood 	Single window 	Flat 	Single 	B. 
Concrete 	High window 	Asymmetric 	Double 	C. 

Figure 6.3: Configurable software – the concept explained by a house.
(Source: Louwsma et al., 2021)

Analytical requirements refer to what the software should be able to calculate, visualize or generate. Besides the land consolidation plan, typically value calculations per stakeholder / landowner are required, as well as cost calculations of constructing infrastructure, cost/benefits per land consolidation scenarios, etc. Part of these algorithms executing these calculations are so-called threshold checks (e.g. total parcel value after must be higher than total parcel value before; total agricultural area must meet certain threshold percentages, etc.).

These three key elements relate to the phase where land consolidation is implemented (see chapter 1, Figure 1.1). This phase is preceded by analyses, and after deliberations, accumulating in a plan that settles the purposes for which the land consolidation project is applied, the stakeholders involved, the procedure applied, financial resources available etc. Figure 6.4 marks this moment with the element ‘start project’. Furthermore, a last element was added for the financial settlements. After reallocation of parcels, any surplus or reduced value of allocated land should be settled between parties. Additionally, some countries might charge title holders for any other benefits that come with the rearrangement of land rights.

Besides the key elements, other elements may play a role in land consolidation software requirements depending on the situational context. Due to different situational contexts, the specific set of additional elements may vary from country to country, both in number and nature. For example, in many countries, it is good practice to compensate for any differences in size and/or value of the exchanged land. Farmers that received more land or land with higher values will have to pay, and farmers that received less land or land of minor quality will get financial compensation. Many different systems for valuation exist. Some countries determine only the value of the exchanged land after the reallocation, whereas other countries have a system for mass appraisal based on the quality of the soil for agricultural production. This may also entail a compensation mechanism for those who agree to stop agricultural activities and sell their lands to the government when mandatory land consolidation measures are applied for

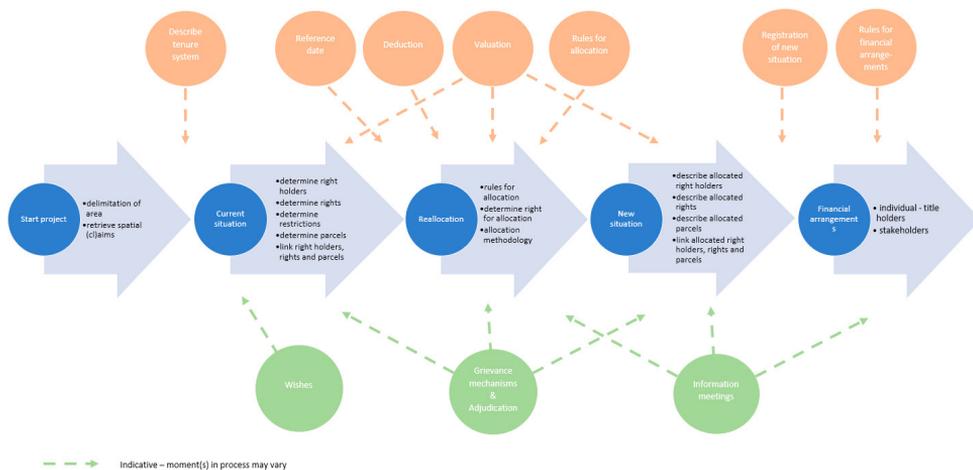


Figure 6.4: A generic configurable tool for land consolidation – describe with actions/ activities/process and artefacts. (Source: Louwsma et al., 2020)

social purposes. The orange elements above the key elements in blue (Figure 6.4), refer to elements specific for land consolidation, such as the prevailing land tenure system, reference date, deduction, valuation, rules for allocation, registration of new situation (deed or titles), and rules for financial arrangements. The green elements below the key elements refer to various forms of participation typical within a land consolidation project. These encompass the expression of wishes regarding the new allocation, grievance mechanisms and adjudication as safeguard for title holders that disagree or lack consent, and general communication such as information meetings.

