STUDY

Requested by the AGRI committee

European Parliament

The challenge of land abandonment after 2020 and options for mitigating measures

Agriculture and Rural Development

Policy Department for Structural and Cohesion Policies
Directorate-General for Internal Policies
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RESEARCH FOR AGRI COMMITTEE

The challenge of land abandonment after 2020 and options for mitigating measures

Abstract

This study examines the phenomenon of land abandonment, its consequences and mitigation options. Using quantitative data, it provides an overview of the possible future evolution of land abandonment in the EU by 2030, its historical evolution and current state of play. Based on desk research and case studies, this research project carries out an analysis of the drivers and effects of the phenomenon, considers mitigating actions to be implemented through EU policies, notably the CAP and outlines different scenarios about land use changes, using as variables climate change, the globalisation of markets and a major health crisis.

This document was requested by the European Parliament's Committee on AGRI.

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DISCLAIMER

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LIST OF ABBREVIATIONS

AGRI	European Parliament's Committee on Agriculture and Rural Development
ANC	Areas facing natural constraints
BPS	Basic payments scheme
CAP	Common Agricultural Policy
CEEC	Central and Eastern European Countries
CF	Cohesion Fund
CLC	Corine Land Cover
CLLD	Community-led local development
CMO	Common market organisation
CS	Case studies
EC	European Commission
EEA	European Environment Agency
EMFF	European Maritime and Fisheries Fund
ERDF	European Regional Development Fund
ESF	European Social Fund
ESIF	European Structural Investment Funds
EU	European Union
FI	Financial instrument
GAEC	Good Agricultural and Environmental Conditions
GHG	Greenhouse gas
GNI	Gross national income
ICT	Information and communication technology
IEEP	Institute for European Environmental Policy
IPCC	Intergovernmental Panel on Climate Change
JRC	Joint Research Centre
LAG	Local action group
LEADER	Liaison entre actions de développement de l'économie rurale
LFA	less favoured areas
MMU	Minimum mapping unit
MS	Member States
NUTS	Nomenclature des unités territoriales statistiques
OECD	Organisation for Economic Co-operation and Development
RDP	Rural Development Programme
SAPS	Single area payment scheme
SGI	Services of general interest
SME	Small and medium sized enterprise
UAA	Utilised agricultural area
VCS	Voluntary coupled support

Country abbreviations, EU28

AT	Austria
BE	Belgium
BG	Bulgaria
CY	Cyprus
CZ	Czech Republic
DE	Germany
DK	Denmark
EE	Estonia
EL	Greece
ES	Spain
FI	Finland
FR	France
HR	Croatia
HU	Hungary
IE	Ireland
IT	Italy
LT	Lithuania
LU	Luxemburg
LV	Latvia
MT	Malta
NL	Netherlands
PL	Poland
PT	Portugal
RO	Romania
SE	Sweden
SI	Slovenia
SK	Slovak Republic
UK	United Kingdom

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EXECUTIVE SUMMARY

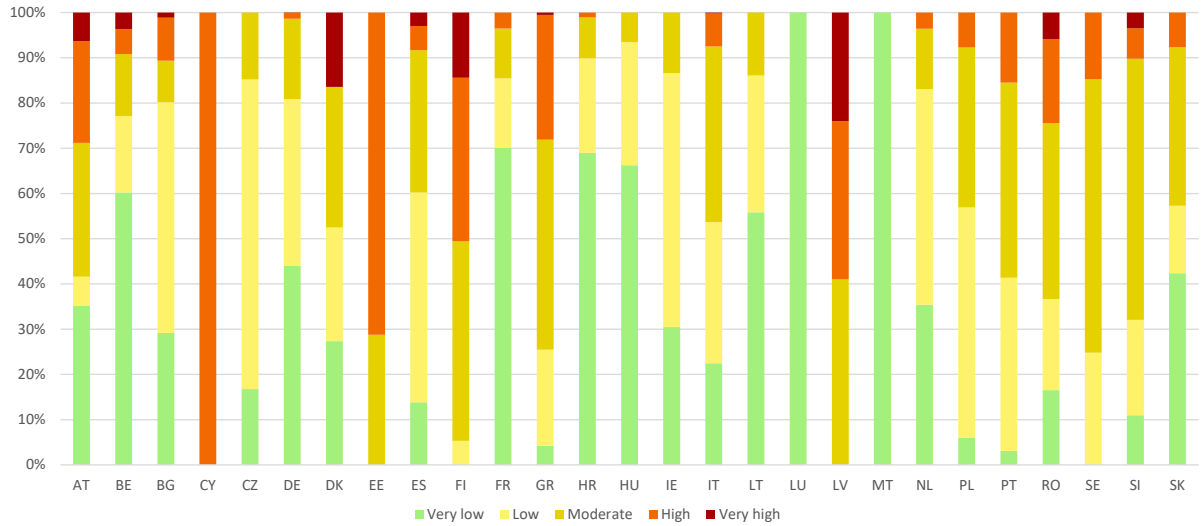
KEY FINDINGS

- Around 30% (circa 56 million ha) of agricultural areas in the EU are under at least a moderate risk of land abandonment. Effective agricultural land abandonment in the EU-27 might total 5 million ha by 2030, or 2,9 % of the current Utilised Agricultural Area (173 million ha).
- Land abandonment is a local phenomenon with a complex set of drivers involving bio-physical, farming, structural, market, regional, institutional and policy factors. Management issues and structural adaptation are the key driving forces affecting this process.
- Harmful effects of land abandonment might threaten the future of semi-natural habitats. However, under specific conditions and in certain phases of the abandonment process, beneficial outcomes might be observed.
- While CAP policy tools can help mitigate land abandonment, their impact on land use changes, production concentration and abandonment trends differs between farm types and production groups.
- Current land abandonment trends will be compounded by external factors (climate change, globalisation, health crises). Key policy tools to minimize the impact of the drivers of land abandonment include the improvement of farming conditions, adapted support to areas with natural constraints, forestry and environmental measures as well as support to rural communities.

Territorial patterns and effects of land abandonment

Around 30% of agricultural areas in the EU are under at least a moderate risk of land abandonment. Such areas exist in almost half of EU Member States. The countries that are most severely affected by higher levels of land abandonment (nearing 30% of areas with high or very high risk) are Austria, Cyprus, Estonia, Finland, Greece, Latvia and Romania (see Figure 1 below).

The share of different levels of the risk of land abandonment at the MS level based on NUTS-3 data in percentage



Source: Consortium, 2020, based on Perpiña Castillo et al., 2018. There is one value for the entire country for Cyprus, Luxembourg and Malta.

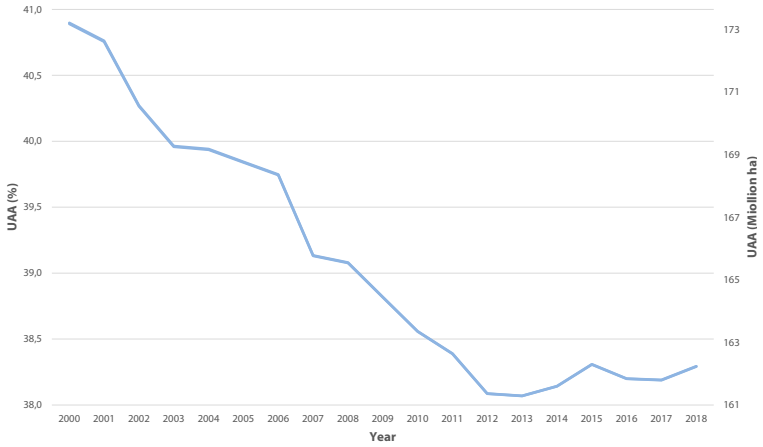
Despite an encouraging trend since 2013 (see Figure 2 below), effective agricultural land abandonment in the EU-27 might total 5 million ha by 2030, or 2,9 % of the current Utilised Agricultural Area (173 million ha).

Remote areas, mountains, islands, coastal and sparsely populated areas are particularly affected by the phenomenon. The prevalence of low and high risk of land abandonment for arable land, permanent crops and pastures is not particularly dependant on the type of land cover, but rather on the geography. In contrast, heterogeneous agricultural areas are affected by high risk irrespective of their location or geography.

The complex pattern of the drivers of land abandonment, as confirmed by the case studies, reveals an interrelated web of bio-physical, farming, structural, market, regional, and institutional and policy factors. Despite the wide array of factors, management issues and structural adaptation remain the key driving forces affecting land abandonment.

While land abandonment can result in harmful environmental effects which may threaten the future of semi-natural habitats, the quality of high nature value farmland, the green corridors linking NATURA 2000 sites and culturally important landscapes, it can also at the same time have beneficial outcomes, e.g. on biodiversity and habitat preservation.

Historic trend of the share of Utilised Agricultural Area in the EU27 (2000-2018)



Source: Consortium, 2020, based on Eurostat.

Mitigating measures

CAP interventions are primarily positive, but can however have varied effects on the process and the extent of land abandonment.

CAP Pillar I

If the mechanisms of Pillar I can mitigate land abandonment through farm income and competitiveness support, inadequate targeting, the greater share of financial support received by large, rather than and small and medium farms and a lack of environmental ambition might however result in increased land abandonment.

CAP Pillar II

Pillar II measures are more focused on addressing spatial challenges, meeting the needs of marginalised and remote rural areas and incorporating farming and forestry within the rural economy through support to diversification, innovation, and value-added activities. The eight measures considered in this study account for over 60% of overall Pillar II funding:

Pillar II measure percentage of total expenditure 2014-2020.

Measure	Measure Name	% Total	Selected
1	Knowledge Transfer	1.2%	
2	Advisory Services	0.92%	
3	Quality Schemes	0.39%	
4	Physical Investments	22.83%	
5	Restoring Production Potential	1.20%	
6	Farm and Business Development	7.27%	✓
7	Basic Services and Village Renewal	6.79%	✓
8	Investments in Forest Development and Viability	4.40%	✓
9	Setting up Producer Groups	0.44%	
10	Agri-Environment-Climate	16.83%	✓
11	Organic Farming	6.40%	
12	Natura 2000 and WFD Areas	0.57%	
13	Areas Facing Natural Constraints	17.01%	✓
14	Animal Welfare	1.45%	
15	Forest-Environment and Climate Services	0.24%	✓
16	Co-operation	1.84%	✓
17	Risk Management Measures	1.37%	
18	Direct Payments for Croatia	0.07%	
19	LEADER/CLLD	6.21%	✓
20	Technical Assistance	2.05%	
OM Measure	113 2007-2013 (early retirement)	0.53%	

Scenarios and Policy recommendations

The current land abandonment trends will also be affected by three major external factors on which actors have little influence but which will have a significant impact on land use change:

- Climate change;
- Globalisation of markets;
- A major health crisis (such as the Covid-19 pandemic).

Policy tools to alleviate the effects of these external factors and impact the other drivers of land abandonment include:

- the improvement of farming conditions (education and training programmes, higher financial security, lower threshold for supporting small farms, new investment sources and easier access to land).
- support to areas with natural constraints (ANC), with a better tailoring to address the risk of land abandonment.
- forestry and environmental measures, which should be adjusted to the different vulnerabilities in different regions.
- rural services of general interest (SGIs) and investment in rural infrastructure, which should be developed making use of synergies between different European Structural Investment Funds (ESIF) and between land use and regional development policies.

1 INTRODUCTION

1.1 Background

The issue of land abandonment has been a long-standing discussion in the scientific community, dating back to the recognition of less-favoured areas and the concern over the limited farmland viability in certain regions. Since then, consideration has since been mounting about agricultural change and the concentration processes of agricultural production. The post-war years saw a steady increase in farm productivity and stronger market integration of farming communities. These changes raised concerns about the preservation of land management, and through it, the preservation of positive environmental and socio-economic benefits of agricultural activities in these "disadvantaged" areas.

With productivity increases and the intensification of agriculture, the extent of land used for agriculture and forestry has been decreasing as tendencies to give up land management are rising. This increased propensity for land abandonment is not, however, equally distributed across the regions and land types of the EU. European regions are characterised by a strong legacy of place-specific land use patterns marked by significant diversity in land cover and land management. Analyses of land use across Europe depict a clear trend of loss of utilised agricultural area (UAA) (Perpiña Castillo et al., 2018). This trend is linked to three main developments:

- First, urbanisation and urban sprawl are not only taking place in agglomeration areas. To a lesser extent, rural regions are also reducing UAA. The price margin between building land and agricultural areas is often so high that economic reasons drive the conversion of agricultural land into urban areas.
- Second, UAA is converted into forests. This often happens in areas where agriculture is economically challenging, and afforestation may correspond to an agricultural extensification strategy.
- Third, productivity increases and regional competitiveness for agricultural production lead to gradual changes in production focus, and to a concentration of production. As a result, farmland that was originally used for farming is no longer cultivated.

The phenomenon of land abandonment may be mostly linked to the third aspect. This dovetails with the findings of a study conducted by the Joint Research Centre (JRC) which concluded that the most common definition of land abandonment "refers to land that was previously used for crop or pasture/livestock grazing production, but does not have farming functions anymore (i.e. a total cessation of agricultural activities) and has not been converted into forest or artificial areas either" (Perpiña Castillo et al., 2018 p. 1)[1].

Land abandonment may be more pronounced in areas with limited production capacity and productivity, e.g. in areas facing natural constraints (ANC). In particular, agriculturally less-favoured areas, such as mountain areas, islands and other remote parts of Europe, face significant challenges in retaining a vital farming structure, and have long been confronted with a steady decrease in

[1] JRC report also refers to a wider definition of land abandonment (see glossary of the report), where agricultural land abandonment involves land used for agricultural production, among others: "Abandoned agricultural land: Land that was previously used to produce economic output (agricultural production, houses for residential purposes, industrial production, etc.) and that is no longer used for that purpose. Thus, abandoned land can be reclaimed back to the original use or possibly converted to other uses, in case demand for such uses exists". However for calculation of (aggregated) risk of land abandonment, only agricultural use of land is considered.

agricultural land use. Location in disadvantaged areas could add to these challenges and hamper integration into effective agricultural value-chains and innovative, quality schemes of food supply. However, land abandonment is not only a sector issue, but has wider implications for societal development, ecological performance, and the rural fabric. These factors include many functions that are of great concern to citizens in all regions, not only rural ones. As such, land abandonment is closely linked to the need to provide future pathways and alternative land use options in mountain areas, other ANCs, or areas with particular hardships and production disadvantages. Beyond that spatial view, farm holdings with reduced viability prospects are often regarded as particularly prone to abandonment processes. Small scale structures (e.g. in Southern or Eastern Europe) face a particular threat of land abandonment.

The decline in the viability of extensive and small-scale land management systems has led to a progressive reduction in farm numbers and to the loss of important landscape features and ecological performance (Baldock et al., 1996). This structural change has been accompanied by agricultural land abandonment in substantial parts of the EU's rural regions. Along those lines, the effects of land abandonment may differ depending on the type of agricultural system (intensive or extensive) in place before the abandonment occurred.

A recent calculation of the extent of land abandonment was presented by the JRC at the LUISA Indicators Territorial Modelling Platform (Perpiña Castillo et al., 2018). It provided a risk map of agricultural land abandonment in the EU. The study indicated the respective areas most threatened by the phenomenon using data at a grid level (100-metres solution). Member States with the highest relevance of the indicator are Spain, Poland, France and the UK.

Land abandonment is a compound phenomenon featuring multifaceted driving forces. A wide set of drivers influences the land abandonment process and leads to the diverse spatial trends. These drivers might be grouped into spatial aspects of natural constraints; unsuitable land conditions; socio-economic factors, in particular demographic changes and pressure; gaps in the institutional framework; or lack of integration/adaptation to agricultural systems. Landscape changes, including land abandonment, are highly dependent on specific political and institutional, economic, cultural, technological, and natural and spatial factors as drivers (Plieninger et al., 2016). Land abandonment is seen as "a complex multi-dimensional process with interlinked economic, environmental and social aspects" (O'Rourke 2019, 2).

There are very few EU-wide studies of land abandonment. However, it is clear from smaller studies that the causes and extent of land abandonment are not the same across Europe and vary both temporally and spatially. It is therefore particularly important to consider land abandonment, future land use development, and landscape changes on a regional level.

In spatial terms, the resilience of areas under severe risk of land abandonment is further threatened by ecological risks, the effects of climate change on natural development, endangered productivity, and low precipitation levels (particularly in Southern European regions). Similar threats to resilience and lasting productivity can nevertheless be found and observed in many other areas across the EU. The intensive land management systems propagated in the past are intensifying these adverse effects. Any strategy to cope with abandonment aspects would need to address the balance of intensive and extensive areas, and the capacity to achieve a shift toward sustainable production management systems (e.g. including organic farming as a "proxy" indicator for this shift).

Scale and location are crucial considerations when the assessing drivers, as well the effects (both negative and positive) of land abandonment. Beyond the large-scale observations noted above for mountainous areas, other areas of natural constraint, or nature conservation areas, small-scale abandonment might appear in extensive and, less commonly, intensive areas. The effects might be

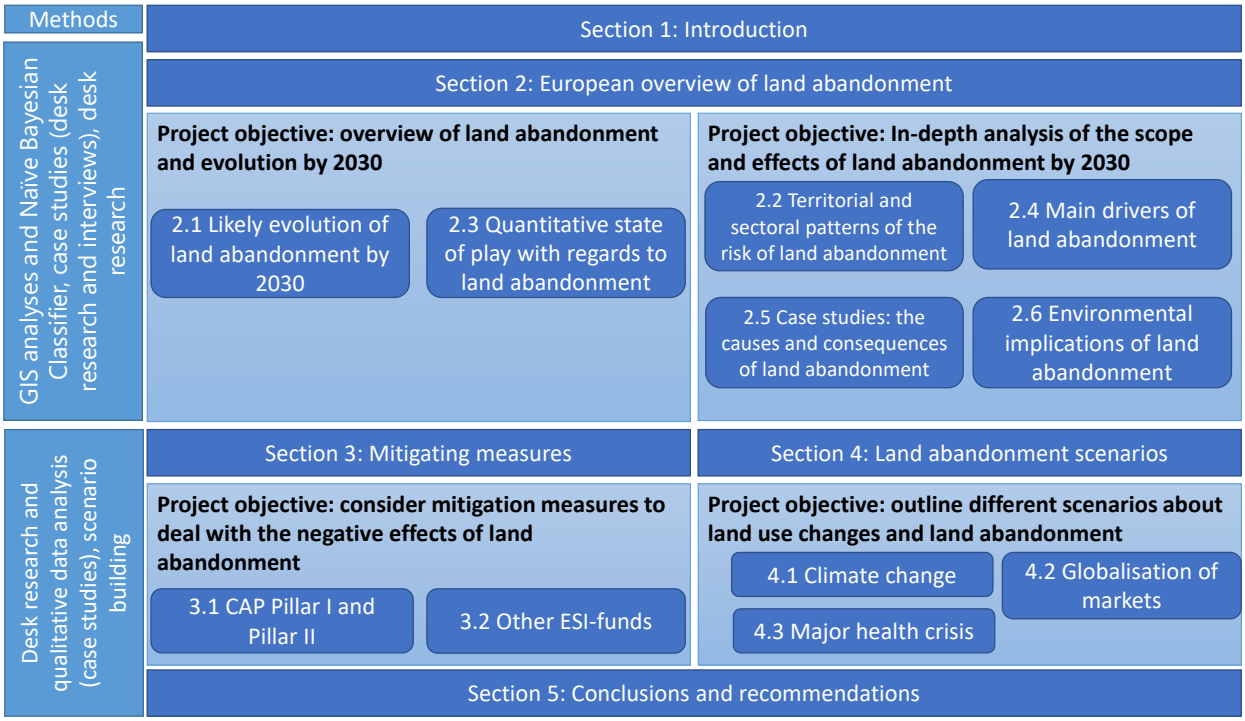
very different from area to area. Location-specific effects and divergent trends for small-scale development have been traced in many contexts, from mountain areas, to peri-urban regions where local effects are also dependent on socio-economic changes.

1.2 Study objectives, data sources and methods

The project provides a deeper and up-to-date understanding of land abandonment in the EU based on available data and information including its development, drivers, mitigating measures across EU policies (not limited to the CAP) and respective scenarios. The resulting study aims to assist the AGRI Committee members in discussing the legislative proposals regarding CAP post-2020, including the Commission communication and Action plan on "A long-term vision for Rural Areas" expected in 2021. It complements existing evidence with specific research on land abandonment and presents conclusions relevant to policy-making regarding the post-2020 CAP policy.

The study has four specific objectives according to which the study structure has been designed. As presented in the figure below, section 2 addresses the first two objectives of the study: to provide an overview and an in-depth analysis of land abandonment, as well as its state of play and developments by 2030. Section 2 consists of six sub-sections which investigate different aspects of land abandonment, in line with these objectives. Numerous research methods are employed. Quantitatively, the methods of GIS analyses and Naïve Bayes classifier are applied in sections 2.1, 2.2 and 2.3. In sections 2.4, 2.5 and 2.6, desk research and case studies involving interviews in sections 2.4, 2.5 and 2.6. Section 3 focuses on analysing the mitigating measures with the help of desk research as well as with findings from the previous sections, particularly case studies. Based on the developed understanding of the scope of land abandonment, its drivers and effects, section 4 outlines scenarios which have been developed in a group workshop. Finally, section 5 presents conclusions and recommendations of the study.

Figure 1: Structure of the study with corresponding project objectives and methods



Source: consortium, 2020.

Given the large array and complex requirements of the topics covered by the research project and the related research work, a multilevel analytical and methodological approach is foreseen:

- **Quantitative data:** Based on the already available quantitative data used by the JRC as well as other data sources such as Corine Land Cover data, the project has collected and provided an overview of current and future land abandonment at different levels (EU, MS and NUTS-3), complementing already available work (notably, by the JRC (Perpiña Castillo et al., 2018)). This data is the basis for further quantitative and qualitative analyses.
- **Quantitative and GIS analyses:** For the purpose of providing different geographical resolutions of land abandonment from the available data as well as crossing these with different types of territories and land classes, GIS analyses have been employed. Further quantitative analyses, such as using Naïve Bayes classifier for defining groups of regions, have been performed in order to analyse the regional characteristics and select case studies.
- **Qualitative data collection and analysis** via desk research, case studies and interviews complements quantitative data. Based on the available quantitative data, addressing the objectives of the research and complementing the already available overview of land abandonment required a considerable qualitative desk research and expert analysis.
- **Scenario-building:** Based on the available information, this exercise required a specific and justified methodological approach and skilled triangulation of collected and processed information.

Quantitative data sources

There are two main data sources which help to inform on land abandonment in this study. Change in utilised agricultural area (UAA) allows for the investigation into whether the amount of agricultural area has changed across the EU at the Member State (MS) and at NUTS-2 level. The UAA is defined by EUROSTAT as "the total area taken up by arable land, permanent grassland, permanent crops and kitchen gardens used by the holding, regardless of the type of tenure or of whether it is used as a part of common land". The decrease in UAA may indicate farmland abandonment in the case of arable land, permanent grassland and permanent crops. The change in kitchen garden area can be less linked to activities of the agricultural industry as kitchen garden areas are predominantly used for domestic purposes. However, the kitchen garden areas can be expected to be much smaller than agricultural areas utilised in the agricultural industry. For this reason, the impact of change in kitchen garden areas on UAA change, in contrast to arable land, permanent grassland and permanent crops, can be neglected and UAA may be understood as referring predominantly to surface used in the agricultural industry.

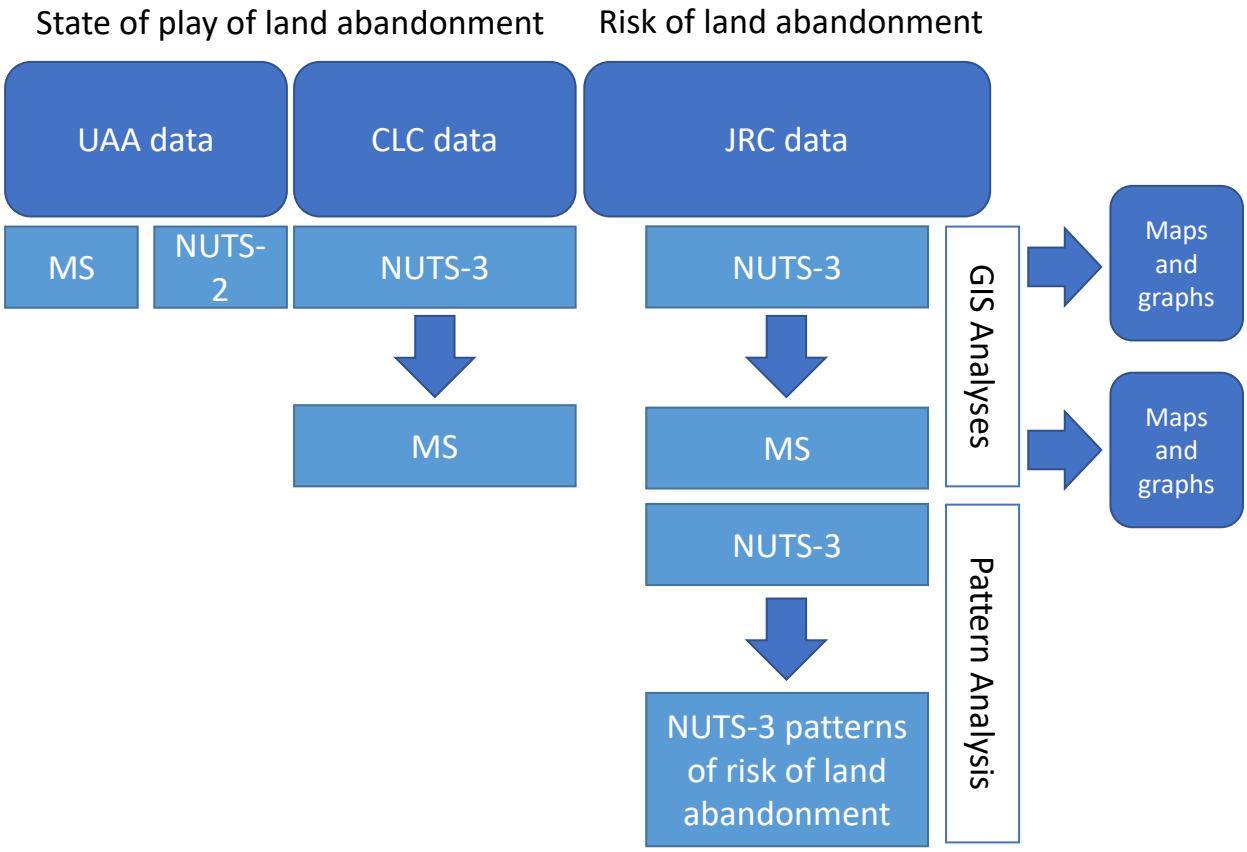
Another source of information enabling the investigation of agricultural land abandonment are CORINE Land Cover (CLC) data which capture the change between different types of land cover. CLC data can show how much agricultural area has decreased or increased, as well as to demonstrate changes into other land cover classes.

The CLC data provides an overview of land cover in Europe. The land cover is defined in 44 classes in the reference years 1990, 2000, 2006, 2012 and 2018. The inventory of the data set also consists of layers showing the land cover changes over a period of time. However, the CORINE Land Cover is measured with a Minimum Mapping Unit (MMU) of 25 hectares, whereas the change data uses an MMU of five hectares. As a result of the different resolutions, the change between years does not correspond to respective change layers. As a change layer has been crossed with a status quo layer in this study, the results will show a certain degree of inaccuracy. Furthermore, land cover units that are smaller than these MMUs are not captured. This means that if a particular land cover type is constantly smaller than

the MMUs, it is underrepresented. Despite the inaccuracy and due to the fact that there are no comparable data available, the data can still give a good overview of land cover classes in the EU. The analysed data was cleaned and implausible values where eliminated to avoid skewed results. UAA and CLC data can be compared as there are significant links between them. The UAA change would be reflected in CLC change of the agricultural land cover types.

The figure below demonstrates the methods applied for purposes of processing each type of data considered (UAA, CLC and JRC data on the risk of land abandonment).

Figure 2: Overview of interrelations between methods and data used



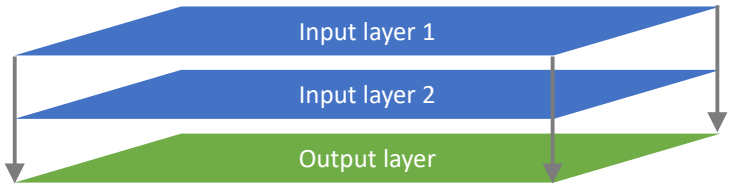
Source: Consortium, 2020.

