



Norges miljø- og  
biovitenskapelige  
universitet

**Masteroppgave 2024 30 stp**  
Faculty of Landscape and Society

# **The use of land consolidation and land readjustment as tools for sustainable development in peri- urban areas**

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## **Acknowledgements**

This master thesis represents the end of my master's degree in real estate. The thesis was written at the Faculty of Landscape and Society at the Norwegian University of Life Sciences. The master thesis provides 30 credits.

I would like to express my deepest gratitude to my thesis advisor, Professor in land consolidation, Per Kåre Sky, for the support and guidance throughout the course of this research. His insights and expertise were most helpful in shaping both the direction and execution of this study. I would also like to thank Professor Emilio Diaz Varela and Professor Ramon Diaz Varela at the Universiade de Santiago de Compostela, for the warm welcome, the helpfulness and for taking interest in my research during my visit in Lugo. I want to thank Carlos Darriba Lopez as well for providing insights into Galician land consolidation and the socio-economic history of the region.

A big thanks to my friends, family and partner for helping me through the semester with encouraging words, and for believing in me.

Last but not least, I want to thank the girls in room U416 for offering support, and good times in between the writing.

## **Abstract**

The master thesis investigates the dynamics of urban expansion into peri-urban areas, emphasizing the roles of land consolidation and land readjustment in fostering sustainable development. Peri-urban areas, characterized by their position at the interface between urban and rural landscapes, are undergoing significant transformations due to urban expansion. These regions face unique challenges, including environmental degradation, loss of agricultural land, and infrastructural deficits, exacerbated by rapid urbanization.

The research explores how land consolidation and land readjustment can be strategically employed to address these challenges. The thesis synthesizes findings from various European contexts to recommend approaches tailored to the Norwegian landscape, leveraging international practices.

This study does not only shed light on the environmental impacts of peri-urban development but also provides recommendations for using land policy tools to promote more resilient and sustainable urban-rural transitions.

## **Sammendrag**

Masteroppgaven utforsker dynamikken av urbanisering av peri-urbane områder, med vekt på jordskifte sin rolle for å fremme bærekraftig utvikling. Peri-urbane områder, karakterisert ved deres posisjon i grensesnittet mellom urbane og rurale landskap, gjennomgår betydelige transformasjoner på grunn av urban ekspansjon. Disse sonene står overfor unike utfordringer, inkludert miljøforringelse, tap av landbruksland og infrastrukturelle underskudd, som forverres av rask urbanisering.

Forskningen undersøker hvordan jordskifte kan brukes strategisk for å møte disse utfordringene. Oppgaven syntetiserer funn fra ulike europeiske kontekster for å anbefale tilnærminger skreddersydd for det norske landskapet, ved å dra nytte av internasjonale praksiser.

Studien kaster ikke bare lys over de miljømessige virkningene av peri-urban utvikling, men gir også anbefalinger om bruk av verktøy innen arealforvaltning for å fremme mer motstandsdyktige og bærekraftige urban-rurale overganger.

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# 1 Introduction

## 1.1 Introduction to the research topic

Peri-urbanisation could become the foremost challenge for city and regional planning in the 21st century. This area, marked by significant shifts in relation to urban growth, often undergoes a rapid and chaotic development resulting in a landscape of urban sprawl. Rather than just seeing it as a transitional or marginal space on the outskirts of cities, the peri-urban can be viewed as a vibrant, multi-purpose landscape essential for the revitalization and expansion of urban areas.

Firstly, this study will try to identify the consequences of urbanisation of peri-urban areas. Secondly, there will be examined possible solutions from international practice with land consolidation and land readjustment for peri-urban areas. Ultimately, the knowledge gained from the first two questions will be connected to Norwegian context, and solutions from the Norwegian land consolidation practice will be discussed.

## 1.2 Structure

In the following I will explain the structure of the master thesis. Chapter one is the introduction chapter and will give information about the objective for the research, the research questions, limitations in the area of study, and a definition table of terms related to the topic that the master thesis will cover. Chapter two contains the methodology, with in-depth information about the two methodological approaches: the literature study and the case study. Further on, chapter three is dedicated solely to the literature review, starting with the theoretical framework for the analysis. Chapter four takes on all aspects of the case study, and like the former chapter, this one also has the theoretical framework incorporated. This means that the theory-part does not have an individual chapter, as is most times the standard structure for a master thesis. The discussion and analysis part are in chapter five, and the conclusion chapter in chapter six. Finally in chapter seven, there is the chapter with references. A more detailed discussion of the structure will be presented in the introduction to each chapter.



### 1.3 Research questions and objectives

The overall objective for the master thesis is to identify the environmental consequences related to the consequences in peri-urban areas, and how land consolidation and land readjustment can be used to accommodate these. From this objective I have formulated three research questions.

1. Which environmental related consequences does peri-urban areas face in relation to urban expansion?
2. What does international practice of land consolidation and land readjustment say about the development of peri-urban areas?
3. How can measures in the Norwegian Land Consolidation Act help the sustainable development in peri-urban areas?

The first research question aims to examine the environmental-related consequences that peri-urban areas face in relation to urbanisation. To identify the impacts, I have conducted a literature analysis with three studies on the topic. The second research question will examine international practices of land consolidation and land consolidation, and how these land management tools can be used to potentially solve the consequences identified in the first research question. The third research question will be based on the two former questions, examine how measures from the Norwegian Land Consolidation Act can be used for sustainable development in peri-urban areas. The third question will use the findings from question one, and see how measures within land consolidation in Norway can be used to solve the issues. There will also be an evaluation if international practices within this field can be transferable to a Norwegian land consolidation practice. Research question number two are dependent of the findings in the first research question, while the third research question is a product of the findings in both the first and the second research question.

### 1.4 Limitation

The master thesis will be centred around the topics of the two land management tools land consolidation and land readjustment. The land management tool of land banking will also be discussed, but not as a tool used in combination with land consolidation. The area of research

is between the urban and the rural. There will therefore not be any research conducted on urban and rural areas. Further on, the focus will be on the consequences regarding environmental sustainability and regulatory planning. Socio-economic factors will not be included in the study.

### 1.5 Definition of terms

English term	Norwegian term	Definition
*Land consolidation	Jordskifte	A land management tool that mainly focuses on bettering property conditions in rural areas. <sup>1</sup>
Land readjustment	Jordskifte	A tool which is used in the process planning and in the expansion of urban areas. <sup>2</sup>
**Peri-urban areas	Peri-urbane områder	Mixed areas under an urban influence, but with a rural morphology <sup>3</sup>
Urban sprawl	Byspredning	<i>“The physical pattern of low-density expansion of large urban areas under market conditions into the surrounding agricultural areas.”</i> <sup>4</sup>
Land fragmentation	Fragmentert jord	The physical characteristic of land with many parcels. <sup>5</sup>
Land banking	Jordbanking	The strategies used by a public institution to buy, sell, exchange, or lease rural land to enhance land mobility, develop agricultural markets, and support public policies on agricultural and rural development, sustainable land use, and large-scale

<sup>1</sup> Louwsma et al. 2017b

<sup>2</sup> Louwsma et al. 2017b

<sup>3</sup> Caruso, 2001, p. 9

<sup>4</sup> European Environment Agency, 2004

<sup>5</sup> Van Dijk, 2003

		environmental and infrastructural projects. <sup>6</sup>
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*Table 1: Definitions of relevant terms.*

\*There are various definitions of the term land consolidation, and the definitions vary depending on the country. In the Norwegian context, the definition of land consolidation differs from the overall international definition. In Norway, land consolidation has become an increasingly important tool to solve juridical problems related to real property also in urban areas, with the Land Consolidation Court's authority to handle cases in urban areas being expanded over several decades.<sup>7</sup> Land consolidation is no longer a tool only to be used in rural area, as it traditionally and historically has been.

\*\*The term peri-urban is used throughout the master thesis to refer to the zones between urban and rural areas.<sup>8</sup>

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<sup>6</sup> Versinskas et al., 2020, p. 1

<sup>7</sup> Hegstad, et al. 2022, p. 14

<sup>8</sup> The term will be explained further in section 3.2.4.

## 2 Methodology

### 2.1 Introduction

The methodology chapter is divided into a sub-chapter for the literature review and a sub-chapter for the case study, each explaining the research design and data collection for the two methodological approaches. After this, there is a sub-chapter which addresses the concerns related to the two methods. The concerns addressed includes internal validity, external validity and reliability. In the final part of the methodology-chapter I reflect on alternative or additional methodological approaches.

The overall approach to the master thesis is a qualitative analysis of documents, articles and existing research on the topic. Firstly, the research focuses on a literature review for gaining fundamental knowledge of areas on the interface between rural and urban areas. The literature review is an overall approach to international practices within land consolidation, land readjustment and peri-urban planning. Further on, a case study is implemented to serve as an illustration of the main topic. The case study focuses on two land consolidated areas that both have had a change in land use after this process. To better understand the area of research and gain knowledge of the study objects, there was conducted a field trip to Galicia in North-western Spain with a duration of one month.

### 2.2 Literature review

#### 2.2.1 Research design

There are various definitions of what a literature review is, but in short, a literature review aims to examine a selection of published material, recent or current. It is applicable to many different subjects and will often include findings in research.<sup>9</sup> The research for this master thesis is focused on the environmental consequences of peri-urban areas, and how land readjustment and land consolidation can be used to accommodate the identified consequences. A literature review helps broaden and create new perspectives that are only possible when the literature is reviewed together and seen in the same context of other research and information.<sup>10</sup> The literature review is seen in context with the case study of the

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<sup>9</sup> Grant, et al., 2009, p. 94

<sup>10</sup> Aveyard, 2023, p. 2

two areas in Galicia. The area of interest for the thesis is complex and extensive, and to get an overview of the existing information and research available, a literature review is seen as beneficial to further gain knowledge on the topic. The literature review will only be used for the first two research questions as the overall objective for the literature review is to gain knowledge about the international context of peri-urban development.

There are different ways to conduct a literature review, and for this master thesis the approach is a thematic review. A thematic review allows the researcher to analyse data to identify key items that were apparent in between and within transcripts.<sup>11</sup> The themes for the analysis is objective, methodology, key findings, analysis of strengths and weaknesses, and relevance to the research question.

### 2.2.2 Data collection

The natural starting point before beginning the actual search for relevant literature, was to find the English translations of Norwegian key words relating to the research topic. In relation to this, the term list for The Planning and the Building Act<sup>12</sup> has been helpful, along with the English translation of the Norwegian Land Consolidation Act. The most central term is “*land consolidation*” which is the accurate translation of the Norwegian word “*jordskifte*”. An important distinction from land consolidation which is used for land management in rural areas, is the term “*land readjustment*” which is oriented around areas in urban locations.<sup>13</sup> Other key words relevant to the search is “peri-urban”, “urban-rural”, “urbanisation” and “environmental”.

The structure of the literature search has taken inspiration from a 15-step guide.<sup>14</sup> This guide ensures the quality and precision in both the findings and the documentation of the search.<sup>15</sup> Due to a short timeframe, I only incorporated some of the steps in my search-strategy, as it would be too time-consuming to follow them all extensively.

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<sup>11</sup> Bryman, 2016, p. 11

<sup>12</sup> Termlist – The Planning and Building Act, made by the Ministry of Local Government and Regional Development,

<sup>13</sup> Louwsma, et al., 2017b. See definition of terms in section 1.5

<sup>14</sup> Bramer et al., 2018, p. 532.

<sup>15</sup> Bramer et al., 2018, p. 531

1. Determine clear and focused questions	<p>Research questions:</p> <ol style="list-style-type: none"> <li>1. Which environmental related consequences does peri-urban areas face in relation to urban expansion?</li> <li>2. What does international practice of land consolidation and land readjustment say about the development of peri-urban areas?</li> </ol>
2. Describe the documents that can answer the questions	<p>Documents regarding areas laying on the interface between urban and rural areas (peri-urban areas)</p> <p>Documents regarding urbanisation of rural land.</p> <p>Documents regarding environmental impact as a consequence of urbanisation.</p>
3. Decide which key concepts addresses the different elements of the questions	<p>For research question number one:</p> <ul style="list-style-type: none"> <li>- Environmental consequences of rural development</li> <li>- Urban expansion on rural areas</li> </ul> <p>For research question number two:</p> <ul style="list-style-type: none"> <li>- Land consolidation in peri-urban areas</li> <li>- Land readjustment in peri-urban areas</li> <li>- Sustainable development using land consolidation</li> <li>- Sustainable development using land readjustment</li> </ul>
4. Choose an appropriate database and interface to start with	<p>The databases I used to conduct the search were: Scopus and Oria.</p>
5. Use database-appropriate syntax with parentheses and Boolean operators <sup>16</sup>	<p>When searching in the two databases, I used “AND” and “OR” as Boolean operators.<sup>17</sup></p>
6. Optimize the search	<p>After conducting the first searches, a new term related to the field of research appeared. The term</p>

<sup>16</sup> Boolean operators were used to combine and modify search terms, which controls the outcomes and decisions reached by the systematic review. Harrisen, et al., 2019, p. 1646.

<sup>17</sup> Bramer et al., 2018, p. 536

	<p>peri-urban, which was not known to me before, unlocked a whole new list of literature of relevance. I optimized the search by adding the new term in combination with the search terms, e.g. Peri-urban AND consequences.</p>
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Table 2: Literature search

To best be able to conduct the search for literature of relevance, I prepared keywords for searching. The level of usefulness of the keywords will be a result of what appears when using them in a search.<sup>18</sup> Naturally, the most paramount keywords are “land consolidation”, “land readjustment” “rural-urban transformation”. The literature search started with a systematic search in databases. The search started off by using the academic search engine Google Scholar, in combination with the databases of Scopus, Oria and Science Direct.

The reporting of the design is done by the guidance of the PRISMA statement. The checklist ensures that each component of the search is documented in full and that it could be replicable. A replicable design helps secure the minimization of bias.<sup>19</sup> PRISMA stands for The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement, and its extensions, can be defined as a minimum set of recommendations designed to promote a pellucid and comprehensive reporting of a systematic review.<sup>20</sup> The 2009 PRISMA statement is extensive and to follow it fully will be way too time consuming given the time frame for this research. Instead, I have chosen to apply a variation of some of the items of the statement to my literature search reporting. The result of this is a table with information of the name and type of the literature, database, and the date when the literature was read.<sup>21</sup>

### 2.2.3 Criteria for literature selection

The area of interest for the literature review is one where there is constantly being done new research. When scoping out relatable research the main focus is the date of publishing. The contents of peri-urban development and sustainable land management is rapidly changing, making it crucial to focus on relatively new research and information on the topic. The

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<sup>18</sup> Aromatis, et al., 2014, p. 49

<sup>19</sup> Rethlefsen, et al., 2021, p. 1

<sup>20</sup> Sarkis-Onofre, et al., 2021, p. 1

<sup>21</sup> See appendix 1

publishing years of the literature included is to make sure that the research is new and applicable to the situations of our society today. The literature analysed in the literature review is from the time period between 2009-2018.