7 MONITORING AND EVALUATION OF LAND CONSOLIDATION PROGRAMMES AND PROJECTS

Authors: Perica Ivanoski, Maxim Gorgan, Morten Hartvigsen

7.1 The purpose of monitoring and evaluation

Land consolidation projects and programmes should require regular monitoring and evaluation and assessment of their socio-economic impacts. Such practices would ensure that the projects and programmes attain their pre-defined objectives and provide recommendations about the eventual future changes at the programme and/or project level. Considering the amounts of money spent on land consolidation programmes and projects, especially in countries with a long tradition, it is remarkable how few efforts have been made and how limited the funds are to evaluate the outcome of the projects and their socio-economic impacts (Hartvigsen, 2015). Monitoring and evaluation refer to a regular and systematic examination of the resources, outputs and results of the activities during their implementation. For this, a set of indicators, tools and processes are used to measure to what extent a project or programme has been implemented according to the plan (monitoring) and is having the desired result (impact evaluation).

To understand monitoring and evaluation there should first be a clear distinction between i) monitoring of the ongoing projects included in the national land consolidation programme as a tool for the responsible authority to supervise the process, ii) evaluation of individual projects, including socio-economic impact assessment and iii) evaluation of the land consolidation programme. One of the most common ways to build a monitoring and evaluation system is using the logical framework approach (LFA). LFA has found wide acceptance as a powerful results-based management tool which stresses the positive and measurable developmental outcome and impact derived from activities and resource investment. The LFA can be applied at different levels of planning and decision-making, i.e. policy or programme and project levels. The log frame is developed in the planning phase, following the logic which starts from the expression of a development goal which is broken down into objectives (or purpose); then into outcomes (or results) and outputs (and activities). In terms of monitoring and evaluating this plan, monitoring will relate to effort or the work that goes on in relation to the activities and outputs; evaluation relates to outcomes or the results of these efforts, and impact relates to changes in peoples' lives that relate to these results.

Monitoring and evaluation should be an embedded concept and constitutive part of every project or programme design, while impact assessment is carried out only on the selected number of projects depending on the volume of the programme and resources available. An impact assessment tries to assess what has happened as a result of the intervention (intended and unintended effects) and what may have happened without it.

7.2 Monitoring and evaluation of land consolidation projects

To assess if land consolidation projects are being implemented in accordance with the objectives and defined procedures, it is important to monitor the land consolidation project during implementation. It is essential to have criteria, indicating if the imple-

mentation of the projects needs additional action or modifications. Furthermore, all projects should be briefly evaluated based on pre-defined indicators included in the project log frame by the responsible authority right upon their completion. For example, such indicators could be the number of parcels before and after the project (reduction index), average farm size, access to parcels, various land consolidation indices and coefficients measuring the efficiency of the land consolidation plan, indicators in relation to constructed/rehabilitate infrastructure.

In Finland, the key indicators used during project evaluation are average parcel size and average distance to the farmhouse and since 2009, unified cost-benefit tools are used. Additionally, as there was a lack of evaluation of social criteria of land consolidation projects, the National Land Survey took respective actions in 2017 to evaluate social aspects of land consolidation projects (Konttinen, 2016). Research on social aspects in land consolidation projects is however continuing. De Vries (2022) categorizes various types of such social aspects, including intrinsic and extrinsic factors which should be taken into account. Examples of such factors include socio-spatial affinity, spatial equity, good neighborhood, fairness and social cohesion. Evaluating the degree to which such factors can be managed could also be part of a generic evaluation of whether land consolidation projects achieve both desired outputs and outcomes. Hence, monitoring of such factors is relevant.

The results of such monitoring should be used not only to supervise the implementation while the project implementation is ongoing, to evaluate a particular project, but also to better plan future projects and better estimate their expected costs. For example, evaluation could allow to assess the cost of field roads per kilometre, average surveying costs per surveyed parcel, costs for rehabilitation of former field roads, costs for campaigns and community meetings, costs for commissions or professional bodies, costs for feasibility studies, etc.