GIS analyses

A geographic information system (GIS) is a computer aided system which allows the gathering, processing and illustration of spatial (location-based) data. Via GIS analyses, available data (e.g. CLC) can be aggregated or disaggregated to be visualised at different geographical (NUTS) levels. Such analyses have been performed and visualised in sections 2.1, 2.2, 2.3.

Figure 3 illustrates the GIS processing used in this study. Input layer 1 represents the data from the CORINE Land Cover. The data of the land cover areas only have the information of the geographic position denoted as x, y coordinates, but not their location in terms of territorial units. Input layer 2 comprises information on the EU27 countries and NUTS-3 territories and also their geographic position. By crossing these two input layers, the land cover types have been assigned to their respective territorial units. The size of the land cover areas has been aggregated by the respective territorial units. This has been performed in a spreadsheet programme. A similar processing method has been performed with the data from the risk map by the JRC (Perpiña Castillo et al., 2018).

Figure 3: GIS processing with spatial data



Source: Consortium, 2020.

Naïve Bayes classifier

To analyse the matching results of different types of regions and land classes with the risk of land abandonment in section 2.2, the method of Naïve Bayes classifier was applied. It is a probabilistic machine learning algorithm [2] based on the Bayes Theorem that is used for a wide variety of classification tasks. Naïve Bayes classifier predicts the most probable class for an input sample. This is done using a learned probability density function (i.e. distribution of input features like percentage of types of urbanisation within a NUTS-3 region),for each of the risk levels of land abandonment (i.e. a very low/low/moderate/high/very high risk). Every risk level is modelled with a multivariate Gaussian distribution. The classifier then chooses the class with the highest return value.

To determine whether a NUTS-3 region with given features defined (e.g. 20% cities, 15% towns and suburbs, 65% rural areas) belongs most likely to one of the five risk levels, the data sample is fed into each of the five risk level's model. For this, the "prior" probabilities for each of the class of risks are computed (the proportion of each risk class out of all the risks from the data, i.e. the distribution of our data). Further, the probability of the likelihood of evidences (i.e. the conditional probability) is calculated. The conditional probability is the likelihood of an outcome occurring, based on the occurrence of the previous outcome. Mathematically, the conditional probability of A given B can be computed as P (A|B) = P(A AND B)/P(B). (Machine Learning Plus, 2020)

The following example represents a 3-dimensional case (i.e. cities, towns and suburbs, rural areas). We illustrate this procedure with an example considering the following dummy data:

Table 1: Dummy data set as a basis for a 3-dimensional Gaussian distribution

Dummy NUTS-3 regions	Risk level	Types of regions (share)		
		Cities (i.e. densely populated areas)	Towns and suburbs (i.e. intermediate density areas)	Rural areas (i.e. thinly populated areas)
NUTS-3 111	low	0.25	0.10	0.65
NUTS-3 112	high	0.40	0.35	0.25
NUTS-3 113	moderate	0.35	0.25	0.40
NUTS-3 121	high	0.42	0.33	0.25
NUTS-3 122	high	0.35	0.37	0.28
NUTS-3 123	low	0.20	0.13	0.67
NUTS-3 131	moderate	0.33	0.25	0.42
NUTS-3 132	low	0.23	0.10	0.67
NUTS-3 133	moderate	0.30	0.25	0.45

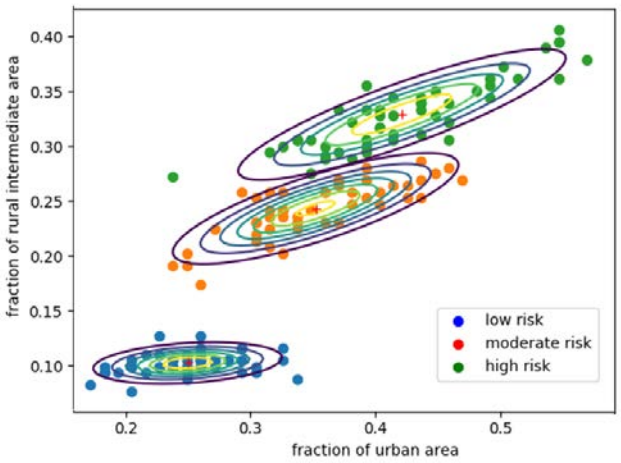
Source: Author's dummy data, 2020.

[2] A probabilistic machine learning algorithm is based on a classifier that is able to predict a probability distribution over a set of classes (Murphy, K.P, 2012).

This approach can be extended to any number of dimensions. However, a slice with 2 dimensions is used for illustrative purposes. The following plot shows a 2-dimensial Gaussian distribution with an increased number of dummy input values.

Based on this example a NUTS-3 region with, for example, an 8% share of rural intermediate area and 28% share of urban area, will most likely belong to the class "low risk level".

Figure 4: 2-D slides of models (mean and co-variance matrix) generated via maximum likelihood estimation for each of the risk classes (on a dummy data set that only consists of three risk levels instead of five)



Source: Authors' own graph; data source: Fisher's iris flower data set[1].

Definition of land abandonment

An essential element of the elaboration of the methodological approach is the definition of key concepts in this project. This is particularly important for the concept of land abandonment itself. In the studies performed by the JRC, agricultural land abandonment is defined rather broadly as abandonment of any type of rural land, not just agricultural land, i.e. also industrial or residential (Perpiña Castillo et al., 2018). However, for the JRC calculations of the risk of land abandonment, only the agricultural use of land is considered. In other studies (e.g. Keeleyside and Tucker, 2010) land abandonment refers only to farmland abandonment, i.e. abandonment of land with agricultural (farming) activities. Moreover, the potential practical understandings and characteristics of these terms may change depending on the national or regional context.

The differentiation between the phenomenon of land abandonment in agricultural areas which is not necessarily farmland should be differentiated from farmland abandonment. At the same time, farmland abandonment is closely related to the wider phenomenon of abandonment of different types of land in rural areas, and vice versa. The primary focus in the study is farmland abandonment, i.e. abandonment of land with the function of agricultural production; also the primary focus of the calculations undertaken by the study. This definition is aligned with the data calculations undertaken by the JRC, thus, there should be no discrepancies between the data used and the definition assumed in this study.

2 EUROPEAN OVERVIEW OF LAND ABANDONMENT

Studies on land abandonment and marginalisation have historically focused on remote areas such as mountain regions, islands, and extreme peripheral locations, and have traditionally been examined through case studies. Review studies concentrated on comparing trends and the effects of associated policy programmes on mountain agriculture and its impact on the environment (e.g. Euromontana 1997), the provision of rural amenities and environmental benefits through extensive agriculture (e.g. OECD 1998, Crabtree et al., 2002), and reviews of policy schemes for LFA with specific implications for farm revenue levels (e.g. Crabtree et al., 2003). The European Commission sought to summarise the scattered evidence on land use development in mountain areas to understand the scope of the challenges (EC 2009) and found rather divergent trends across various countries and large-scale regions of Europe.

Relevant studies focused on the assessment of the implementation of the least favoured areas (LFA) scheme and the changing discourse from a primarily socio-economic perspective towards a more service-oriented and ecological view. At first, implications for farm households, the viability of farming in these areas, and the relevance for income support was emphasized (see IEEP 2006). The improved availability of geographically small-scale data calculation for land development at various spatial levels enriched several studies on land abandonment development and at-risk areas. One of the first comprehensive overviews on farmland abandonment in the EU (Keenleyside and Tucker 2010) addressed the results of Land Use Modelling (CAPRI model and RURALIS) and revealed the "variable levels of farmland abandonment in Europe, primarily in areas where agriculture is less productive, particularly in remote and mountainous regions and areas with poor soils and harsh climates" (Keenleyside and Tucker 2010, 4). It underpinned that the loss of utilised agricultural area might not only lead to direct land abandonment, but that parts of it might be converted to forest land, or to "artificial uses" or urban areas. It also pointed out that lost farmland might be regained after a crisis period. These divergent trajectories of farmland use make it particularly challenging to provide an estimation of the extent of land abandonment and the future risks for abandonment. They also highlight that abandonment might directly impact the development of agriculture in Natura 2000 sites and in high nature value (HNV) farmland, and might imply positive or negative impacts on ecological parameters, in particular biodiversity.

In recent years, scientific discourse on the issue has intensified. Large-scale quantitative evidence on various dimensions of landscape change has been gathered across European regions (García-Martín et al., 2020) and long-term assessment of transitions in European land management regimes have been explored (Jepsen et al., 2015). These studies have provided valuable background to the problem of on-going polarization of land uses, the resulting pressure towards land abandonment in specific areas, and the environmental effects linked to particular trajectories of land management systems. Data on land abandonment and its projections into the future are a valuable source of information that complements qualitative discussions and differentiated information from specific territories. In order to understand the future development of land abandonment, it is essential to investigate its historical development. The different sources of data and analyses provided below will offer an overview of the quantitative state of play of land abandonment.

2.1 Likely evolution of land abandonment by 2030

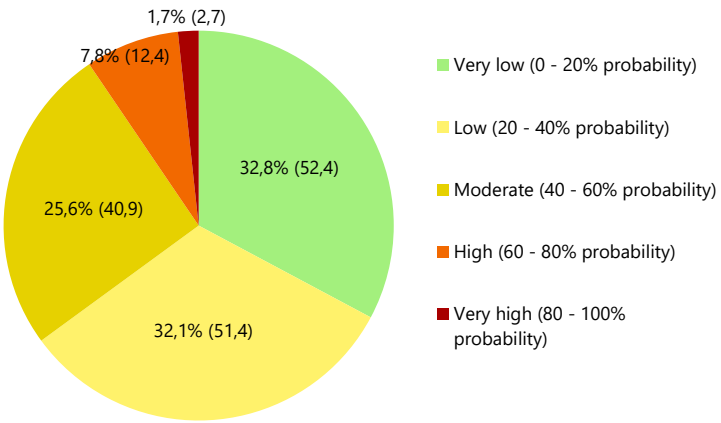
Key findings

- Around 30% (or 56 million ha) of agricultural areas in the EU are under at least a moderate risk of land abandonment. In almost half of EU Member States, around and above 50% of agricultural areas present at least a moderate risk of land abandonment.
- Agricultural land abandonment in the EU-27 might total 5 million ha by 2030, or 2,9 % of the current EU-27 Utilised Agricultural Area (173 million ha).
- Various regions and Member States can become severely affected by land abandonment. The rankings of those most affected have changed during the investigated periods.
- 13 out of 27 member states, or almost half of EU countries, have around 50% of their agricultural areas designated as moderate to high risk for abandonment. The countries with the highest levels of risk are Austria, Cyprus, Denmark, Estonia, Finland, Greece, Italy, Latvia, Poland, Portugal, Romania, Sweden and Slovenia.

The JRC has developed a risk map depicting the estimated risk of agricultural land abandonment in the EU by 2030 (Perpiña Castillo et al., 2018). It considers all land types used for agricultural purposes (arable farming, livestock grazing, mixed crop-livestock, permanent crop). The indicator is built based on a framework that considers the following: 1) bio-physical land suitability for general agricultural activities, 2) farm structure and agricultural viability, and 3) population and regional context.

The JRC data on the risk of land abandonment at NUTS-3 level (presented further in Figure 7) can be aggregated at the level of the EU27. The results show that over 30% (56 million ha) of the total agricultural area face moderate, high, or very high risk of abandonment (see Figure 5 below). Very low and low risk respectively characterise approximately 30% of the remaining agricultural surfaces (roughly over 100 million ha)[3].

Figure 5: The share of different levels of the risk of land abandonment compared to total agricultural areas at the EU27 level based on NUTS-3 data (values in brackets in million ha)



Source: Consortium, 2020, based on Perpiña Castillo et al., 2018.

Figure 6 shows the shares of different levels of land abandonment risk at the level of the Member States. The data at the Member States level was aggregated based on NUTS-3 risk level data obtained from the JRC. The share of risk levels was aggregated at Member State level according to the size of the share of each region within each risk level[4].

The diagram depicts several trends:

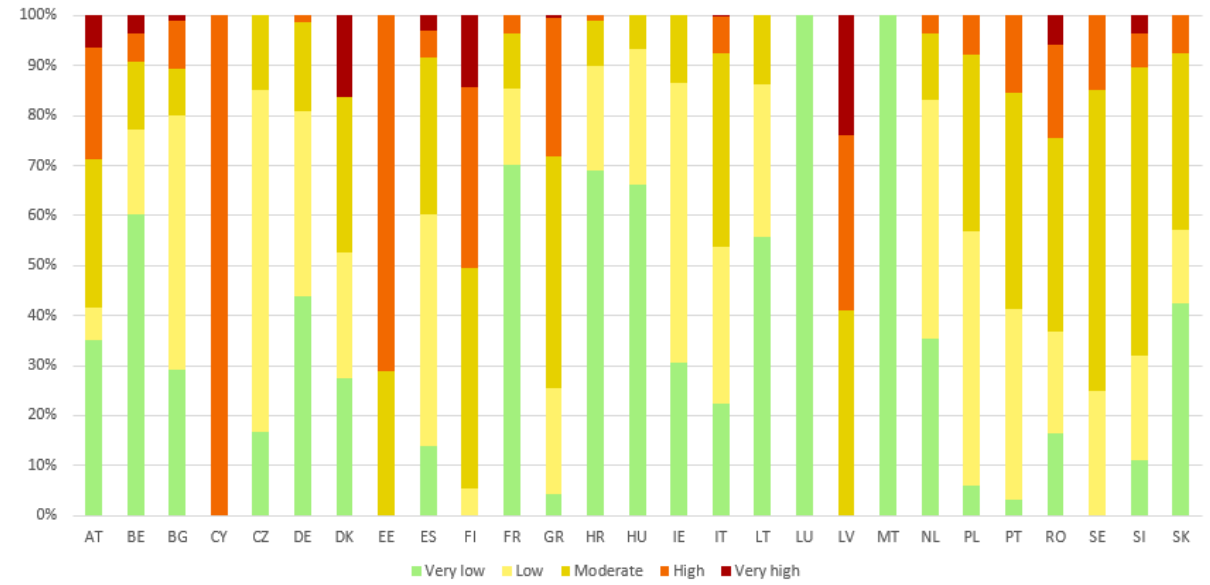
[3] This result differs from a similar pie chart developed by the JRC due to: 1) the exclusion of the United Kingdom in the dataset used here and 2) use of data at NUTS-3 level in the present study as opposed to the use of data at grid level in the JRC study (although both grid level and NUTS-3 level data stems from the JRC).

[4] For each Member State, a sum of these regional values for each risk level was calculated. These values were then divided by the total agricultural area of each Member States. The resulting values of each risk level, thus, are based on the proportional share of each risk level, considering the size of regions for which this risk level was initially attributed.

- 13 out of 27 member states, or almost half of EU countries, have around 50% of their agricultural areas designated as moderate to high risk for abandonment. The countries with the highest levels of risk are Austria, Cyprus, Denmark, Estonia, Finland, Greece, Italy, Latvia, Poland, Portugal, Romania, Sweden and Slovenia.
- Particularly high levels (close to 30% designated as high or very high risk) are present in Austria, Cyprus (there is one value for the entire country as it is only one NUTS-3 region), Estonia, Finland, Greece, Latvia and Romania.

However, it is clearly observable that calculations of the risk of land abandonment are not always aligned with historical trends, as analysed in Section 2.3. This suggests that conclusions based on these calculations of the risk of land abandonment should be drawn carefully.

Figure 6: The share of different levels of the risk of land abandonment at the MS level based on NUTS-3 data in percentage



Source: Consortium, 2020, based on Perpiña Castillo et al., 2018.

The JRC has also developed projections of land abandonment over 2015-2030. The results suggest that agricultural land abandonment in the EU-28 might reach 4.2 million ha by 2030 in cumulative terms, which implies an abandonment scope of about 280,000 ha per year on average over the period 2015-2030 (Perpiña Castillo et al., 2018). Agricultural land abandonment in the EU-27 might total 5 million ha by 2030, or 2,9 % of the current EU-27 Utilised Agricultural Area (173 million ha). This is especially alarming given that a 1% decrease of agricultural land is expected in the EU over this same period. As arable land is the dominant type of agricultural land, it will also account for the largest share of abandonment (more than 70%) (Perpiña Castillo et al., 2018).

These projections can be compared to the absolute numbers of UAA trends until 2018, which are further presented in section 2.3.

Table 2: Comparison of absolute numbers of UAA change historically (2000-2018) and projected values (2015-2030)

UAA change in EU27 2000-2018 in absolute numbers (million ha)		Projected UAA change in EU28 2015-2030 in absolute numbers (million ha)
-11		- 4.2
UAA change 2000-2012	UAA change 2013-2018	
-11.9	0.9	

Source: Consortium, 2020, based on Eurostat and Perpiña Castillo et al., 2018.

Table 2 shows a comparison of absolute numbers of UAA change between 2000-2018, distinguishing between the 2000-2012 and 2013-2018 periods where a change in trend is observed with the JRC projection. It can be observed that the projected loss of UAA is almost three times lower than the actual loss in the years preceding. However, the value of -11 million ha concerns a period 3 years longer than the projection period.

Comparing the value of -4.2 million ha projected for 2015-2030 to the value of -11 million ha in the period of 2000-2018 gives the impression UAA loss is slowing. Nevertheless, this analysis should take under consideration the changing in trend that occurred between 2012-2013. **In recent years (2013-2018) there was a positive UAA trend** (see Figure 12). **However,** the positive trend may be unstable, **as the projections up to 2030 show decreasing UAA.** Despite the positive trend seen in 2012-2013, the threat of land abandonment persists.

2.2 Territorial and sectoral patterns of the risk of land abandonment

Key findings

- Remote areas and areas with territorial specificities: mountains, islands, coastal and sparsely populated areas are particularly vulnerable.
- NUTS-3 regions with a high share of rural areas are especially affected by a moderate to very high risk of land abandonment, whereas NUTS-3 regions with a higher share of cities are characterised by a very low risk level of land abandonment.
- The higher the share of mountains within a NUTS-3 region, the higher the risk of land abandonment. Most NUTS-3 regions with a very low risk level of land abandonment are characterised by a share of 75 to 100% non-mountainous areas.
- The prevalence of low and high risk of land abandonment with regards to arable land, permanent crops and pastures is not so much dependant on the type of land cover but on the geography. In contrast, heterogeneous agricultural areas are affected by high risk irrespective of their location or geography.

Regional differentiations of land abandonment risk

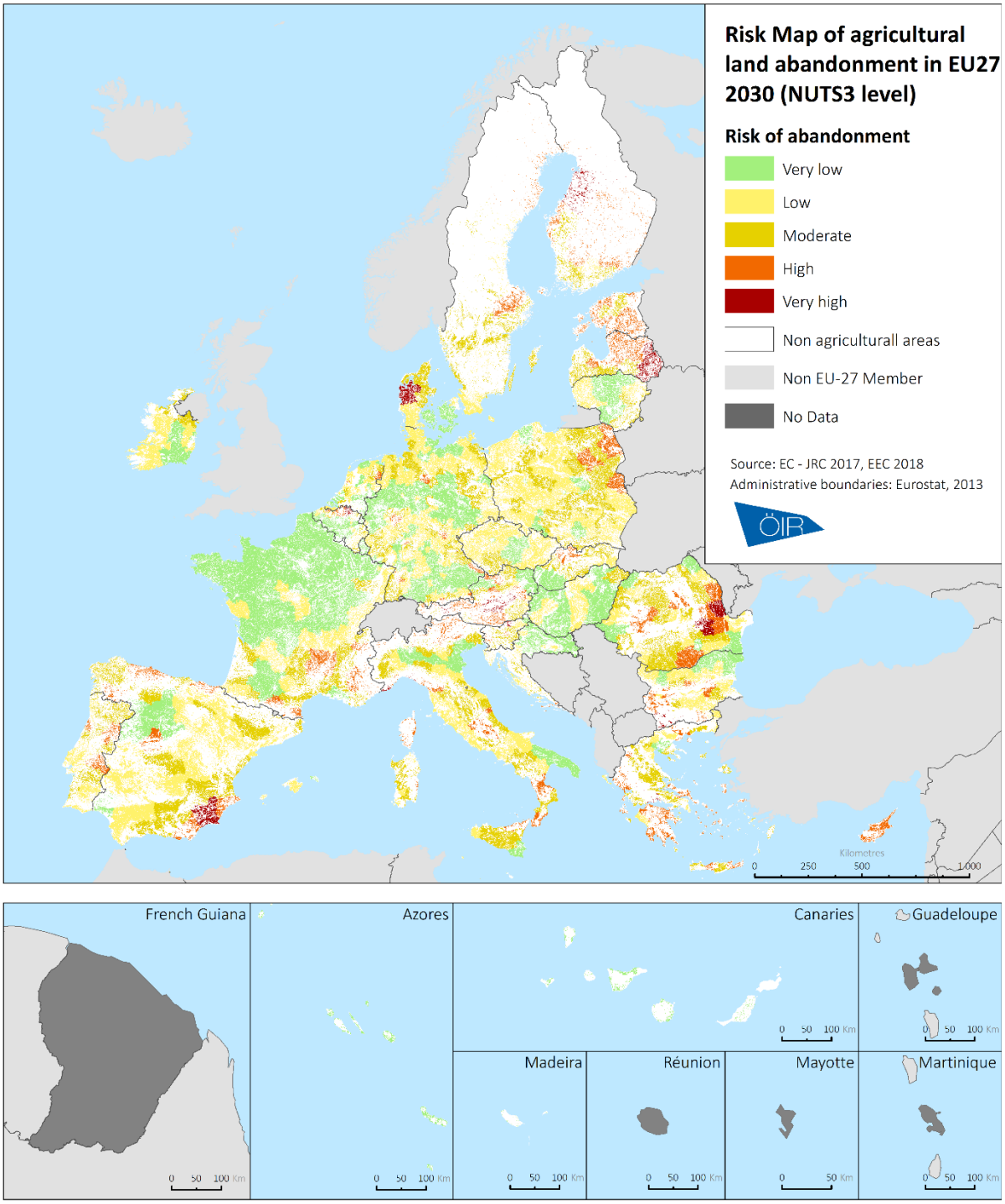
Land abandonment is an issue across the EU; however, it affects certain regions more than others. Some territories, particularly in mountain regions may account for more than 30% of the areas affected over the period 2015-2030 by land abandonment (Perpina Castillo et al., 2018). Desk review indicates that the threat felt by farmers is most clearly expressed at more local levels. For this reason, it is necessary to analyse the developments in land abandonment at finer regional levels.

Figure 7 depicts the risk level of agricultural land abandonment in 2030 in NUTS-3 regions, based on NUTS-3 data obtained from the JRC. Within each NUTS-3 region, values are shown only for areas that are classified as agricultural according to the CLC in 2018. Hence, even though the data is for NUTS-3 regions, it is shown at the grid level, according to CLC. The risk values from the JRC dataset, which range

from 0 to 100%, have been attributed to the agricultural areas within the respective NUTS-3 region and depicted in five levels of risk, aligned with the classification in the JRC report (Perpiña Castillo et al., 2018).

The risk map shows that regions with at least a moderate risk of land abandonment are present in every region. **Regions with a moderate-to-very-high risk of land abandonment are often located in territories with geographical specificities: remote or sparsely populated, mountainous, coastal areas and island.** The trend of land abandonment is projected by the JRC to take place particularly in mountain areas and other areas of natural constraints (ANCs) due to place-specific natural, or other, handicaps creating limitations for enhanced mechanisation, and remoteness limiting access to markets.

Figure 7: Risk of land abandonment in EU27 at NUTS-3 level



Source: Consortium, 2020, based on Perpiña Castillo et al., 2018.

Looking at the incidence of abandonment at the regional level, several "hotspots" across the EU can be observed:

- Southern European regions: Northern Portugal, Southern France, Sardinia in Italy, and the Peloponnese peninsula and several islands in Greece.
- Central and Eastern European countries: Northern and Eastern parts of Poland, Eastern Slovakia, Northern Hungary and inner (mountain) areas of Romania.
- Mountain ranges: large parts of the Alps (France, Austria), Carpathians (Slovakia, Romania), the Apennines (Southern Italy), Greek mountains, many middle-mountains (Germany) etc.

- Northern Europe: peripheral locations in Finland and Sweden, western coast of Scotland and Wales.

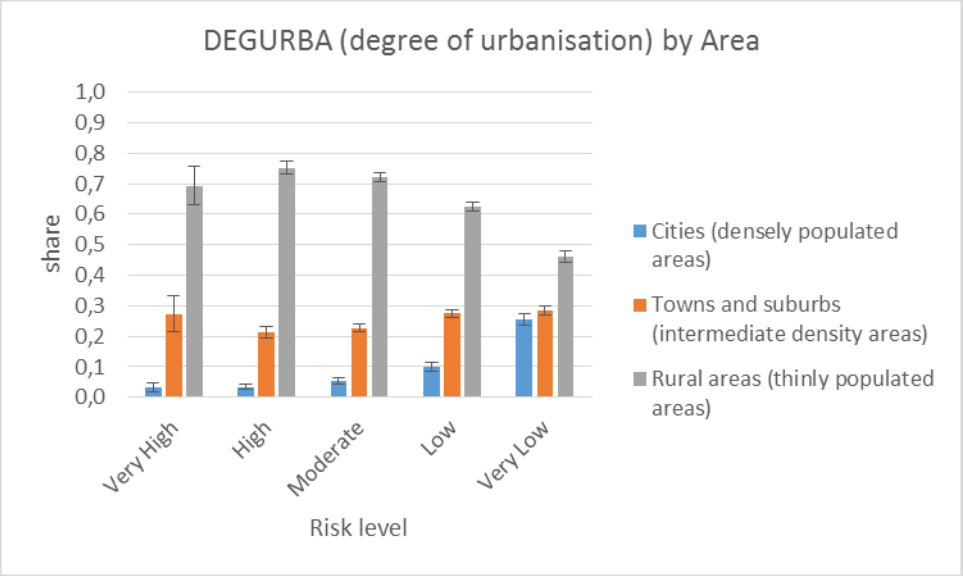
Regarding particular regions, the risk map indicates possible hotspots of land abandonment which do not overlap with the hotspots of UAA reduction in the 2000-2012 and 2012-2018 analysed in section 2.1., except for two regions: Tyrol and Carinthia (Austria) and Murcia (Spain). According to Figure 7, hotspots of land abandonment risk are also located elsewhere: in Liguria (Italy), Antwerp (Belgium), Styria and Carinthia (Austria), West Jutland (Denmark), eastern Latvia, Blagoevgrad and Smolyan Provinces (Bulgaria), Bacău and Galați (Romania) and regions in Central Greece (Evrytania and Phocis). **The changing occurrence of hotspots suggests that the formation of hotspots of land abandonment is dynamic, and that despite this, the most vulnerable areas remain remote territories with geographical specificities.**

Risk level and regional typologies

Crossing the risk map at the NUTS-3 level (based on Perpiña Castillo et al., 2018) with the territorial typologies of different types of regions (e.g. types of urbanisation within a NUTS-3 region) allows for an in-depth analysis of land abandonment patterns. Naïve Bayes classifiers were used to further predict the risk level of any combination of land shares. The following results are based on data from DEGURBA (degree of urbanisation) (EUROSTAT, 2019) and on mountainous versus non-mountainous areas (DG Regio, 2016).

It is not surprising that especially rural areas are affected by various levels of risk of land abandonment (Figure 8). The results indicate that NUTS-3 regions with a very high risk level of land abandonment are on average composed of 69.4% rural areas (i.e. thinly populated areas), 27.4% of towns and suburbs (i.e. intermediate density areas) and only 3.2% cities (i.e. densely populated areas). Whereas NUTS-3 regions with a higher average share of cities (25.4%) are characterised by a very low risk level of land abandonment.

Figure 8: Average share (mean ± SE, standard error) of various degree of urbanisation within the five risk levels



Source: Consortium, 2020, based on DEGURBA data from Eurostat (2019)
note: 1 (i.e. total share) refers to sum of cities, towns and rural areas available in NUTS-3 regions

As can be further seen from the scatterplots in the annex (chapter 2) higher concentration of moderate to very high risk level of land abandonment occur within those NUTS-3 regions where the share of rural areas is comparably high.

For each type of urbanisation, classes where created, ranging from very low (<20%) to very high area share (>80%) within each NUTS-3 region. These classes were used as the model input. Naïve Bayes algorithm calculated the prior and conditional probability for each risk-level within individual types of area of cities, towns-suburbs and rural areas.