## 2.3 Case study

### 2.3.1 Research design

The research questions take on an exploratory approach as the questions are formulated in a way that they primarily focus on the “what”. Exploratory studies are versatile and can be applicable to all of the five social science research methods: experiment, survey archival analysis, history and lastly case study.<sup>22</sup>

The purpose of the research is to explain how instruments such as land consolidation and land readjustment are being used, and the effects they have. The case study seems adequate as the questions demand a more in-depth description of these tools.<sup>23</sup> The case study is being used to further research an area in depth and within its real-world context, especially since the boundaries between phenomenon and context may not be clear.<sup>24</sup> By including the case study, the concept of former rural, now turned urban areas, are being represented with two practical examples.

There are many varieties within the realm of case studies, and the definitions of these vary from author to author. From the definitions of Robert Yin, it is evident that case studies can differ depending on if they are single-case designs or multiple-case study designs.<sup>25</sup> For this case study I have chosen to look at one specific region, and the use of land consolidation in that area. The case study will therefore be placed under the category of a single-case study.

For the single case-study he lists five rationales which describe different reasons as to why the case study fits under the single-case study umbrella. The rationales are *critical*, *unusual*, *common*, *revelatory* or *longitudinal* cases.<sup>26</sup> While examining the nature of the case, I found that my specific case fits under the third rationale - *common* case. The case study will give an

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<sup>22</sup> Yin, 2018, p. 9-11

<sup>23</sup> Yin, 2018, p. 4

<sup>24</sup> Yin, 2018, p. 15

<sup>25</sup> Yin, 2018, p. 49

<sup>26</sup> Yin, 2018, p. 49



insight into an area that has been through the process of land consolidation and will in this matter illustrate and extend the theory from the literature review. Further on, Yin lists the two variants of single-case designs: the embedded and the holistic design. For this case the research will be focusing on two areas within the same region, making the case fall under the category of the embedded design. Whereas the holistic design only focuses on one segment.<sup>27</sup>

Even though there are two areas of focus of the case study, there will not be conducted a comparative analysis of the two. Neither will there be a comparative analysis of land consolidation in Spain and land consolidation in Norway. They simply illustrate two different changes in land use after both areas underwent a land consolidation process, with one being urbanised and the other being industrialised. More on this in chapter 4.

### 2.3.2 Data collection

The data collection related to the case study naturally began with gaining knowledge about the region of Galicia. The first step was to establish a dialogue with the professors of Universidad de Santiago de Compostela (USC). My advisor shared their contact info with me, making it possible to correspond with them before my visit to Lugo. The initial contact was made using email, where I asked a few questions about land consolidated areas in urban and peri-urban areas. When I arrived at USC, we had a meeting discussing what the exact area of research was. Following this, there was an introduction to the juridical system of land consolidation in Galicia, as well as the context of regional history and cultural heritage. All of this being crucial to understanding the need for and use of land consolidation in the region.

Further on, Professor Emilio Varela at USC guided me through the steps to which one can access the database for all land consolidation cases accessed within the official website of The Regional Government of Galicia. The system is comprehensive, and gives a full overview of all land consolidated cases in Galicia, dating back to the 1950's.<sup>28</sup>

## 2.4 Addressing concerns related to the method of choice

In the following, the quality of the research design will be put through different tests. An approach for testing this has been to conduct four tests. The whole point of executing these

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<sup>27</sup> Yin, 2018, p. 51

<sup>28</sup> See appendix 2 for the Guide

tests is because the research design is required to symbolise a logical list of statements. The list includes testing of internal validity, external validity and reliability.<sup>29</sup>

#### 2.4.1 Internal validity

Internal validity in qualitative research concerns the extent to which the researcher's procedures and findings accurately reflect the purpose of the study and represent reality.<sup>30</sup> There are different approaches to increase the likelihood of the research producing reliable results, one of them being continuous observation.<sup>31</sup> When conducting the one-month field trip to Galicia, I invested enough time to get to know the of land consolidation in the region. I had little knowledge of land consolidation outside of Norway before the field trip was conducted. The knowledge of the culture and history related to land consolidation told by researchers from the region contributed to a deeper understanding of the context of the research topic. The stay in Galicia strengthened the internal validity of the research.

#### 2.4.2 External validity

The external validity is about the extent to which the findings of a study can be generalised beyond the specific context of the study to other settings and characteristics. A concern with this single case-study is the ability for generalisation. A way to address this is to look at case-studies like experiments, they are generalisable to theoretical propositions and not to populations or universes. The goal with the case study research is to expand and generalise theories and not to extrapolate probabilities.<sup>32</sup> The case is focused around one particular region in Spain with a juridical system which even differs within the same country. The cultural and socio-economic composition are also components in which the process around land consolidation is a result of. The case will therefore not be comparable with other land consolidated areas in other countries. The case is not intended to be a sample, rather an illustration of theoretical concepts and principles.<sup>33</sup>

#### 2.4.3 Reliability

The objective for reliability in case studies, is the opportunity of replication by another researcher. The goal is to minimise errors and biases in the study.<sup>34</sup> The core of a good

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<sup>29</sup> Yin, 2018, p. 42

<sup>30</sup> Johannessen et al., 2016, p. 232

<sup>31</sup> Lincoln and Guba, 1985, cited in Johannessen et al., 2016, p. 232

<sup>32</sup> Yin, 2018, p. 21

<sup>33</sup> Yin, 2018, p. 38

<sup>34</sup> Yin, 2018, p. 46

replication in case studies is thorough documentation of the procedures followed. To address this, I have made two guides with the goal of making the case study more replicable. Appendix 3 is showcasing the steps to accessing the database of the maps for land consolidation cases in Galicia. Appendix 4 is a guide for accessing information about the land consolidation cases for the two study objects. The background for the making of the two guides is the potential issue of a language barrier that might occur when trying to find the information about the case study objects. The original languages of the websites are Galician and Spanish, and unless the researcher speaks one of these, it can be difficult to access the sites with the same data that I sampled for the case study. There is an alternative to use Google Translate for websites when accessing it, but the translation is poor and may cause greater confusion.

A solution to replication of ethnographic studies, it is suggested that the researcher adopts a similar role that the original researcher had. If the researcher performing the replication does not see and hear things that are comparable to what was observed in the original study, the findings will not match.<sup>35</sup> A replication of the procedure for the Galician case study would in this instance mean that the researcher had to conduct a trip to Lugo, and interact with the same researchers and persons at the Universidade de Santiago de Compostela as I did. The field trip was crucial to understand the use and history of Land Consolidation in Galicia and see the context of it in real life. A trip of this calibre would seem necessary for replicating the study.

Another aspect of reliability is the dependability of the results. This can be done by providing the reader with a detailed description of the context of the research.<sup>36</sup> In the introduction for the respective chapters for both qualitative methods used in this master thesis, there is information that demonstrates the contemporary relevance of the research.

## 2.5 Additional, or alternative methods

There could have been other methods that would be beneficial for answering the research questions for this master thesis. One of them being a comparative case study between land consolidated areas in peri-urban areas in Spain and similar areas in Norway. In that way, the

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<sup>35</sup> LeCompte and Goetz, 1982, p. 37

<sup>36</sup> Johannessen et al., 2016, p. 232

research would have been focusing on the potential similarities and differences in such practice in these countries. The international context would have been placed in a Norwegian one, and the revelations might have been beneficial for learning about for example if the effects of land consolidation are similar in Galicia and in Norway. There are many variants of case studies, and there are certainly other case study methods that could have been conducted for this research. An example of this is a cross-case synthesis where the research consists of identifying key variables and then gathering the cross-case data for every variable.<sup>37</sup> Nevertheless, I believe that a literature review of international research gives better insights into the development of the usage of land management tools, rather than the characteristics of the process of land consolidation. The focus is not solely on the land consolidation process, but also what factors and tools that can help ensure a sustainable development of these areas. Hereby referencing existing research and analysing different experiences from using these tools. The theme explicitly dives into the *development*, and not the differences, of practices internationally.

There are also alternative methods in which I could have added to my research methodology. Interviews is another type of qualitative methodology which could have contributed with empirical foundation for my research. However, interviews are more focused on the individuals experience regarding the issues that you want to research.<sup>38</sup> This is not particularly fitting to my research questions, as the perspective is on the physical impact on a certain type of area, and the use of land management to accommodate this. The perspective of the research is not aimed at the social impact. Additional to this, interviews are known to be a time-consuming process with many steps.<sup>39</sup> The timeframe for this research would not be sufficient to include this as a research method on top of the other two I have chosen to go through with.

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<sup>37</sup> Yin, 2018, p. 196

<sup>38</sup> Seidman, 2012

<sup>39</sup> Robson, 2011

## 3 Literature review

### 3.1 Introduction

In this chapter, there will be a short introduction of the contents of the literature review. As mentioned in the introduction chapter in chapter one, the theory related to the review is incorporated in this chapter. This provides the information needed to understand the topic of the selected literature for the review, as well as an overview of land consolidation in Norway. After this, there will be conducted a thematic analysis of five works of literature divided under two sub-topics. Each sub-topic relates to one of the first two research questions. Following the analysis is an overview of the key findings from the literature review of all five studies.

Theory on land consolidation in Norway is included because of its significance to the discussion of the findings from the literature review. The main focus in this chapter is how land consolidation and land readjustment are being used in an international context, and the mention of such practices in Norway will therefore in this chapter be kept to a minimum. In the chapter of the discussion, the findings from the literature review will be tied to the Norwegian context, making it important to introduce the measures of relevance in Norwegian legislation in this chapter. More on this in chapter five. It was not deemed beneficial for the study to conduct a literature review for the third research question in the same way as it was for the first two questions. This is because the objective is to learn from international practices first, and then see if there is possible to implement some of these in Norwegian land consolidation practice.

The literature review works as a gathering of knowledge of the consequences following urbanisation of peri-urban areas, and the use of land consolidation and land readjustment in these zones from an international perspective. The literature is selected by their significance to the research questions and will therefore surround the topics and questions stated within them. The first sub-topic of the literature analysis is urban expansion and sustainable development, whilst the second sub-topic is land readjustment and land consolidation.

## 3.2 Theoretical framework

### 3.2.1 Land consolidation in Norway

In Norway the process of land consolidation is controlled and enforced by the Land Consolidation Court and regulated by the Land Consolidation Act.<sup>40</sup> When “*Land Consolidation Act*” is mentioned elsewhere in the text, it will be the Norwegian one that I am referring to. The Land Consolidation Court have authority to take on cases located in both rural and urban areas, having several legal instruments enshrined in the law. As mentioned, the term land consolidation also encompasses the term land readjustment.<sup>41</sup>

Historically, the location of land consolidation cases were solely in rural areas, mainly concerning agricultural land.<sup>42</sup> In later years this has changed, and according to the published records at The Lovdata Foundation, land consolidation cases is now increasing in urban areas.<sup>43</sup> The legal measures in the law has been applicable for urban areas for some time, but it is not until recent years that the measures have been utilised more consequently in urban areas.

The sole purpose of the Land Consolidation Act is defined in the first paragraph, section 1-1: “*The purpose of this Act is to facilitate the efficient and advantageous use of real property and resources for the benefit of owners, easement holders and wider society*”.<sup>44</sup> In the following I will introduce some legal instruments from the Land Consolidation Act, that are specifically relevant for peri-urban areas. These legal instruments will be elaborated further in the discussion in chapter five.

One of the most central measures of the Land Consolidation Act is section 3-4. This measure makes it possible for the land consolidation court to do modifications to property. The background for this is to make a better consolidation of the property and reduce the number of parcels. Parcels with unfavourable shapes can also be reshaped. This applies to all types of properties, making this measure relevant in urban, peri-urban and rural areas.<sup>45</sup>

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<sup>40</sup> Land Consolidation Act of 21<sup>st</sup> of June 2013

<sup>41</sup> See section 1.5 Definition of terms

<sup>42</sup> Hegstad et al., 2022, p. 14

<sup>43</sup> Elvestad & Sky, 2021, p. 3

<sup>44</sup> Land Consolidation Act of 21<sup>st</sup> of June 2013

<sup>45</sup> Bjerva et al., 2023

Another relevant legal basis is section 3-2 first paragraph second full stop. This is the legal basis for the use of project-related land consolidation.<sup>46</sup> Project-related land consolidation is a type of case that is carried out as a result of a public or private measure being implemented.<sup>47</sup> The case type is about reducing impractical property arrangements that would otherwise occur without land consolidation after the implementations of a measure.<sup>48</sup> When initiating project-related land consolidation, it is natural to use section 3-22 as a measure. Section 3-22 facilitates the use of land consolidation to implement legally approved measures or protection through land exchange. The measure has similarities to land banking, as both can be used to allocate land for infrastructure or other types of project developments.<sup>49</sup>

Back in 2015, The Norwegian scientist Reidar Almås<sup>50</sup> proposed a new state enterprise: A state-owned land bank to create sensible agricultural properties in Norway. The background for the proposal is that the amount of leased agricultural soil has increased immensely in the past decades.<sup>51</sup> In 2022, the share of rented land was 48 percent of all areas in operation, while in 1969 only 15 percent of the agricultural land was rented land.<sup>52</sup> With a state-owned land bank it would be possible for those who do not farm the land themselves, but who own arable land, forest or outlying land, to register their property. They can themselves decide if they want to rent it out to the land bank or put up in for sale. In the proposal he further states that it would be up to the land bank to develop parcels with good consolidation, and then further selling them.<sup>53</sup>

### 3.2.2 Apeldoorn Declaration on Land Consolidation and Land Readjustment for Sustainable Development

The Apeldoorn declaration was made of participants of the International Symposium on Land Consolidation and Land Readjustment in Apeldoorn in the Netherlands, and provides definitions of land consolidation and land readjustment, advocating for comprehensive, participatory, and inclusive approaches. The two are defined as “*umbrella concepts about the exchange of land rights that can be adapted according to context*”<sup>54</sup>. While land

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<sup>46</sup> Project-related land consolidation is an English translation of the Norwegian term “tiltaksjordskifte”

<sup>47</sup> Land Consolidation Act section 1-3 letter b

<sup>48</sup> Udnes, 2021, p. 271

<sup>49</sup> Udnes, 2021, p. 276

<sup>50</sup> Norwegian sociologist and researcher with rural sociology and regional policy as his specialties

<sup>51</sup> Bondelaget, 2015

<sup>52</sup> Statistics Norway, 2023

<sup>53</sup> Bondelaget, 2015

<sup>54</sup> Louwsma et al, 2017a, p. 1

consolidation normally is being used as a tool for managing rural and mostly agricultural land, land readjustment is being used in urban areas. This is a clear distinction from the Norwegian practice, where land consolidation can be used for managing land in both urban and rural areas.