When the field work in land consolidation projects such as the feasibility study and the re-allotment planning is not conducted by staff of the responsible authority but contracted to private service providers, the Responsible authority has an additional need to closely monitor the implementation of the different stages of the projects. This obviously also requires that the staff of the responsible authority has the technical skills, competences, and experience to monitor and supervise all aspects of the implementation of land consolidation projects. For this reason, it is recommended that not all projects are outsourced but at least some projects are fully implemented by the staff of the responsible authority.

Lessons learned from monitoring and evaluation should be collected for future adjustment of procedures and also discussed with private service providers if involved.

7.3 Project socio-economic impact assessments

To assess the positive and negative impacts of land consolidation projects, it is recommended to select on a regular basis several projects for a more in-depth socio-economic impact assessment. How many such assessment should be conducted would depend on the volume of the national programme and the variety in scope of land consolidation projects. The selected projects should represent practice to be able to assess the impact, draw respective conclusions and recommend improvements.

The responsible authority should be required to prepare brief annual reports as well as a more detailed programme evaluation every three or five years following standard programme evaluation principles.

Socio-economic impact assessments results may also together with the evaluation of each project serve as evidence for the responsible authority convincing new governments and decision makers about the positive outcomes of land consolidation, showing that it is worth the investment. The results of such assessments may also be useful in raising awareness about the benefits of land consolidation among farmers and landowners.

A full and detailed socio-economic impact assessment of a selected implemented project requires significant funding, therefore, only the impact of some 5–10 percent of the implemented land consolidation projects could be fully assessed. From 2017, the National Land Survey of Finland performs such ex-post impact assessments, even though this is not mandatory. In Serbia impact assessments have been performed in 2018 in seven projects in the south-eastern Serbia, implemented with German support by GIZ, and three in the Autonomous Province of Vojvodina.

A well-implemented impact assessment requires a good baseline, i.e. detailed socio-economic data for the pre-land consolidation situation to compare with the situation after. The assessment should not only look into increased productivity because of consolidation of land parcels (e.g. larger and better shaped parcels, reduced transportation and fuel costs, reduced emission of greenhouse gasses) but it should also assess broader range of envisioned as well as un-envisioned impacts over the stakeholders including gross and net farm income, changes in land use and catalysed private investments (e.g. establishment of new orchards and vineyards, installation of on-farm irrigation system, etc.). Such baseline indicators should ideally be established during the feasibility phase of the project. Socio-economic impact assessments of projects should be carried out earliest 2–3 years after the land consolidation project ended to capture all the different impacts.

FAO implemented a pilot evaluation of land consolidation in Türkiye during 2014–2015 together with the Ministry of Agriculture and Forestry (UTF/TUR/060/TUR) (FAO, 2015). The socio-economic impact assessment showed that the project fulfilled all four key objectives related to the reduction of fragmentation, access to roads, irrigation and access to water, and financial effectiveness. It also evaluated the achieved results and impacts in the field of parcel pattern and related costs, water, land use, productivity, value of production, and investments of farmers. The efficiency of the land consolidation project was also evaluated. It was concluded that 1 million TR (492,000 €) in the land consolidation project investment generated:

- Increased parcel size of 31%
- Reduced fragmentation (number of parcels per owner) of 23%
- Increased number of optimal shaped parcels with 25%
- 45,700 meters of new rural roads constructed
- Reduced farm work and transportation costs with 7.8%
- 24,300 meters of new irrigation system constructed
- 8.2 million TL (4 million €) in private (farmer) investments in total

- 5 million TL (2.46 million €) in private (farmer) investments because of the land consolidation project

As an illustration of the private investments catalysed by the implementation of a land consolidation project, in the aforementioned project several farmers after the land consolidation invested in drip-irrigation systems because they now had larger and more productive parcels and because they had now access to irrigation water.