Table 3 below shows the model output for the DEGURBA data, indicating, for instance that mainly NUTS-3 regions with a very low share of urban areas (i.e. < 20% of surface area) are most probably affected by risk of land abandonment. In contrast, NUTS-3 regions with a very high share of rural areas (> 80% of surface area) have the probability of between 40 and 60% to belong to either a moderate, high or very high risk level of land abandonment.

Table 3: Conditional probability of different types of areas (cities, suburbs and rural) per risk level (based on model output of Naïve Bayes Classifier)

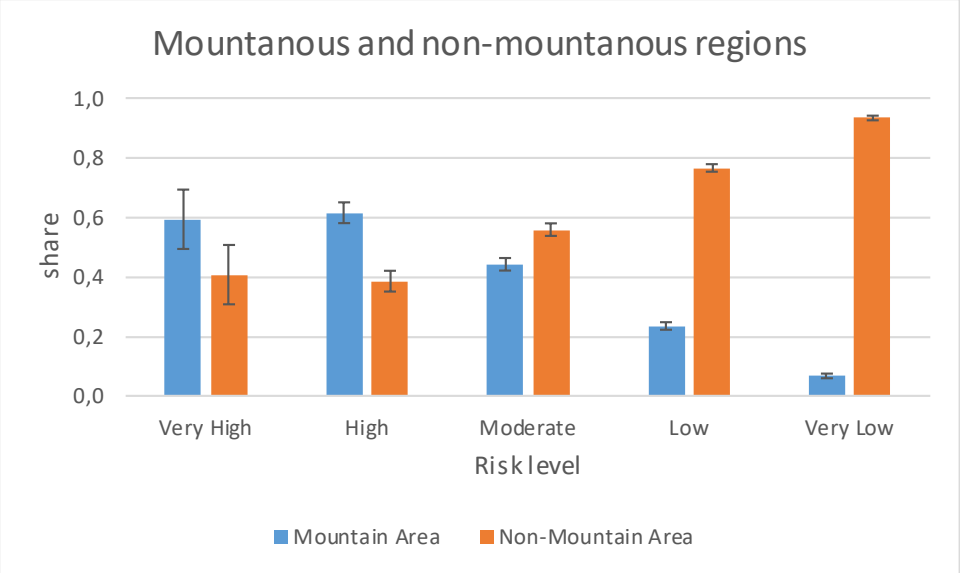
Share of Urban areas / Risk level (%)	Very high (> 80%)	High (60-80%)	Moderate (40-60%)	Low (20-40%)	Very low (< 20%)
Very high	0	0	0	0.045	0.954
High	0	0.008	0	0.045	0.957
Moderate	0.026	0.004	0	0.015	0.956
Low	0.055	0.006	0.012	0.049	0.878
Very low	0.219	0.005	0.012	0.034	0.729
Share of Towns/ Suburbs Risk level (%)	**Very high (> 80%)**	**High** (60-80%)	**Moderate** (40-60%)	**Low** (20-40%)	**Very low** (< 20%)
Very high	0.091	0.045	0.136	0.227	0.500
High	0.038	0.023	0.122	0.191	0.626
Moderate	0.011	0.048	0.103	0.288	0.549
Low	0.043	0.064	0.128	0.299	0.466
Very low	0.078	0.100	0.109	0.209	0.502
Share of Rural areas / Risk level (%)	**Very high** (> 80%)	**High (60-80%)**	**Moderate** (40-60%)	**Low** (20-40%)	**Very low** (< 20%)
Very high	0.409	0.318	0.136	0	0.136
High	0.588	0.176	0.145	0.038	0.053
Moderate	0.491	0.277	0.129	0.052	0.052
Low	0.372	0.277	0.134	0.082	0.134
Very low	0.266	0.190	0.107	0.090	0.346

Source: Consortium, 2020, based on DEGURBA data from Eurostat (2019).

With regard to NUTS-3 regions with a high share of mountain areas (or in contrast with a high share of non-mountainous areas) it can be observed that the higher the share of mountainous areas, the higher the risk of land abandonment (and vice versa – the higher the share of non-mountainous areas, the smaller the risk of land abandonment, Figure 9). This can be also seen in the scatterplot (annex, chapter 2) where the percentage distribution between mountainous and non-mountainous areas of the NUTS-3 regions is grouped by the five risk levels of land abandonment. The plot shows that the highest number of dots that corresponds to a very low risk of land abandonment are located in areas which are characterised by a very high share of non-mountainous surface areas.

For mountainous and non-mountainous areas, classes ranging from very low (<20%) to very high area share (>80%) were created and fed into the model. As can be seen from the model output (Table 4) the probability of regions belonging to either a high or even a very high risk of land abandonment lies above 50% for regions with a very high share of mountainous areas.

Figure 9: Average share (mean ± SE, standard error) of mountainous and non-mountainous areas within the five risk levels



Source: Consortium 2020, based on DG Regio, 2016
note: 1 (i.e. total share) refers to sum of mountainous and non-mountainous regions available in NUTS-3 regions

Table 4: Conditional probability of mountainous areas per risk level (based on model output of Naïve Bayes Classifier)

Share of mountain areas / Risk level (%)	Very high (> 80%)	High (60-80%)	Moderate (40-60%)	Low (20-40%)	Very low (< 20%)
Very high	0.545	0.0455	0.0455	0	0.364
High	0.511	0.145	0.046	0.015	0.282
Moderate	0.169	0.266	0.162	0.052	0.351
Low	0.012	0.055	0.210	0.232	0.491
Very low	0.017	0.005	0.019	0.061	0.898

Source: Consortium, 2020, based on DEGURBA data from Eurostat (2019).

Risk level and agricultural land cover

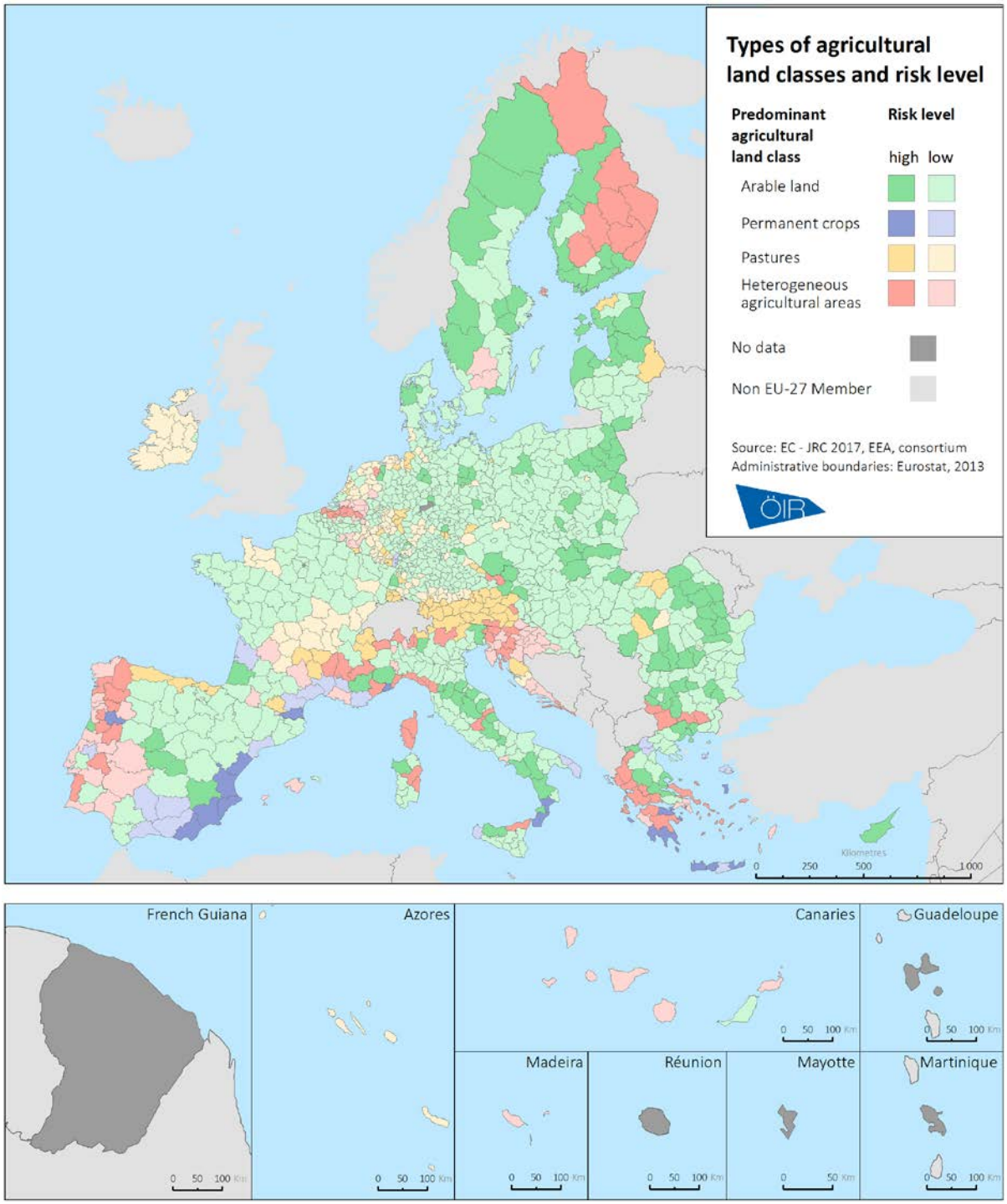
The map below (Figure 10) shows the predominant risk level (five original classes of risk have been grouped into two – namely High and Low risk) for NUTS-3 regions based on their prevalent agricultural CLC class. The crossing of these two types of information enables the examination of whether there is any relation between risk level and predominant agricultural CLC.

It can be observed that in each type of CLC class there are both regions with high and low risk of land abandonment level, as follows:

- **High risk in areas with predominantly arable land is present in remote and sparsely populated areas,** for example in Sweden, Eastern Poland and Romania, central Italy and central Spain.

- **High risk in areas with predominantly permanent crops is present in coastal areas** (Spain, France) **and islands** (Crete).
- **High risk in areas with predominantly pastures can be observed in the mountainous Alpine area,** as well as other regions in Atlantic coast of Spain, central France, and single regions in eastern Latvia, Germany, Romania and Croatia.
- **High risk is experienced to a large extent in heterogeneous agricultural areas located across Europe.** This is particularly visible in Finland, Corsica, Italy, Bulgaria, Greece, and to a mixed extent in Portugal, Belgium, France and Croatia.

Figure 10: Types of agricultural land cover classes and risk of land abandonment in NUTS-3 regions



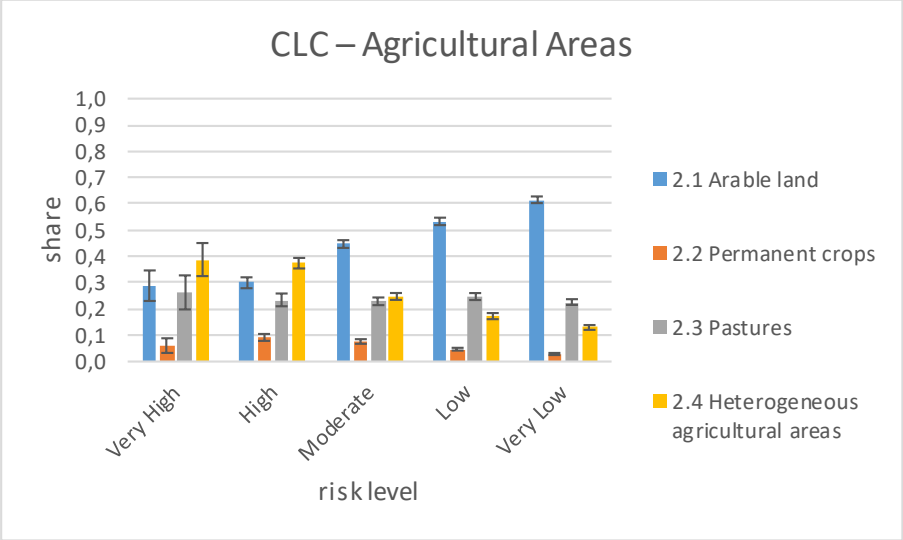
Source: Consortium, 2020, based on EEA (CORINE Land Cover Data).

Agricultural areas derived from CLC (2018) were also assessed in more detail via pattern analysis. Average risk of land abandonment across NUTS-3 regions was calculated, followed by the use of Naïve Bayes classifier to predict the risk level for each agricultural class.

Findings of the pattern analysis are to a large extent coherent with those derived from Figure 10. As can be seen in Figure 11 below, a higher risk level of land abandonment is valid for all types of land cover and is particularly high for heterogeneous areas. Beyond conforming with Figure 10 in this respect, Figure 11 also indicates that the share of heterogeneous areas rises with risk level, and is highest in instances of very high risk.

Risk level decreases for areas with a higher share of arable land, pastures and, to some extent, for permanent crops (although in the case of permanent crops the peak is for "high" rather than "very high" as in case of arable land and pastures).

Figure 11: Average share (mean ± SE, standard error) of different agricultural areas within the five risk levels



Source: Consortium, 2020, based on CLC (2018);
note: 1 i.e. total share) refers to total agricultural area available in NUTS-3 regions

The models output below (Table 5) shows separately the conditional probability for each feature (i.e. sub-class of agricultural area). The risk level "very high" has the highest probability where the size of an agricultural fields is very low (i.e. < 20% of area).

Indicating that smaller agricultural fields (independent of agricultural land type) are affected more from land abandonment than larger fields of the same type.

Table 5: Conditional probability of different classes of agricultural areas per risk level (based on model output of Naïve Bayes Classifier)

Share of Arable land / Risk level (%)	Very high (> 80%)	High (60-80%)	Moderate (40-60%)	Low (20-40%)	Very low (< 20%)
Very high	0.045	0.227	0.045	0.091	0.591
High	0.039	0.084	0.206	0.282	0.389
Moderate	0.048	0.276	0.239	0.254	0.184
Low	0.126	0.377	0.218	0.123	0.156
Very low	0.298	0.308	0.191	0.108	0.095
Share of Permanent crops Risk level (%)	**Very high* (> 80%)**	**High** (60-80%)	**Moderate** (40-60%)	**Low** (20-40%)	**Very low** (< 20%)
Very high	-	0	0.045	0.091	0.863
High	-	0.008	0.061	0.115	0.817
Moderate	-	0.018	0.044	0.069	0.868
Low	-	0.003	0.015	0.049	0.932
Very low	-	0.002	0.012	0.022	0.963
Share of Pastures Risk level (%)	**Very high** (> 80%)	**High (60-80%)**	**Moderate** (40-60%)	**Low** (20-40%)	**Very low** (< 20%)
Very high	0.045	0.182	0.045	0.182	0.545
High	0.092	0.008	0.092	0.244	0.565
Moderate	0.029	0.074	0.110	0.202	0.585
Low	0.055	0.046	0.110	0.233	0.555
Very low	0.034	0.046	0.095	0.227	0.597
Share of Hetero-geneous land Risk level (%)	**Very high** (> 80%)	**High** (60-80%)	**Moderate** (40-60%)	**Low** (20-40%)	**Very low** (< 20%)
Very high	0.136	0.045	0.227	0.136	0.455
High	0.023	0.153	0.290	0.275	0.295
Moderate	0.026	0.055	0.136	0.294	0.489
Low	0.021	0.034	0.077	0.181	0.687
Very low	0.010	0.027	0.061	0.159	0.743

*to low input data for very high share of permanent crop areas available
Source: Consortium, 2020, based on DEGURBA data from Eurostat (2019).

2.3 Quantitative state of play with regards to land abandonment

Key findings

- A strong shift in the UAA development at the European scale is observable in 2012. In the period 2000-2012 there was a strong and continuous decrease in UAA while in 2012-2018 the UAA stabilized and even started to slightly increase, with very limited changes in UAA in this period (from year to year).
- Between 2012 and 2018 urban sprawl remained a driver of land abandonment. However, the shift from agricultural land to land used for residential, commercial and industrial activities has slowed down significantly between 2012-2018. Instead, substantial areas of agricultural land were lost to industrial, mining, transport and commercial activities.
- At the national level, generally, the pace of UAA decrease has reduced strongly. In some cases, agricultural areas have started to expand. However, in Romania, Bulgaria, Ireland, Luxembourg, Estonia, Greece and Malta UAA has continued to decrease.
- Land cover change to natural surfaces sped up between 2012 and 2018 across the EU. In many regions, land previously used for agricultural activities was reclassified into natural surfaces.

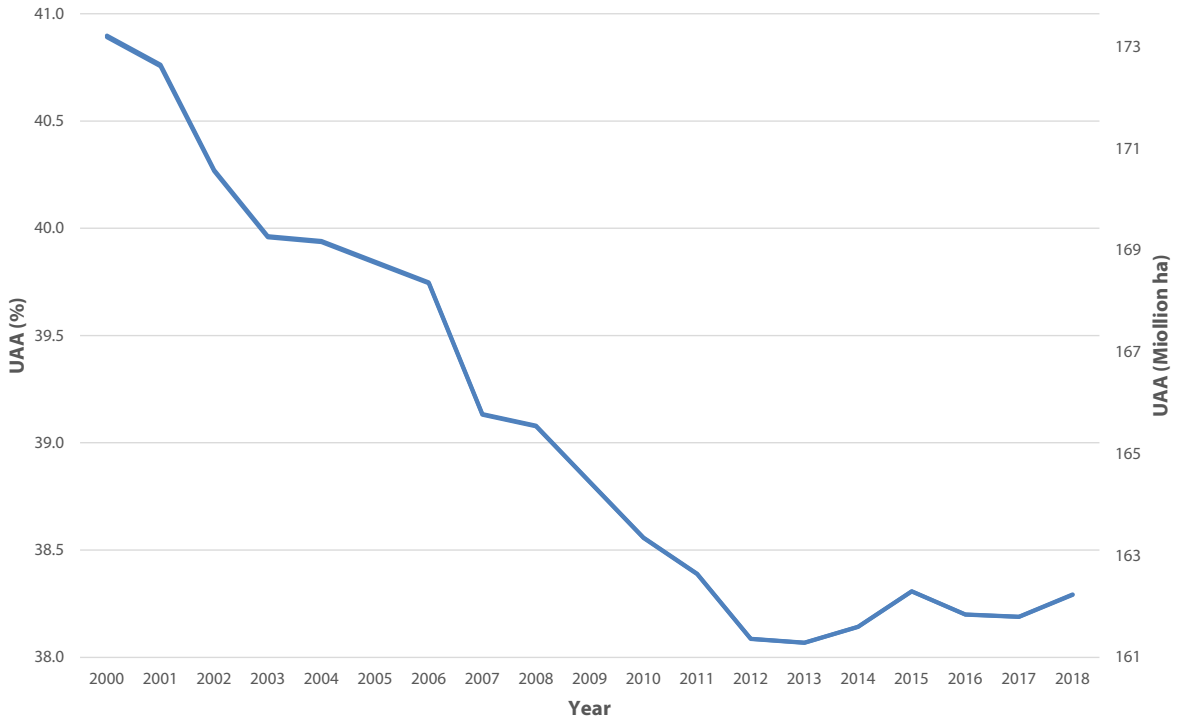
Utilised Agricultural Area change

Figure 12 below demonstrates an interesting trend with regard to the historical development of UAA. Across the European Union (EU-27), the **share of UAA has been in a continuous decline from 2000 until 2012.** The **decline has slowed significantly in 2012 and from 2013 until 2018 when an opposite trend, a slight increase in UAA, can be observed.** Despite certain interruptions in this positive trend in 2015, the overall trend has remained positive. This more recent change toward an increase in agricultural production, might reflect the global trend of turning the focus on food security concerns and intensification, following the 2008 crisis. It should, however, be noted that since the JRC projections suggest that 4.2 million ha of agricultural land will be abandoned, the positive UAA trend observed between 2013-2018 may not be sustained, and further land abandonment can take place between 2015-2030.

Since a significant change in the land abandonment trend was observed between the time periods of 2000-2012 and 2012-2018, the analyses of the changes in UAA and CLC data will, whenever appropriate, highlight the two time periods separately. In terms of understanding the recent history of land abandonment, it is more appropriate to consider a shorter time period of six years (2012-2018). The focus on the period 2012-2018 is also supported by the change in the UAA trend which has taken place since 2012. Moreover, also CLC data is also available only every six-year time periods, including the period of 2012-2018. In sum, focusing on the six-year period of 2012-2018 will show the most recent trend of land use change and will enable comparisons between the CLC and UAA data.

For purposes of contrasting, similar calculations as for 2012-2018 are available for the time period 2006-2012 in the annex. Whenever appropriate, they will be referred to in the below analyses.

Figure 12: Historic trend of the share of UUA in the EU27 (2000-2018)



Source: Consortium, 2020, based on Eurostat.

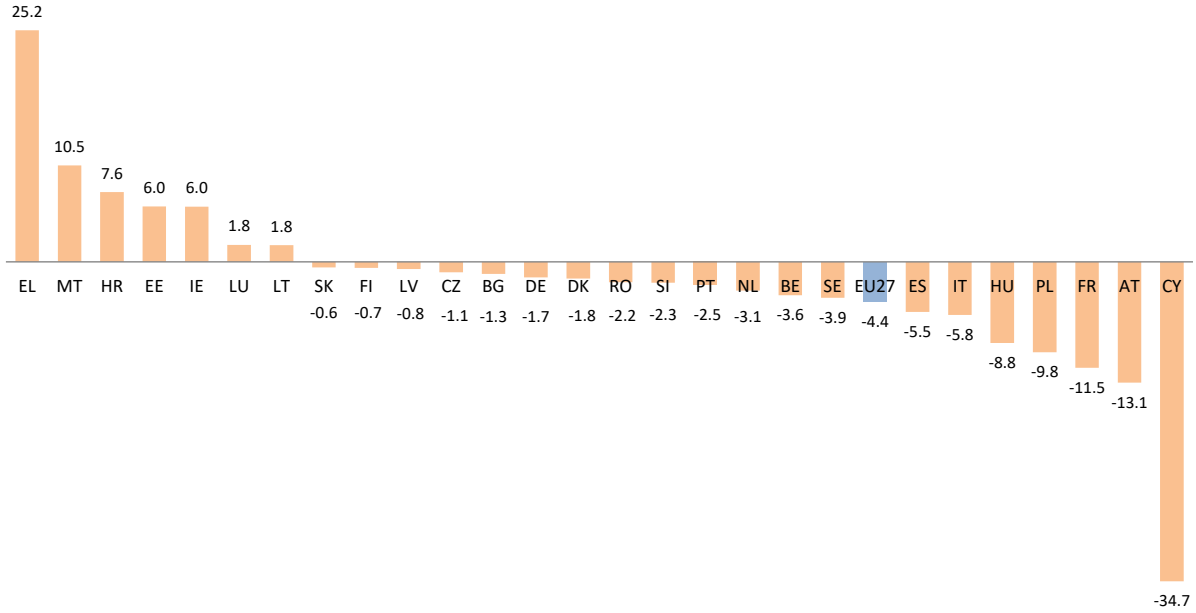
The **overall change in the UAA rate at the EU level in 2006-2012 was -4.4% while the UAA rate change at the EU level in 2012-2018 was 0.5%** (see Figure 13 and Figure 14). This confirms the shift in trends between the two time periods. Both maps and figures visualising the UAA change in the two time periods show that the values of both the increases and the decreases of UAA have been significantly lower in 2012-2018 than in 2000-2012. Since both time periods are of equal length, this suggests that, **next to an overall slowing down of the UAA decrease, the latter period is characterised by a much more stable change in UAA.**

The diagram below (Figure 13 and Figure 14) enable the exploration of the changes of UAA in Member States in greater detail, and based on concrete values in each country. While the overall slowing down of UAA decrease and a general shift from a negative to a positive UAA change trend is confirmed, there are some diverse patterns observed:

- **Slowing pace of UAA decline:** countries which in 2000-2012 saw a strong decrease of UAA (Cyprus, Austria, France, Poland, Hungary, Italy), in 2012-2018 have registered a slowing pace of UAA reduction. On the regional level (see annex, section 1.1) UAA reduction hotspots in 2006-2012 that are stabilising include Lisboa, Algarve (Portugal), Aragon (Spain), Tirol (Austria), Calabria (Italy), Podkarpackie (Poland) and Bucharest (Romania).
- **Relatively constant pace of UAA decline:** the change of UAA in some Western European, Central European and Nordic countries has remained at a similar level, usually as a mild negative shift to an even milder negative change in the latter period. This includes Germany, Portugal, Netherlands, Slovenia, Czechia, Slovakia, Sweden Denmark, Finland.
- **UAA expansion:** in some countries, the UAA has changed from a slight negative to relatively strong positive value: Latvia, Belgium and in Lithuania and Croatia the UAA increase has intensified. In other countries, Ireland, Luxemburg, Estonia, Croatia, Greece and Malta, the strong positive UAA values have reduced.

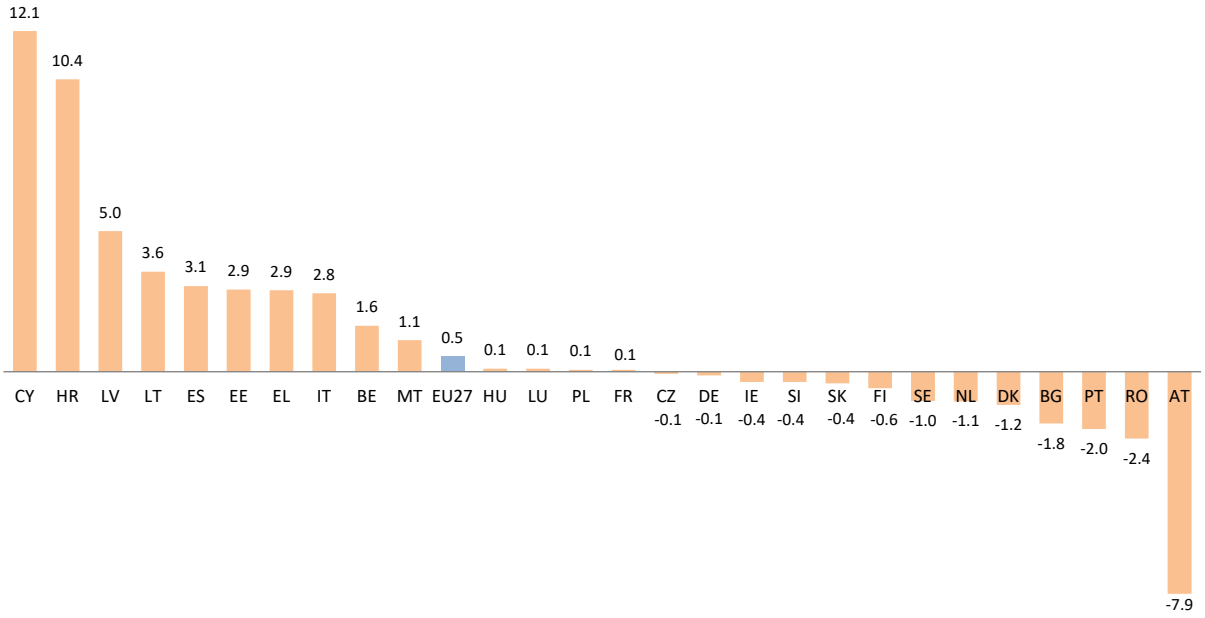
- **UAA decrease intensification:** in some countries, the UAA decrease has intensified: Romania, and Bulgaria. On the regional level (see annex, section 1.1), the hotspots that have strong (>-30%) decrease in UAA between 2012 and 2018 are located in the Mediterranean islands (Greek islands, Corsica and Sardinia) as well as Murcia (Spain).

Figure 13: Change in UAA between 2006 and 2012 in EU27 MS (%)



Source: Consortium, 2020, based on Eurostat.

Figure 14: Change in UAA between 2012 and 2018 in EU27 MS (%)



Source: Consortium, 2020, based on Eurostat.

Regarding the interpretation of the above diagrams, it should be noted that the values of UAA change are relative to the UAA surface. Thus, the same UAA changes are more emphasised in countries with smaller total UAA surface (e.g. this may explain fluctuations in Cyprus).