The main objective of the declaration is to promote how these land management tools can be used for sustainable development by enhancing land tenure security, and addressing contemporary challenges such as climate change, food production and population growth. The main take from the declaration is that there is no one-size-fits-all solution, and that each country has their own traditions and history using land consolidation and readjustment. What seem to be the common fundamental factors for success for these instruments is an effective and inclusive land administration, as well as participatory and inclusive processes.<sup>55</sup>

### 3.2.3 Land banking

The essence of land banking involves a public institution engaging in the purchase, sale, and/or leasing of land to and from landowners. The objective behind land banking is to enhance land mobility, supporting the development of rural markets, minimizing land abandonment, and achieving various other public goals.<sup>56</sup> It is recommended by the Food and Agriculture Organization of the United Nations (FAO) to use land consolidation in combination with land banking by creating a legal framework that makes a fusion between the two possible. This approach aims to enhance land mobility, support the expansion of farms, and offer landowners compensation through land rather than financial means when agricultural lands are repurposed for projects initiated by the public sector. Legal frameworks governing land banking should ensure that these activities align with the overarching strategic goals of land consolidation. Furthermore, the laws overseeing land banking operations should permit the integration of agricultural land owned by the state into the land bank.<sup>57</sup>

### 3.2.4 Peri-urbanisation

Areas on the interface between the urban and the rural can also be referred to as peri-urban. Multiple definitions of peri-urbanisation exist, reflecting its complex nature. One of the definitions is that peri-urban areas are made when peri-urban regions merge, forming a new

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<sup>55</sup> More on the Apeldoorn Declaration in section 3.3.2

<sup>56</sup> Versinskas, 2022, p. 1

<sup>57</sup> Veršinskas, 2020, p. 163



type of landscape which does not fall into the category of either of the two.<sup>58</sup> Caruso states in his report that “*peri-urban areas are mixed areas, they are urban because of a commuting link and rural because of agricultural land use*”.<sup>59</sup> The development of peri-urban areas is related to technological and infrastructural development such as roads and IT networks, and socio-economic processes. The borders of these areas are not easily distinguishable, and the areas are characterised by a mix of functions where consumption and production compete for land.<sup>60</sup> A key concept within the peri-urban is the “urban sprawl”. Urban sprawl is characterised by low-density, inefficient land use with negative impacts on the environment, including high carbon emissions and loss of agricultural land.<sup>61</sup>

### 3.3 Analysis of related literature

The selected literature for the analysis has been separated under two sub-topics. The two sub-topics are related to one of the two research problems which is stated under each section. In this way, the literature gets presented in a structure that is easy to follow. It is also easier to see the relevance of the studies to each research question. I have conducted a thematic analysis of the studies which are analysed by four categories. The categories are objective, methodology, key findings, analysis and relevance to the research question.

The objective briefly explains the main research topic of the study. The methodology-section showcases the methodological approaches used to conduct the research for the individual studies. Following this is an overview of the key findings, which highlights the most important items from each study. Lastly, I will discuss how the study is relevant to the research question in which it is situated under.

#### 3.3.1 Sub-topic 1: Urban expansion and sustainable development

*Research-question 1: Which environmental related consequences does peri-urban areas face in relation to urban expansion?*

The first sub-topic of the literature review is urban expansion and sustainable development. This topic is linked to the first research question, and the studies presented here are analysed

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<sup>58</sup> Nilsson, et al., 2013, p. 5

<sup>59</sup> Caruso, 2011, p. 12

<sup>60</sup> Cavailhès, 2001, p. 26

<sup>61</sup> Caruso, 2011 p. 23

to identify the possible consequences that peri-urban areas may face in relation to urban growth.

#### 3.3.1.1 Study 1: Peri-urban futures: Scenarios and models for land use change in Europe

##### **Objective**

*Peri-urban futures: Scenarios and models for land use change in Europe*<sup>62</sup> is a book about the interactions between urban, peri-urban, and rural areas, particularly focusing on sustainable land use changes. The book aims to provide an in-depth analysis using scenarios and models that forecast changes in land use, and to offer strategies that can assist in managing growth, preserving green spaces, and enhancing sustainable development within peri-urban regions. The book centres around the The PLUREL project, which is an EU-financed project with thirty-six partners from 14 European countries and China. The project is coordinated by the University of Copenhagen, and the main objective was the sustainable development of land use systems.<sup>63</sup>

##### **Methodology**

The data collection methodology in the book integrates both qualitative and quantitative data. The dual approach captures a spectrum of information necessary for effective land use planning and scenario development. The book utilises future scenarios to predict and analyse changes in land use patterns. These scenarios are based on different potential developments and policy decisions. Allowing for a comprehensive examination of their impacts on urban, peri-urban, and rural interactions.<sup>64</sup>

Various models are developed and employed to assess the environmental, social, and economic impacts of land use change. These tools help in understanding how different scenarios might play out and what strategies could be effective in managing these changes. A participatory approach is used where a board comprising planners, local politicians, NGOs, and other relevant stakeholders from the case-study regions is formed. This board plays a crucial role in following the research closely, providing feedback, and ensuring that the models and scenarios are aligned with practical policy needs. The methodology involves

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<sup>62</sup> Nilsson et al., 2013

<sup>63</sup> Nilsson et al., 2013 p. 5

<sup>64</sup> Nilsson et al., 2013 p. 5

continuous interaction with the stakeholders through workshops and feedback sessions, which helps refine the tools and strategies developed during the research.<sup>65</sup>

To make the study more illustrative, the book includes detailed case studies from several European regions, each with unique challenges and planning traditions. These case studies serve as a primary method for applying the models and scenarios, ensuring that the recommendations are tested against real-world conditions. By comparing different regions, the book identifies best practices and successful strategies for managing peri-urban land use changes in a comparative analysis.<sup>66</sup>

After the case studies were conducted, tools for assessing the sustainability impacts of land use changes are developed, which consider a wide range of indicators including environmental degradation, social equity, and economic viability. The project adopts a two-level approach where broader issues are evaluated at the pan-EU/national level, while more detailed analyses are conducted at the regional level using the specific case studies. With the PLUREL project, the analysis is moved into a broader frame, making it possible to see connections and separations between European countries.<sup>67</sup>

The use of quantitative modelling involves statistical and spatial data to build models that quantify land use changes and their impacts. Alongside quantitative methods, the book also incorporates qualitative assessments through scenarios that explore various qualitative factors like policy changes, cultural shifts, and potential future developments.<sup>68</sup> Findings from the research are intended to inform policy by suggesting integrated, territorial policies that consider the complexities of rural-urban interactions.<sup>69</sup>

### **Key findings**

The book encapsulates a wide range of findings from the PLUREL project, focusing on the dynamics between urban, peri-urban, and rural interactions under the influence of various developmental scenarios. The key findings from the text can be divided into five different categories: Urban expansion, sustainability practices, policy impacts, and planning strategies.

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<sup>65</sup> Nilsson et al., 2013 p. 80, 93

<sup>66</sup> Nilsson et al., 2013, p. 6, 92

<sup>67</sup> Nilsson et al., 2013, p. 5

<sup>68</sup> Nilsson et al., 2013, p. 5, 228

<sup>69</sup> Nilsson et al., 2013, p. 301

### Dynamics of Urban Expansion

The book finds that peri-urban areas face increasing urbanisation pressures that include sprawl<sup>70</sup> and disjointed land use changes. These areas are expanding more rapidly than urban cores due to low land costs, available space, and increasing connectivity due to improved transportation networks. Changes in demographics such as smaller household sizes and increasing population have intensified the demand for housing in peri-urban areas. This shift is promoting a scattered, low density urban sprawl often lacking systematic planning.<sup>71</sup>

### Policy Recommendations and Governance

One of the core recommendations is the development of integrated, multi-scalar policies that address the unique needs of peri-urban areas. These policies should coordinate transport, housing, and environmental management to prevent poorly planned urban growth. Engaging a broad spectrum of stakeholders including local governments, NGOs, and community groups is vital. The book details processes and frameworks for stakeholder engagement that help align policy implementations with community needs and sustainability goals.<sup>72</sup>

### Planning Strategies and Tools

The use of sophisticated modelling tools and scenarios is advocated to predict future land use changes and their impacts. These tools help planners and policymakers visualise potential outcomes and make informed decisions. The findings suggest establishing robust governance structures that can oversee the complex dynamics of peri-urban areas. This involves creating policies that are flexible and adaptive to changing land use patterns and demographic trends. Strategies for urban containment including the designation of agricultural belts, conservation areas, and the prioritisation of brownfield development over greenfield sites are recommended to control sprawl.<sup>73</sup>

The findings from the book demonstrate a comprehensive approach to understanding and managing the peri-urban landscapes of Europe. The findings from the book suggest that sustainable management practices, integrated policy framework, effective stakeholder management, and innovative planning tools are essential for shaping the future of peri-urban

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<sup>70</sup> See definitions of terms section 1.5

<sup>71</sup> Nilsson et al., 2013, p. 21, 411

<sup>72</sup> Nilsson et al., 2013, p. 107

<sup>73</sup> Nilsson et al., 2013, p. 108-121

areas in a way that balances development pressures with environmental and social needs. These strategies not only aim to mitigate the adverse effects of urban sprawl but also enhance the liveability and sustainability of expanding peri-urban regions.

### **Relevance to the research question**

The book touches on consequences of urban expansion that is related to many perspectives, including economic and social perspectives. The sub-research question is related to the consequences from a planning and environmental perspective, which the book also dives into. These impacts are multifaceted, reflecting the complex interactions between urban growth and peri-urban environments. The environmental consequences include the loss of ecological habitats, degradation of natural resources and increased environmental pollution. From a planning and regulatory perspective, the consequences include challenges in infrastructure development, land use conflicts, regulatory and jurisdictional issues, and urban sprawl and inefficient land use.

The urban expansion often leads to the fragmentation and loss of wildlife habitats and ecosystems in peri-urban areas. This transformation can disrupt local biodiversity and reduce the ecological services these areas provide, such as air and water purification, climate regulation, and recreational opportunities. As cities expand into peri-urban areas, the increased development can lead to soil degradation, agricultural productivity, and compromised water quality due to runoff from impervious surfaces and pollution. Expansion often brings more traffic, industrial activity, and higher energy consumption, leading to increased air and noise pollution in peri-urban zones that previously had lower levels of environmental contaminants.

Urban expansion requires extensive infrastructure development, including transportation, sewage, water and energy systems. Peri-urban areas often struggle with the rapid pace of development, leading to inadequate or overstretched infrastructure services that can diminish the quality of life for residents. As urban areas encroach on peri-urban landscapes, conflicts can arise between existing land uses, such as agriculture or recreation, and new urban uses. This requires careful planning to manage competing interests and ensure sustainable development. Peri-urban areas may fall under different administrative jurisdictions, complicating coherent planning and development efforts. Coordinating policies across multiple local government areas can be challenging, often leading to piecemeal or

inconsistent approaches to land use, environmental protection, and urban design. Without effective planning controls, urban expansion can result in sprawl-low-density, car-dependent development that is inefficient and unsustainable. This type of growth can exacerbate environmental impacts and lead to inefficient use of land and resources.

To address the challenges posed by urban expansion into peri-urban areas, the book outlines an integrated approach that combines sustainable urban design, strategic land use planning, enhancement of green infrastructure, and the strengthening of regulatory frameworks.

Promoting Sustainable Urban Design: The strategy emphasises the importance of compact, high-density developments to minimise land consumption and reduce the extent of infrastructure needed. By encouraging mixed-use developments that integrate residential, commercial, and recreational spaces, urban areas can reduce the need for long commutes, thereby decreasing traffic congestion and enhancing residents' quality of life. This approach not only conserves natural areas but also makes urban expansions more manageable and sustainable.

Enhancing Green Infrastructure: The book advocates for the integration of natural elements within urban settings, including parks, green roofs, and urban forests. These features play a crucial role in improving air quality, providing recreational opportunities, and supporting biodiversity. Importantly, they help manage the urban heat island effect and contribute to climate adaptation efforts. Ensuring that these green spaces are interconnected allows for the creation of green corridors that support ecological stability and wildlife movement, reinforcing the resilience of urban and peri-urban environments.

Implementing Strategic Land Use Planning: Strategic planning is highlighted as vital for considering long-term environmental impacts and making informed decisions about land use. This involves a proactive approach to planning that includes regular updates and revisions to accommodate changing environmental conditions and urban needs. Such adaptive land management helps in making peri-urban development more sustainable and aligned with broader environmental conservation goals.

Strengthening Regulatory Frameworks: Effective management of urban expansion requires robust regulatory frameworks that enforce planning regulations and ensure orderly development. These regulations should protect peri-urban environments from unplanned development and promote orderly growth that aligns with sustainability objectives. Enforcing

these regulations help maintain the ecological and aesthetic values of peri-urban areas while accommodating urban growth.

Together, these strategies form a comprehensive approach to mitigating the negative impacts of urban expansion on peri-urban areas. By integrating sustainable practices into urban planning, enhancing green infrastructure, and enforcing strong regulatory measures, urban expansion can be managed in a way that promotes environmental sustainability and improves the quality of life for both urban and peri-urban residents. This holistic approach ensures that the expansion is not only responsive to immediate urban needs but also responsible towards long-term environmental and social goals.

In summary, "*Peri-urban futures: Scenarios and models for land use change in Europe*" highlights the significant environmental and planning challenges that peri-urban areas face due to urban expansion. The book offers valuable insights into how these challenges can be addressed through integrated planning approaches and sustainable development practices, aiming to create resilient peri-urban landscapes that balance growth with environmental stewardship.

### 3.3.1.2 Study 2: Strategies for sustainable urban development and peri-urban linkages

#### **Objective**

The book "*Strategies for sustainable urban development and peri-urban linkages*" examines strategies for sustainable urban development and the relationship between urban and rural areas. It is based on findings from the PLUREL project which involved over 100 researchers across 15 countries. This comprehensive study aims to address urban sprawl, peri-urbanisation, and their impacts on land-use, proposing strategies for managing these phenomena sustainably.<sup>74</sup>

#### **Methodology**

The methodology was structured around several core components, including data collection, scenario development, case studies, and stakeholder involvement. Each of these components played a crucial role in understanding the complexities of peri-urban interactions and

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<sup>74</sup> Nilsson et al., 2014 p. 3

developing sustainable strategies. The methodology explains the methods used in the PLUREL project.<sup>75</sup>

### Data collection and analysis

The study began with a thorough collection of data on urban expansion and land use changes across Europe, utilising historical data sets and contemporary mapping technologies. The data were analysed to assess growth patterns, land use efficiency, and the extent of urban sprawl. This analysis provided a baseline for understanding the impact of urban growth on land consumption and set the stage for deeper case-specific studies.

### Scenario development

One of the key innovative aspects of the methodology was the development of future urban growth scenarios. These scenarios were based on different assumptions about economic, demographic, environmental, and policy conditions. The researchers used the Intergovernmental Panel on Climate Change (IPCC) framework to create scenarios that reflected a range of possible futures, from rapid technological advancement and economic growth to more localised and sustainable development models. These scenarios were instrumental in projecting the long-term impacts of various urban and peri-urban development strategies.<sup>76</sup>

### Case studies

The core of the research methodology involved detailed case studies of six European cities and one Chinese city. Each case study provided insights into specific local challenges and responses to urban sprawl and peri-urbanisation. The case studies were chosen to represent a diverse set of urban environments, from densely populated and rapidly growing cities to those experiencing population decline. Researchers conducted field studies, interviews, and participatory workshops with local stakeholders to gather qualitative data and local perspectives, which were crucial for contextualising the broader data trends.