7.4 Programme evaluation

At the programme level, many countries implement large land consolidation programmes without having clear evidence of the impact of the funds allocated. However, there are countries that assess the respective effects, which land consolidation produces. Finland evaluates land consolidation with a long-term perspective. The National Land Survey of Finland surveyed 25 project areas, evaluating such criteria as the number of farms, cultivated area, leased area, number of parcels, average parcel size, farming distance from farmhouse to parcel by road. One of the results of the evaluation study was that the “parcel structure has not deteriorated in areas where land consolidation was completed 15 years ago. (...) Investigation of older land consolidation projects showed that over 100 years have not much changed the Finnish parcel structures” (Versinskas et al., 2020). The study also found that the average parcel size remained almost the same in some areas and demonstrated small growth in other areas over the period of 100 years after the completion of respective projects.

EU Member States, which fund land consolidation projects from the national Rural Development Programmes (RDP) with EU co-financing are required to evaluate the land consolidation measure as part of the EU programme cycle evaluation according to the EU Regulation No 1305/2013 on support for rural development. The mandatory EU evaluations provide an overview of how the funding under the RDP was spent including on measures funding land consolidation projects. However, the EU evaluations should complement and not replace more detailed and technically focused evaluations conducted at the initiative of the Responsible authority.

7.5 Conclusions

The responsible authority should closely monitor the implementation of the individual land consolidation projects, in relation to accomplishment of activities, outputs and outcomes. Before operational closure, each individual project should be evaluated to capture the lessons learned for future adjustments of procedures and programme and reflect critically on whether the original socio-spatial and financial-economic objectives were sufficiently or appropriately achieved.

Given this recommendation, it is clear that from the onset this requires the responsible authority to develop monitoring and evaluation plans for both programme and projects level and to ensure that the plan is implemented according to the plans.

As a rule of thumb, a selected sample of 5–10% of the implemented projects should undergo detailed socio-economic impact assessments, 2–3 years after completion of the projects.

8 THE WAY FORWARD

Authors: Walter de Vries, Marije Louwsma

In view of climate change and the increased global pressure on food security because of the multiple crises, sustainable land use is more urgent than ever. Land consolidation is a land policy instrument that can consider spatial developments in a coherent and comprehensive approach, integrating various sectoral policy domains. Based on global land consolidation practice and country contexts, this publication provides more insight in the main aspects of land consolidation.

Rooted in traditions of agricultural advancement, land consolidation has much more to contribute to rural areas. Programmes and projects have proven that land consolidation can also address nature restoration, water management, and integrated rural development for example. Nonetheless, new applications are needed to deal with the effects of climate change, which become more and more urgent. Land use in deltas for example is threatened globally by sea level rise and additional effects such as salination, higher ground water levels, and limited accessibility of land. Other noticed effects of climate change are reduced or irregular river discharges and rainfall patterns, leading to limited availability of water for agriculture, industry, and consumers. The carrying capacity of what rural areas can handle regarding the impact of climate change is almost reached. Another relevant development is population growth in many countries and additional effects such as urbanisation – often requiring the conversion of fertile agricultural land into residential areas – and more pressing demand for food security. A transition towards renewable energy also has its impact on land use, although geographical differences between regions exist.

The demand for land becomes spatially diverse, more than ever. Climate changes pushes the spatial re-arrangement of land use, leading to higher demand for land in specific regions. Since the negative impact of climate change is apparent, the question is how land consolidation can develop in response to the increasingly complexity and the urgent need for a sustainable development. A novel approach is needed, and land consolidation is one of the instruments to seek new paths towards a sustainable development. At the same time land consolidation has already proven to be a suitable instrument to address climate change both in relation to adaptation and mitigation.