The above trends can be further investigated at the regional (NUTS 2) level in order to identify the "hotspots" of UAA decrease. Figure A.1 and A.2 in the annex, section 1.1, show some intensification of

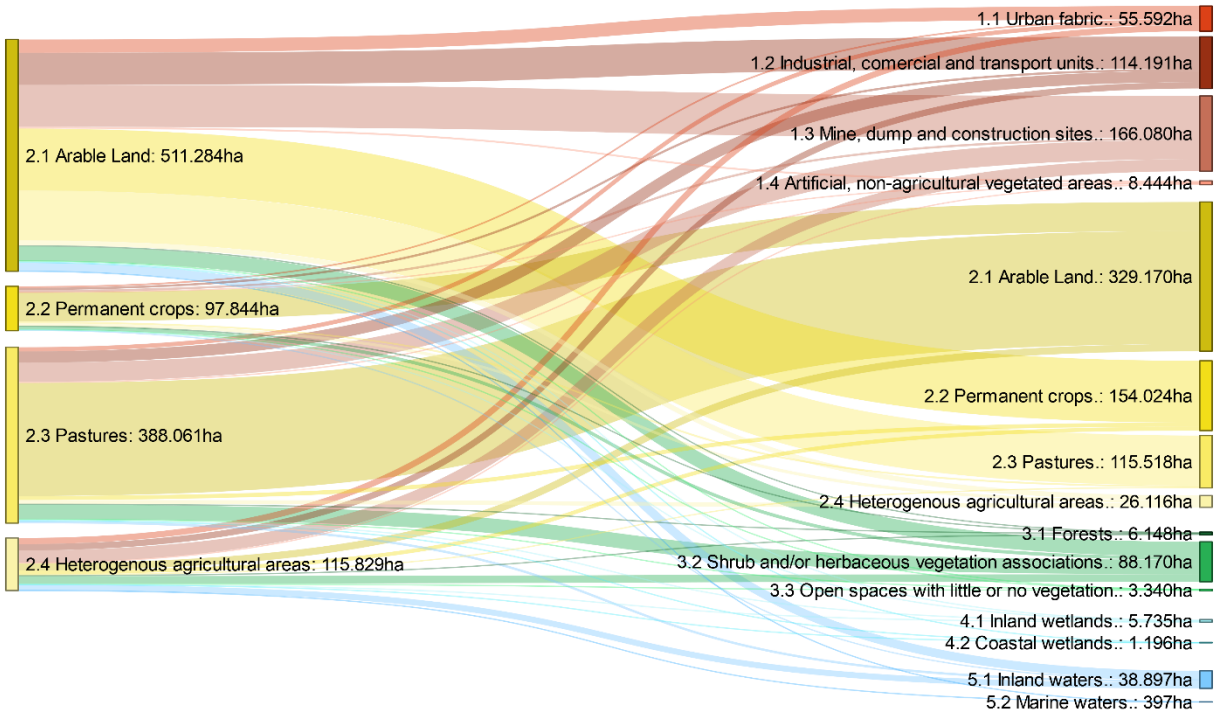
present UAA trends. The maps confirm that **fewer regions register strong UAA decrease in 2012-2018 as opposed to 2006-2012.**

The hotspots that in the more recent period have **strong (>-30%) decrease in UAA are located in the Mediterranean** islands (Greek islands, Corsica and Sardinia) as well as Murcia (Spain). Regions that maintain high decrease in UAA in the latter period are Basque Country (Spain), Lubuskie (Poland) and Central and West Macedonia (Greece) (where the rate of UAA decrease has intensified relative to the earlier period). Vorarlberg, Tirol and Carinthia (Austria) also maintain a decrease in UAA, although one that has been less drastic in the 2012-2018 as opposed to the 2006-2012 time period.

CORINE Land Cover change

The shift of agricultural areas to other types of surface usage is in the focus of this analysis, and artificial surfaces and natural surfaces between 2012 and 2018 are considered. It is assumed that change from agricultural areas, and particularly into natural and artificial surfaces, corresponds to the phenomenon of land abandonment. Land that ceases to be used for agricultural production can either turn to natural surfaces such as forests or shrubs, or can be converted to artificial surfaces, partially as a result of the phenomena of urban sprawl, as well as to make room for industrial development. Changes between different agricultural land classes (for example, arable land and permanent crops), do not demonstrate land abandonment but rather changes in the use of agricultural land surfaces for different types of agricultural production. These surface area changes are illustrated in two Sankey figures (Figure 15 and Figure A.3 in the Annex, section 1.2).

Figure 15: Land cover change from agricultural areas into other land cover classes at EU27 level 2012 to 2018



Source: Consortium, 2020, based on EEA (CORINE Land Cover Data).

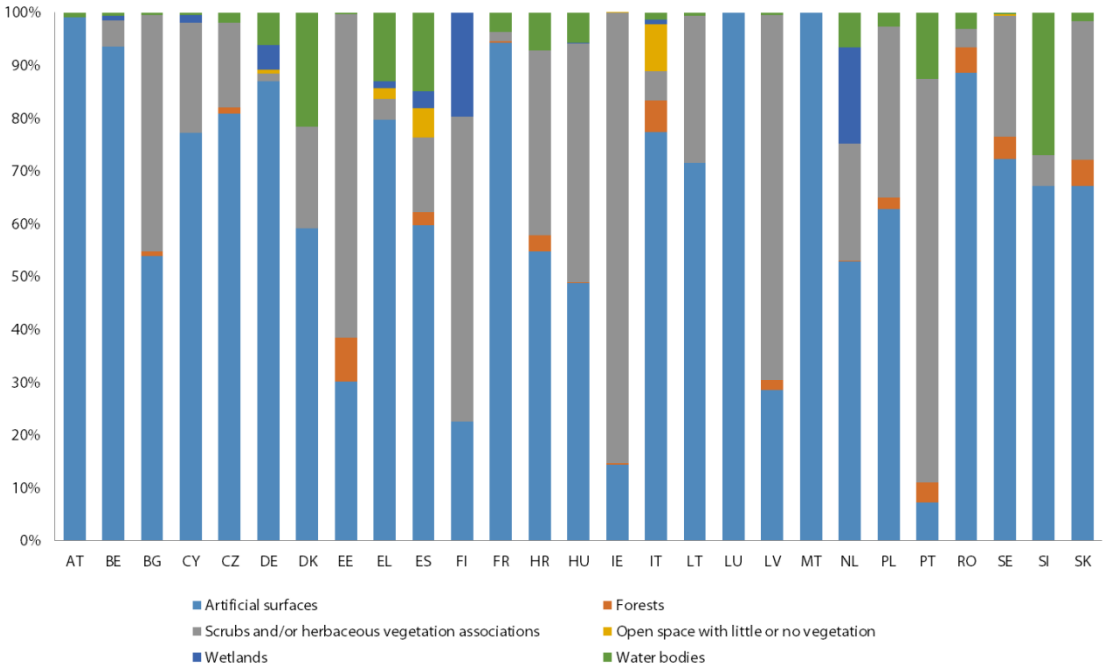
The change in land cover classifications of agricultural areas in the EU between 2012 and 2018 is visualised in Figure 15. Between the two points in time, agricultural land has shifted mostly within different classes of agricultural land use, however it has also shifted to other uses, predominantly to artificial surfaces. This is particularly visible in terms of the transformation of 166,080 ha of agricultural

areas to mine, dump and construction sites and the 114,194 ha of agricultural areas that has been converted to industrial, commercial and transport units. Urban sprawl remains a significant driver of land abandonment with 55,592 ha of agricultural areas now turned into urban fabric.

Agricultural land abandonment in terms of changes to other non-agricultural natural surfaces, i.e. forests or scrubland, did not occur to the same extent as the shift to artificial surfaces. For example, surface land changes from agricultural areas to forest and semi-natural areas, including wetlands and water bodies, are relatively small. However, a somewhat significant surface area (88,170 ha) was reclassified to scrubs and/or herbaceous vegetation associations and 38,897 ha to inland waters.

The vast majority of Member States experienced the conversion of agricultural land predominantly into artificial surfaces, spanning the dates 2012 and 2018 (Figure 16). In some Member States (e.g. Austria, Latvia, and Malta), the loss of agricultural surface area was (nearly) completely absorbed by artificial surfaces, pointing to intensive urbanisation, industrialisation and sprawl. Land transformation to natural areas (such as forests) occurred only in a minority of Member States (e.g. Portugal, Estonia, and Ireland) as the most prominent type of land abandonment. In comparison, between 2006 and 2012 (see annex, section 1.3), land transformation to natural surfaces was much more prominent in many Member States.

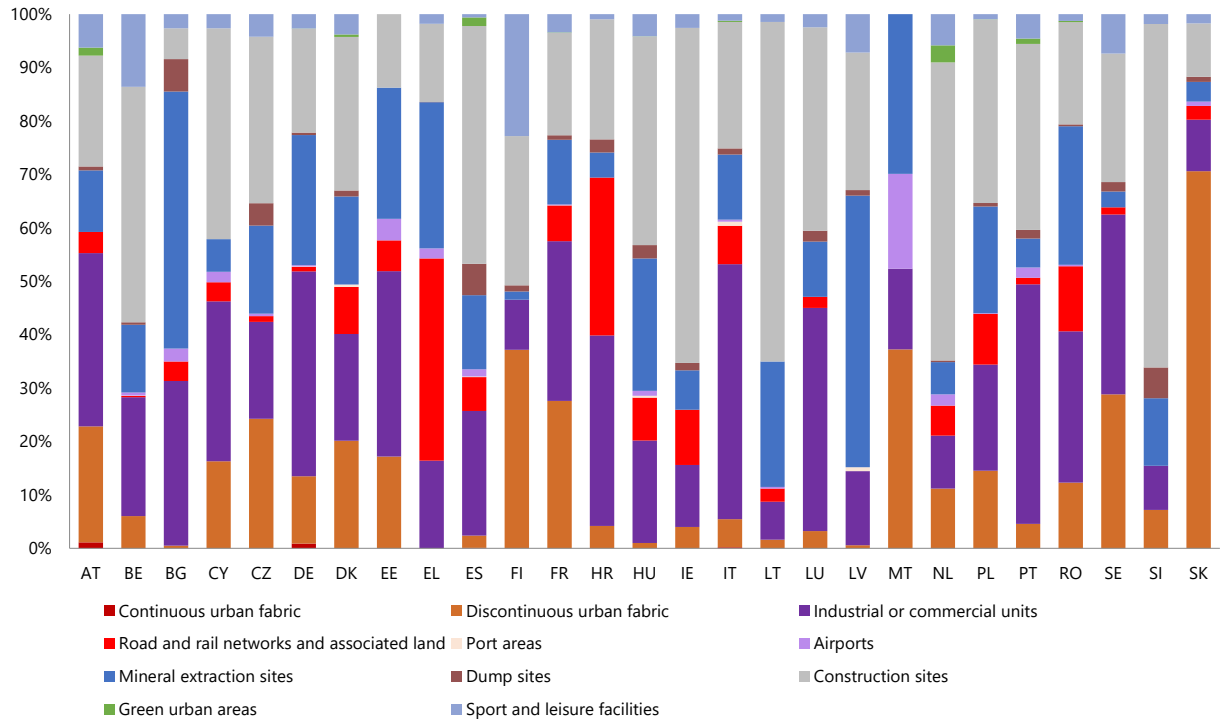
Figure 16: Land cover change from agricultural areas into other land cover classes between 2012 and 2018 at MS level



Source: Consortium, 2020, based on EEA (CORINE Land Cover Data).

In the time period 2012 to 2018 (see Figure 17), commercial and industrial zones expanded greatly into former agricultural area across all Member States. Mineral extraction sites have also absorbed significant agricultural areas in some Member States, such as Bulgaria and Latvia. Large shares of this land cover change were taken up by construction sites across all Member States (particularly Lithuania, Ireland and Slovenia). In contrast, in the time period between 2006 and 2012, the most prominent transformation of agricultural land into non-natural surfaces, across most Member States, was the conversion into residential and commercial areas (see annex, section 1.3).

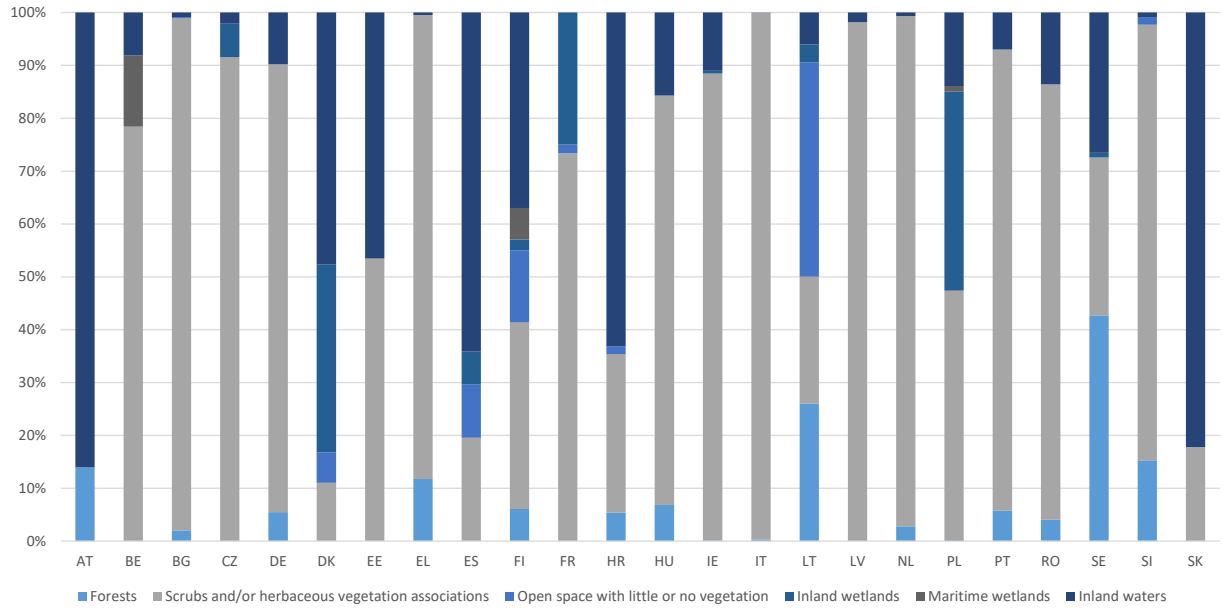
Figure 17: Land cover change from agricultural areas into artificial surfaces between 2012 and 2018 at MS level



Source: Consortium, 2020, based on EEA (CORINE Land Cover Data).

Across most Member States between 2012 and 2018 (see Figure 18), inland waters and light vegetation were the largest absorbers of agricultural land in terms of natural surfaces. The patterns are heterogeneous across the Member States. While most Member States saw the largest shift to light vegetation, in some Member States (e.g. Austria, Croatia and Slovakia) relatively more agricultural areas were reclassified as inland waters or wetlands. These patterns of land abandonment largely mirror the developments between 2006 and 2012 (see annex, section 1.3) among the Member States.

Figure 18: Land cover change from agricultural areas into natural surfaces between 2012 and 2018 at MS level



Source: Consortium, 2020, based on EEA (CORINE Land Cover Data).

In sum, across the regions of EU-27, agricultural land loss to artificial areas declined substantially between 2012 and 2018 (see Figure 19) in comparison with the period between 2006 and 2012 (see annex, section 1.4). The share of agricultural areas reclassified into artificial surfaces was below 0.5% of total agricultural surface area for most NUTS-3 region across EU-27. Urban centres are the main regional hotspots of land abandonment in terms of agricultural land loss to artificial surfaces. Urban centres and their surrounding areas (e.g. Warsaw, the Ruhr Valley, Amsterdam-Rotterdam, or Sofia) see higher shares of agricultural areas reclassified into artificial areas, than their more rural peers.

However, land loss is much more focused and much less widespread than in 2006 to 2012 (see annex, section 1.4). This development is also highlighted in terms of UAA changes between 2012 and 2018 (see annex, section 1.1): In comparison to the period 2006-2012, in 2012-2018 the UAA loss stabilised and, and in cases UAA even expanded, particularly in Northern Germany, Central Poland and Latvia.

The two maps below, Figure 19 and Figure 20, show the above-discussed changes between agricultural land types and natural and artificial surfaces in the period 2012-2018 at the regional level. The most significant hotspots of agricultural land loss to natural surfaces were located in Ireland, the Baltics, Northern Bulgaria, Southern Spain and Portugal. In addition, land abandonment also picked up in more densely populated areas across the Netherlands (especially Zeeland and Holland), large parts of Poland and parts of Germany (the Ruhr Valley). However, a clear pattern is the relatively stronger degree of land abandonment in Member States situated in Central and Eastern Europe and those in the Southern parts of the Iberian Peninsula.

Figure 19: Land cover change from agricultural areas into natural surfaces between 2012 and 2018 at NUTS-3 level

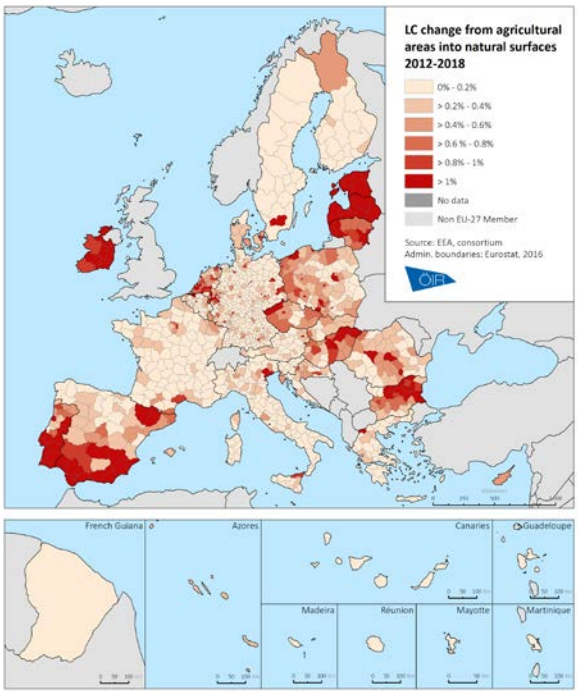
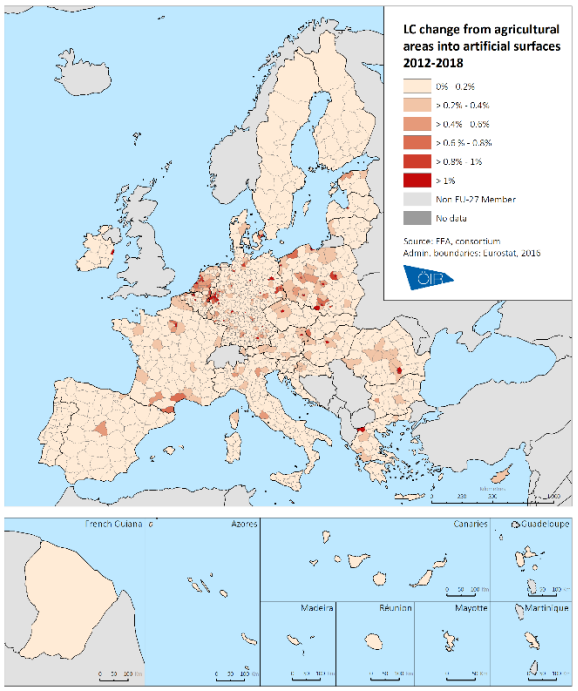


Figure 20: Land cover change from agricultural areas into artificial surfaces between 2012 and 2018 at NUTS-3 level



Source: Consortium, 2020, based on EEA (CORINE Land Cover Data).

2.4 Main drivers of land abandonment

Key findings

- The complex pattern of land abandonment drivers reveals an inter-related web of bio-physical, farming, structural, market, regional, and institutional and policy factors influencing decisions on land use and its changes.
- Despite the wide array of factors, management issues and structural adaptation remain the key driving forces.
- Policy interaction is an inter-related system impacting land management activities within specific socio-ecological systems that reflect regional contexts, institutions and governance frameworks.
- As land abandonment may evolve gradually over long time periods and at a very fine geographical scale, it is particularly important to observe and monitor land use changes at the local level and address long-term effects.

The evolution of land use and the resulting changes in landscape have gained particular attention over past decades. Concern about the persistence of socio-economic challenges and increasing depopulation trends in many rural regions in the EU has spurred the European Commission to launch a public consultation. This consultation will inform the upcoming Communication on the Long-term Vision of Rural Areas planned to be adopted in the second quarter of 2021, and should facilitate a debate at the European level on the future of rural areas by 2040 (Massot and Nègre 2020) and commitment for appropriate action at all levels. This enhanced focus on the specific challenges of rural areas is of key concern to future land use decisions. In particular, it highlights the ways in which diverse types of land management affect other regional activities and economic uses, including tourism development, and underscores fundamental ecological implications. In the face of widespread environmental degradation and increasing land use conflicts, the necessity of addressing critical aspects and linkages within complex social-ecological systems has increased substantially (García-Martín et al., 2020).

Investigating the main drivers of land abandonment at the EU level relies on a good understanding of the variability of influential factors, and their relative weight. The interplay of land abandonment's bio-physical and socio-economic aspects evolves quite distinctly in different societies, regions and cultures. It is also particularly linked to the objectives for land use and related services derived from land management and agricultural and forest activities. The place-specific causes and effects of land abandonment must therefore be clarified when assessing whether interventions have yielded positive, negative, or mixed outcomes according to dimensions observed and various stakeholder perceptions. An assessment of the main factors might vary considerably between diverse spatial contexts and is linked to the scale and definition of socio-ecological systems taken into consideration.

Studies on the causes contributing to land abandonment (e.g. Baldock et al., 1996, Benayas et al., 2007, Jepsen et al., 2015, Terres et al., 2015, Lasanta et al., 2017, Ustaoglu and Collier 2018) underpin a set of drivers which are grouped in the table below There are complex interactions between these drivers that should be taken into account when analysing land-use changes. The following table (Table 6) summarizes the key components of the drivers of land abandonment and their main features.

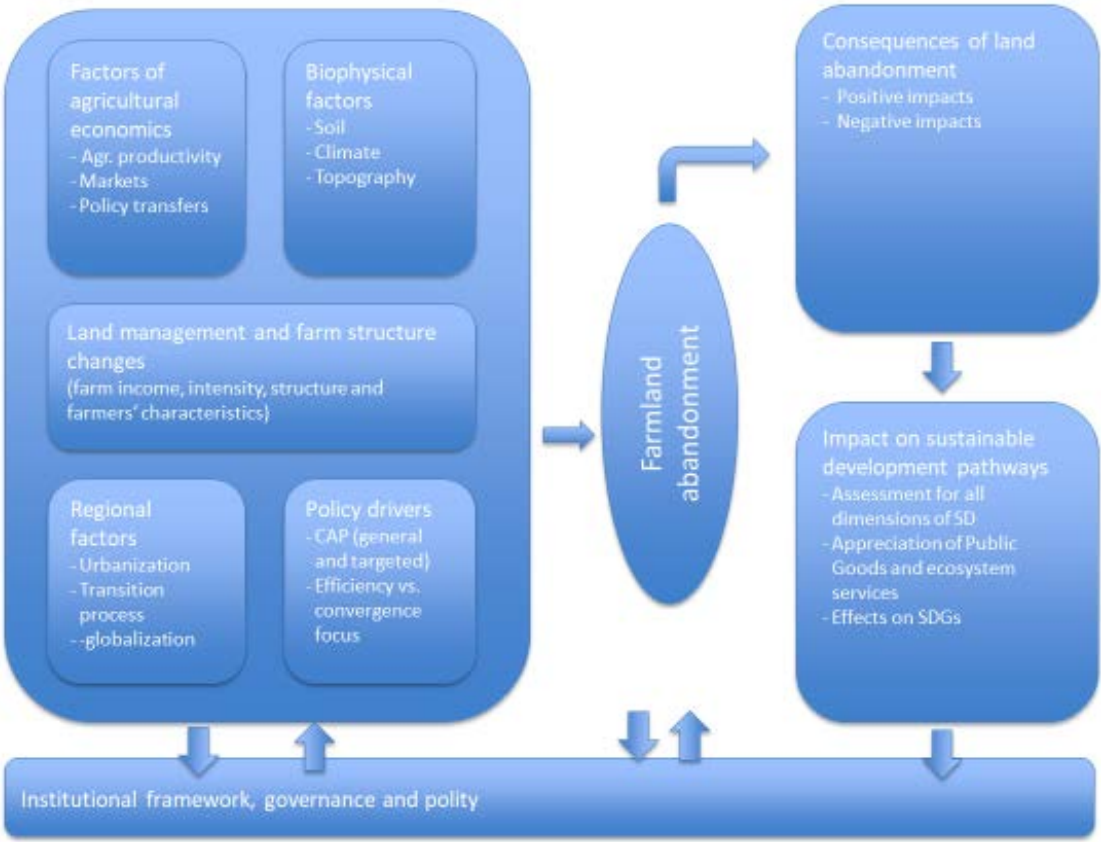
Table 6: Groups of drivers and main aspects of land abandonment

Group of drivers	Main features
Bio-physical factors	Soil, climate, topography
Market-related factors	Market integration/access; value chain organization; food demand and food quality needs; recognition of public goods
Agricultural structures	Size of farms (and farm plots); specialization of farming; property rights/ownership structure; extension services; role of commons
Policy impact	CAP, including implementation strategy and operation; other relevant EU policy (SF, regional, social, environmental …); regional and local policies
Institutional framework	Sector organization and representation; regional development institutions; public-private cooperation; local decision patterns
Regional context	Local integration and demand; demographic trends; labour market and pluriactivity; tourism type and relevance; local identity and perception

Source: Consortium, 2020.

To present the complex set of drivers and their interactions, the following figure builds on the concept elaborated by Ustaoglu and Collier (2018). It includes various factors impacting land abandonment and identifies the divergent consequences that may be expected, and how these consequences can impact sustainable development pathways. While the main focus of this study is how the CAP addresses these drivers, any analysis should not neglect the substantial contributions of other policies and socio-economic changes affecting land management decisions and land use changes. In particular, it should be noted that a detailed understanding of land abandonment must be based on a comprehensive perspective of landscape change and contrasting trends of intensification and de-intensification within the same regions (García-Martín et al., 2020). The framework of this study categorizes drivers thematically, and highlights the crucial "nudging" role of CAP.

Figure 21: Drivers of land abandonment and integration into sustainable development pathways



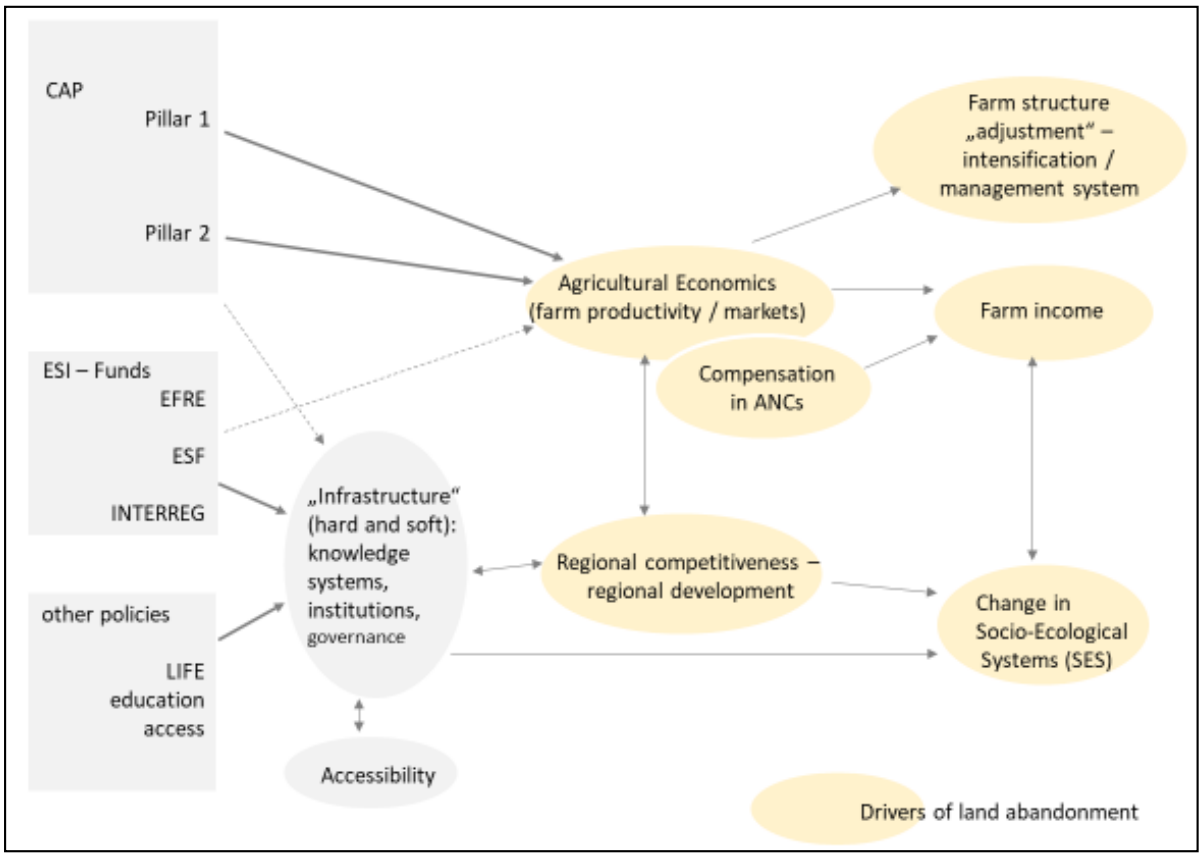
Source: modified from Ustaoglu and Collier 2018, 405

The interactions presented in the figure above emphasize how land abandonment is dependent on economic development, socio-cultural drivers, and regional and institutional aspects. Despite the wide array of factors influencing land abandonment, management issues and structural adaptation remain the key driving forces. The complexity of the interactions between these primary, internal drivers and the aforementioned large-scale, mainly external triggers contributes to the difficulty of observing land abandonment processes (Lasanta et al., 2017). Moreover, difficulties arise when the specific, contextual aspects of a given region are subject to a generalized institutional response. These factors cannot be changed in the short-term and hence underpin the long-term nature of many land abandonment processes.