### Stakeholder involvement

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<sup>75</sup> Nilsson et al., 2013

<sup>76</sup> Nilsson et al., 2014 p. 5



A significant aspect of the methodology was the active involvement of stakeholders at various stages of the research. This included urban planners, policymakers, community organisations, and the general public. Stakeholder workshops and feedback sessions were used to validate findings, refine scenarios, and develop practical strategies. This collaborative approach ensured that the research was grounded in real-world needs and could lead to actionable policy recommendations.

### Integration and synthesis

Finally, the findings from data analyses, scenario projections, and case studies were integrated to develop a comprehensive set of strategies for managing urban and peri-urban growth sustainability. The researchers used a combination of statistical analysis, modelling tools, and expert judgement to synthesise the diverse inputs into coherent policy guidance.

This methodology allowed for a holistic examination of urban sprawl and peri-urbanisation issues across different geographical and cultural contexts. By combining empirical data analysis with scenario-based planning and stakeholder engagement, the study provided a robust foundation for developing strategies that are both sustainable and adaptable to specific local conditions. This approach highlights the importance of integrating technical research with participatory planning in addressing complex urban development challenges.

### **Key findings**

The key findings from the article provide a comprehensive overview of trends, challenges, and potential solutions in managing urban sprawl and peri-urban areas effectively. Here are the key findings:

Peri-urban areas are identified as dynamic zones experiencing intensive, often unplanned development. These areas serve as a buffer but are increasingly becoming hotspots for new housing developments and commercial activities. The article notes that peri-urbanisation brings challenges such as land use conflicts, environmental degradation, and governance issues. These areas often lack adequate urban planning and management, leading to chaotic developments.<sup>77</sup>

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<sup>77</sup> Nilsson et al., 2014 p. 3

Factors contributing to urban sprawl include increased demand for residential and commercial space due to higher living standards, smaller household sizes, and a preference for suburban lifestyles. Additionally, economic growth and infrastructural developments have facilitated greater urban expansion.

One of the key findings is the importance of integrated planning that coordinates transport, land use, and open space planning. Such integration helps manage urban growth more sustainably, preventing poorly planned sprawl and promoting efficient land use. Strategies like urban containment and densification have been highlighted as effective in managing sprawl. These strategies involve setting clear boundaries for urban growth, promoting higher-density developments within existing urban areas, and preserving rural and green spaces from development.<sup>78</sup>

Preserving and enhancing green and blue infrastructure in urban and peri-urban areas is crucial. This not only helps in maintaining ecological balance but also provides recreational spaces, enhances urban aesthetics, and contributes to the overall quality of life. Encouraging local food production and preserving agricultural lands in peri-urban areas are vital for sustainable peri-urban linkages. Such practices help maintain food security, reduce transportations emissions, and sustain rural livelihoods adjacent to urban areas.<sup>79</sup>

Another finding highlights the preservation of agricultural land and the enhancement of local food production as part of building sustainable peri-urban relationships. Historically, resource cycles between towns and countryside were shorter, and there is a need to re-establish these in various sectors like water, waste, and food production for a sustainable future. High land prices in urban and peri-urban areas pose significant challenges.<sup>80</sup>

#### Governance and policy implications

The article states that effective governance mechanisms are essential to implement the strategies successfully. This involves collaboration across different levels of government and with various stakeholders including local communities, private sector, and non-governmental organisations. The findings suggest that urban planning policies should focus more on

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<sup>78</sup> Nilsson et al., 2014 p. 15-16

<sup>79</sup> Nilsson et al., 2014 p. 17

<sup>80</sup> Nilsson et al., 2014 p. 18

creating sustainable peri-urban linkages and consider the impacts of urban policies on surrounding rural and peri-urban areas. There is a call for policies that are adaptive and context-specific, considering local environmental, social, and economic conditions. “*The time has come to challenge the historic distinction between urban and rural issues*”.<sup>81</sup>

The key findings underscore the complexity of managing urban and peri-urban growth in a sustainable manner. They highlight the need for a multifaceted approach that integrates planning, governance, and community engagement to address the challenges posed by urban sprawl and peri-urbanisation effectively. These findings provide a strong foundation for policymakers, planners, and researchers to develop targeted strategies that promote sustainable urban development while preserving the vital peri-urban linkages.

### **Relevance to the research question**

The study discusses several consequences related to planning and environment that peri-urban areas face as a result of urban expansion. In relation to planning, the peri-urban areas often experience intense land use conflicts due to overlapping interests of urban development, agriculture, and conservation. These areas serve as transition zones where urban and rural activities intersect, leading to challenges in managing space for housing, commercial developments, and maintaining green spaces. There is frequently a lack of integrated planning strategies that encompass both urban and peri-urban areas effectively. This can result in haphazard development patterns, insufficient infrastructure, and inadequate public services that do not meet the needs of a growing peri-urban population. Peri-urban areas often fall under multiple administrative jurisdictions, which can complicate governance and lead to inconsistent policy enforcement. This fragmentation can hinder the implementation of comprehensive development plans and may exacerbate the effects of urban sprawl.

In relation to environmental consequences urban expansion into peri-urban areas often leads to the degradation of ecosystems. Natural habitats are fragmented or lost due to construction and land conversion, which affects biodiversity and the ability of these areas to provide ecosystem services such as air and water purification, flood regulation, and climate moderation. As urban areas expand, they bring with them increased pollution, including air, water, and soil contamination. There's also an uptick in resource consumption, particularly

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<sup>81</sup> Nilsson et al., 2014 p. 21

water and energy, which can strain local resources and lead to unsustainable exploitation. Urban expansion often consumes fertile agricultural land, which can have significant impacts on local food production and the agricultural economy. This not only affects food security but also the livelihoods of rural communities transitioning to peri-urban environments.

The document also discusses strategies to mitigate these planning and environmental consequences, including developing integrated planning frameworks that include both urban and peri-urban areas that can help manage land use more effectively, coordinate infrastructure development, and preserve important natural and agricultural areas. Further on, the study finds that implementation of urban containment policies such as green belts or urban growth boundaries can limit the spread of urban sprawl, protect natural environments, and help maintain the distinctiveness of peri-urban areas. Another approach is to encourage sustainable agricultural practices, conservation of natural resources, and green infrastructure development that can mitigate environmental impacts while enhancing the quality of life and ecological health in peri-urban areas.

These findings highlight the need for comprehensive approaches that address both the planning challenges and environmental impacts of urban expansion into peri-urban areas. The strategies suggested aim to create a balanced development that respects both urban growth needs and the preservation of peri-urban characteristics.

### 3.3.1.3 Study 3: Determinants of Urban Expansion and Agricultural Land Conversion in 25 EU Countries

#### **Objective**

The study aims to analyse the main causes of agricultural land conversion to urban uses in 25 European Union countries between 2000 and 2006. It seeks to understand the complex interplay of socio-economic drivers, policy-related factors, and natural and location-based influences on land use.<sup>82</sup>

#### **Methodology**

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<sup>82</sup> Ustaoglu et al., 2017, p. 717

The study adopts a robust quantitative approach, leveraging an econometric analysis to explore the relationships between urban expansion, agricultural land conversion, and various driving factors. This methodology allows for a detailed assessment of the impact of socio-economic, natural, geological, climatic and policy-related drivers on land-use changes across different European regions.<sup>83</sup>

### Data collection

Data for the analysis were primarily sources from Corine Land Cover (CLC) Maps. These maps provided detailed land cover data for the years 2000 and 2006, which helped identify changes in land use over the specified period. Additional data on socio-economic, geological, climatic, and policy related factors were collected from various European sources, ensuring a comprehensive dataset for the analysis.<sup>84</sup>

### Econometric model

The core of the methodology is the application of a seemingly unrelated regression (SUR) model. This model is particularly suited for scenarios where there are multiple interrelated outcomes to be examined, which is the case with the various types of land-use conversions studied (e.g., agricultural land to residential, industrial, or recreational uses).<sup>85</sup> The model comprises several equations, each representing a type of land-use conversion. The dependent variables in these equations are the amounts of agricultural land converted to different urban uses in various regions. The independent variables include a range of socio-economic indicators (like GDP, population density, employment rates in agriculture)<sup>86</sup>, natural and geological factors (such as soil quality, topographical features), and policy influences like Common Agriculture Policy (CAP) subsidies. A key feature of the SUR model is that it allows for the correlation of error terms across different equations, indicating that the conversions are not independent of each other but are influenced by overlapping factors.<sup>87</sup>

### Analytical Process

The collected data were integrated and prepared for analysis. Involving cleaning, normalisation, and structuring into a format suitable for econometric analysis. The SUR

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<sup>83</sup> Ustaoglu et al., 2017, p. 722

<sup>84</sup> Ustaoglu et al., 2017, p. 718

<sup>85</sup> Ustaoglu et al., 2017, p. 722

<sup>86</sup> Ustaoglu et al., 2017, p. 727

<sup>87</sup> Ustaoglu et al., 2017, p. 722-723

model was applied to the structured data to estimate the relationships between the variables and the types of land-use conversion. This step involved detailed statistical testing to validate the model's assumptions and the robustness of the findings. The output from the econometric model was then interpreted to understand the impact of various factors on land-use change. This involved comparing the coefficients and significance levels across different model equations to draw conclusions about the relative importance of various drivers. The use of the SUR model enabled a nuanced analysis of complex interactions between multiple factors affecting land-use decisions.<sup>88</sup>

This approach not only provided insights into the individual effects of different drivers but also highlighted how these effects are interlinked across different regions and types of land conversion. Such a comprehensive methodological approach is crucial for informing policy and planning decisions aimed at managing urban growth and preserving agricultural land.

## **Key findings**

### Regional variations in urban expansion

The study reveals considerable regional variations in the patterns and rates of urban expansion and agricultural land conversion across the EU. In economically advanced regions, particularly those with significant industrial or service sectors, there was a higher rate of land conversion. These areas often corresponded with major urban centres or regions with strong infrastructure development. In contrast, less developed regions experienced slower rates of urban expansion and land conversion. However, these regions showed potential for future changes driven by evolving economic conditions and policy interventions.<sup>89</sup>

### Impact of CAP subsidies

A crucial finding was the role of the Common Agricultural Policy (CAP) subsidies. CAP subsidies appeared to have a mitigative effect on the rate of urbanisation. Regions receiving higher levels of CAP support showed less agricultural land being converted into urban areas. This suggests that CAP subsidies help maintain agricultural activities by providing economic stability to farmers. The subsidies also support environmental sustainability by preventing the

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<sup>88</sup> Ustaoglu et al., 2017, p. 722-729

<sup>89</sup> Ustaoglu et al., 2017, p. 726

overuse of agricultural land and encouraging practices that are less damaging to the ecosystem.<sup>90</sup>

### Socio-economic drivers

The study identifies several socio-economic factors that significantly influence land conversion, amongst them being economic prosperity, infrastructure development and demographic pressures. Economic growth, indicated by GDP and employment rates, strongly correlates with increased land conversion.<sup>91</sup> Prosperous areas attract more residential and commercial development due to higher demand for housing and business spaces. Proximity to infrastructure such as roads, ports, and airports was another significant driver. Regions well-connected by major transport links saw more extensive urban development due to easier access and better logistics. Population density and growth also played a critical role. Higher population density generally leads to increased demand for land, driving conversion from agricultural to urban uses.<sup>92</sup>

### Natural and location-based factors

The natural environment and specific location attributes significantly impact land-use changes. Areas with fertile soil and favourable topographical features were more likely to be developed for residential and industrial purposes. Conversely, regions with poor soil quality or challenging landscapes (e.g. steep slopes) were less frequently converted. Climatic conditions played a dual role, affecting both the viability of agricultural practices and the desirability of areas for living or recreating, influencing the patterns of land conversion accordingly.<sup>93</sup>

### Policy and Institutional influence

The study highlights the substantial impact of policy settings and institutional frameworks on land-use dynamics with both planning and zoning regulations, as well as environmental policies. Effective spatial planning and zoning regulations were found to be critical in managing urban expansion. Regions with strict zoning laws and comprehensive urban planning had more controlled and sustainable patterns of land conversions.

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<sup>90</sup> Ustaoglu et al., 2017, p. 727

<sup>91</sup> Ustaoglu et al., 2017, p. 727

<sup>92</sup> Ustaoglu et al., 2017, p. 729-730

<sup>93</sup> Ustaoglu et al., 2017, p. 731

Policies aimed at protecting the environment, such as restrictions on development in protected areas (e.g., NATURA 2000 sites), significantly influenced land-use decisions, preventing the conversion of agricultural land in ecologically sensitive areas.<sup>94</sup>

These findings illustrate the complex interplay of multiple factors driving the conversion of agricultural land to urban uses across Europe. By identifying these key influences, the study provides valuable insights that can help policymakers, planners, and stakeholders make informed decisions to manage urban growth sustainably and preserve valuable agricultural and ecological resources.

### **Relevance to the research question**

The case studies showcase several consequences related to planning and environment, for the former this includes the loss of agricultural land. The expansion of urban areas into peri-urban zones often results in the conversion of agricultural lands to residential, industrial, and commercial uses. This not only reduces the area available for food production but also impacts the ecological services provided by these lands, such as carbon sequestration and groundwater recharge. Urban expansion typically leads to increased pollution and degradation of natural habitats. The construction and development processes can disrupt local ecosystems, lead to loss of biodiversity, and increase pollution levels in air, water, and soil.

Peri-urban areas often suffer from inadequate infrastructure that cannot cope with the rapid expansion of urban boundaries. This includes insufficient transportation networks, water supply systems, and waste management facilities, which can lead to environmental stresses and challenges in sustainable urban management. Urban expansion often leads to the fragmentation of natural landscapes, which can disrupt wildlife habitats and reduce the ecological connectivity that is essential for various natural processes, including species migration and ecological resilience.

Managing land-use changes effectively in peri-urban areas often presents significant regulatory challenges. There can be a mismatch between urban planning policies and environmental conservation needs, leading to conflicts and inefficiencies in land-use

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<sup>94</sup> Ustaoglu et al., 2017, p. 739



management. Additionally, the expansion of urban areas might cross multiple jurisdictional boundaries, complicating governance and coordination of planning efforts.

Even though the study does not include Norway as a research object, the content can still be transferable to conditions in Norway.

### 3.3.2 Sub-topic 2: Land readjustment and land consolidation

*Research-question 2: What does international practice with use of land consolidation and land readjustment say about the development of peri-urban areas?*

The literature review under sub-topic two will be oriented around international practices of land readjustment and land consolidation. The purpose of the study is to identify practices in which can be relevant for Norwegian conditions in relation to peri-urban development. The first piece of literature is related to land consolidation and land readjustment for sustainable development from an overall international context, not related to a specific country. The second is related to the use of land banking as a tool for land management with land consolidation and showcases examples from different European and Central Asian countries.