As this publication has shown, geographical differences in the application of land consolidation occur since demands and contexts differ from one location to the other. These differences might even become more distinct globally, due to mentioned developments. Land consolidation can foster the dialogue about land use optimisation, both to mitigate the negative effects of climate change and to prevent them as much as possible. How this materializes on the ground needs to be further explored. It is expected that local food production chains, with short distribution networks and based on circular economy standards are demanded.

The exchange of land rights between right holders remains the underpinning principle of land consolidation. Nevertheless, the guiding principles may change. Land may be valued differently for example based on changing perspectives on land as a commodity. Technical advancement of the instrument may provide one path, whereas socio-economic equity – i.e. access to land – can lead to other pathways. In the end, the puzzle still needs to be solved with all stakeholders involved, balancing current and future needs for a sustainable rural development.

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LIST OF AUTHORS



Marije Louwsma is senior advisor at the international department of the Cadastre, Land Registry and Mapping Agency in the Netherlands. For FIG she chaired commission 8 Spatial Planning and Development for the term 2019–2022. With MSc degrees in spatial planning and geo-information management and applications, her professional interest focuses on an interdisciplinary approach in the field of land administration, land use planning and geo-information. She has published several articles, papers, and book chapters among others.



Walter Timo de Vries (Prof. dr. ir.) is Chair of Land Management at the Technical University of Munich (TUM) since 2015. He is Academic Program Director Geodesy and Geoinformation and director of the Master and PhD programs in Land Management and Geospatial Science. He has worked since in numerous international projects in Asia, Africa and South America, dealing with land information and land reform, urban and rural development, geospatial data infrastructures and professional training and education in land issues, cadastre and spatial planning and development. His current research interests at TUM include smart and responsible land management, urban and rural development and land consolidation.



Morten Hartvigsen is since 2015 working for the Food and Agriculture Organization of the United Nations (FAO), Regional Office for Europe and Central Asia, as Land Tenure Officer. He graduated as Chartered Surveyor in 1991 from Aalborg University, Denmark. In 2015, Morten Hartvigsen defended his PhD Thesis on land reform and land consolidation in Central and Eastern Europe. He was during 1991–2006 employed by the Land Consolidation Unit of the Danish Ministry of Food. Since 2000, he has worked internationally with land consolidation, land banking, land management, land market development and rural development.



Wioleta Krupowicz (PhD. Eng.) is an assistant professor at the Department of Spatial Planning and Environmental Sciences, Faculty of Geodesy and Cartography, Warsaw University of Technology (Poland). She is a certified real estate appraiser with academic interest focusing on social, environmental and economic challenges in rural areas, bottom-up community development, sustainable landscape development and how digital technologies with multi-criteria methods can support these processes. She is the representative of the Association of Polish Surveyors (SGP) in FIG Young Surveyors Network.



Maxim Gorgan is from 2020 Land Tenure Officer at the Food and Agriculture Organization of the United Nations (FAO), the Regional Office for Europe and Central Asia. He joined the organization in 2016 as International Land Tenure Consultant. He is also a PHD candidate at the Czech University of Life Sciences Prague, Department of Economics and Development. His research interests have grown from his professional experience and include agricultural land markets, land abandonment, land consolidation and other land management instruments.



Niels Otto Haldrup holds a degree in land surveying and cadastral science from Copenhagen Agricultural University (1975) and a PhD from Aalborg University (2004). The early working years were in Southern Africa. For some years, he was a full time farmer. Thereafter, he has worked with land consolidation in The Danish Land Consolidation Agency and in a private firm. He was two years in Kosovo and subsequently had short assignments in Armenia and Kosovo.



Kalle Konttinen is Head of Land Consolidations at Finnish National Land Survey (Maanmittauslaitos). He has over 20 years an experience in Land Consolidations at rural Finland mainly focusing Agricultural Land Consolidations but also experience from Environmental and Project Land Consolidations. He has land surveying M.Sc. (land management, land and environmental justice) from Helsinki University of Technology (current Aalto University) from year 2002.