The increasing difficulty of producing highly-demanded public goods linked to specific land management types, and often related to region-specific land use systems, is a recent challenge that may drive land abandonment. The trend toward land abandonment may be reinforced by failures in institutional settings and policy frameworks to provide adequate support to systems of public goods provision. This is particularly acutely felt in "marginal" areas where alternative land use systems are limited (Zavalloni et al., 2019). However, the threat is widespread and can be observed in many locations and contexts.

A recent study on how to secure and nurture public goods among diverse land management systems in the EU has revealed that these values are not adequately recognized in our current support mechanisms, and called for a "step change" in CAP policy (Maréchal et al., 2018). This call for greater recognition of public goods is particularly timely in respect to the CAP reform discussions, as removing CAP support for public goods might result in detrimental effects on land management, leading to higher levels of abandonment (EC 2018, 20). Similarly, should the predominant features of CAP support remain unchanged, they risk falling short of providing effective and sufficient incentives to address ecological needs through land management in different spatial contexts (Peer et al., 2020). Moreover, it is argued that failure to "remunerate(e) farmers for all the services they provide could lead to land abandonment and closed landscapes" (EC 2018, 26). Gaps in policy support are identified in relation to areas of natural constraints (ANCs), permanent grassland or large organic areas, as well as in the need to address biodiversity and nature protection concerns (EC 2018, 38 and 61).

Figure 22: Policy interaction on land abandonment



Source: Consortium, 2020.

Triggers for change and levers for impacting actors' behaviour occupy a prominent place in the framework of land abandonment drivers. The multitude of influencing factors should not discourage stakeholders and decision-makers from seeking out the most prominent triggers in order to identify a scope of action that will carve out pathways for mitigating land abandonment processes. In the assessment of policy drivers and their interaction with other framework conditions for land management decisions and land use changes, the complexity of the cause-effect linkages requires a thorough analysis of indirect and linked effects. Important as they are, relevant policies are but one among many drivers that can impact farm competitiveness, and in consequence shape farm behaviour and land use trends or contribute to regional conditions and competitiveness. In turn, regional development features may either favour or discourage specific agricultural and forest activities and farm adjustment. A series of studies points to the difficulties inherent in assessing the time dimension and extent of envisaged changes due to the complexity of land abandonment. In this respect, large-scale influences at "the level of globalization, as well as the level of regulation of economic activity (Lasanta et al., 2017, 815) reveal the additional role of Regional Policy ("Structural Funds"), as well as other policy fields shaping the attractiveness and well-being of regions.

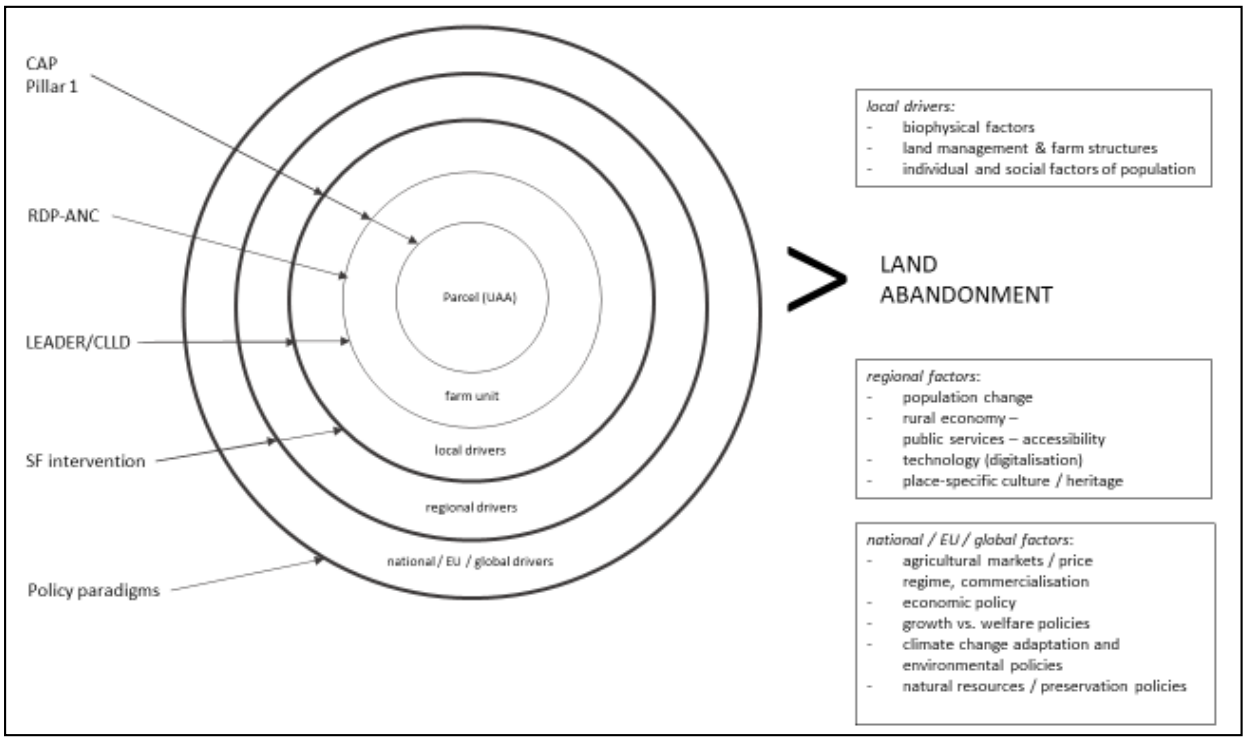
In order to understand the temporal and spatial adjustment of farm management, quantitative efforts to measure the expansion or decline of land cover and changes in land use must be complemented with more qualitative studies. Qualitative studies seek to understand the patterns of change and the basic foundations of the socio-ecological systems in which land management takes place. Studies of landscape change underscore the persistent focus of land management practices on farm productivity and its trade-offs with biodiversity and ecosystem services. In the context of increasing competition over land, land abandonment is the result of intensity changes in land management practices.

Kuemmerle et al. (2016, 7) point out that these "changes in management intensity for cropland, grazing land, forestry, and urban areas at high spatial resolution across all of Europe… highlight… the substantial geographic variation in land-use change processes found in Europe." Due to the context-specific assessment of factors, these changes do not easily and directly translate into land abandonment trajectories.

European data monitoring on land use change highlights the main factors in recent development. A European Environment Agency (EEA) report concludes

> *accelerating rates of construction, changing demographics, technological changes, and climate change are some of the key drivers influencing the use of Europe's vast landscapes. (…) The continent's land use increasingly sees striking changes and conflicts over land demand which will require reconciling place-based management and macro policies to foster responsible land use* (see EEA report 2017).

Figure 23: Relevant policies for land abandonment and scales of intervention



Source: Consortium, 2020.

With regard to the core roles of "place-based management and macro policies" in mitigating land abandonment, the different scales of action should be clarified. Policy incentives to change farm behaviour (aimed at supporting continued agricultural and forestry activities) are oriented at the parcel and farm unit level. As outlined in Figure 23, different policies may address different scales, and the influencing spheres might reveal highly diverse characteristics. In assessing the diversity of policy interventions and their relevance for land abandonment scenarios, scale of action is hence central. Further considerations include the multitude of trade-offs between different policies, the outcomes of multi-level governance arrangements, institutional settings, and the contextual features influencing individual land change decisions.

2.5 Case studies: the causes and consequences of land abandonment

Key findings

- The analysis of land abandonment at local and regional levels through four case studies confirmed the need to highlight specific geographic contexts with different management patterns and land abandonment narratives.
- The case studies presented reveal critical situations in regions at risk of further land abandonment in the Mediterranean, mountainous and Northern areas, and in new Member States of the EU.
- Land use changes are the result of dual processes of intensification and marginalization, often observed simultaneously within the same region in close spatial proximity.
- Awareness of the negative consequences of land abandonment is high, and some emerging discussion also mentions its potentially positive side effects in regard to environmental performance, including climate change mitigation.

When exploring the different causes, trajectories, pace, visibility, and effects of land abandonment, insights from place-specific observations regarding the underlying processes should be integrated into quantitative assessments of land use changes. Several analyses of European studies (HERCULES – Plieninger et al., 2016; VOLANTE – Kristensen 2016; EUROLAN – Brouwer et al., 2008; EU-LUPA; etc.) argue that it is only on a very fine geographical scale that the very particular features of land use changes and the specific mix and interaction of driving forces can be assessed. Many experts point out that

> *spatial data alone is insufficient to assess cause-effect relationships of landscape transitions, landscape structure and pattern. Circumstantial evidence points to substantial effects of EU and national policies on landscape services through landscape transition. These – often unintentional – effects can substantially affect biodiversity, cultural identity and landscape character* (van der Sluis et al., 2019).

The four case studies from different regions across Europe presented here highlight the diversity of land use change and narratives of land abandonment.

2.5.1 Case study selection

The case studies (CS) are intended to support the quantitative assessments of land use changes and literature on the main drivers of land abandonment in European regions. Since land abandonment can take very different forms, and in general is observable at a very small scale, these can hardly be taken as representative of their wider geographical regions. Nevertheless, they indicate "typical" cases and common narratives of abandonment. Hence, they illustrate examples of the main causes of land abandonment in European regions and testify to the substantial diversity of land use change and abandonment processes across Europe.

Criteria definition for selection of CS

The case studies have been selected on the basis of various criteria which illustrate not only the diversity of land abandonment processes, but also the complexity of drivers leading to it. The challenge was to provide different regional examples that all show significant influences on abandonment

processes. As per the initial project investigation, the following aspects have been addressed in the selection (see Table 7):

- CS should be emblematic of different large-scale geographical locations in Europe. These should not only illustrate spatial differences but could also serve as a proxy for the variance of national systems of spatial planning.
- The next three criteria groups focus on aspects limiting (or defining) agricultural productivity and its impact on land abandonment: Areas of Natural Constraint (ANC), including topography and remoteness; the relevance of agricultural structures (with small-scale farming related to higher rates of abandonment); and land management systems (with different agricultural production, implying internal changes between cropland and grassland; and the relevance of diverse intensity levels).
- Agricultural policy refers directly to aspects of agricultural production, but implementation and policy use vary considerably across the EU. Thus the impact of a policy framework is dependent on its interaction with institutional settings, experience and intensity, and societal support.
- Beyond these sector dimensions, the general economic development and performance of a given region may also influence land abandonment decisions.
- Finally, the selected case study regions provide particularly vivid examples of land abandonment processes, whether in the recent past, or over long periods (exemplifying cases of "legacy" development) and/or are at risk for future land abandonment.

Table 7: Criteria for selection and profile of case studies

Set of Criteria	CS 1	CS 2	CS 3	CS 4
Geographical location in Europe	Central and Eastern European countries (CEEC)	Southern European regions	Mountain areas	Northern European regions
Topography, territorial typology; accessibility	"border"/ANC	coastal areas; dry zone/ANC	mountain	remote/low density
Agricultural structures	small-scale farming and large farms	small-scale	commons	small share of UAA
Land use systems	shifting from cropland to grassland	permanent cultures	grassland, pastures	mixed; role of forests
Political framework	high relevance of Pillar II	Limited intensity of CAP	Decisive role of national approach	partly high support levels
Regional economy	still "lagging" economy	weak performance	from low to high performance	high performance
Extent of land abandonment and risk	high incidence and legacy, and continuing risk	long-term abandonment processes	internal variation of abandonment incidence	large-scale threat of abandonment
CS region selected NUTS-2 (or NUTS-3)	Podlaskie (PL34), Poland	Murcia (ES62), Spain	Tyrol (AT33), Austria	Pohjois- ja Itä-Suomi (FI1D), or Kainuu (FI1D4), Finland

Source: Consortium, 2020.

Proposed Case Studies

The four proposed case studies are selected at NUTS2 level, although for Finland, a concentration of the case study implementation on one of the NUTS3 regions within that large area is suggested. The main arguments for the inclusion of each case study are:

- Podlaskie (PL34), Poland

This region in North East Poland is characteristic of an agricultural area with high production potential and some development of agri-tourism activities. Due to out-migration, many family farms face substantial problems when it comes to the inheritance of farm units. In many respects, this is a

particularly deprived region, where legacy development and the challenges of CEEC regions accumulate.

- Murcia (ES62), Spain

This region on the coast of the Mediterranean Sea enjoys high agricultural production potential (with intensive permanent cultures), but also faces significant ecological and social threats which contribute to high levels of land concentration, land abandonment and increased risk for continuing management in many parts of the area. It is a case of a Southern European region where, despite productivity potential for specialized cultures, the long-term tendency toward abandonment could not be halted.

- Tyrol (AT33), Austria

Tyrol is an example of mountain region where land use is limited to grassland and livestock production, and which is strongly supported by diverse CAP support options. Nevertheless, due to topographical challenges, land use continues to shift and "more difficult" terrain (usually steep slopes or high-mountainous areas) is abandoned to a large extent.

- Kainuu (FI1D4), Finland

This region in Eastern Finland is an example of a Northern European region whose remote location presents challenges both to regional development and agricultural productivity. These difficulties stifle local development options and enhance out-migration and abandonment processes. Remoteness and low-density structures exacerbate land abandonment trends and complicate mitigating policy approaches.

2.5.2 Case study findings with regards to causes and consequences of land abandonment

Each of the four case studies has been analysed through desk research and two expert interviews. These interviews covered regionally specific studies and provided expertise on the regional contexts for land management and land use change, drivers for land abandonment processes and place-specific effects and challenges arising from recent developments. As these CS represent examples from diverse geographical locations across Europe, they also address quite distinct narratives of land abandonment. The case study interviews have been prepared using a common set of guideline questions (see interview guidelines in the annex, chapter 4) and reported via templates to summarize the contextual socio-economic and land management information, the history and present situation of land abandonment, drivers and effects of land use changes, mitigating measures, and policy recommendations, where relevant.

More detail is presented in the CS reports (see annex, chapter 3). Here, short profiles for each of the four cases in the boxes below synthesize the main findings and relevant information for subsequent comparisons of these cases.

Case Study 1 Podlaskie (Poland; PL34)

The case study area Podlaskie Voivodeship is a NUTS 2 region (PL84) located in Eastern Poland, bordering Belarus, which represents a typical Polish lowlands region, characterized by rural features and extensive grassland areas. The vast Białowieża Forest, one of the oldest unspoiled European forests, is a particular component of land use in the area. Meanwhile, its biggest city, Białystok, is an important regional centre with nearly 300,000 residents. With its mix of agricultural, forest and water areas, the region is an area of particularly high environmental quality which experiences increasingly significant challenges due to climate change, in addition to land change tensions.

In a remote location with regard to EU agglomeration centres, the region's location is a specific driver of land abandonment. Both the remoteness and resulting rural shrinkage spurred by depopulation trends pose a severe challenge to quality of life. These factors also threaten generational renewal, resulting in detrimental effects on land use continuity. Together, all these factors decrease regional attractiveness and interest in local farming activities. Further obstacles to farming are presented by concern over protecting the region's many areas of high ecological value and relatively more challenging climate conditions than those seen in the South of Poland.

Actual agricultural activities are in decline as land management strategies for farmers focus on official ownership and continuation, and this may result in negative effects for the environment. According to regional experts, ongoing land abandonment trends lead to the conversion of land use into natural areas, increasing the share of unproductive and "wilderness" areas. However, because this transformation is neither monitored nor accompanied by ecological management plans, harmful, unplanned changes to ecological quality are occurring. The improved provision of ecosystem services would require modifications and plans for restoration activities.

Policy tools, in particular CAP interventions, have a very mixed impact. On the one hand, it can be argued that CAP support slows down land abandonment and reduces the inclination of local farmers to quit agricultural activities. On the other hand, even farmers with very limited agricultural activity qualify for payments. Given our understanding of marginalization as a core issue of this region, and recognizing how it relates to land abandonment, more emphasis in regional policy support should be devoted to social groups leaving the farm sector and actions to retain populations in the region. Moreover, integrated approaches are crucial to address land change issues, regional economy and life quality, and the ecological implications of these changes in regional activities.

Case Study 2 Murcia (Spain; ES62)

The region of Murcia is located in the South East of the Iberian Peninsula and stretches from coastal areas to the mountains in the hinterland. It thus combines very diverse natural and topographical conditions, which are reflected in the significant socio-economic diversity of the various sub-parts of the region. Analysing the characteristics of the area therefore requires consideration of this internal diversity and its differentiated effects on regional economy, land use, and land abandonment features.

The region is an example of Mediterranean areas with a strong dependence on large scale production opportunities, crucial reliance on water resources, and exposure to climate change, as well as long-standing challenges related to the shrinking of rural areas and wide-spread socio-economic challenges. Land use decisions and land management have been influenced by two significant changes since the early 1980s: the organization of the water regime in the area; and the intensive increase of tourism demand and resulting infrastructure development in the coastal zone.

These two separate developments are the main drivers for land use changes in the region. The water regime management was direly needed due to low precipitation levels in the area. In order to make use of the substantial production potential of the region, water resources were supplied through a

large-scale "water-transfer" from the river Tajo (in the "inner area" of Spain) to the river system of Murcia (river Segura), which has for decades supplied abundant amounts of water through a river-diversion scheme for irrigation purposes in the Murcia region. While the increased availability of water led to the intensification of agricultural production in irrigated areas, it contributed to the acceleration of abandonment processes in areas where irrigation could not be made available, implying dual development trends of intensification ("modern farming") and land abandonment (mostly among "traditional" farmers communities). The second factor, the dramatic increase in European tourism development and industrial development in the agglomerated area of Murcia and the port of Cartagena, spurred demand for artificial areas and reduced agricultural land use in the coastal area. The significant changes in regional economic structure added to the process of converting land into settlement and infrastructure uses ("artificial areas").

Several historical moments have informed the current situation in Murcia. In the 1960s, Spain began to transition from an autarchic to a liberal economic system with industrial development, urbanisation and rising tourism as key sectors promoted to develop a competitive economy. This aggravated the trend towards land abandonment all over Spain. The Tago-Segura water transfer system completed in the late 1970s turned out to be a key factor for agricultural success. The newly-available water also facilitated a construction boom which supported the expansion of urban-tourism and touristic residents. And finally, from the second half of the 1990s until the global financial crisis of 2008, low interest rates fuelled a housing construction boom, enabled by the expansion of second home ownership, both among Spaniards from other parts of the country, and foreigners. This encouraged farmers to sell or rent agricultural fields, particularly to multinational companies for construction and industrial uses.

As such, addressing policy challenges requires an integrated view of all the different policies as they impact regional land use and management aspects. Harmful environmental effects, for example, have only recently begun to be discussed, and policy change is slow. The first signs of stricter planning regulations and environmental considerations have appeared in recent years, which may eventually also impact spatial dynamics and land abandonment trends in different parts of the region.

Case Study 3 Tyrol (Austria; AT33)

The Austrian region of Tyrol is situated completely in the Alps and is thus a characteristic representative of a mountain area region. In contrast to other remote places in Europe, only a small share of the work force is active in the primary sector. Farmers are confronted with various natural production difficulties such as steep slopes, a short vegetation period, and a limited scope of production options. To support farming in areas facing natural constraints, and to preserve the typical Alpine landscapes, substantial CAP funding and national support is provided to Tyrolean farmers. The most important support instruments are the CAP Pillar I Basic Payment Scheme (BPS)/Single Area Payment Scheme (SAPS) and Voluntary Coupled Support (VCS), and Pillar II measures including the "Austrian programme for the promotion of an environmentally-compatible and extensive form of agriculture that protects the natural living spaces" (*Österreichisches Programm für umweltgerechte Landwirtschaft*, ÖPUL) and Measure 13 (Payments to Areas Facing Natural or Other Specific Constraints), which is covered by the compensatory allowance payment. The mountain areas of Austria benefit from a particularly high level of support through Pillar II, which affects the stability of mountain farmers positively and contributes to the preservation of land use in the mountains.

The region's economic situation is favourable due to the region's integration in the European economic space and a very high share of tourism development. Good economic performance has led to a steady population increase over the last decades. However, more recently, population decline has been observed in some remote places, including numerous less accessible side-valleys. In particular,

young women are significantly less integrated into the labour market than young men, and are affected by higher levels of unemployment in these areas.

Both factors, limited agricultural productivity and differentiated regional economic development, have implications for land abandonment aspects. In addition, very high density construction expansion in the main settlement area of Inn Valley contributes to an accelerated process of land-take in the areas relatively more favourable to agricultural production. Meanwhile, land use on steep slopes and remote places is severely endangered as those areas are experiencing a gradual cessation of management. However, this happens at a very slow pace and is superseded by increasing interest in settlement in many attractive landscape locations. These dual trends therefore obscure the problem of long-term shifts in land management in this mountain region from agricultural uses towards forest areas and settlement areas.

Case Study 4 Kainuu (Finland; FI1D4)

The case study Kainuu is a NUTS3 region located in Northern and Eastern Finland, bordering Russia to the East. With a very low population density of only 3.1 inhabitants per km2, it is exemplary of many remote regions in Scandinavian countries that face challenges of sparsity and Nordic climate conditions with reduced vegetation periods. Land use in the region is predominantly forest, and only a very minor share of the area is managed as agricultural land. This geographical location poses severe problems with regard to accessibility and market integration, which has led to an assessment of particularly high risk for land abandonment through JRC's modelling of future land use trends.

Due to ample forest coverage, uses connected to forestry and wood production are the backbone of the regional economy. In recent years, the scope of use of renewable natural resources has expanded, but still centres around key activities related to forest bio-economy development, including biofuels, bioethanol, wood construction, and paper and pulp technologies. Internal forest use changes represent the most visible shifts in land use, demonstrating the core relevance of the sector.

The limited area used for agriculture is primarily oriented at dairy farming, with minor cultivations of cropland, restricted mainly to barley and grassland. The national and regional awareness of land abandonment is very weak, since changes had largely occurred prior to EU accession in 1995. Over the last two decades, land use changes have appeared only gradually and involved small strips of land at one time. While the greatest structural changes have probably already taken place, structural adjustment and loss of farm numbers is an ongoing phenomenon related to the main challenge of preserving the remaining open land in regions like the CS (but throughout many regions in Finland as well). This threat is linked to the decline of valuable habitats, particularly those found at the intersection of agricultural land and forest areas.

The strongest influence on land use in this context is seen in the adoption of the CAP support system, which in the first period after EU accession led to an increase of cultivated land, even in remote areas like Kainuu. When Finland joined the EU in 1995, a specific support scheme, Nordic Aid, was introduced as a "long-term national aid with a view to ensuring that agricultural activity is maintained in the northern regions." It aimed to smoothly adjust high Finnish agricultural price levels to corresponding market prices within the EU, so that traditional primary production (about half of the support in Finland was targeted at milk production) and processing, as well as region-specific structures, could adapt. Hence, besides the EU funds provided through the CAP, these national top-up payments also contributed to the cultivation of new fields and the extension of agricultural areas. More recently, the Nordic Aid scheme has concentrated on existing farmland, without supporting further extension. Nevertheless, this policy framework is considered a strong stimulus for the stable development of agricultural areas. However, its capacity to keep land in production is limited, and wanes as the distance of agricultural areas from the farm-stead increases.

This case study illustrates some specific aspects of land abandonment issues in the Nordic context, i.e. climate change, with already significant changes in temperature and vegetation features in the region; a heated discussion on peatland conversion and related ecological problems; and the necessity of preserving the remaining UAA in management to avoid the development of a mono-structural area of woodland, which would be harmful to the attractiveness of the region, well-being for local inhabitants, and destination management for tourists. The threat of losing the "last" open areas has recently raised policy consideration for supporting non-profitable farms in remote areas on ecological and regional development grounds. The current national discussion is said to be at a crossroads, and policy makers must decide whether to engage in such a strategy, or continue favouring strategies that support competitiveness in agriculture.

The four case studies are very different examples of rural regions dealing with the complex issue of land abandonment. They are located in different geographical locations and serve as distinct examples of specific regional contexts and vegetation zones. A synthesizing view of their challenges will require reflection on the historical development and the path-dependency of current assessments and future trends. Legacy aspects are manifold and appear linked to the distinct history of European regions and gaps in European integration processes. As for land use and land management, we can observe somewhat divergent developments, largely dependent on a range of physical, structural, sectoral, regional and wider socio-economic factors. The core remit of this study is to highlight linkages and potential contributions to land abandonment development and mitigation through EU (and national) policy adaptations.

All four regions clearly reveal significant implications for the CAP and its place-specific implementation features. In the case of the Finnish CS, we observe how, even in an area with a high risk assessment when it comes to the threat of land abandonment, the strong EU and national support, along with high intensity agricultural land use, can actually lead to the extension of the UAA. Similar effects can be observed for the CS in Tyrol, in Austria, where the combination of support for mountain regions and the societal consensus for the importance of agricultural support of less-favoured areas, has shaped the preservation of the mountainous landscape for tourism uses and as attractive natural places. Experiences in the other two CS are more mixed. In the CS region Murcia, the focus on elaborating a competitive Mediterranean agriculture based on irrigation and a specific water supply was conducive to intensive land management in the lowlands, while in non-irrigated areas of the same region, marginalization and land abandonment have increased. Moreover, Murcia faces a particular challenge when it comes to adapting CAP support to the diverse types of farming in the area. In Poland, the CS region Podlaskie faces tensions related to balancing structural changes, with the need to preserve valuable ecological areas. CAP payments provide a significant resource for farm households which are relevant beyond the farming sector. The integration of regional and social objectives and policies is therefore crucial for coping with land management issues in such a context.

The analysis of the case studies illuminates many additional elements which are particularly dependent on a region's contextual background. Identifying common or divergent aspects through CS analysis reveals general issues surrounding land abandonment that are relevant to other European regions. Study findings suggest the following:

- Marginalization and urbanization processes are major causes of land abandonment. Quite often, regional discussions of land abandonment are limited to marginalization processes, while aspects of increased settlement and construction development are referred to under the term "land take."

- The scale of observation is decisive in perceiving and understanding land abandonment. Regional insights support more in-depth discussions on the features of land abandonment. It is important to recognize internal divergence within regions and identify small-scale drivers and developments. Relevant aspects include topography, area ruggedness, productivity potential of the soil and area, remoteness, and many contextual issues.
- Implications of global markets on agricultural structural changes are wide-spread and might show particular spatial differences and features linked to other drivers, such as location, markets, institutions and policy development.
- Integration into regional, national, and global markets often becomes visible through value-chain development. This implies trends of intensification, product choice and structural development, as well as changes in management styles.

On all these aspects, the respective policy concept and programme framework is decisive, confirming the key role of the CAP, but also clearly referencing the need for an integrated view of other regional, social, and environmental policies. All the above-mentioned aspects are closely inter-related and should be seen to reinforce each other through complex relations and repercussions.