#### 3.3.2.1 Study 1: Land Consolidation and Land Readjustment for Sustainable Development – the Issues to be Addressed

##### **Objective**

The article Land Consolidation and *Land Readjustment for Sustainable Development – the Issues to be Addressed*<sup>95</sup> elaborate on the content of the Apeldoorn Declaration<sup>96</sup> concerning land consolidation and land readjustment for sustainable development. It focuses on sharing practices, guidelines, and recommendations based on experiences and knowledge from various global contexts to improve the application of land consolidation and land readjustment effectively.

##### **Methodology**

The methodology of the article involves an analytical review of the symposium outcomes on land consolidation and readjustment. It incorporates a diverse range of perspectives and uses contexts from different countries to establish a set of guidelines and recommendations. The analysis draws from historical data, current practices, and projected needs for sustainable development in urban and rural settings.<sup>97</sup>

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<sup>95</sup> Louwsma et al., 2017b

<sup>96</sup> Louwsma et al., 2017a

<sup>97</sup> Louwsma et al., 2017b

The core of the methodology is rooted in the proceedings of the international symposium held in Apeldoorn, the Netherlands. This event was a collaborative initiative involving organizations like FIG Commissions 7 and 8, the Food and Agriculture Organization of the United Nations (FAO), LANDNET, and the Dutch Cadastre, Land Registry and Mapping Agency, supported by Global Land Tool Network (GLTN) and the World Bank. The symposium gathered about 200 participants from 50 countries, providing a broad spectrum of experiences and expertise.<sup>98</sup>

The methodology involved collecting detailed accounts and data from the participants, who shared their state-of-the-art practices in land consolidation and readjustment. This collection gathered a wide range of knowledge and practical experiences from various countries, which were then analysed to discern common challenges, successful strategies, and innovative practices. Based on the symposium's discussions and the collated data, the document's authors worked on drafting preliminary guidelines and recommendations for land consolidation and land readjustment. This involved identifying underpinning principles mentioned during the symposium and aligning them with the Sustainable Development Goals (SDGS) and other global agendas like the New Urban Agenda. The methodology also emphasised analysing the Apeldoorn Declaration from different perspectives and contexts. This included examining historical developments, current practices, and future needs in land consolidation and readjustment. The diverse use contexts - from rural to urban and from developed to developing countries - provided a comprehensive understanding that informed the drafting of the guidelines.

Finally, the methodology discusses the integrated core principles such as no one-size-fits-all solutions, comprehensive and participatory approaches, inclusiveness, and the role of robust land administration systems. These principles were essential in crafting a set of practices that could be adapted to different local, regional, and national contexts. The methodology employed in the document is largely participatory and analytical, leveraging the collective knowledge and experiences shared during the symposium. It aims to provide a solid foundation for future applications and improvements in land consolidation and readjustment processes, aligning them with broader sustainable development objectives. This approach

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<sup>98</sup> Louswma et al., 2017a

ensures that the recommendations are not only based on theoretical insights but are also grounded in practical, real-world applications and diverse global experiences.<sup>99</sup>

### **Key findings**

One of the prominent findings is that there is no universal solution to land consolidation and readjustment challenges. Effective practices must be adapted to the specific socio-economic, cultural, and legal contexts of each region. This finding underscores the necessity of developing “fit-for-purpose” solutions rather than attempting to apply a uniform model across different settings.

Another finding emphasises the value of land, from food production to providing a safe and healthy environment for the people. A coherent approach in land consolidation and land readjustment makes way for a balanced decision in relation to sustainable land use with respect for social, economic and environmental demands.

The article states that land consolidation and land readjustment must go beyond their traditional roles. Modern approaches should address broader sustainable development goals such as environmental protection, social equity, and economic development. This includes considering the impacts on climate change, food security and urbanisation. The finding highlights the need for multi-functional projects that integrate various land uses and purposes, reflecting a more holistic approach to spatial planning.

Another significant finding is the symbiotic relationship between effective land administration systems and successful land consolidation and readjustment projects. Solid land administration systems facilitate the implementation of these projects and, conversely, well-executed projects enhance the capabilities of land administration systems. This integration is crucial for maintaining updated land records, ensuring legal security of tenure, and supporting sustainable land use planning.

The key findings from the document highlight the complexity and dynamic nature of land consolidation and readjustment in the context of sustainable development. They advocate for adaptive, inclusive, participatory, and comprehensive approaches that are integrated with robust land administration systems. These findings serve as a foundation for developing

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<sup>99</sup> Louwsma et al., 2017b

guidelines and practices that can be tailored to meet the diverse needs and challenges faced by different regions around the world.

### **Relevance to the research question**

The content and discussions from the symposium are highly related to the sub-topic about how both land consolidation and land readjustment can contribute to the development of peri-urban areas. Firstly, the document provides numerous examples and case studies that showcase how land consolidation and land readjustment have been effectively used to develop urban and rural areas. For instance, it discusses how these practices can help manage and optimise land use by rearranging property ownership to support planned development, improve accessibility, and facilitate infrastructure improvements. This is crucial for peri-urban areas that need structured development to accommodate growth and ensure sustainable land use.

As mentioned, land consolidation typically focuses on agricultural and rural lands, while land readjustment often targets urban areas. The document explores how these tools can be integrated to address the continuum of urban to rural development needs. For example, it discussed the transition of land from rural to urban uses through readjustment projects that include the development of public infrastructure and services, which are essential for sustainable urban expansion into rural areas.

The document aligns these land management practices with global sustainable development goals. It underscores how land consolidation and readjustment can contribute to environmental sustainability, economic development, and social equity - key aspects of sustainable development in peri-urban contexts. This includes considerations like climate change adaptation, where land consolidation can be used to manage water resources or set aside land for flood management, which in return will benefit both urban and rural communities.

The emphasis on participatory processes is also in focus in this study. The content highlights the importance of involving all stakeholders in the planning and execution of land consolidation and readjustment projects. This is particularly relevant in peri-urban areas where the needs and rights of diverse groups - including farmers, urban dwellers, local businesses, and indigenous communities - must be balanced. Participatory planning ensures

that the development benefits are equitably shared and that the projects have broad community support and legitimacy.

The document discusses the importance of robust legal and institutional frameworks to support land consolidation and readjustment. This is critical for peri-urban development, where complex legal, administrative, and property rights issues often intersect. By providing guidelines on aligning these practices with existing laws and regulations, and suggesting ways to improve these frameworks, the document assists policymakers and practitioners in navigating the challenges inherent in managing peri-urban interfaces.

Finally, the content provides a scalable and adaptable solution that can be customised to local conditions in different peri-urban areas. This adaptability is crucial given the varied nature of such areas, which may differ greatly in terms of economic activities, cultural landscapes, and environmental conditions. The document's exploration of land consolidation and land readjustment offers valuable insights and practical guidance on utilising these tools to foster coordinated and sustainable development in peri-urban areas. It provides a comprehensive resource for understanding how these practices can be tailored to enhance connectivity, efficiency, and sustainability in transitioning landscapes between urban and rural domains.

### 3.3.2.2 Study 2: European good practices on land banking and its application in Eastern Europe and Central Asia

#### **Objective**

The main objective of the study is to evaluate the application and effectiveness of land banking practices in Western Europe and to assess their potential applicability in Eastern Europe and Central Asia. The study aims to identify good practices that could address land management issues concerning agricultural land market development, land consolidation, and land abandonment.<sup>100</sup>

#### **Methodology**

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<sup>100</sup> Hartvigsen et al., 2021

The study used different approaches to gather comprehensive insight into the current state and effectiveness of land banking systems. Amongst them being a survey, case studies, review and feedback integration, and lastly publication and dissemination.

An online survey was conducted in 2021 by FAO<sup>101</sup> to gather an overview of land banking practices in Europe. The invitations to participate in the survey was sent to pre-identified experts in the field from Europe and Central Asia, that have experience and knowledge of land banking and land consolidation. The survey included questions about land consolidation, land banking, management of state land and land abandonment. The article mainly reports on the findings corresponding with land banking and its connection to land consolidation.<sup>102</sup>

In 2020 the FAO conducted case studies on five Western European countries: Denmark, France, Germany, the Netherlands, and Spain to analyse established land banking practices. The case studies were conducted through desk research, supplemented by consultations with key land management professionals in the selected countries.<sup>103</sup> The objective was to understand the structure, functions, and impacts of land banking systems in these countries.

Before the finalisation of the project, the preliminary findings were presented during an FAO-organised webinar in December 2020. Feedback from the participants was collected during the webinar and subsequently integrated into the final draft of the study.<sup>104</sup> The final draft was reviewed by a group of 12 international land banking and land management experts. Comments and suggestions were incorporated to refine the study's conclusions and recommendations.<sup>105</sup>

After incorporating feedback, the study was finalised and prepared for publication to reach a wider audience and to inform policymaking in the target regions. The findings and recommendations were disseminated through various channels, including academic publications, conferences, and workshops, to reach stakeholders involved in land management and policy development.<sup>106</sup>

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<sup>101</sup> Food and Agriculture Organization of the United Nations

<sup>102</sup> Hartvigsen et al., 2021

<sup>103</sup> Versinskas et al., 2022

<sup>104</sup> Hartvigsen et al., 2021

<sup>105</sup> Hartvigsen et al., 2021

<sup>106</sup> Hartvigsen et al., 2021

## **Key findings**

### Variability in practice

The study found that land banking practices vary across different countries, and there were identified two approaches to land banking among the selected Western European countries. In Denmark, France, Germany and the Netherlands land banking is used as a tool for active land purchase and sale, while in France and Spain (Galicia) it is used as facilitation of land lease transactions.

### Acquisition and sale of land

The principal method of land banking utilized by four of the five countries studied—Denmark, France, Germany (specifically in Mecklenburg-Vorpommern), and the Netherlands—entails actively purchasing and selling agricultural land to and from private owners. This land is acquired on the market either through open competition or by exercising pre-emption rights, which are legally established in all four countries but are practically employed only in France and Germany (Mecklenburg-Vorpommern). The land procured is typically used for public infrastructure development, integrated into land consolidation projects, sold to designated groups such as young farmers, or utilized for other public objectives. The acquisition process, aimed at facilitating public projects, occurs either prior to or during the implementation of these projects. The initiative to acquire land can originate from the land bank itself or from public entities managing projects that require land. Additionally, in land consolidation projects, the voluntary acquisition of land from private owners enhances the pool of available land, thereby improving land mobility and the options for re-allotment within the project area. This approach also secures land for public use or for expanding farm sizes.<sup>107</sup>

Typically, land acquired is leased out temporarily until it can be sold for strategic purposes, which allows for the generation of additional revenue and maintains the land in good condition. During this interim period, the land may also be enhanced (e.g., clearing vegetation, reconfiguring parcels, or developing agricultural infrastructure) or transformed in other ways (e.g., changing its designated use). Proceeds from land sales are reinvested in new acquisitions to sustain the activities of the land bank. As stated, there is a variation within these countries of how the application of land banking is happening. In the article, the

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<sup>107</sup> Hartvigsen et al., 2021

practice in Denmark is stated as an example. Danish land banking is closely integrated with land consolidation and is seldom utilised outside of these projects. The main goal is to increase land mobility in land consolidation areas.

The study highlights that efforts to introduce land banking in Central and Eastern Europe have largely been unsuccessful due to a lack of coordination between land consolidation programs and land banking, as well as the absence of a unified approach<sup>108</sup>.

### Potential Benefits

Land banking could significantly benefit Eastern European and Central Asian countries by enhancing land mobility, facilitating market development, and helping in the recovery and use of abandoned agricultural land.<sup>109</sup>

### Policy Recommendations

The study suggests comprehensive policy recommendations for implementing land banking in Eastern Europe and Central Asia, including the establishment of clear objectives, integration with other land management instruments, and a phased implementation approach starting with pilot projects.

The findings show that using land consolidation together with land banking has positive results for both areas where land is planned and ongoing. The land mobility is higher in the planning phase of the land consolidation case, and this results in a better outcome of the land consolidation project.<sup>110</sup>

### **Relevance to the research question**

The article is relevant to the research question as it gives insights into the use of land banking as an instrument in combination with land consolidation. The article underscores the role of the practice of land banking and how it can support broader rural development strategies. By using land consolidation and reallocating it through land banking, there can be a more rational and efficient use of land resources, reducing the pressure on urban areas and promoting balanced development. Both land banking and land consolidation can facilitate the

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<sup>108</sup> Hartvigsen et al., 2021

<sup>109</sup> Hartvigsen et al., 2021

<sup>110</sup> Hartvigsen et al., 2021



implementation of infrastructure projects. For instance, land banks can acquire parcels for public purposes like roads or community centres, which are essential for sustainable development in both urban and rural areas.

### 3.4 Summary of key findings

There are several parts to highlight from the literature analysis regarding the environmental impact on peri-urban areas, and the use of land consolidation and land readjustment for these particular zones. In the analysis of the first topic that is related to identify the consequences of peri-urban areas facing urbanisation, there are several key findings from the literature review. All of the key findings will be discussed more extensively in chapter five. This section will simply provide a quick overview.

Research question 1: *Which environmental related consequences does peri-urban areas face in relation to urban expansion?*

- Lack of infrastructure
- Loss of agricultural land
- Loss of biodiversity

Research question 2: *What does international practice with use of land consolidation and land readjustment say about the development of peri-urban areas?*

- The usage of land banking together with a land consolidation project can be used in peri-urban areas to increase efficiency in the use of land resources.

The article is relevant to the research question as it gives insights into the use of land banking as an instrument in combination with land consolidation. The article underscores the role of the practice of land banking and how it can support broader rural development strategies. By using land consolidation and reallocating it through land banking, there can be a more rational and efficient use of land resources, reducing the pressure on urban areas and promoting balanced development. Both land banking and land consolidation can facilitate the implementation of infrastructure projects. For instance, land banks can acquire parcels for

public purposes like roads or community centres, which are essential for sustainable development in both urban and rural areas.

- Identification of research gap

Despite an extensive search of available literature using the search strategy in table x, few studies regarding the use of land readjustment and land consolidation in peri-urban areas have been identified. The research gap is significant for the discussion of, and the possibility of providing a fulfilling answer to the second research question. Peri-urban areas are hot spot zones with often chaotic development <sup>111</sup>, the need for more research on the area in relation to land consolidation and land readjustment are important to secure a sustainable development of these areas. The lack of literature underscores the need for more research on this particular field.

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<sup>111</sup> Nilsson et al., 2014, p. 3

## 4 Case study

### 4.1 Introduction to the case study

In this chapter there will be an introduction to the region of Galicia, followed by the justification for the case. The theory will provide an insight into land consolidation and other land management tools to better the property structure in the region. Further on, the relevance of the case to the literature review is explained, and then the two case study objects are introduced.