Adrianna Czarnecka is an Assoc. Prof. at the Department of Spatial Planning and Environmental Sciences, Faculty of Geodesy and Cartography, Warsaw University of Technology. She is a landscape architect with academic interest focusing primarily on rural landscape changes and landscape heritage aspects in participatory planning in rural development processes. Her research aims to investigate the social activities and practices that shape rural landscapes determining the resilience of rural areas to climate change.



Perica Ivanoski is an Agricultural Economist with over 20 years of experience in the analysis, formulation, implementation, and M&E of agricultural and rural development policies in CAP style. Since 2009 he designed and managed the introduction of land consolidation and land management policies supported by FAO, DLG, and the EU. Ivanoski has worked as a State Counselor and Deputy Minister in the Macedonian Ministry of Agriculture and in international consultancy. He holds a MSc in Agricultural Economy from the University of Reading, UK.



Anka Lisec is an associate professor at the University of Ljubljana, Faculty of Civil and Geodetic Engineering. Her research interests focus on geospatial data processing and analysis, geoinformatics, and GIS support for spatial decisions, with particular emphasis on interdisciplinary fields of land administration and land management that combine engineering, technology, and natural sciences with social sciences and humanities. In the field of land consolidation, she is involved in the preparation of guidelines at national and international levels, e.g., FIG, UN FAO.



Kwabena Obeng Asiana is currently a lecturer at the Department of Land Economy, KNUST, Ghana. Prior to this, he was a lecturer at the Geodetic Institute of the Leibniz University Hannover, Germany. He received his PhD. (2019) and MSc. (2015) from the University of Twente (ITC) with a focus on Land Administration. Kwabena is currently Chair of the FIG Young Surveyors Network, and the Chair-elect of the FIG Commission 8 on Spatial Planning and Development.

FIG PUBLICATIONS

The FIG publications are divided into four categories. This should assist members and other users to identify the profile and purpose of the various publications.

FIG Policy Statements

FIG Policy Statements include political declarations and recommendations endorsed by the FIG General Assembly. They are prepared to explain FIG policies on important topics to politicians, government agencies and other decision makers, as well as surveyors and other professionals.

FIG Guides

FIG Guides are technical or managerial guidelines endorsed by the Council and recorded by the General Assembly. They are prepared to deal with topical professional issues and provide guidance for the surveying profession and relevant partners.

FIG Reports

FIG Reports are technical reports representing the outcomes from scientific meetings and Commission working groups. The reports are approved by the Council and include valuable information on specific topics of relevance to the profession, members and individual surveyors.

FIG Regulations

FIG Regulations include statutes, internal rules and work plans adopted by the FIG organisation.

List of FIG Publications

For an up-to-date list of publications, please visit www.fig.net/pub/figpub

ABOUT FIG



International Federation of Surveyors is the premier international organization representing the interests of surveyors worldwide. It is a federation of the national member associations and covers the whole range of professional fields within the global surveying community. It provides an international forum for discussion and development aiming to promote professional practice and standards.

FIG was founded in 1878 in Paris and was first known as the Fédération Internationale des Géomètres (FIG). This has become anglicized to the International Federation of Surveyors (FIG). It is a United Nations and World Bank Group recognized non-government organization (NGO), representing a membership from 120 plus countries throughout the world, and its aim is to ensure that the disciplines of surveying and all who practise them meet the needs of the markets and communities that they serve.



Across the world, the negative impact of climate change is felt already. The need for a sustainable use of the limited amount of available land is more urgent than ever. Land consolidation is a specific land policy instrument that can consider spatial developments in a coherent way, integrating the implementation of multiple sectoral policies. This FIG report discusses international land consolidation practices. Several topics are elaborated from a practitioners perspective, such as existing variations of the instrument, public participation, valuation and developing the land consolidation plan. The expertise of the surveyor can enhance an inclusive, just, and fair reallocation process in various tenure systems and land administration traditions. As such this report aims to be a practical guidance for professionals, whereby international project examples complement information from literature.