As to the consequences of land abandonment perceived through the CS, both negative and positive effects can be observed. This largely confirms the literature review and previous research highlighting the contextual reference of effects and the need for a comprehensive assessment of diverse outcomes and consequences of land abandonment developments. The main consequences of land abandonment evident in the CS speak to the following aspects:

- The CS address both negative and positive effects of land abandonment as potential outcomes. However, the cessation of agricultural activities is generally perceived as a threat where negative effects for the sector and society prevail.
- The loss of agricultural land was identified as a major consequence of land abandonment, but effects also extend to non-farming issues like regional marginalization, out-migration, decline in regional economies, and detrimental social effects. These factors collude to produce a loss in regional development options and a "downward cycle" of regional development.
- Similar negative effects often accompany land use changes wherever extreme withdrawal from agricultural land use is observed. Loss of characteristic landscape features, the reduction of habitats and biodiversity, and a trend towards mono-structural land use and management are among the detrimental consequences of land abandonment. However, from an ecological point of view, the extent of land abandonment is crucial and limited shares of land use changes might also result in positive environmental outcomes (e.g. on soil, biodiversity and habitat developments).
- Quite often, land change uses can result in soil changes on previously managed land. This can threaten local soil quality and have significant ecological implications at the local scale. Climate change accelerates such changes in local production capacity and farming productivity and increasingly influences regional conditions and individual farmers' decisions. Important place-specific effects can only be observed through local analysis (and hence cannot be addressed through CS), but the inclusion of such analysis is crucial for a comprehensive assessment of land abandonment effects.

2.6 Environmental implications and dual effects of land abandonment

Key findings

- Land abandonment has specific environmental implications according to spatial characteristics and the change process itself.
- Harmful effects may include threats to the future of semi-natural habitats, quality of High Nature Value farmland and linkages of Natura 2000 sites, and highly appreciated cultural landscapes.
- However, under specific conditions and in certain phases of the abandonment process, beneficial outcomes may be observed, e.g. on biodiversity and habitat preservation.
- These dual effects call for policies (such as the agri-environment-climate measure and CAP eco-schemes, etc) that include increased environmental considerations in their design, which further support positive outcomes in terms of land abandonment and land management, through integrating more fundamentally important environmental practices.

Agricultural land use in mountains and on poor soils presents adverse challenges (MacDonald et al., 2000). Case study findings on local threats to ecological development indicate that areas of semi-natural habitat, and the species that inhabit them, are considered particularly at risk (Keenleyside and Tucker, 2010). According to the EU Birds and Habitats Directives, these habitats and species have a significant European value and are included as an important category under the term High Nature Value farmland. Some are protected in Natura 2000 sites, but large "areas outside the Natura network would have little protection" if not associated within other designated landscape or nature areas (IEEP and Veen, 2005). Particularly in those contexts, farmland abandonment might directly impact European Union and national nature conservation tasks. All CS include protected natural areas, and the need to devise a balanced approach towards elaborating protection areas and land management development is particularly pronounced in the case of the Polish CS.

Moreover, in certain instances, the effects of farmland abandonment may border on beneficial when it comes to issues like protecting biodiversity, in particular species preservation and habitat development, e.g. farmland birds whose populations have been continuously dwindling over the last three decades due to agricultural intensification (European Bird Census Council 2017). While agri-environmental schemes implemented under the EU's agricultural policy are considered to have a positive effect, generally attenuating the decline of farmland bird populations, these endeavours are insufficient to reverse the downward trend (Gamero et al., 2017). The discontinuation of agricultural activities in some places might have a positive impact on restoring biodiversity. Yet, abandoned farmland might also ultimately become unpropitious for certain species depending on the level of land abandonment. The research conducted in Croatia by Mikulic et al. (2014) on this issue suggests that new and integrative land use management concepts for areas affected by land abandonment must be developed in order to formulate sound conservation policy (Mikulic et al., 2014).

As Stoate et al. (2009, 39) argue that "despite successive reforms of CAP, effects to improve the environmental sustainability of agricultural systems are compromised by intensification and abandonment but are increasingly important in the context of concern about future food security." While agri-environmental payments have helped focus attention on ecological effects and have had some positive impact on the ecological status of agricultural systems, achieving the effectiveness of the resultantly introduced farm practices benefits requires more active monitoring. The potential to improve environmental conditions has been addressed widely in policy implementation analysis and the need for changes has been highlighted in various sector studies and scenario presentations

(Paterson et al., 2012). In the current reform considerations, a more integrated view of both Pillars of the CAP was advanced in discussions regarding the integration of eco-schemes under Pillar I and a focus on environmental and climate benefits along both Pillars (Meredith and Hart 2019). Moreover, the recent EC's Biodiversity (EC 2020a) and Farm to Fork (EC 2020b) strategies strengthen the current environmental orientation of policy reform through underpinning the key role of protected and non-farmed agricultural areas as instruments in protecting biodiversity and the environment at large. In particular, the indirect influences of land use changes are addressed as mitigation options to cope with biodiversity loss and the maintenance of natural capital.

This crucial aspect is related to the difficult trade-offs between land management issues and the challenges of coping with agricultural abandonment and rural depopulation. A more explicit "analysis of the trade-offs between different conservation and management objectives is presented as a useful step towards the strategic achievement of multiple objectives," including ecological development objectives (van der Zanden, 2017, 299). This approach takes into account the range of positive and negative consequences of land abandonment. Land abandonment for certain areas may result in positive consequences such as carbon sequestration and preservation of habitats for large mammals but result in losses in cultural landscapes and quality production in other areas. Assessing environmental aspects therefore calls for a "focus … on this spatial diversity and context-dependent, nuanced policy and management strategies" (van der Zanden, 2017, 299).

3 MITIGATING MEASURES

Key findings

- CAP support is beneficial for mitigating land abandonment processes. However, effects are unevenly distributed among different farm types and production groups. There are contrasting effects between the measures and a mixed overall CAP impact on land use changes, production concentration and abandonment trends and abandonment.
- In contrast to these overall mitigating effects of CAP interventions on land abandonment processes, some measures might also augment drivers towards ceasing land management.
- Although the mechanisms of Pillar I support might mitigate land abandonment through its farm income support and competitiveness support, different effect patterns are observed for regions, management types and farm structures.
- Pillar II focuses more on the linkages between land management, environmental concerns, and rural communities via its integrated approach. It takes account of territorial differences, e.g. through support for areas of natural constraints, including mountain areas. These measures encourage wider social benefits, quality of life and thus aim to maintain vibrant rural regions.
- While the on-going CAP reform provides continuity with the current toolbox, the effectiveness of the future policy framework for mitigating land abandonment will depend on the MS and the implementation of the national strategic plans at regional level.
- It is crucial to harness other European structural and investment funds (ESIF) to mitigate land abandonment. Synergies and place-based action could be built around local development strategies of LEADER/CLLD approach and could address the linkages of human-nature resource use.

A wide array of region-specific drivers contributes to land abandonment in the European Union's rural areas. The Common Agricultural Policy (CAP) is an overarching policy approach that includes measures and instruments designed to address the various causes of land abandonment.

> *For years the EU Common Agricultural Policy (CAP) has been providing financial support to farmers for the management of natural resources, biodiversity, sustainable farming, maintaining valuable landscape and helping rural areas to remain attractive, while responding to the public demand for sustainable agriculture in Europe.* (European Commission 2009).

According to most indicators, the quality of land use is deteriorating in the EU, and Member States are not on track to meet the 2030 or 2050 policy targets (EEA 2020). In particular, current land management trends fall short of actualising the significant potential of this multi-functional resource, including providing a wide range of primary needs to society, in general referred to as ecosystem services. It is apparent that "land take," the process in which urban areas and sealed surfaces take over former agricultural, forest or other semi-natural and natural areas, is the characteristic trend for Europe throughout the period 2000-2018 (EEA 2020 117f), which leads to a decrease of valuable ecological functions of soils and contributes to negative climate change effects. Therefore, it is urgent that public incentives for land-based goods and services be oriented in such a way that they deliver these common goods (Allen 2020). Land abandonment can be framed in this challenging context as one outcome indicator of land management decisions. A detailed assessment of the effects of land abandonment depends on the actual land use changes, and the nature and quality of the "new uses" within a specific regional context.

The CAP's region-specific measures, and those instruments linked to the maintenance of land management in risk-prone areas, represent direct and substantial interventions that mitigate land abandonment. Beginning with the introduction of the Less Favoured Areas (LFA) scheme in 1975 (Dax and Hellegers, 2000), through the incorporation of environmental concerns into the CAP through agri-environmental measures (Primdahl et al., 2003), agricultural policy has increasingly oriented toward promoting the retention of actively managed agricultural areas. In particular, the establishment of CAP Pillar II in Agenda 2000 explicitly identified the mitigation of the negative effects of land abandonment as a key objective of the CAP. This is especially relevant within areas of natural constraint, such as the adverse agricultural conditions found in mountainous contexts (Haddaway et al., 2014). Many of the environmental effects of land use changes and land abandonment have far-reaching socio-economic consequences.

In general, CAP support is considered beneficial for mitigating land abandonment processes. However, detailed analysis of the diverse policy measures clearly illustrates the presence of contrasting effects and reveals a mixed assessment of the overall CAP impact on land use changes, production concentration and abandonment trends. Assessing CAP impacts therefore requires taking into account all of the controversial effects, as well as the spatial differentiation of effects, to arrive at a balanced evaluation that speaks to the different contexts found among EU regions and the associated region-specific non-agricultural effects and drivers. The increasing incidence of land use polarization over recent decades and the horizontal nature of many CAP payments suggest that **effects might be unevenly distributed and perceived among different farm types and production groups.** This relativistic perspective is also useful for understanding the push effects in less-favoured regions that drive many farming households to cease management of specific plots and reduce or give up farming entirely.

The lessons learned during this programming period can guide the scope and implementation of future policy. The current reform discussions, and the upcoming decisions on the future of the CAP, will certainly have implications for land abandonment trajectories in the future. Mitigating risks associated with land abandonment calls for strategies "to adjust policies to the local characteristics, including the promotion of rewilding and the management of succession of larger areas of less-productive land" (van der Zanden et al., 2018).

3.1 CAP Pillar I and Pillar II

Analysing the current challenge of land abandonment is not just a technical task limited to outlining the ways land is and will be used in specific areas. It also requires the careful observation and analysis of a varied set of influential drivers, the sectors involved, and the territorial effects of land abandonment. Land abandonment is linked to larger socio-economic trends of "rural shrinkage," which are fuelled in part by a reduction in agricultural activities and shifts in land use that cause serious hardship and regional discontent.

CAP interventions have varied effects on the process and extent of land abandonment. Policies that provide income support and enable the proliferation of social and environmental public goods yield positive effects, while negative effects can be observed in areas where CAP measures unintentionally increase out-competition, adversely affect land-use patterns, or fall short of achieving environmental and biodiversity goals. Therefore, it is important to assess both positive and negative impacts of the CAP when discussing its overall effect on land abandonment mitigation.

The CAP Pillar I instruments and Pillar II measures considered in this section are selected based on the study requirements and on their relevance to land abandonment. The measures and instruments[5] investigated are as follows:

Pillar I:

- Basic Payment Scheme and Single Area Payment Scheme (BPS/SAPS)
- Redistributive Payments
- Payments for Young Farmers
- Small Farmers Scheme

Pillar II:

- Measure 06: Farm Business and Development.
- Measure 07: Basic Services and Village Renewal in Rural Areas
- Measure 08: Investments in Forest Area Development and Improvement of the Viability of Forests
- Measure 10: Agri-Environment-Climate Measures
- Measure 13: Payments to Areas Facing Natural or Other Specific Constraints
- Measure 15: Forest Environmental and Climate Services and Forest Conservation
- Measure 16: Cooperation
- Measure 19: Support for LEADER Local Development (CLLD)

Pillar I

Pillar I instruments account for approximately three-quarters of the CAP budget. Primarily considered income support for farmers, Pillar I is divided into direct payments and market measures. Direct payments make up the bulk of payments, and include BPS/SAPS, re-distributive payments, greening payments, payments for young farmers, the small farmers scheme, voluntary coupled support, and optional payments for areas of natural constraints (ANCs).

Specifically, in this present programming period, funding amounting to upwards of € 291 billion (current prices) was allocated to direct payments, representing 72% of the overall CAP budget, and 27% of the overall EU budget (EP, 2020). Given their budgetary share, direct payments are of primary concern, and are potentially the most influential CAP policy force affecting the continuity of farming and land abandonment in rural regions. **The importance of direct payments cannot be understated, as farm income traditionally represents a fraction of the income of other sectors, and farming communities often rely on direct payment income support to remain operational** (EC, 2017).

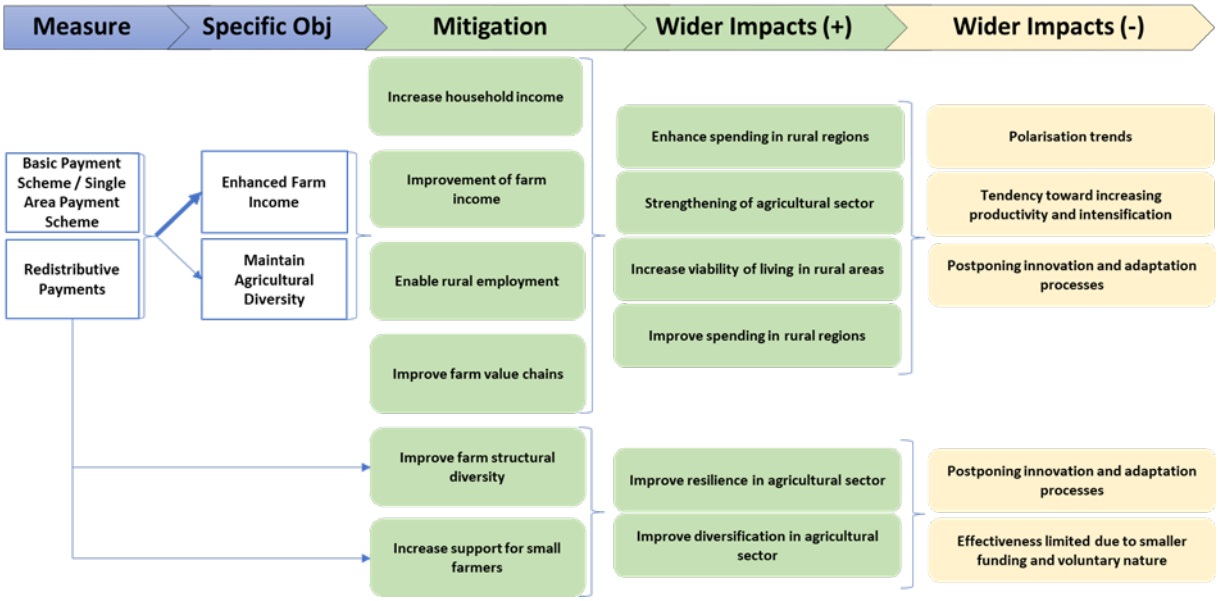
The mechanisms through which Pillar I may mitigate land abandonment include **income support for farmers, improvements in agricultural competitiveness, providing environmental goods, and maintaining agricultural diversity.** Positive effects notwithstanding, criticisms of Pillar I as an efficient policy tool for mitigating land abandonment include inadequate targeting; its potential to support inactive farmers; the larger share of financial support received by large-scale, rather than medium and small-scale farms, which may result in negative structural changes; and insufficient modulation of and support for environmental goods and biodiversity protection.

The effectiveness of direct payments in mitigating land abandonment must be assessed critically as the volume of funding is so substantial. The impact of Pillar I instruments in mitigating land

[5] Only Denmark opted for the implementation of the payment for areas with natural constraints under Pillar I. Pillar I ANC overlaps significantly with Pillar II ANC Measure 13. Therefore, the Pillar I ANC instrument will not be discussed in detail due to its geographical limitation and optional nature, rather the ANC measure under Pillar II will be in focus.

abandonment should therefore take into account both the funding volume provided to farmers, and the pathways through which these funds impact the agricultural sector and rural communities; and the general and programme-specific objectives of CAP direct payments.[6]

Figure 24: Proposed impacts of Pillar I BPS/SAPS and redistributive payments



Source: Consortium, 2020

CAP support, and in particular BPS/SAPS, is inductive to keeping land in management throughout the EU and reducing the prevalence of land abandonment. However, this effect is **felt less clearly in remote and less-favoured areas,** which are often exposed to more negative drivers. These areas are affected by socio-economic processes such as weak market linkages and value chain integration, have reduced options for off-farm labour markets, and experience accessibility constraints, depletion of local skills, and lack of social services. The presence of such adverse socio-economic effects can have negative impacts on the confidence and morale of local populations. These dynamics influence farming decisions, reduce innovation and investments, and adversely affects the resilience of the primary sector. A difficult socio-economic environment often increases the rate of outmigration, and the consequent land abandonment, thus exemplifying the negative feedback loop of socio-economic effects.

The effect of **Pillar I on rural economies is estimated at 5.2 million employees retained** in the agricultural sector in rural areas (Schuh et al., 2020). While BPS/SAPS are linked to positive effects in the mitigation of land abandonment, it has been argued that this **hectare-based income support disproportionally benefits larger farms** and contributes to payments for inactive farmers. This results in negative structural changes and further polarises the agricultural sector.

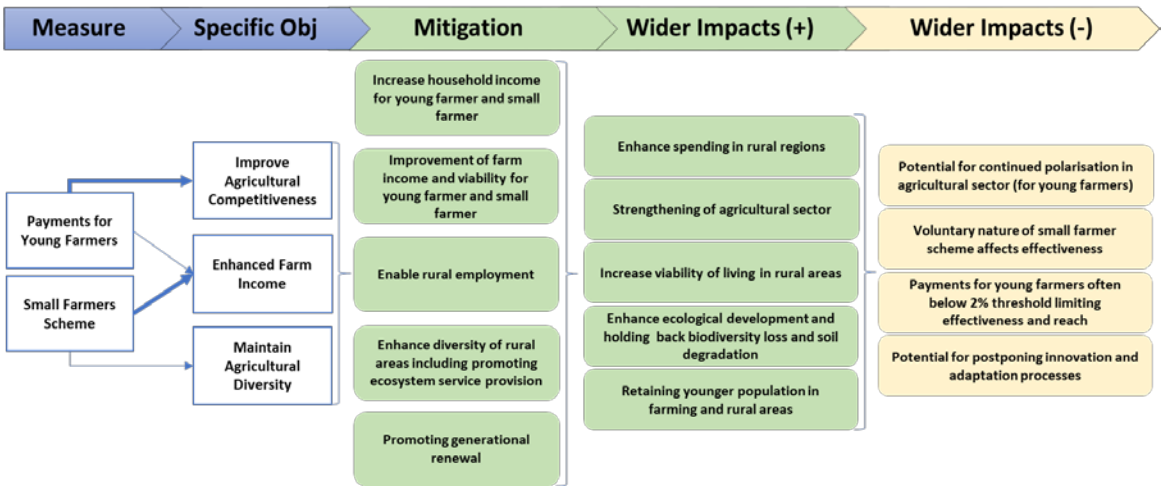
Redistributive payments have therefore been introduced as a complement to BPS/SAPS payments. These payments assist small and mid-sized farmers by redistributing up to 30% of the national Pillar I budget into payments for the first few eligible hectares (the average threshold is approximately 30 hectares). Among the 28 Member States implementing Pillar I in the 20014-2020 programming period,

[6] Pillar I Specific Objectives: enhanced farm income; improved agricultural competitiveness; maintaining market stability; meeting consumer expectations; providing environmental public goods and climate action; and maintaining agricultural diversity. CAP General Objectives: Viable food production; sustainable management of natural resources and climate action; balanced territorial development.

three (Bulgaria, Germany, and Lithuania) have been applying redistributive payments since 2014. An additional nine Member States[7] introduced this instrument in 2015, and Portugal instituted redistributive payments in 2017. Since both the instrument itself and its thresholds are discretionary, Member States have been able to apply redistributive payments in different ways. For example, in Germany, Romania, and Poland, there is a graduation in the number of hectares within the maximum limit, while Brussels-Wallonia and France consider the maximum number of payment entitlements or hectares in relation to the number of legal persons or groups. Overall, however, the budget allocated to redistributive payments tends to fall well below the 30% cap allowed for in the regulations, with Member States apportioning between 0.5% (UK-Wales) and 15% (LT) of their national Pillar I envelope to the scheme in 2015. France pledged up to 20% of its direct payment envelope to redistributive payments from 2018 onwards (EC, 2016).

In the four case studies explored, distribution of direct payments varied significantly, indicating that **the CAP's most significant instrument has very different relevance across case study regions.** For example, in Finland, the case study reveals overwhelmingly positive effects of high CAP support, while Murcia exemplifies the association between CAP funding and land use polarization. In Tyrol, support for ANCs points to the strong relevance of Pillar II measures, and in Poland, the availability of CAP support may encourage the retention of farmland even where farm management has been terminated or minimized.

Figure 25: Proposed impacts of Pillar I payments for young farmers and small farmers scheme



Source: Consortium, 2020

The small farmers scheme available in some Member States makes funding more easily accessible to small farmers by streamlining the funding process and replacing all other Pillar I instruments with one comprehensive aid scheme. A total of 15 Member States have opted to implement this voluntary instrument.[8]

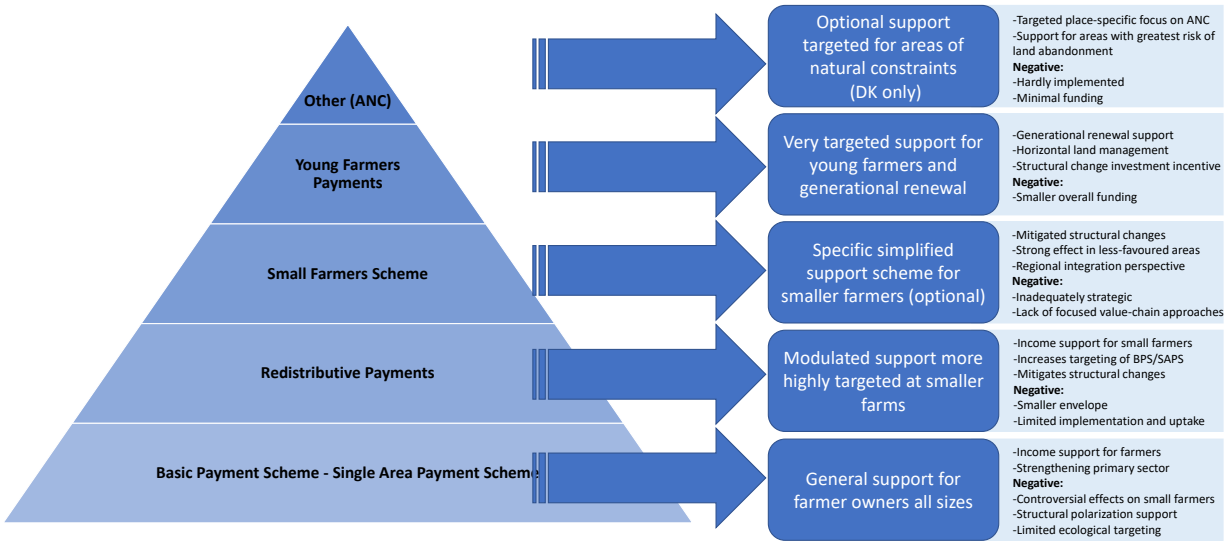
Young farmer payments are top-up payments to farm holders below the age of 40 during their first five years of farming. This instrument encourages new entry into farming, supports generational renewal, and is specifically aimed at mitigating rural abandonment. Member states have estimated that € 2.6 billion will be spent granting young farmer payments for the period 2015-2019.[9] In 2016, young farmer payments were estimated at 1.23% of total direct payments (in comparison to 1.33% in 2015) for the EU as a whole, or around € 513 million. These payments may represent up to 2% of the national Pillar I

[7] BE-Wallonia, FR, HR, PL, RO and UK-Wales.
[8] BG, DE, EE, EL, ES, HR, IT, LV, HU, MT, AT, PL, PT, RO and SI.
[9] Based on the notifications of the August 2015 revision.

envelope. Member States are required to satisfy all claims up to this maximum. Even so, in most Member States, payments fall well below this threshold.

Both the small farmer scheme and the young farmer payments represent specific policy pathways toward continued land management. The young farmer payments smooth the process of farm transition from generation to generation, while the small farmer scheme improves the viability of small farms by making funding more accessible. There is **strong evidence that young farmer payments are crucial to regeneration and farm renewal, and hence to securing land management over generations.** Supporting evidence for the effects of the small farmer scheme on land management, however, is less pronounced. Nonetheless, even if from a quantitative perspective, the small farmer scheme appears less relevant, **it has proven decisive in specific regions, where it has significantly improved access to essential funding for small farmers.** Areas managed by small farmers are often located in places that are at the margins of policy decisions. As they manage relatively small UAA, their changes are not always visible in large-scale observations (e.g. CORINE land cover analyses). However, as demonstrated in case study areas, such as the north of Finland, or the mountainous regions of Austria and Spain, **small land areas can be positively affected by targeted instruments, and the resultant ecological effects may have significant impacts on local biodiversity development,** and help cope with soil degradation threats which would otherwise go unaddressed.

Figure 26: Possible Pillar I land abandonment mitigation effect



Source: Consortium, 2020

The CAP aims to support farming which respects Good Agricultural and Environmental Conditions (GAEC) and incentivize a shift towards "green farming." However, this narrative depends on implementation by the Member States and, in many cases, is characterized by a strong "path dependency" (Matthews, 2016), limited integration of both pillars into a CAP framework for enhancing sustainable agricultural development (Dwyer, 2013), and a slow shift towards environmental objectives (Erjavec and Erjavec, 2015).

While overall, Pillar I is highly effective in supporting farm incomes, its effects on rural landscapes are controversial. **Individual instruments include aspects that might be beneficial for mitigating land abandonment trends,** however, overall **the impact of Pillar I on enabling structural adjustment favours the polarization of agricultural sectors within regions and the EU.** Though measures counteracting this overall tendency are built into Pillar I instruments, on balance, they are inadequate

to address this unintended effect. **Specific measures targeting farms acutely threatened by land abandonment aim to overcome these structural challenges, but they often require severe policy trade-offs and suffer from inherently limited effectiveness.** Much depends, therefore, on Pillar II, the smaller of the two Pillars, and on regional policies aimed to reduce marginalization trends and nurture development opportunities in those regions.

Pillar II

Whereas Pillar I provides income support for farmers, **Pillar II takes a more integrated approach and aims to strengthen agriculture and agro-forestry while encouraging wider social benefits in rural communities** (EC, 2017). Pillar II measures are focused on addressing spatial challenges, meeting the needs of marginalised and remote rural areas, and incorporating farming and forestry within the rural economy through supporting diversification, innovation, and value added activities. These activities have a **distinct impact on land management changes and land abandonment.** A series of Pillar II policy measures is analysed for their specific contributions to the mitigation of land abandonment threats.

Table 8: Pillar II measure percentage of total expenditure 2014-2020

Measure	Measure Name	% Total	Selected
1	Knowledge Transfer	1.2%	
2	Advisory Services	0.92%	
3	Quality Schemes	0.39%	
4	Physical Investments	22.83%	
5	Restoring Production Potential	1.20%	
6	Farm and Business Development	7.27%	✓
7	Basic Services and Village Renewal	6.79%	✓
8	Investments in Forest Development and Viability	4.40%	✓
9	Setting up Producer Groups	0.44%	
10	Agri-Environment-Climate	16.83%	✓
11	Organic Farming	6.40%	
12	Natura 2000 and WFD Areas	0.57%	
13	Areas Facing Natural Constraints	17.01%	✓
14	Animal Welfare	1.45%	
15	Forest-Environment and Climate Services	0.24%	✓
16	Co-operation	1.84%	✓
17	Risk Management Measures	1.37%	
18	Direct Payments for Croatia	0.07%	
19	LEADER/CLLD	6.21%	✓
20	Technical Assistance	2.05%	
OM Measure	113 2007-2013 (early retirement)	0.53%	

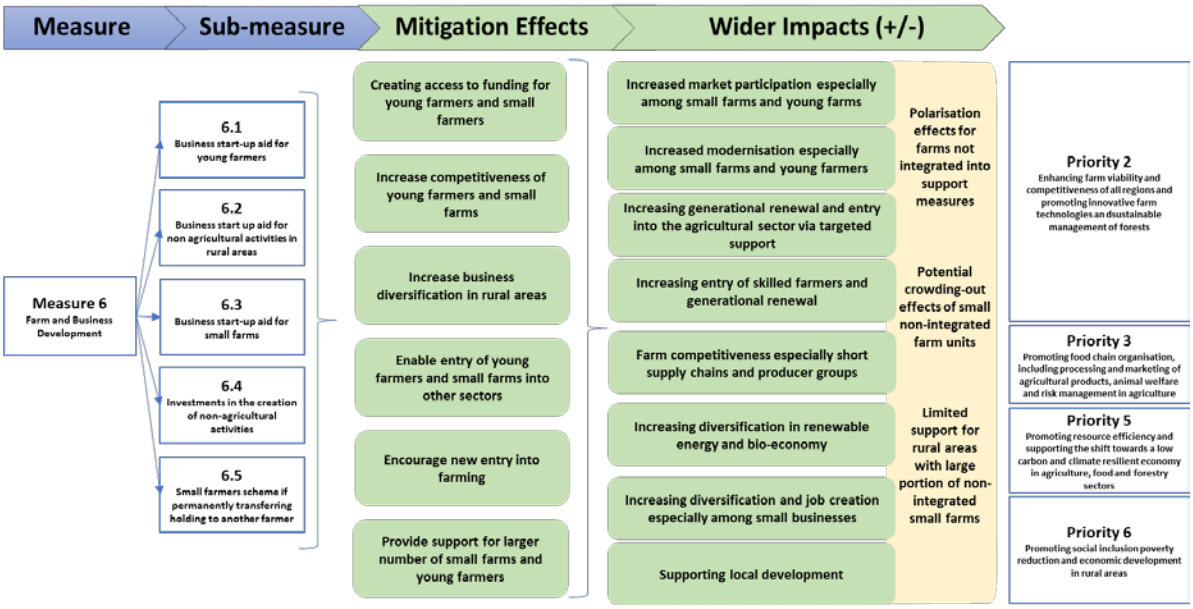
Source: adapted from Dwyer et al., 2016, p.42

Table 8 demonstrates the distribution of Pillar II funding across the EU by measure and area of intervention. The funding allocation indicates an emphasis on investments in physical assets (22.8%), agri-environmental and climate (16.83%), ANCs (17.01%), farm business and development (7.27%), and basic service provision (6.79%). Apart from investments in physical assets, all but one of the aforementioned measures are directly associated with mitigating land abandonment. In fact, the eight

measures considered in this study account for just over 60% of overall Pillar II funding, indicating the high relevance of Pillar II in impacting land management and land abandonment.