To get a deeper understanding of the urbanisation of agricultural land in an international context, I decided to conduct a case study by examining two specific areas in Galicia, Spain. By choosing two areas I could get a broader picture of the region, as well as more data to extract, as opposed to focusing on just one area. The land consolidations took place in the 1960's and has since then differentiated in the direction of land use, as one had been turned into a residential area whereas the other an industrial area. The region of Galicia has been characterised as an area with a fragmented landscape, and major loss in agricultural areas. To better the situation, the integration of different practices and policies, such as land consolidation and land banking, have been set in place. The area has been in focus for many researchers, aiming to measure the effects that these implementations have had on these areas.

Due to limited resources and a short timeframe, there was not sufficient time to look into the process of the land conversion of the two areas after the land consolidation cases was concluded. The case study objects serve as illustrations of land consolidated areas which imbeds both urban and rural characteristics. They classify as peri-urban areas because of their location and infrastructure development, making them representable for the areas in the literature review.

### 4.2 The region of Galicia

Galicia is an autonomous region in the Iberian northwest, that consists of four municipalities: A Coruña, Lugo, Pontevedra and Ourense. The total population of the region is

approximately 2,7 million people.<sup>112</sup> Galicia represents 6% of the total Spanish surface and covers an area of 29.575 km<sup>2</sup>.<sup>113</sup> Agriculture plays a comparably larger role in Galicia's economy than in the rest of Spain or the EU. A considerable part of the territory is used for livestock feed, reflecting a strong specialisation in livestock farming.<sup>114</sup>



Figure 1: The geographical location of the region of Galicia.<sup>115</sup>

The landscape of Galicia is characterised with extreme fragmentation, which differs from the rest of Spain. The consequence of the fragmentation is that farmers need more parcels to be able to profit from agricultural production.<sup>116</sup> The Government of Galicia has implemented a variety of land management tools to accommodate the fragmentation of the landscape, including land consolidation and land banking.

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<sup>112</sup> INE, 2023

<sup>113</sup> Coimbra, 2015 p. 137

<sup>114</sup> López, 2014, p. 1

<sup>115</sup> Source: Britannica, 2024,  
<https://www.britannica.com/place/Galicia-region-Spain>

<sup>116</sup> Crecente et al., 2002, p. 137

## 4.2 Justification for the case study and relevance

To broaden the perspective of land consolidation to an international context, I have decided to include two case study objects from Galicia. The case study aims to shed light on two land consolidation cases that have undergone a change in land use after the land consolidation took place. The study objects were formally characterised as rural areas but has in later years been transformed to areas of residential and industrial buildings. Because of their location on the outside of a urban centre, they can be deemed as peri-urban zones. The literature review provides theoretical insight into peri-urban areas and the consequences they face in relation to urbanisation (and industrialisation). The case study objects serve as practical examples of these consequences.

The case study is relevant to the topic of research in several ways. Firstly, the case study visualises two international land consolidation cases, and showcases the transformation of former agricultural land into residential and industrial areas. Secondly, the theoretical framework on land management practices relates to the second research question, showcasing methods used in Galicia to manage land. Specifically in relation to the use of land consolidation and land banking. The inclusion of the case study is important to uncover, learn and highlight practices and implementations of instruments that can better manage areas on the interface between the urban and the rural. Galicia is a region with a long history dealing with land fragmentation, many land consolidation cases, and a good reporting system on data from the cases. The Universidade de Santiago de Compostela (USC) also in Lugo have an active research environment on the field.

## 4.3 Theoretical framework

The Galician practice of land consolidation and policy making relating to managing and preservation of agricultural land dates a long way back. With the theoretical framework, there is hope in gathering key concepts and tools within this field. There have been implementations of several instruments to face the challenges of the region, two of them being land consolidation and land banking.<sup>117</sup>

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<sup>117</sup> Fernández, 2019, slide 3

As a foundation for gaining knowledge about the area and its history, the report from “*Jordskifte i Galicia*”<sup>118</sup> The report gives a thorough insight into the land tenure and land consolidation in Galicia. The report includes topics like the organisation of the land consolidation authority, and the process of a land consolidation case.

#### 4.3.1 Land consolidation and landscape in Galicia

The administrative structure of land consolidation work in Galicia can be divided into a central and a regional part. The field of land consolidation is located under the jurisdiction of the Ministry of Agriculture in Galicia. The central administration is located in Santiago de Compostela. There is separate provincial administration in the four provinces. The first land consolidation project was initiated in 1954 and has since then been the most used tool for land management in the region.<sup>119</sup> There are two types of processes, depending on what the content and goal with the land consolidation project is. The regular land consolidation process follows these steps:

1. Initiation
2. Feasibility study with the corresponding environmental impact study and the development plan of the area to be consolidated
3. Decree of consolidation
4. Provisional bases
5. Definitive bases
6. Consolidation project
7. Plot consolidation project
8. Act of reorganization of the property

The second type is the land restructuring procedure which includes these following phases:

1. Previous initiation study
2. Decree
3. Bases for land restructuring
4. Land restructuring agreement
5. Act of reorganization of the property

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<sup>118</sup> Sky, 2001

<sup>119</sup> Fernández, 2019, slide 6

#### 4.3.2 Approaches to peri-urban development in Galicia

The regional government of Galicia created a manual called “*Manual for environmental and landscape integration of land consolidation in Galicia by The Regional Government of Galicia*”. The purpose of the guide is to develop a practical methodology for carrying out parcel restructuring with a more integrative vision. The manual provides an objective for the need for parcel restructuring, the history of such practises, legal frameworks and tools for landscape assessment. It also dives deeper into the areas of sustainability, biodiversity and the protection of natural and cultural heritage.<sup>120</sup>

The manual emphasises the importance of balancing rural and urban development through sustainable practices. It highlights how Galicia’s territorial uniqueness requires integrated planning approaches that consider both agricultural productivity and environmental preservation. The manual also discusses initiatives to prevent rural depopulation and supports rural economies, emphasising the need for rural-urban integration to ensure balanced regional development. Furthermore, it addresses land restructuring projects that influence both rural and urban areas, advocating for holistic solutions that maintain ecological and social harmony.<sup>121</sup>

#### 4.3.3 Land banking in Galicia

To deal with the massive fragmentation and abandonment of agricultural land in Galicia, The Ministry of Rural Affairs of Galicia implemented land banking as an instrument to accommodate the issue. There are several definitions of land banking, one of them being “*public or publicly authorised acquisition of land to be held for future use to implement public land policies*”.<sup>122</sup> Land banking makes it possible for the government to exercise its influence on different policies with spatial impact, this being oriented around the topic of infrastructure, environment, or agriculture. The purpose behind the creation of the land bank in Galicia was to make agricultural land more accessible in relation to mobilization and use.<sup>123</sup> Since the land banking practice in Galicia is not used in combination with land consolidation, it will not be discussed further.<sup>124</sup>

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<sup>120</sup> Martínez, et al., 2023, p. 11

<sup>121</sup> Martínez, et al., 2023, p. 39-40

<sup>122</sup> Strong, in Van Dijk and Kopeva, 2006, p. 290

<sup>123</sup> Coimbra, 2015, p. 135-142

<sup>124</sup> Hartvigsen et al., 2021

#### 4.4 Study objects and presentation of data

The case study includes two areas which lie in the North-western part of Spain in the region of Galicia. Both areas are characterised with a fragmented landscape consisting of a high number of parcels and owners. Originally being areas of agricultural land, have now after the land consolidation process been transformed into other forms of land use, with one now being used for residential purposes, and the other for industrial.

When looking for areas to examine, it was necessary that the two objects of study met certain criteria. Firstly, the location of the cases must be in the interface of urban and rural areas, making the area of the object stand in relevance to the topic of research. The second being that the objects had undergone a change in land use after the land consolidation had taken place, so that both areas had the same chronological order of events. However, the land consolidated areas went through this process some years ago meaning that other laws were applicable at the time. The two cases were both finished in the late 1960's meaning that the legal framework was the Law of Land Consolidation of 1952.

##### 4.4.1 Object 1 - San Miguel dos Agros - industrial

Object number one is the area of San Miguel dos Agros located in the municipality of Santiago de Compostela, in the province of A Coruña. The total case area measured 1105 hectares, and originally consisted of 10123 parcels with 576 owners. The result of the land consolidation was that the number of parcels was reduced to 1395<sup>125</sup>. Making the landscape less fragmented, and the agricultural activity more optimised.

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<sup>125</sup> See appendix 4 for information on how to access more details of the case



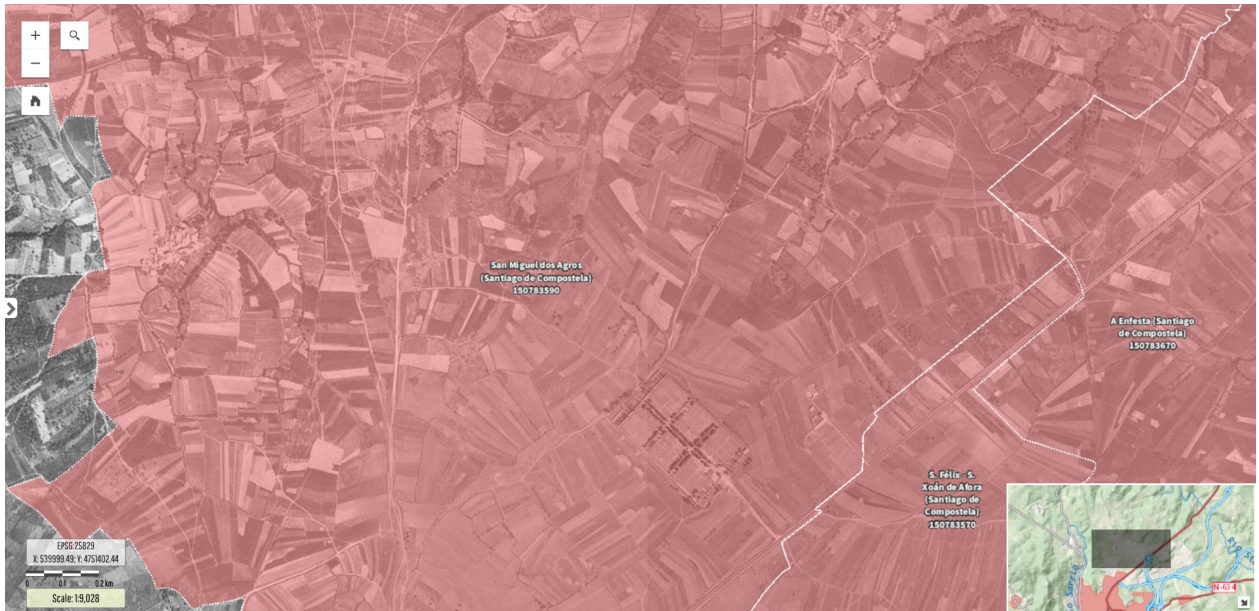


Figure 2: San Miguel dos Agros before land consolidation.<sup>126</sup>



Figure 3: San Miguel dos Agros after land consolidation.<sup>127</sup>

An extract of the area has now been turned into a space for industrial activity, replacing the original agricultural use of the plots. A significant difference between in the land use before and after the land consolidation.

<sup>126</sup> Overview with background map American Flight 1956\_1957. Screenshot from : <https://mapas.xunta.gal/visores/parcelaria/> (07.02.2024)

<sup>127</sup> Overview with background map PNOA 2020. Screenshot from: <https://mapas.xunta.gal/visores/parcelaria/> (07.02.2024)

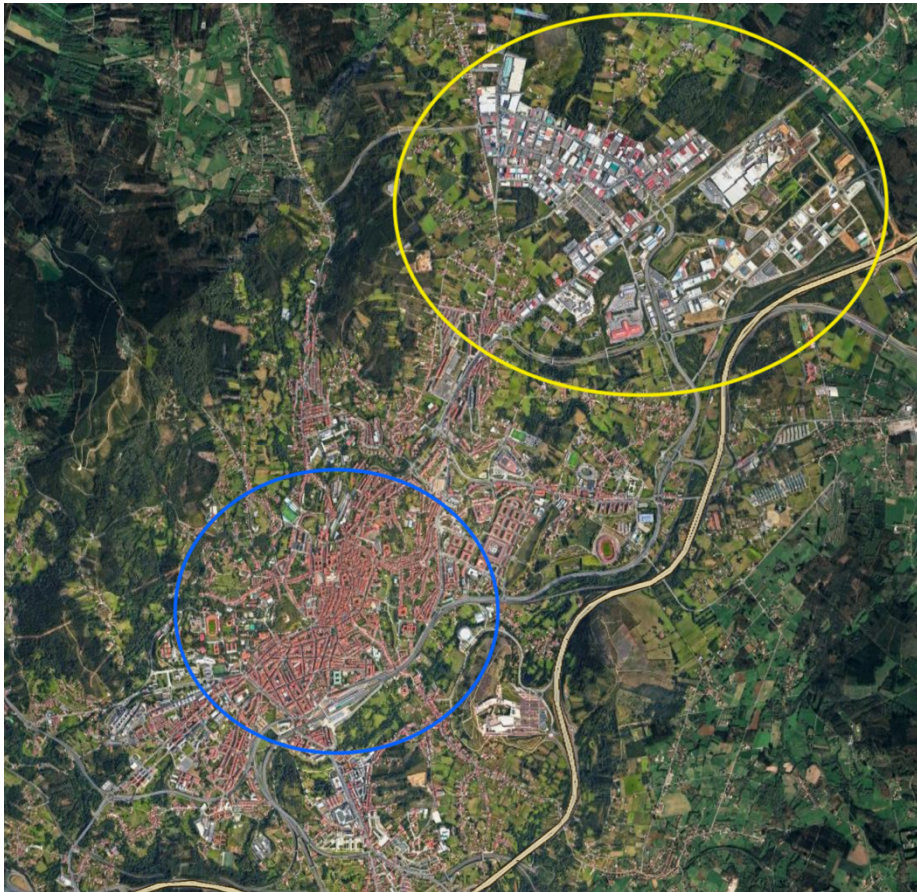


Figure 4: Overview of San Miguel dos Agros.<sup>128</sup>

The case area is situated right outside of the city centre of Santiago De Compostela. The cause of industrialisation may be because of its proximity to the urban areas.