This section of the report will discuss the mitigation effects and wider impacts of the selected measures on land use and land abandonment and will evaluate the interplay between measures in order to develop a comprehensive description of these complex policy pathways.

Figure 27: Proposed impacts of Measure 06 Farm and Business Development



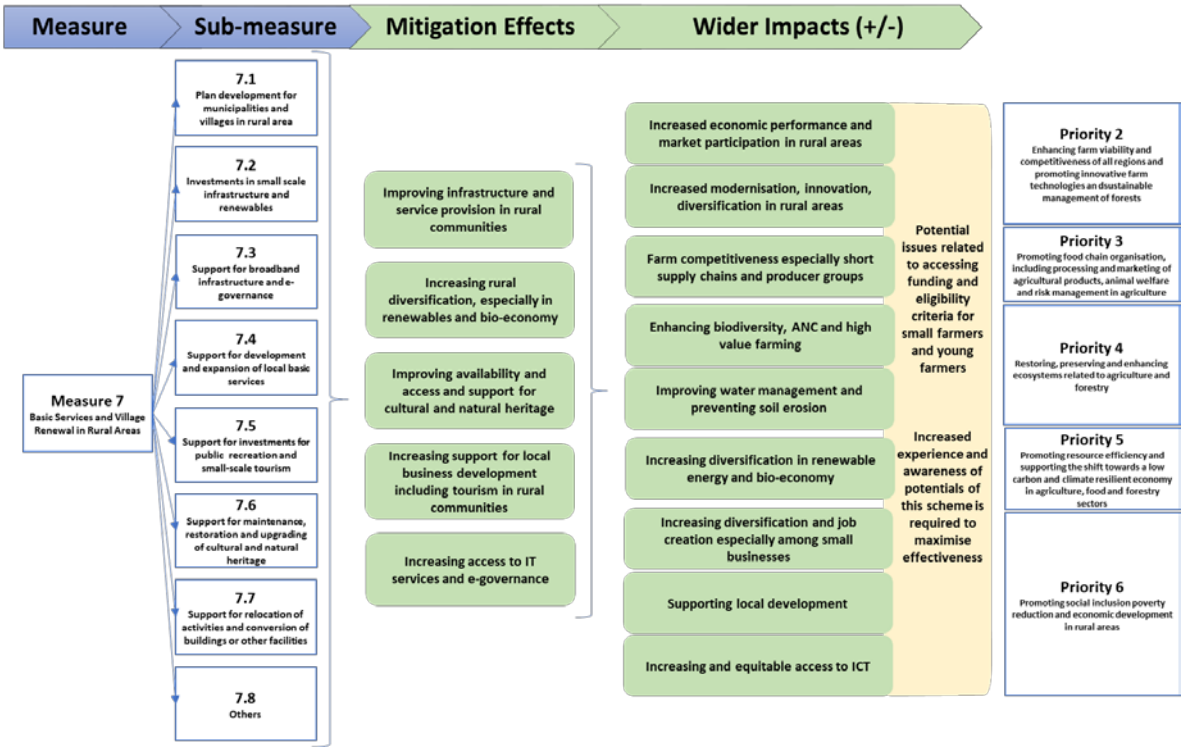
Source: Consortium, 2020

Measure 06 Farm and Business Development, contributes to **increasing the overall diversification of farm businesses by supporting investments in farm units, especially for small farmers, and providing aid for small businesses and tourism.** It includes investment in non-farming activities in rural areas, addresses the investment needs of young farmers, and offers support to small farmers

The mitigating effects of Measure 06 on land abandonment are linked to its ability to support diversification in rural communities, and in particular, its focus on small farmers and young farmers. However, since this measure is primarily focused on business development, it can encourage land use polarisation if not mitigated through a policy mix that applies other measures and programmes. Particularly when it comes to agricultural development and farm incomes, farm businesses that are not integrated through the measure risk finding themselves at the wrong end of a widening divide. This has the potential to increase land abandonment in farms and businesses not supported by the scheme, and thus less able to compete. The positive impacts of Measure 06 are much more pronounced when interventions are included in regional strategies that address the potential negative "crowding-out effects" on small, non-integrated farm units.

In the Murcia case study region, Measure 06 has been particularly effective at supporting farm business development in densely populated, irrigated lowland areas, while hardly affecting those parts of the case study region threatened by land abandonment challenges. In the case study region of Podlaskie, it was reported that advisory services often "push" farmers into investments and advocate a high-risk approach to agricultural adjustment strategies. Such strategies frequently fail because farmers are unable to repay debts during periods of reduced production and income. A more place-sensitive practice is hence necessary, one which would more closely consider the farm business potential and prospects, land management intensity already present in the area, and the broader rural development characteristics of the region.

Figure 28: Proposed impacts of Measure 07 Basic Services and Village Renewal



Source: Consortium, 2020

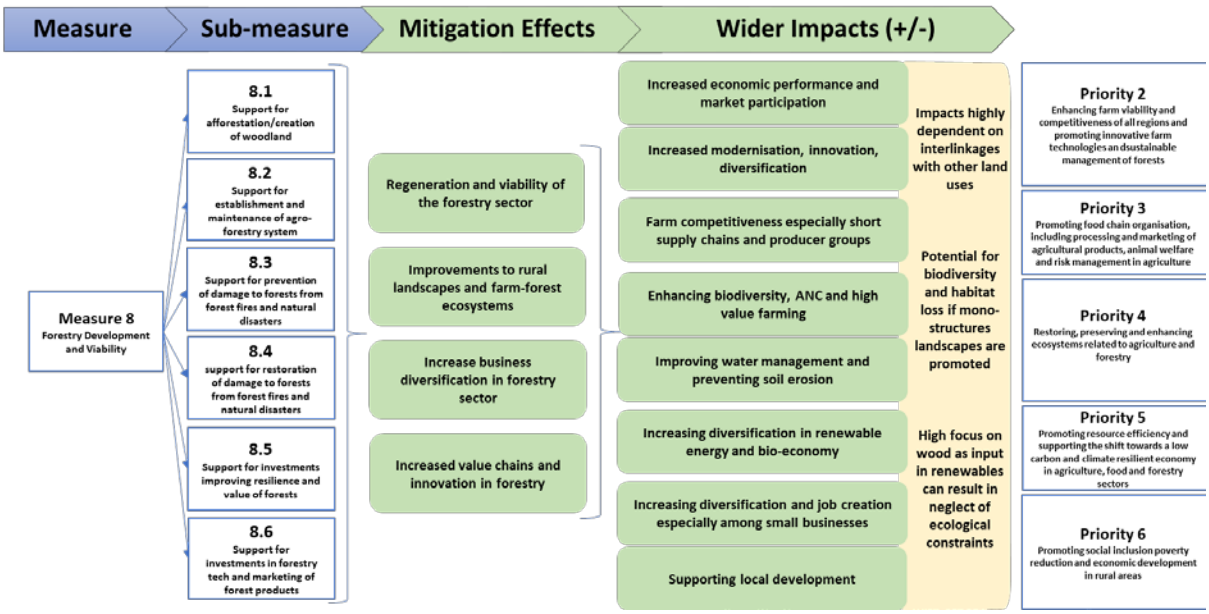
Measure 07, Basic Services and Village Renewal, addresses service investments in rural areas, focusing on small-scale infrastructure and renewables, recreation, cultural heritage and small-scale tourism. This measure has a wide range of potential positive effects when it comes to various aspects of rural infrastructure, the attractiveness of rural areas, rural quality of life, and maintaining the social fabric that contributes to vitality in rural communities. The wider impacts of Measure 07 include increasing accessibility, social integration, and exposure to cultural changes, thus targeting some of the main social concerns in rural communities susceptible to land abandonment.

Basic services support has been extended to introduce a wider range of sub-measures in the present programming period. The case study findings reveal that uptake of these new sub-measures was sometimes limited, and in certain cases, even viewed with suspicion by agricultural stakeholders. This has been found to seriously diminish the effectiveness of the measure. Therefore, increased awareness regarding the benefits of Measure 07 is required in order for it to achieve its full potential.

The effects of Measure 07 on land abandonment during this programming period can be described as indirect. **Through supporting the development of basic infrastructure, Measure 07 in turn increases rural attractiveness, enables market access for farming populations, and contributes to long term quality of life.** These effects encourage farmers to continue actively managing their land, even in regions with social, economic, or environmental challenges, as it demonstrates the potential for positive changes and improved living conditions in the long run.

The case study area of Tyrol exemplifies how a mountain-orientated agricultural policy has had a transformative effect on the provision of basic services, which in local communities had been lagging for decades (Dax, 2001). Witnessing the benefits of regionally-focused action has stimulated national support for policies that specifically address and favour agriculture in mountainous regions. This, in turn, has improved the effectiveness of CAP funding, and resulted in positive land management and rural development trends.

Figure 29: Proposed impacts of Measure 08 Investments in Forest Development and Viability

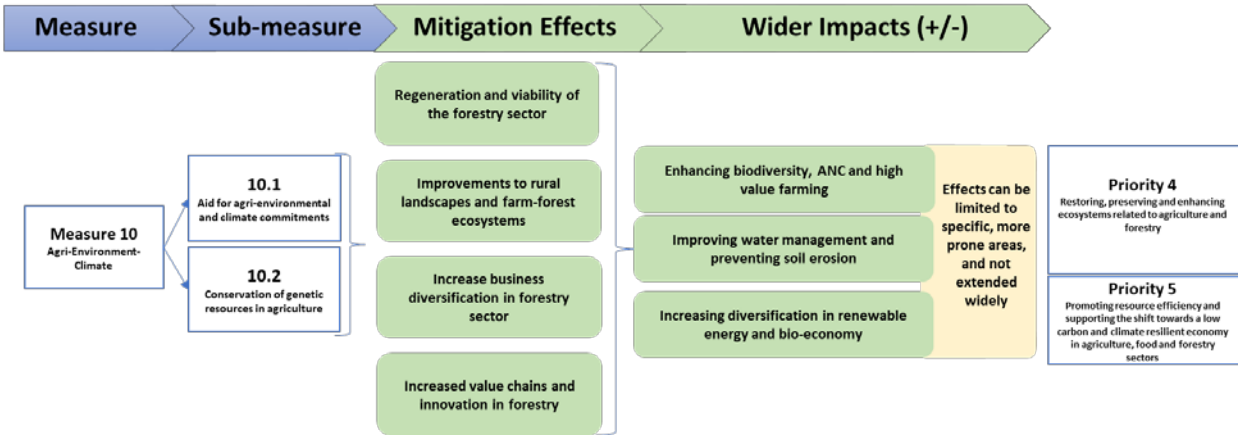


Source: Consortium, 2020

Measure 08, Investments in Forest Development and Viability, focuses on agro-forestry, and includes afforestation, forest preservation, and forestry innovation. Resilient forest areas help prevent rural abandonment by providing healthy forest-farm ecosystems, promoting tourism, and contributing to social and cultural benefits through the provision of recreational areas and aesthetic rural landscapes (Zavalloni et al., 2019). However, these wider impacts are very much dependent on interactions with other land uses in the region, particularly between agriculture and forestry, and on the wider national and regional strategies in place. When efforts are coherent, positive mitigation effects on land abandonment are observed. On the other hand, incoherent strategies may result in no positive effects on land abandonment, and possibly even an increase in land abandonment, if only forestry measures are implemented in an area already vulnerable to abandonment or in a non-diversified region. Further, a loss of biodiversity due to mono-structured landscapes, and habitat loss may occur if too strong of a focus is made on the production aspects of forest development. For example, supporting only the renewable resource aspects of forestry, without requiring that other positive externalities of forestry be considered, can result in mono-structured landscapes with poor biodiversity characteristics.

Forest development investment support is integrated into the support framework of rural development programmes (RDPs), which have traditionally been limited to agricultural support schemes. Its application is subject to national forest policy priorities, which can result in distinct and varied effects. **While the overarching intention of Measure 08 is to improve forest ecosystems, pragmatic considerations sometimes prevail over ecological ones** (KANTOR, 2015). The different share of forest in land use across the EU suggests a diversified and localized approach to land use is necessary to successfully mitigate land abandonment. For example, in highly-forested areas such as Finland, an extension of the forest area would be counter-productive, whereas in the Southern regions, this might represent an important, if challenging, environmental objective. The need for a range of approaches is vividly illustrated when comparing case study regions Murcia and Kainuu. In the former region, a strategy for forest development has only recently been elaborated, while in the Finnish case, the use of forested land has long been critical to discussions surrounding the drivers of land use change

Figure 30: Proposed impacts of Measure 10 Agri-Environment-Climate



Source: Consortium, 2020

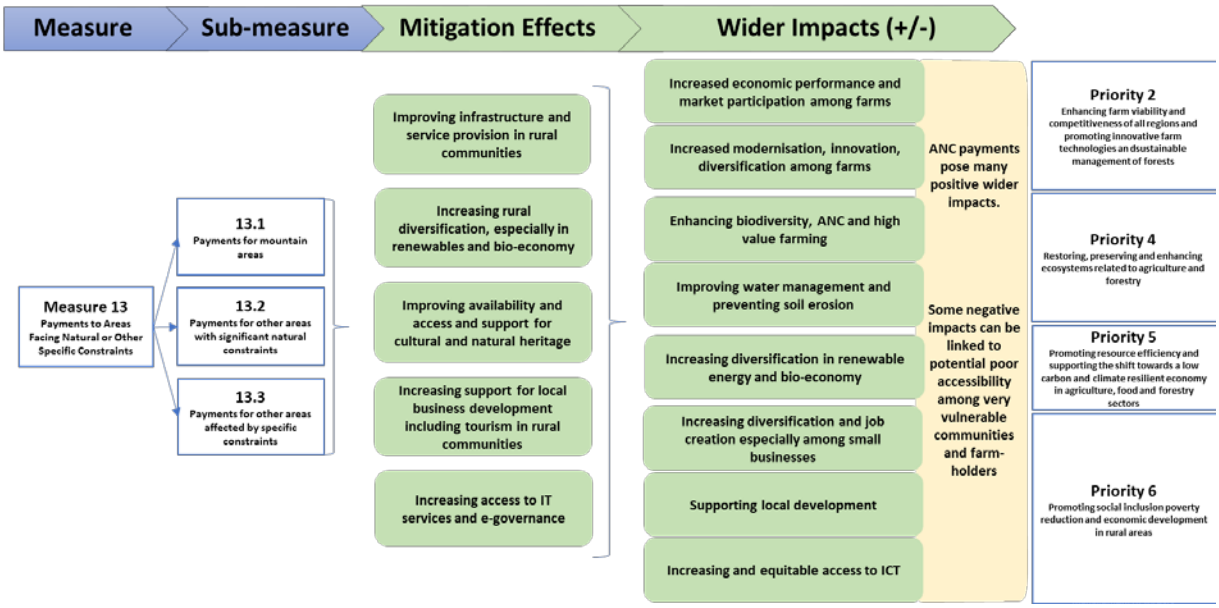
The Agri-Environment-Climate measure represents a substantial portion of Pillar II funding, behind only physical investments and support for ANCs. Measure 10 has significant potential to enhance the provision of ecosystem services. The implementation of this measure, and its attendant environmental mitigation effects, is often seen in the regions with lower agricultural concentration most prone to land abandonment. **Implementation is less frequently observed in regions with high concentrations of agriculture, yet these are precisely the regions that most urgently require a transition towards environmentally sensitive management practices.**

Together with Measure 11, Organic Farming Support, the Agri-Environmental Climate measure is the backbone of the CAP strategy to address ecological challenges and steer policy toward environmentally sensitive and sustainable agricultural management. Combined, the two measures account for more than 20% of Pillar II funding, and in some countries represent more than 50% of Pillar II support (e.g. in Austria, Ireland and Finland). Member states and regions that have achieved a high implementation rate have demonstrated improvements in their environmental conditions over the past two decades, or at the very least, have prevented further degradation. Nevertheless, the future CAP would benefit from enhanced ecological quality and biodiversity measures (Peer et al., 2019).

All four case study regions cited agri-environmental climate and organic farming measures as the most relevant to mitigating land abandonment. In particular, case study regions **Tirol and Murcia referred to them as the most influential measures in Pillar II, and as the primary policy instruments used to halt land abandonment processes.**

Support for Less-Favoured Areas (LFA) is a long-standing tradition in farm support policy under Pillar I. The concept, and terminology, has evolved to address ANC. This change represented the increasingly shared view that LFA support should not be allocated according to with socio-economic criteria, as laid down in earlier regulations prior to 2000, but should be re-orientated toward towards clear bio-physical indicators (Van Orshoven et al., 2012). Early on, in countries with particularly high shares of mountain areas, the instrument proved crucial to raising support levels for mountain farmers and providing a support system targeted at preventing swift and large-scale land abandonment in those areas.

Figure 31: Proposed impacts of Measure 13 Payments to Areas Facing Natural or Other Specific Constraints



Source: Consortium, 2020

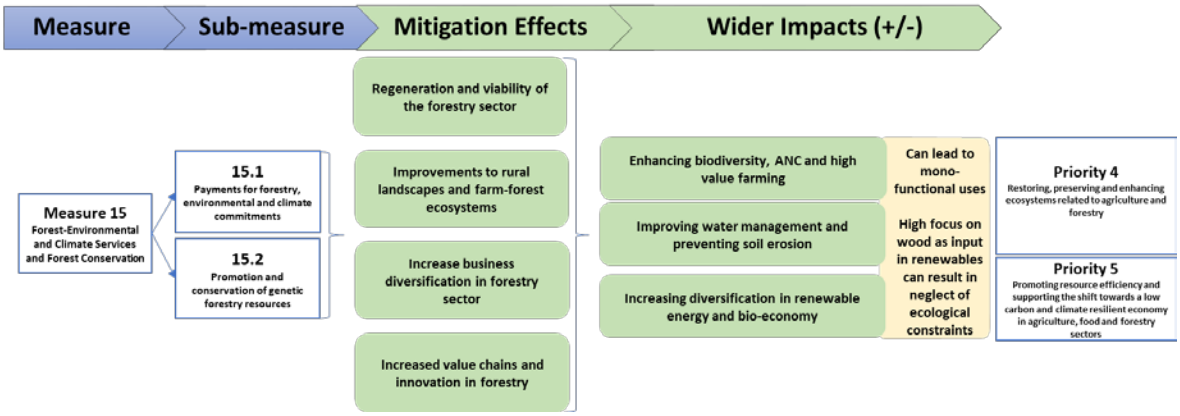
Payments for ANC have the second largest budget share of all Pillar II measures. ANC payments provide support to farm and forestry enterprises in areas with both natural and specific constraints, as well as in mountainous areas. Measure 13 supports a wide array of initiatives in these areas, including farm and forestry viability, the development of economic opportunities, and business diversification. Wider impacts range from enhanced biodiversity and carbon-sequestering capacity, to better ICT services, improved economic performance, market participation, modernisation and innovation. **Through targeting UAA areas most threatened by abandonment (such as sloped areas, distant and peripheral areas, those with poor topographical conditions, and others), Measure 13 significantly mitigates land abandonment.** This measure supports farm income levels in regions that would otherwise be disadvantaged when it comes to accessing and competing in agricultural markets. It further promotes agricultural production in areas with High Nature Value farming systems, maintaining the ecological quality of these areas. **Measure 13 is important for maintaining production potential in remote areas, mountainous areas, and contributes to national economies by including these regions in agricultural and rural development efforts.**

Since its establishment, the ANC measure has evolved to address market integration aspects, linkages to value chains, institutional weaknesses, and environmental interaction, in addition to population decline. **This measure remains particularly important for farmers in many mountainous regions, and in new Member States, some of which have applied this measure as an important trigger to enhance local support in remote regions.**

Literature on remote areas, and particularly mountain systems, shows that a basic support scheme such as ANC imparts important incentives for farmers to remain in the management of some of their "threatened" areas (e.g. distant fields or plots on slopes or hardly accessible areas). This confers clear benefits both for mitigating land abandonment, and contributing to overall land quality and biodiversity. Some of the case study findings support and exemplify this. In the mountainous regions of Tyrol, where farmers face significant challenges achieving an adequate income, farmers reported remaining on the land due to ANC payments. Similar findings were reported in the remote areas of Kainuu and in Podlaskie.

However, the effectiveness of the measure is brought into question, especially in new Member States not applying a good mix of ANC interventions, and in regions with a limited reliance on ANCs. In these cases, there may be unbalanced and even harmful implementation practices. For example, in the case study region of Podlaskie, ANC support is sometimes equated with support for idle areas. Overall, currently about 17% of total RDP finances are spent on ANC, signifying its high relevance in many countries and regions, and indicating the importance of promoting its effective implementation.

Figure 32: Proposed impacts of Measure 15 Forest-Environmental and Climate Services



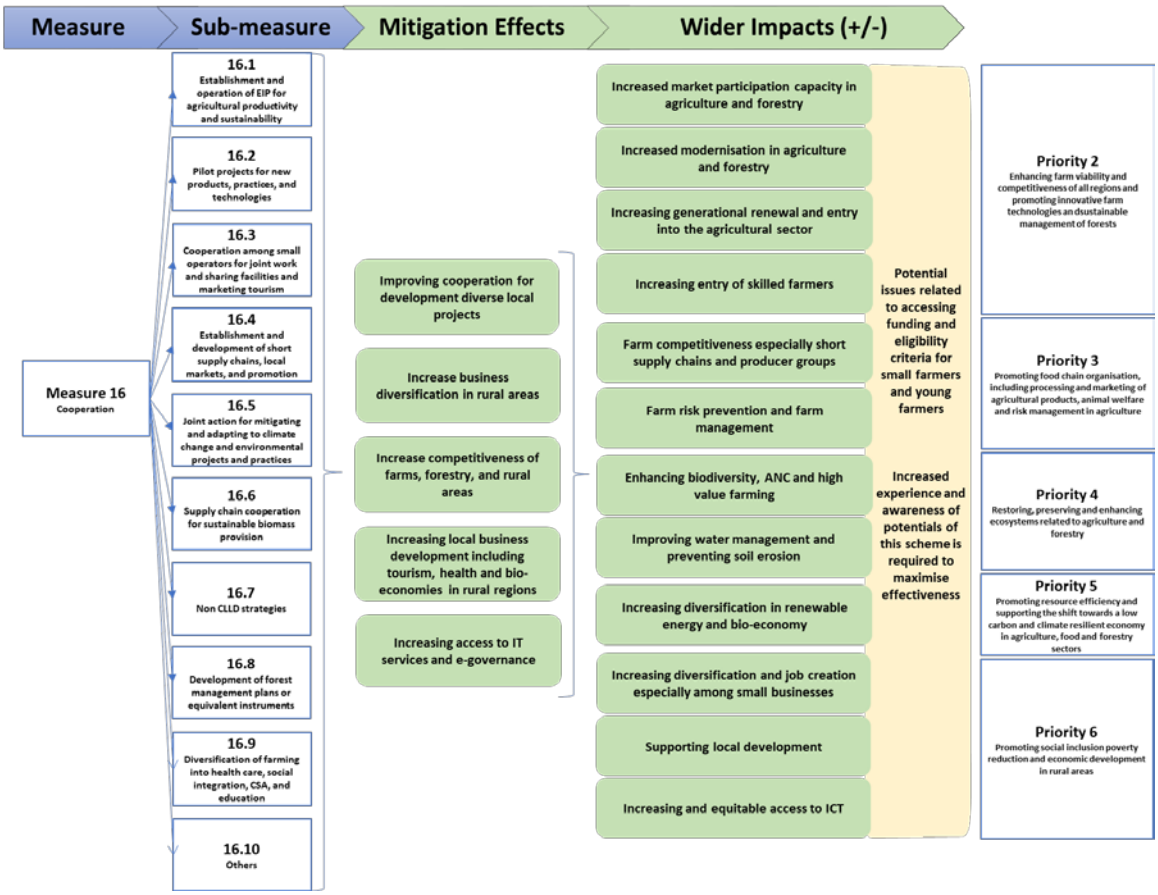
Source: Consortium, 2020

The Forest-Environmental and Climate Services measure is the smallest measure in RDP programming, representing only 0.24% of the overall Pillar II envelope. The observed effects of Measure 15 in mitigating land abandonment are similar to those of Measure 13 (ANCs) (above), however, on a much smaller scale, as the measure is rarely implemented. **There is a significant potential for extending its use in specific cases.** Areas like the case study region of Kainuu, for example, have an overall land use policy shaped by forest development. In such instances, **Measure 15 could be particularly effective in mitigating land abandonment by introducing wider positive effects such as increasing diversification into renewables and promoting the bio-economy, as well as through contributing to ecological resilience by improving water management and preventing soil erosion.**

Even if not directly targeting land use, **Measure 16, Cooperation, is very important in addressing the socio-economic context that leads to land abandonment in rural areas.** This measure provides much needed room to manoeuvre for farm households wanting to engage in specific land-related activities and to create and participate in local groups. Measure 16 links value chains and markets, and provides alternative development options in fields such as agriculture, forestry, tourism, and economic diversification at the local and regional level. The measure aims to engage rural communities in improving land management and preservation, while **bolstering the community's adaptive capacity, therein alleviating some of the drivers of land abandonment.**

As a recently implemented measure, uptake is somewhat limited in this programming period, representing only 1.84% of RDP spending. In many countries, a more intensive and better integrated application of this measure is expected in the CAP post-2020.

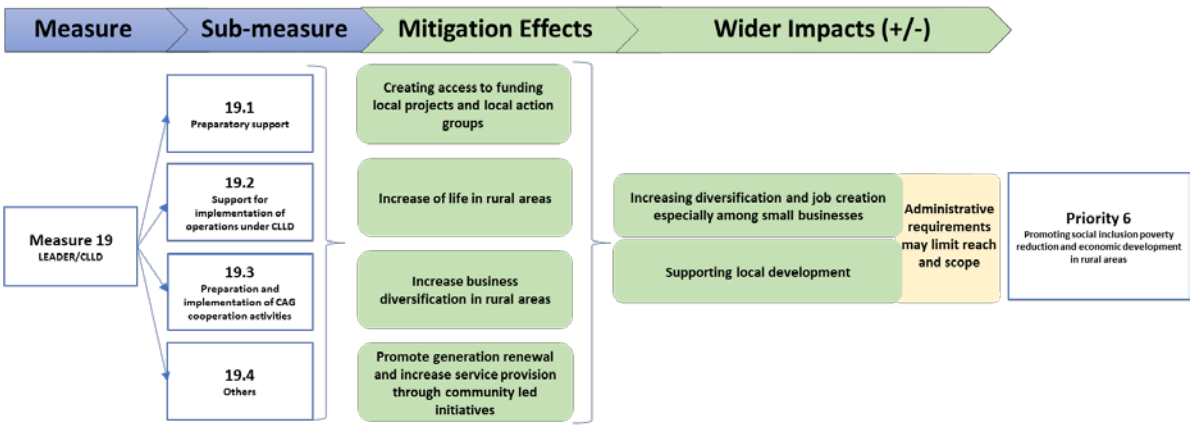
Figure 33: Proposed impacts of Measure 16 Cooperation



Source: Consortium, 2020

Measure 19, LEADER, supports a variety of local development initiatives. Introduced in the early 1990s, LEADER has proven to be a flexible and effective instrument for rural development in many diverse rural contexts. In the nearly thirty years since its implementation and incorporation within the CAP, LEADER has evolved through experimentation and methodological refinement. It has been demonstrated to be a potent driver of rural innovation that has improved the rural development narrative (Dax and Oedl-Wieser, 2016). Focusing on local actors and region specific strategies, LEADER addresses land management and prevents rural outmigration by **supporting local economies, service provision, and quality of life.** The place-based solutions at the centre of Local Action Group (LAG) priorities are integral to the many achievements of this measure.