#### 4.4.2 Object 2 - San Juan de Ortoño - residential

Object number two is the area of San Juan de Ortoño located in the municipality of Ames in the province of A Coruña. The case measured an acreage of 356 hectares. This area consisted of 8430 parcels with 822 owners. The result after the land consolidation was a reduction to 1030 parcels.<sup>129</sup>

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<sup>128</sup> Yellow outline: Land consolidation area of San Miguel dos Agros.  
Blue outline: City centre of Santiago de Compostela. Google Earth, 2022

<sup>129</sup> See appendix 4 on how to access more information on the case

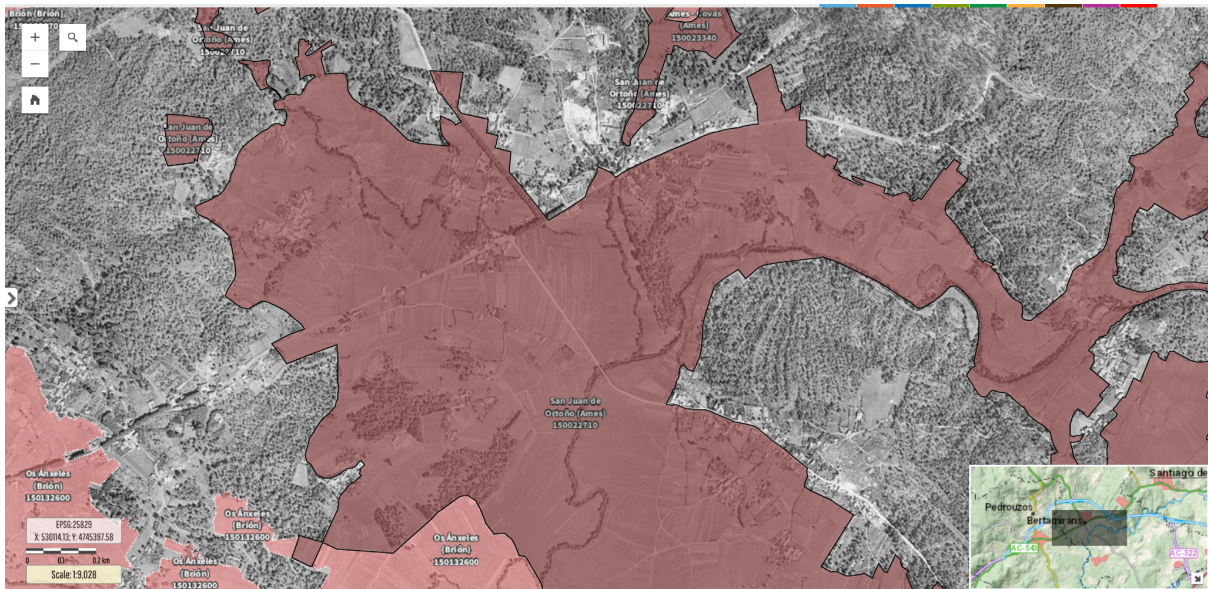


Figure 5: San Juan de Ortoño before land consolidation.<sup>130</sup>

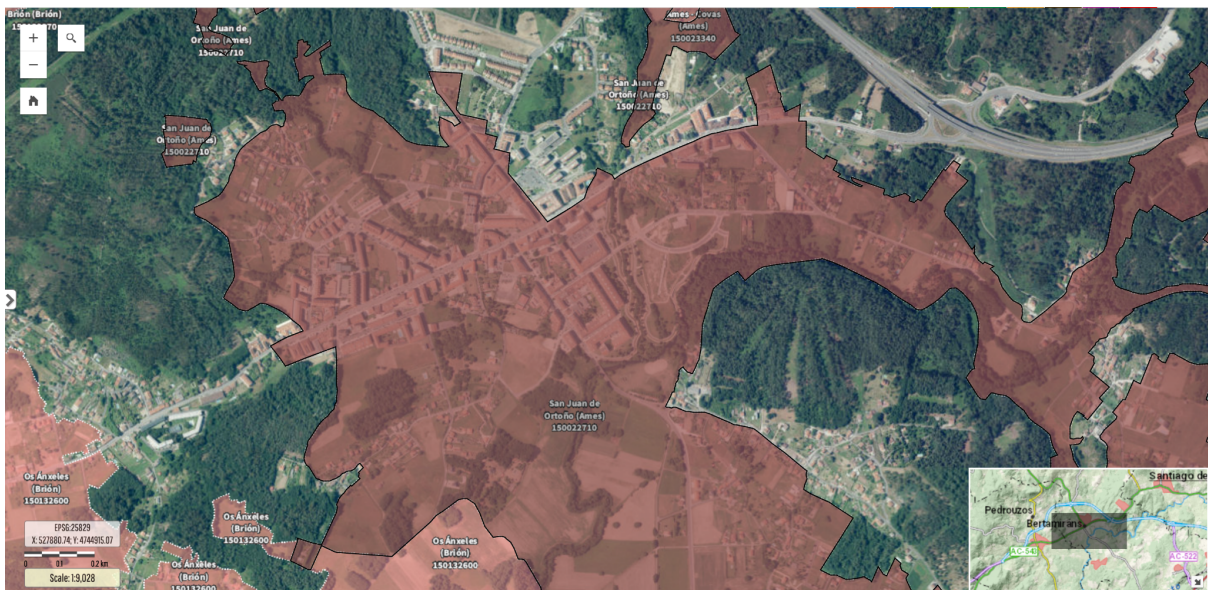


Figure 6: San Juan de Ortoño after land consolidation.<sup>131</sup>

<sup>130</sup> Overview with background map American Flight 1956\_1957. Screenshot from: <https://mapas.xunta.gal/visores/parcelaria/> (07.02.2024)

<sup>131</sup> Overview with background map PNOA 2020. Screenshot from <https://mapas.xunta.gal/visores/parcelaria/> (07.02.2024)



*Figure 7: Overview of San Juan de Ortoño<sup>132</sup>*

The land consolidation area of San Juan de Ortoño is also situated fairly nearby the city of Santiago de Compostela. Although the area is not fully linked with the city, it still portrays characters of urban centres with the infrastructure development and residential buildings being prominent in the area.

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<sup>132</sup> Yellow outline: Land consolidation area of San Juan de Ortoño.  
Blue outline: City centre of Santiago de Compostela. Google Earth, 2024.

## 5 Discussion and analysis

### 5.1. Introduction

The discussion section of the master thesis aims to answer and reflect on the research questions presented in the previous chapters. The first research question aims to identify the consequences of peri-urban zones caused by urbanisation, in relation to planning and environment. In the second research question I will try to find out how land consolidation and land readjustment can be used to accommodate the issues caused by urbanisation of peri-urban areas. There will also be mentioned of the use of land banking as a land management tool in combination with land consolidation to accommodate the environmental consequences in peri-urban zones. In short, the first research question states the problems, while the second will try to offer the solutions.

The chapter will be organised with each of the research question divided into a section of their own. In that way, the content is presented in a clear matter that works in conjunction with the structure of the literature review. The discussion will be synthesising the theory and empirical content derived from using the two methodological approaches: literature review and case study. The relevance of the Galician case-study objects will also be discussed further and implemented in the discussion.

There are a variety of perspectives when looking at the development of peri-urban areas. In accordance with the first research question, the perspective will be on the environmental related consequences following urban expansion on these zones. Further, the ability of land consolidation and land readjustment to ensure a sustainable development in peri-urban areas will be reviewed. Both relies on content derived from the literature review and the case study. In the third research question I will examine how the measures from the Norwegian Land Consolidation Act can be used to ensure the development of peri-urban areas.

### *5.2 Which environmental related consequences does peri-urban areas face in relation to urban expansion?*

It is natural to think that peri-urban areas are facing more pressure regarding urbanisation and infrastructure development seeing as they are neighbouring urban centres, and therefore the next stepping stone for urban expansion. When there is urban growth, one of the main issues

of peri-urban areas is the lack of infrastructure. The rapid pace of development often results in inadequate or overstretched infrastructure services on for peri-urban areas.<sup>133</sup> These areas can in a sense be said to not “be ready” for the fast urbanisation that is happening.

In relation to housing when city centres expand, the areas adequate for a “suburban” type of living gets pushed further and further out and will then result in the need for residential buildings with infrastructure that serves the need of such land use. The most eminent example being public transport and higher quality roads that meet the needs of commuting citizens. The infrastructure in the area has developed immensely following the urbanisation of the area. The reasoning not behind is not necessarily only because of the residential buildings, but that is definitely partly the reason because of it. One of the key takeaways from the book *Strategies for sustainable urban development and peri-urban linkages*<sup>134</sup> highlights that the need for residential and commercial space are factors contributing to urban sprawl. In this instance one can draw parallels to the case study objects of San Miguel dos Agros and San Juan de Ortoño, which shows the development of industrial and residential buildings in former agricultural zones in Galicia.<sup>135</sup>

Another consequence to consider in peri-urban areas is the loss of agricultural land. The study of *Urban Expansion and Agricultural Land Conversion in 25 EU Countries* conclude that the natural environment and location attributes has a considerable impact on the change of land use. A key finding from the study, is that areas with fertile soil and favourable topographical features were more likely to be developed for residential and industrial purposes. In contrary to this, regions with poor soil quality or challenging landscapes were less frequently converted. This revelation is concerning in several ways, as the loss of fertile agricultural soil has several consequences. Not only will this mean a reduction in food production capacity, but it may also lead to habitat loss, deforestation and loss of biodiversity.<sup>136</sup>

The loss of biodiversity is as a consequence of urban growth listed as a key finding in all three of the studies analysed under sub-topic one in the literature review. In study one<sup>137</sup> the

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<sup>133</sup> Nilsson et al., 2013 p. 391

<sup>134</sup> Nilsson et al. 2014. Analysed in section 3.3.1.2

<sup>135</sup> See p. xx-xx

<sup>136</sup> Nilsson et al., 2013

<sup>137</sup> Nilsson et al., 2013. Analysed in section 3.3.1.1.

preserving of natural landscapes to maintain biodiversity and recreational spaces is pointed out as an important area of focus. In study two and three<sup>138</sup> the damage of biodiversity is highlighted as a result of urban expansion, and it is determined that it can lead to increased pollution, including air, water and soil contamination.

### *5.3 How can land consolidation and land readjustment contribute to a sustainable development of peri-urban areas?*

The general definition is that consolidation and land readjustment are two land management tools that each serve their distinct purpose in rural and urban areas. A key takeaway from the literature review is the importance of integrated planning that coordinate transport, land use, and open space planning. These are among conditions which land readjustment and land consolidation can contribute to. In the following is a description of how these instruments can be used to facilitate this.

One of the identified consequences of urbanisation in the discussion of the first research question was the need for adequate infrastructure. In the study *Land Consolidation and Land Readjustment for Sustainable Development – the issues to be addressed*<sup>139</sup>, there is elaborated on how the two tools can be used to integrate the continuum of urban to rural development needs. An example being a rural to urban transition using readjustment projects to include the development of public infrastructure. The document presents an overview of the differences between using compulsory acquisition, and land readjustment to make space for new infrastructure. Compulsory acquisition is deemed an unfavourable solution as its “often incapable public space, infrastructure and re-organisation of the urban fabric”.<sup>140</sup> In contrary, the use of land readjustment makes up a fairer alternative, in the sense that landowners neighbouring new infrastructure projects give up an equal piece of land.<sup>141</sup> In return they get new road access to their parcel and better shaping of it.

The following two figures show an example of the outcome for two different approaches to reallocation regarding the makings of new infrastructure.

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<sup>138</sup>Study two: Nilsson et al. 2014. Analysed in section 3.3.1.2.

Study three: Ustaoglu, 2017. Analysed in section 3.3.1.3.

<sup>139</sup> Louwsma et al. 2017b

<sup>140</sup> Louwsma et al. 2017b

<sup>141</sup> See figure 8

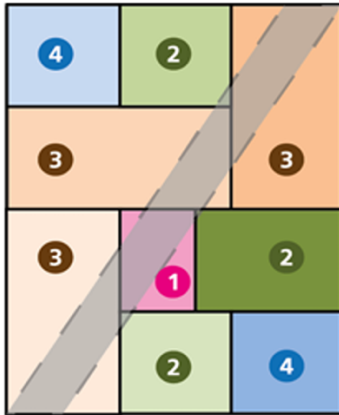


Figure 8: Compulsory acquisition: outcomes for different landholders<sup>142</sup>

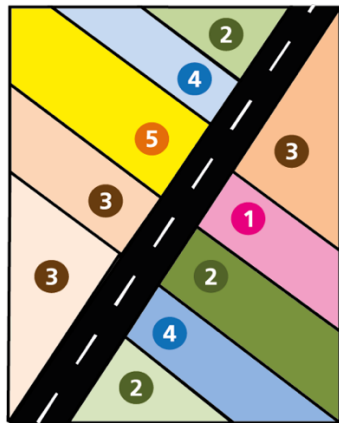


Figure 9: Land readjustment: Outcomes for different landholders<sup>143</sup>

In figure 9 using land readjustment resulted in a new parcel, number 5. This parcel is located to the municipality, and can be used for public space, or sell to cover the cost of the new infrastructure. A suggested strategy from one of the studies in the literature review<sup>144</sup> is to promote a high-density development to minimise land consumption and reduce the extent of the needed infrastructure. In this way new projects will not break new ground, but simply extend the already existing feature of urban areas. This approach can possibly help in solving issues related to both infrastructure development and loss of agricultural and natural areas.

Another identified consequence on peri-urban areas following urban growth, is the loss of agricultural land. An approach that has been implemented in other countries to accommodate this issue is land banking. Land banking is a land management tool used in several countries today (e.g. Galicia in Spain<sup>145</sup>) to accommodate unfavourable property conditions. As seen in

<sup>142</sup> UN-Habitat, 2016, p.11, via Louwsma, M. et al. 2017b

<sup>143</sup> UN-Habitat, 2016, p.11, via Louwsma, M. et al., 2017b

<sup>144</sup> Study one: Nilsson et al. 2013. Analysed in section 3.3.1.1.

<sup>145</sup> Land banking in Galicia p. x



the study of practices on land banking in Europe<sup>146</sup> the approaches differ between the countries. The practice of land banking in Denmark was used as an example. In Denmark, and other western European countries<sup>147</sup>, the approach to land banking is the acquisition and sale of land. Land banking is used together with land consolidation to re-allocate land to increase land mobility in land consolidation areas. The land from the land bank can also be sold to young farmers or used in installation of public infrastructure. The demand for the land acquisition come from the land bank or from the public institutions implementing land demanding projects.<sup>148</sup> By selling the land to young famers it can promote the agricultural activity among the younger generation which can ultimately lead to less abandoned agricultural land.

A possible solution to the loss of biodiversity is the integration of natural elements within urban settings. This means leaving space for green areas like parks and urban forests. This will result in better air quality, opportunities for recreation and supporting the biodiversity of areas.<sup>149</sup> This may not only be reserved for urban centres, but also zones undergoing a process of urbanisation. Ultimately this may lead to a more resilient peri-urban area in terms of environmental sustainability. The Manual for environmental and landscape integration of land consolidation in Galicia<sup>150</sup>, emphasizes a practical methodology to utilize land consolidation with a more integrative vision, where the conservation of the landscape is a key value throughout the process. The manual outlines a new philosophy and strategy of green infrastructure in the context of land consolidation, with a focus on environmental sustainability and landscape integration. This green infrastructure strategy is conceived as a multifunctional and multidisciplinary planning tool. It aims to manage the territory appropriately to enhance connectivity, ecological restoration, and biodiversity. It is described as a multiscalar concept, aligning with the objectives of sustainable development as defined by the United Nations. This strategy is integral to the new approaches in peri-urban development, ensuring that parcel restructuring also supports agricultural sustainability and biodiversity.<sup>151</sup> The multifunctional and multidisciplinary planning tool is part of the broader efforts in peri-urban development, ensuring that parcel restructuring supports agricultural

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<sup>146</sup> Hartvigsen et al., 2021. Analysed in section 3.3.2.3

<sup>147</sup> France, Germany and the Netherlands. Hartvigsen et al., 2021.

<sup>148</sup> Hartvigsen et al., 2021

<sup>149</sup> Nilsson et al. 2013

<sup>150</sup> Martínez et al., 2023

<sup>151</sup> Martínez et al., 2023 p. 11

sustainability and contributes positively to environmental and landscape integration.<sup>152</sup> Even though land consolidation in Galicia is exclusively used in rural areas today, this manual suggest that the measures used within land consolidation regarding parcel restructuring can be beneficial for a coherent peri-urban development.

#### *5.4 How can measures in the Norwegian Land Consolidation Act help the sustainable development in peri-urban areas?*

There are several legal instruments in the Norwegian Land Consolidation Act which can be used to accommodate issues regarding infrastructure. In section 3-4 of the Act, the measure gives the Land Consolidation Court authority to modify properties.<sup>153</sup> This is one of the most central tasks within Land Consolidation in Norway. This makes it possible to reduce the number of parcels for a property, or in this case make room for infrastructure. This measure can be used for all types of properties regardless of the location is in urban, peri-urban or rural areas.

Another identified consequence on peri-urban areas following urban growth, is the loss of agricultural land. An approach that has been implemented in other countries to accommodate this is land banking. Land banking is a land management tool used in several countries today (e.g. Galicia in Spain<sup>154</sup>) to accommodate unfavourable property conditions. In Norway, there is no practice of this today. However, the use of project-related land consolidation, could be a measure to accommodate this. In section 3-22 of the Norwegian Land Consolidation Act is a legal basis that allows for the allocation of land for special purposes. It is stated in the paragraph that *“If any party needs land for special purposes, he can request that this be allocated from his share”*. This legal instrument came to be because of the negative impact of infrastructure projects on agricultural properties. It is reasonable to believe that “negative impact” relates to the loss of agricultural land and fertile soil. The cases for project-related land consolidation normally concerns the building of infrastructure. However, the measure goes beyond this, and can also be used as a more general measure for developers building for other purposes.<sup>155</sup>

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<sup>152</sup> Martínez et al., 2023 p. 105

<sup>153</sup> Bjerva, et al., 2024

<sup>154</sup> Land banking in Galicia p. x

<sup>155</sup> Udnes, 2021, p. 276

Something important to note of section of 3-22 is that the landowner(s) can demand, but they are not entitled to, the allocation of land. This assessment is up to the land consolidation court. Even though the section is utilised for projects in rural areas, this is an instrument that can also be used in peri-urban zones. The use of the legal instrument of section 3-22 has not been utilised in non-rural areas, seeing as its limitations did not expand until the legislative change of the land consolidation act in 2006. This development has resulted in today's legal measure for project-related land consolidation, which serves as an alternative to expropriation. The competence to use this legal instrument applies to all types of measures, and all types of property. Private project initiators can also demand project-related land consolidation.<sup>156</sup>

Project-related land consolidation can be used for private initiators regarding property development in peri-urban areas, seeing as there is no need to be a landowner to claim this type of case for the land consolidation court.<sup>157</sup> This legal basis is the closest practice to land banking in Norway as the principles for both in reality is the same. Both practices can be used to secure land in relation to construction projects in rural areas. This does also relate to peri-urban areas, as they are often lacking the needed infrastructure to handle the rapid urbanisation of the areas. The section of the Land Consolidation Act may appear to be a bit "hidden", and more knowledge and use of it may be beneficial. Especially in the case when private initiators look to develop and transform a peri-urban zone into one with more urban-like features. One of the reasons behind the lack of use may be that there is not much knowledge of its existence by project developers and others initiating projects in peri-urban areas. This again may be a consequence of its relatively "new" appearance in the Land Consolidation Act in 2006.

An alternative solution to protect peri-urban areas facing urbanisation is to implement land banking with land consolidation. These are practices which are being used in combination in several European countries like Denmark, Germany and the Netherlands, and are being promoted as a combination by the FAO.<sup>158</sup> It is being used to increase land mobility during the re-allotment planning.<sup>159</sup> Using land banking, or in a Norwegian context project-related

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<sup>156</sup> Udnes, 2021, p. 276

<sup>157</sup> Udnes, 2021, p. 276

<sup>158</sup> Veršinskas et al, 2020, p. 161-163

<sup>159</sup> Veršinskas et al, 2020, p. 161

land consolidation, when peri-urban areas undergoing a construction process may prove helpful in preserving agricultural land. The instrument is used to compensate landowner in land, when agricultural land is taken out of production.<sup>160</sup> This serves as an alternative to monetary compensation and is therefore more environmentally friendly as the loss of soil is held to a minimum. The principle of this legal measure already exists within the Land Consolidation Act, in section 3-2 and 3-22, but the area of use is today only being utilised in rural areas. The legal measure does not limit the use to only rural areas regarding agricultural properties in rural areas but can also be used in urban and peri-urban areas to protect other types of land uses as well. An example of this can be parks, forests and other places for recreation. Even though there is a legal measure for project-related land consolidation in the land consolidation act, there is no land bank in Norway today. There have however been discussed and developed ideas of such a scheme within the country. One of the people opting for such a scheme is the Norwegian scientist Reidar Almås, he proposed a new state enterprise, a state-owned land bank to create sensible agricultural properties in Norway. The background for the proposal is that the amount of leased agricultural soil has increased immensely in the past decades.<sup>161</sup> With a state-owned land bank it would be possible for those who do not farm the land themselves, but who own arable land, forest or outlying land, to register their property. They can themselves decide if they want to rent it out to the land bank or put up in for sale. In the proposal he further states that it would be up to the land bank to develop parcels with good consolidation, and then further selling them.<sup>162</sup> This is where the measures within land consolidation can come into function. As mentioned, in section 3-4 of the land consolidation the authority to make modifications to property is a measure which can help develop the parcels which lays within the land bank.

To tackle the rising percentage of leased agricultural land within the country, the approach to land banking as seen in Denmark<sup>163</sup> may seem as a beneficial solution for the situation in Norway with high amount of leased agricultural land. The approach is, as mentioned, an acquisition and sale of land, and is used together with land consolidation projects.<sup>164</sup>

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<sup>160</sup> Veršinskas et al, 2020, p. 161

<sup>161</sup> Bondelaget, 2015

<sup>162</sup> Bondelaget, 2015

<sup>163</sup> Hartvigsen et al., 2021

<sup>164</sup> Hartvigsen et al., 2021

The loss of biodiversity was also one of the identified consequences that peri-urban areas might face in relation to urban growth. A measure from the Land Consolidation Act that can accommodate this issue, is the sections 3-30 to 3-32. These measures give the land consolidation court authority to “*distribute the net added value from rezoning between the properties that are covered by a zoning plan*”.<sup>165</sup> In this way, all property owners within the same plan, will get a share of the added value from the rezoning grounded on a suitability appraisal. This means that property boundaries are not pertinent, and the development of the area can happen regardless of these. The project can therefore be located in the place within the plan that benefit the purpose of the project the most. From an environmental perspective this means that the area of construction, whether it be for infrastructure, residential or industrial buildings, can be located outside zones with high biodiversity, and can therefore be left untouched. This principle also goes for the preservation of agricultural land.

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<sup>165</sup> Elvestad & Sky, 2019

## 6 Discussion

### 6.1 Introduction

In this chapter there will be a summarisation of the most relevant findings under the three research questions. These are divided into a sub-chapter of their own. Under the first research question the environmental consequences on peri-urban areas regarding urban growth will be discussed. Then, in the second research question the discussion will revolve around the use of land consolidation and land readjustment to accommodate the consequences which is identified in the first research question. The third research question builds on the findings from the two former questions, relating it to a Norwegian context. The After this, there will be a short section discussing the lessons learned from international practices. The chapter concludes with suggestions on future research.

### 6.2 Answer to research questions

#### 6.2.1 *Which environmental related consequences does peri-urban areas face in relation to urban expansion?*

In the research there are identified three environmental consequences of urban growth for peri-urban areas. The list is not exhaustive, but these summarise the topics most extensively covered by the literature review. The three main concerns regarding environmental consequences for peri-urban areas is: inadequate infrastructure, loss of agricultural land and loss of biodiversity.

The first consequence for peri-urban areas is inadequate For infrastructure regatIn the studies from the literature review, the first consequence presented was that peri-urban areas often lack the needed infrastructure to accommodate the rapid urban growth. When urban centres expand into rural areas, the rapid pace of development can lead to inadequate or overstretched infrastructure services.

A concerning revelation shows that fertile soil and favourable topographical features were more likely to be developed for residential and industrial purposes. This discovery leads further to several environmental consequences, with the most crucial being the reduction of food security. Conversion of fertile soil should be the last resort when planning a construction project in a rural area, seeing the negative irreversible consequences this will make.

Lastly, the damage on biodiversity in peri-urban areas is highlighted as a consequence of urban expansion, and can lead to increased pollution in air and water, as well as contamination of soil. Deforestation and destruction of natural habitats for plants, animals and organisms are also important environmental consequences for peri-urban areas.

#### 6.2.2 How can land consolidation and land readjustment contribute to a sustainable development of peri-urban areas?

The second research question will answer how the consequences identified in the first research question can be handled using measures from land consolidation and land readjustment.

For accommodating the lack of infrastructure in peri-urban areas, a solution is to use project-related land consolidation in peri-urban areas. This approach allows for a fair and effective integration of urban and rural development needs by reallocating land among existing owners, which facilitates infrastructure expansion while also improving access and bettering the shapes of the properties for those involved. Another solution is to promote high-density development as a strategy to minimise land consumption and reduce the scale of infrastructure required. This approach not only conserves land but also leverages existing urban layouts, potentially mitigating the negative impacts on agricultural and natural areas.

By implementing land banking in relation with land consolidation and use of project-related land consolidation in peri-urban areas, it is possible to prevent the loss of agricultural land. These tools can help redistribute land effectively, providing land compensation instead of monetary compensation to landowners. This approach is environmentally friendly and helps maintain agricultural productivity. The establishment of a state-owned land bank in Norway can improve the management of agricultural properties and minimise the number of agricultural fields that are left fallow.

A solution to accommodate the issue of losing areas rich in biodiversity is to incorporate natural elements into peri-urban planning. A proposal is to leave spaces for green areas such as parks and forests, which not only will enhance air quality and offer recreational opportunities but also support local biodiversity. The approach can be applicable to existing

urban centres but also to areas currently undergoing urbanisation, promoting environmental sustainability across both urban and rural zones.

### 6.2.3 How can measures in the Norwegian Land Consolidation Act help the sustainable development in peri-urban areas?

- The legislative measures found in the Land Consolidation Act sections 3-30 to 3-32 can be used as a measure in peri-urban planning. These sections authorise the land consolidation court to equitably distribute the financial gains from rezoning, enabling development projects to be situated in areas that maximize environmental benefits. This can help ensure that regions of high biodiversity or agricultural value are preserved by ensuring that a project gets built on the soil most fit for the project.
- The establishment of a state-owned land bank in Norway can improve the management of agricultural properties and minimise the number of agricultural fields that are left fallow. A suggestion could be a state-owned land bank which serves as a register for agricultural land in the country. The land bank would be the intermediary between people wanting to sell agricultural land, and people wanting to buy.
- The section in the Land Consolidation Act might seem somewhat “hidden”, and increasing awareness and application of it could prove advantageous. This is particularly relevant when private developers aim to convert peri-urban areas into more urban-like environments. One potential reason for its underutilization could be that project developers and other initiators working in peri-urban zones are not well-informed of its presence. This lack of awareness could stem from its relatively recent introduction into the Land Consolidation Act in 2006.
- Lack of research on the use of land consolidation and land readjustment in peri-urban areas made it difficult to give a full answer to especially the second research question. It seems as there are still a wide division in the field of land readjustment and land consolidation internationally, and a framework for combining these in peri-urban areas would be seen as beneficial.



### 6.3 Future research

When seeking information about the procedure of land consolidation in Galicia, I gained brief knowledge of a step in the procedure called “The environmental report for Galician land consolidation processes”. This could potentially be interesting to analyse for future research. A suggestion could be to do an analysis of reports made from the cases that has used this reporting system, since its implementation in Galician land consolidation practice.

Another suggestion for future research is the implementation of the Apeldoorn Declaration to land consolidation in Norway. The declaration call upon different aspects to be considered when using land readjustment and land consolidation. Norway is also a member country of the Fig 7 committee, so it would be natural to analyse it further.

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Øystein Jakob Bjerva mfl., *Jordskiftelova. Lovkommentar*, [§ 3-4. Ny utforming av eigedom og alltidvarande bruksrett](#), [Juridika](#) (kopiert 15. mai 2024)

## Appendices

Appendix 1: Literature included in Sub-topic 1: Urban expansion and sustainable development.

<b>Title</b>	<b>Year published</b>	<b>Type of literature</b>	<b>Databases/ search</b>
Peri-urban futures: Scenarios and models for land use change in Europe.	2013	Book	Oria

Strategies for sustainable urban development and peri-urban linkages.	2014	Research brief	Oria
Determinants of Urban Expansion and Agricultural Land Conversion in 25 EU Countries.	2017	Article	Oria

Appendix 2 Literature included in Sub-topic 2: Land readjustment and land consolidation.

<b>Title</b>	<b>Year published</b>	<b>Type of literature</b>	<b>Databases/ search</b>
Land Consolidation and Land Readjustment for Sustainable Development - the Issues to be Addressed.	2017	Article	Scopus
European good practices on land banking and its application in Eastern Europe and Central Asia	2021	Conference Paper	Scopus
Land readjustment for sustainable rural development.	2009	Report	Scopus

Appendix 3: Guide for accessing maps through the official website of Xunta de Galicia.

1. Access the map portal by the Regional Government of Galicia through this link:  
<https://mapas.xunta.gal/visores/parcelaria/>

2. Type in the coordinates. For the case of San Miguel Dos Agros: coord. aprox.: 42.91128472413199, -8.522601840187887  
For the case of San Juan de Ortoño (coord. aprox.: 42.858792051159845, -8.649629903413185)

Appendix 4: Guide for accessing information about the land consolidation cases in chapter 4.

Case study object 1: San Miguel dos Agros

1. Access the website for the Regional Government of Galicia through this link:  
<https://ovmediorural.xunta.gal/gl/consultas-publicas/concentraciones-parcelarias-procesos>
2. Under “Provincia”, select “A Coruña”.
3. Under “Concello”, select “Santiago de Compostela”.
4. Click “Buscar”.
5. Press “seguinte”, in the second page you will find the case with the name “San Miguel dos Agros”.

Case study object 2: San Juan de Ortoño

1. Access the website for the Regional Government of Galicia through this link:  
<https://ovmediorural.xunta.gal/gl/consultas-publicas/concentraciones-parcelarias-procesos>
2. Under “Provincia”, select “A Coruña”.
3. Under “Concello”, select “Ames”.



4. Click “Buscar”.
5. On the first page you will find the case with the name “San Juan de Ortoño”.



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