Figure 34: Proposed impacts of Measure 19 LEADER/CLLD

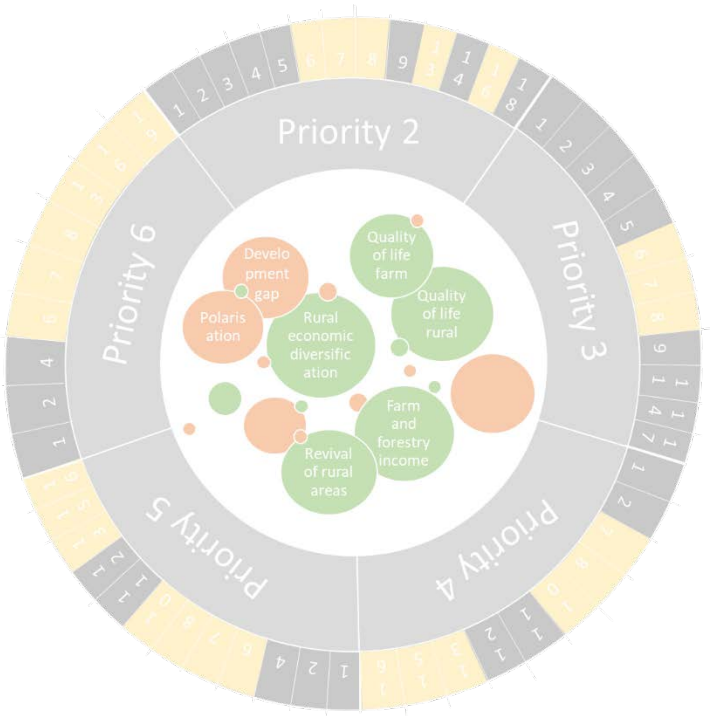


Source: Consortium, 2020

LEADER activities highlight aspects of value chain organisation, integrating unique regional values into geographical, high-quality branding, targeted (sustainable) tourism development, social integration activities, local involvement of less integrated groups, and processes to raise regional attractiveness. In the case study region of Tyrol, LEADER is utilized by LAGs seeking to harness the potential of resources naturally available in the area.

Pillar II measures have very inter-linked effects on the mitigation of land abandonment which are associated both with direct and indirect pathways. The figure below delineates the multifaceted effects of Pillar II on the mitigation of land abandonment.

Figure 35: Pillar II land abandonment mitigation



Source: Consortium, 2020

Pillar II RDPs encompass a wide range of territorial strategies for mitigating land abandonment that prioritize local and regional challenges. However, because Pillar I funding comprises a much larger part of most regional and Member State budgets, the effects of **Pillar II measures risk being undercut or overshadowed, particularly in instances where their objectives are not coherent.**

The figure above presents the interplay of Pillar II measures and highlights their inter-relatedness. The first priority, Innovation, is not represented in the figure, since it is a horizontal measure that supports all activities. The other five priorities are assembled in a circle to highlight their interactive relationship and relevance to land management issues. The decisive effects of RDPs, both positive and negative, are indicated in the centre of the figure and represent issues such as quality of life in rural areas, farm and forestry income, polarisation, rural economic diversification, revival of rural areas and the creation of development gaps. **These are some of the main drivers for land use changes addressed or abetted by Pillar II interventions.**

There is not often a single, linear relationship between various measures, but instead a highly complex interaction of effects. Impacts from other policies (e.g. Regional Policy, Environmental Strategy and Social Policy), the contextual conditions within a region, services available, institutions in place,

governance structures, regional perspectives, and availability of natural resources all have an impact on the effects of Pillar II measures.

When constructing a rural policy strategy aimed at coping with land abandonment issues, it is important to consider the various effects of Pillar II. This complex framework is hindered by multi-level governance and institutional settings that place less concern on land abandonment issues than on other sector policy objectives. In future policy reform discourse, it may be useful to **conceive of land abandonment not as a side-effect of general policies that can be treated by turning specific measures on or off, but as an inherent and specific challenge.** Addressing land abandonment will require the sustainable use of natural resources through balanced and place-sensitive structures of land management. In particular, **land management aspects need to be aligned much more strongly with regional, context-specific features and socio-economic activities oriented towards the elaboration of vibrant rural regions.**

CAP reform

The upcoming programming period marks changes in the approach of the CAP. The legislative proposal of the post-2020 CAP was introduced on 1 June 2018 by the European Commission (COM(2018)392, COM(2018)393, COM(2018)394 and others). It lays out several proposals to improve the CAP, including simplification and a stronger focus on environmental issues and climate action. Structural changes in the CAP that focus on ensuring its effectiveness and efficiency are also foreseen. The proposals for the CAP post-2020 are relevant considerations when investigating the future of land abandonment in EU regions.

The policy changes proposed by the EC outline structural programme changes as well as a stronger focus on specific themes. Among others, **relevant revisions include an increased focus on small and medium-sized farms, a stronger focus on young farmers, mechanisms to ensure funds are allocated to active farmers practicing high quality land management, a stronger focus on environment and climate action, simplification and modernisation. It must also be pointed out that following the agreement reached at Council level on 21 July 2020 regarding the next multi annual financial framework (MFF) the CAP budget post 2020 will decrease as compared to the 2014-2020 period.**

Anticipated policy changes to prioritize small and medium-sized farms may be implemented through a higher level of support for these farms. Additionally, a more equitable distribution of funds may be achieved by reducing the share of direct payments above € 60,000 per farm and limiting payments at € 100,000 per farm. **It is questionable whether a capping of € 100,000 per farm will adequately mitigate the concerns over a fairer distribution of the CAP.** Recent assessments show an increased inclination toward flexible and subsidiary regulations. The German presidency has spoken out in favour of voluntary capping for Member States. Whether or not capping will become mandatory across Europe depends on the European Parliament's position, the outcomes of formal trilogue meetings, and whether contesting approaches are put forward. While a voluntary scheme might be easier for Member States to accept, it may come at the expense of a common level playing field across the EU, and lead to reduced ambitions in national CAP Strategic Plans (Metta 2020). As witnessed in the implementation of previous CAP reform rounds, this could reduce opportunities for establishing strong commitments and for introducing a policy mix that addresses complex issues like land abandonment.

A firm commitment by Member States to support young farmers is expected in the post-2020 CAP reform as the challenges of increasing generational renewal and attracting young farmers gain more attention. Principally, a minimum of **2% of direct payments in each Member State is to be allocated**

to young farmers. This is in addition to financial support received under rural development measures facilitating access to land and land transfers.

In order for the CAP to effectively mitigate land abandonment, funds must be allocated appropriately to the farmers and beneficiaries who contribute to social, economic, and environmental benefits. In the upcoming programming period, there will be a push to ensure that Member States have systems in place to guarantee that farmers receiving support are truly actively managing their land. This will rely on a **conditionality system aimed at improving the targeting of funds and refining the pool of CAP beneficiaries.** In particular, criteria regarding "territorially-oriented measures" already available in Pillar II, are expected to more explicitly applied. However, without a substantial common framework and guidance, the anticipated effect can only be expected to marginally contribute to increasing the implementation capacities in this regard.

A stronger focus on environmental and climate action has been at the heart of CAP reforms for decades. **Now more than ever, ensuring that environmental benefits are achieved by the CAP is crucial.** Environmental and biodiversity benefits contribute to carbon neutrality, and in areas with high environmental goods, particularly high forestation, these measures seem to contribute to a reduction in land abandonment (Zavalloni et al., 2019). However, since long-term policy assessments indicate that the CAP falls short of biodiversity goals (Bocaccio et al., 2009), recent discussions have called for sustainability challenges to be addressed in a more comprehensive and effective manner (Peer et al., 2020)

Simplification and modernization in the upcoming period are urged as a means of **improving the reach of the CAP and its ability to meet the needs of medium and small-scale farmers and smaller beneficiary organisations.** This will require an emphatic shift away from compliance, and towards results and performance factors (increased orientation towards policy impacts). The simplification of administrative processes is also desirable.

Because so much of the **efficacy of Pillar II depends on appropriate targeting,** a crucial consideration for CAP reform discussions must include revised targeting practices. This concern is particularly pronounced in regard to environmental protection measures and support for young farmers. One approach to improve targeting is to increase the capacity of local managing authorities to direct funds. However, regional experts and actors, who have repeatedly iterated the need for improved targeting, remain sceptical that this intervention will have a significant positive impact on regional conditions for land management.

Arguably, one of the most discussed changes in the upcoming programming period is the **overall reduction of the CAP budget.** Matthews (2018) has estimated that in order to preserve the funding available for direct payments, Pillar II would bear the brunt of any budgetary reductions. Adaptations of specific instruments, such as more precise targeting, and support for small farmers, are therefore necessary to secure the beneficial effects of the CAP even within a context of reduced overall funding. As the analysis of case studies reveals, continuation of the existing financial structure will not have a significant impact on the challenge of land abandonment, at least not from the general European perspective. It is therefore up to the national CAP Strategic Plans to more aggressively combat land abandonment issues.

3.2 Other ESI-funds

In addition to the CAP, other EU policies and instruments provide financial support that may in various ways contribute to the mitigation of land abandonment. Each of the five funds comprised under the European Structural and Investment Funds (ESIF) may address problems driving land abandonment, such as low economic viability of farms or life-quality in rural areas.

The Community-Led Local Development (CLLD) approach, **LEADER** (which is obligatory under the EAFRD, Pillar II of CAP), has been extended to three additional EU Funds (the European Maritime and Fisheries Fund – EMFF, the European Regional Development Fund – ERDF, and the European Social Fund – ESF). The "one-stop-shop" approach is managed by Local Action Groups (LAGs) and addresses various EU and national programmes related to local (rural) development. Similar groups financed by funds other than EAFRD may also be active in rural areas.

The **European Regional Development Fund (ERDF)** promotes balanced development in the different regions of the EU and addresses numerous needs of rural areas. This includes improved accessibility (based on transport infrastructure projects), better availability of high-speed internet, improved quality of public services, strengthened regional economy (through innovation activities), etc. Furthermore, areas that are located in disadvantaged natural areas (such as remote, mountainous or sparsely populated areas), as well as the outermost regions benefit from special ERDF treatments. The ERDF Operational Programme of Sachsen-Anhalt (Germany), for instance, includes two priority axes which impact rural regions. As a large share of the area is characterised by either rural or intermediate regions, general SME support and integrated territorial development approaches indirectly support the rural economy. Furthermore, the combined implementation of CLLD/LEADER contributes to rural development, inclusion and viability or the rural economy. In addition, in Tyrol (Austria), which belongs to the regions that also uses the LEADER/CLLD method as an integrated approach, developed local development strategies that address rural values, natural resources, common good and functions, as well as growth and employment. Another ERDF project, established in Belgium in 2016, renovated an old farm in Neerpede in order to start up farm incubators and to establish new permanent farms.

INTERREG (funded by the ERDF) is one of the key instruments which supports cooperation across borders (INTERREG A – cross-border cooperation, INTERREG B – transnational cooperation, INTERREG C – interregional programmes). All programmes have either direct or indirect impacts on rural areas and thus on farmers. The "Social Farming Across Borders (SoFAB)" project is one example of a successful EU INTERREG IVA funded project which operated in the border region of Ireland and Northern Ireland, and established a cross-border programme of care farming.

This brief overview shows that ERDF funds also contribute to farm and rural area development in direct ways. Through the overall improvement of framework conditions, ERDF funding is capable of strengthening the socio-economic situation of farmers and preventing land abandonment.

The **European Social Fund (ESF)**, supports employment-related projects throughout Europe and invests in Europe's human capital, impacts farmers through various educational programmes, support in job creation, social inclusion, poverty alleviation, and others. Even if these projects do not target rural communities directly, some ESF co-funded projects address key socio-economic challenges of rural populations (and thus also farmers). The ESF co-funded "Mons Inser Job Training" project, in the Mons area of Wallonia (Belgium), for instance, is designed to give jobseekers training in several core areas of business along the food chain (including food production, processing and distribution). Since the beginning of the project in 2014, more than 7,000 people have benefited from the training and more than 400 have found an appropriate job. Another ESF co-financed project in the Basilicata region (Italy) trains young people with disabilities in agriculture, livestock and forestry. Other projects addresses

directly generational renewal by supporting entrepreneurship and business leadership transitions in light of demographic changes. This type of ESF projects may strengthen employment in farming which contributes to the maintenance of agricultural activities.

The **Cohesion Fund (CF),** which supports transport and environment projects in countries where the gross national income (GNI) per inhabitant is less than 90% of the EU average, especially affects Eastern European countries. Through better accessibility options (e.g. investments in railway infrastructure or motorways constructions – such as bypasses of settlements) or environmental projects (e.g. improved quality of water ecosystems, increased retention capacity of landscapes, etc.) rural areas and farmers benefit from CF co-funded projects. CF projects particularly contribute to better living conditions in rural areas, and thus may indirectly mitigate agricultural land abandonment.

Arguably, some ESIF programmes, particularly from the ESF fund, may contribute to land abandonment by offering skills development that enables farmers to quit agricultural activities. This, however, should not necessarily be considered as a negative impact on agricultural development. The provision of possibilities for professional mobility and changing of professions in many cases is reasonable and should be supported. This indeed concerns the dilemma of whether famers should be supported to continue agricultural activities or to change professions. In case of some regional contexts (e.g. with abundance of farms), farms with low economic viability and poor agricultural options and prospects, the continuation of farming should not necessarily be encouraged.

4 LAND ABANDONMENT SCENARIOS

Key findings of the three different scenarios

- The **"Climate Change" scenario** forecasts flooding at coastal areas and drought and water competition in the south. Northern countries will benefit from a shift in vegetation zones. Landslides and loss of fertile soil will increase. Natural hazards will endanger crops. Part-time farmers working in the tourism sector will lose additional sources of income. Agricultural land abandonment will occur all over Europe (especially in the South, mountain regions and coastal areas).
- The **"Globalisation of markets" scenario** supports agricultural production only in favourable locations. Whereas the average farm size increases, the number of farms are decreasing – leading to abandonment of agricultural areas, especially in remote areas.
- The **"Major health crisis**" scenario will stimulate regional and organic production within the first years. A demographic shift from urban centres to rural area will occur. Through land-use conflicts, a shift to more efficient production approaches will emerge in all areas, coupled with new technological solutions. Land abandonment will not be an issue as the finite resource of land will become increasingly valuable.

The final task of this study is the development of qualitative scenarios of land abandonment. These scenarios differ from land abandonment projections in so far as they are characterised by the impact of different external factors, as well as different levels of involvement of drivers. External factors are major factors over which actors have no influence. The most relevant external factors identified in the context of land abandonment are:

- Climate change.
- Globalisation of markets.
- A major health crisis (such as the Covid-19 pandemic).

The methodology to develop qualitative land abandonment scenarios was proposed in an internal workshop and assumed that each of the three major external factors was the primary characteristic of each scenario. Three distinct scenarios were identified, each of which was defined by an extreme negative interpretation of the respective external factor. Each scenario further characterised the drivers of land abandonment by grades of relevance, as described in section 2.4. For each scenario, the group sketched out territorial impacts, and outlined possible socio-economic, environmental, and agricultural consequences relevant to land abandonment.

Group brainstorming about the scenario, its characteristics, consequences and possible mitigating measures, led to the formation of recommendations. The possibility of any single scenario occurring in isolation is highly uncertain. Nevertheless, current knowledge and understanding of external factors are important prerequisites to unfolding alternative images of an uncertain future. In effect, this exercise simulated participants' thinking about possible policy recommendations. After outlining and describing the characteristics and consequences of each scenario, keeping in mind the impact of the three most relevant external factors and respective consequences on land abandonment, the group reflected on a set of possible policy answers. As a result, this set of policy recommendations, which is presented in section 5, can be understood as addressing all external factors and related drivers, characteristics and consequences.

4.1 Climate change

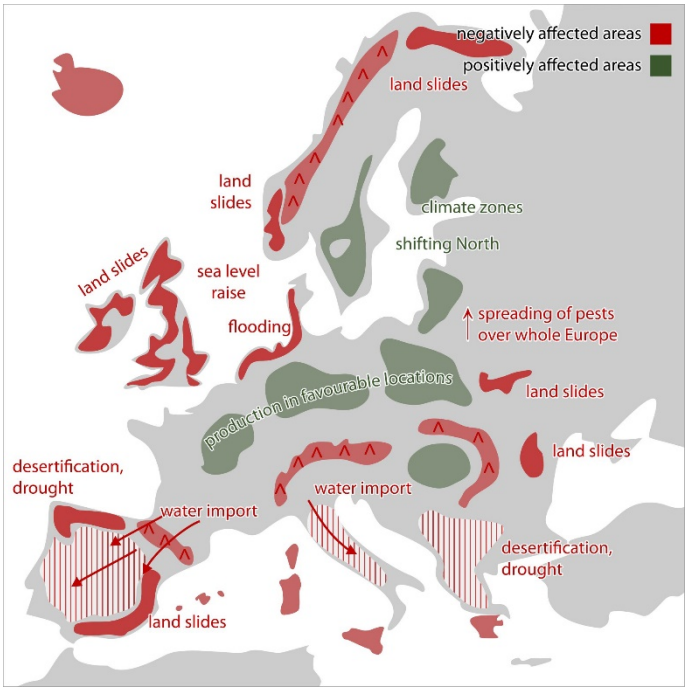
This scenario follows a "worst case" prognosis of limited consensus of adaptation measures, as outlined by the Intergovernmental Panel on Climate Change (IPCC). It refers to a predicted temperature increase of approximately 4 °C by 2100, relative to pre-industrial temperatures. The scenario combines assumptions about high fossil energy demand and greenhouse gas (GHG) emissions coupled with a lack of fundamental climate change policies. Due to the rise of temperature, Europe is expected to suffer extreme heat, droughts and flooding by 2030. Coastal areas in Europe (in particular the Netherlands and Denmark) will experience flooding due to ice melting in Greenland and in the Arctic Sea. Droughts in the south (especially in the Mediterranean region) will stimulate competition for water both between and within countries. Greater quantities of water will be required to satisfy irrigation purposes, resulting in lower harvests and increasing difficulties concerning livestock production. A shift in the zones of vegetation is anticipated, both toward northern European countries and towards higher altitudes in mountainous regions, resulting in positive and negative effects for these areas. On the one hand, lower energy methods of cultivation of new plants (especially crops) are possible (i.e. for glasshouse heating systems or hay drying). On the other hand, forest and agricultural pests are spreading all over Europe. As mountain areas experience rising temperatures, animals and plants will be forced to migrate to higher altitudes. This may endanger their existence, resulting in lower biodiversity. Winters will become more dangerous, as will seasons with increased precipitation rates and strong rainfall events. The water retention capacity of soils will decrease, resulting in landslides and loss of fertile soils. Crops will be endangered by sudden storms, floods or hails. Rising temperature levels will have a critical impact on part-time farming (especially for those working in the tourism-sector). In mountainous regions, part-time farmers who depend on ski tourism will suffer. Summer tourism activities in southern countries will decline due to extreme heat and water restrictions. All of these effects will result in unforeseeable and incalculable risks for farmers, their production, and their financial returns. These severe implications for the agricultural sector will cause land abandonment all over Europe – but especially in the vulnerable southern, mountainous, and coastal regions.

Figure 36: Brainstorming result on scenario "Climate Change"

Climate Change

- raising sea level ↑
- natural hazards ↑ (heavy rain, droughts, floods)
- irrigation ↑ land slides
- change in biodiversity
- vulnerability to environmental change (pests, loss of harvest)
- unpredictability of production
- intensification vs. bringing remote areas into agricultural production
- loss of soil
- distribution of water
- shifting of climate zone
- decertification
- vegetation zones move north/up, with restrictions
- migration pressure ↑

Source: consortium, 2020.



The map above shows the output of the brainstorming session "Climate Change." This is the most

probable course of future development if there are no drastic changes in policy over the next years. The map shows the regions most negatively affected by land abandonment (in red) and regions that might benefit due to an increase in temperature (in green).

4.2 Globalisation of markets

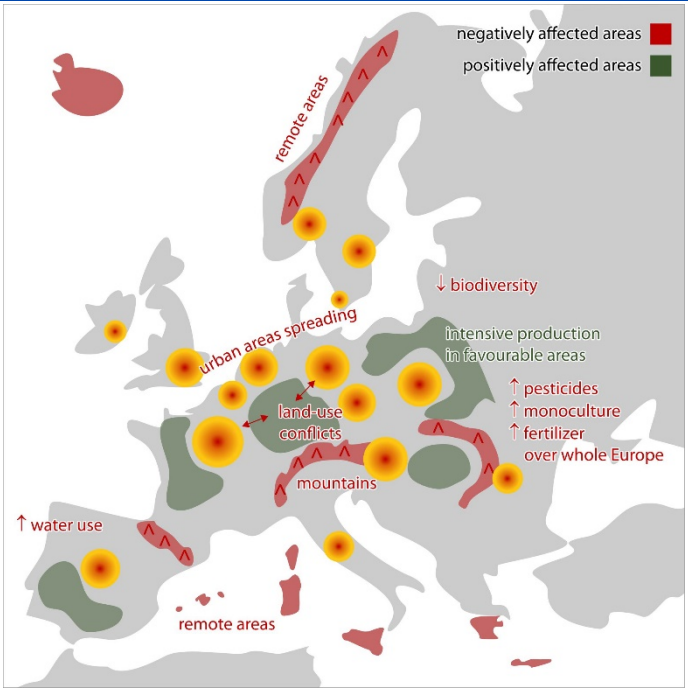
The period from 2020 to 2030 will be characterised by economic growth, a rapid increase in global population and newly emerging and more efficient technologies. Europe's level of urbanisation will increase, whereas the share of people living in rural areas will decrease continuously. Globalisation will peak, and world economic development will become completely independent from production sites as a result of the growing scale of cross-border trade and the rapid spread of technologies. Economic boundaries among nation states and economic zones will be removed, enabling an unrestricted and fast flow of finance, goods, services and people. Geographical distance will no longer represent a barrier. Due to the increased interaction between different regions and populations around the globe, national thinking will fade. In this scenario, people are citizens of the world. However, this is accompanied by several drawbacks. The pollutants released into different spheres (such as hydro-, bio- or atmosphere) through trade and production will reach unprecedented dimensions. The globalisation of markets will further contribute to climate change and the disruption of ecosystems globally. Within the agricultural sector, intensification and concentration on few products in favourable locations will become the norm. Automated processes will replace a large degree of the human work force. While the total number of farms decreases, farm size increases continuously. Intensified farming will optimize agricultural production per unit of input (such as labour or land), with negative implications for the environment and inhabitants. Self-reliance and preservation of local identities will become unnoticeable. As natural biological diversity is replaced with monocultures, pests specialised to specific crops will spread easily. This will lead to the increased application of various pesticides, which will be accompanied by negative implications for farmer and consumer health. Whereas more land-use conflicts will take place in favourable locations, remote areas (such as mountains or islands) will be less cultivated or completely abandoned, as will small-scale family farms. The discussed results of "Globalisation of markets" can be seen in the map below.

Figure 37: Brainstorming result on scenario "Globalisation of markets"

Globalisation of market

- intensification of agricultural products
- biodiversity ↓
- concentration of products
- connection to water/soil
- periphery basins
- polarisation
- resilience ↓
- diseases ↑
- digitalisation of agricultural products
- efficiency ↑
- no. of farmers & change of character of farms ↓
- urbanisation ↑
- land use conflicts ↑
- dependence of food from abroad

Source: consortium, 2020.



4.3 Major health crisis

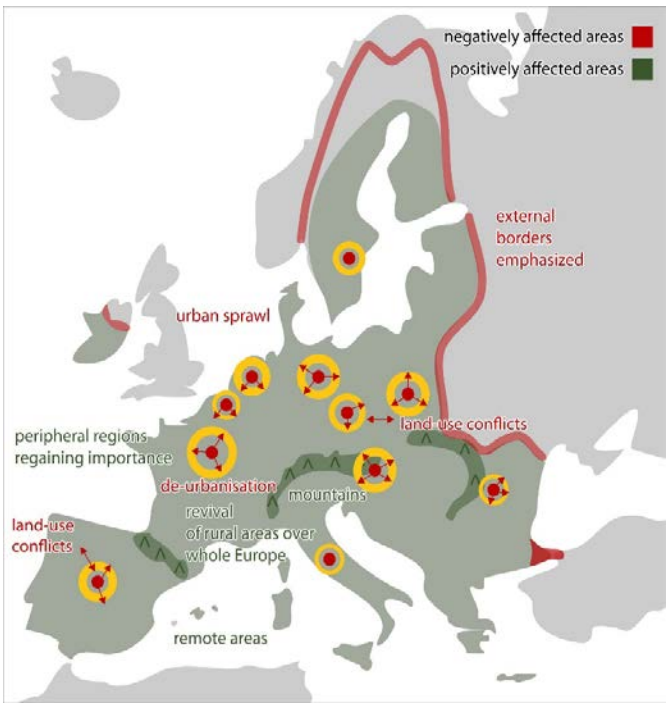
In this scenario, the 2020 pandemic will still be active in 2030. Despite various measures (such as social distancing, travel restrictions, mouth and nose protection, vaccinations, etc.), the virus will continue to mutate and elude containment, resulting in the closure of European borders. As a consequence, international trade and passenger traffic (especially between Europe and other continents) will be reduced to a minimum. The continuous economic decline and termination of imports will force the European Member States to reorient their economies and develop various strategies in order to cope with this isolation from the rest of the world. Within the first years after the outbreak, the desire to lead a healthier lifestyle will spur changes in diet, increasing the demand for organic food and agro-tourism among the population. Regional production and national value creation will gain importance, as will the diversification of regional and national food and/or goods production. A shift away from urban centres to "smart villages" will lead to a revival of rural areas. However, by 2030, the importance of soil as a resource will become obvious. Various land-use conflicts between several interests (e.g. settlements, infrastructure, increased diversified food production) will become the norm. To satisfy these interests, it will be necessary to shift from a romanticised and diversified perception of farming toward a more efficient production, leading to the extension of agricultural production to all available land. Land as a finite resource will need to be used as much as possible, which will increase land-use in more remote and unfavourable locations. To cope with territorial difficulties (such as steep slopes, barren stony soils, dry grasslands, etc.) new technical and digital solutions will emerge that enable the cultivation of these sites. Despite technological innovations, shortages in food and goods production are inevitable. As a consequence, the population size will become stable or even decline. Declining birth rates will lead to an aging of the population and labour force shortages. To ensure food security, agriculture (especially food production) will re-emerge as the most important sector across Europe – which will be reflected in an increase in food prices. Thus, rural land abandonment is not an issue in this scenario – it will be urban areas or European border regions that will be at risk of depopulation trends.

Figure 38: Brainstorming result on scenario "Health crisis"

Health crisis (e.g. COVID Pandemic)

- healthy lifestyle ↑ → change in diet
- re-regionalisation in agricultural production ↑
- organic food ↑
- production in more remote areas
- diversification
- ageing ↑
- lack of labour force
- pressure on efficiency
- quality of life
- revival of rural areas
- (home office)
- "smart village"
- agro tourism ↑
- mass production ↓
- mobility ↓ → imports ↓ → shorter value chains
- practical innovation for extensification
- digitalisation ↑
- land use conflicts ↑
- risk of supply
- stabilized population

Source: consortium, 2020.



5 CONCLUSIONS AND RECOMMENDATIONS

Key findings

- Land abandonment remains an important challenge in the EU and affects different countries and regions differently. It leads to irreversible effects in social and ecological terms.
- Farming conditions can be improved through additional education and training programmes for farmers (especially those focused on fostering farmers managerial, entrepreneurial and synergistic skills). Equally important is fostering financial security, lowering the minimum threshold for supporting small farms, by making use of different funds or by enabling access to other investment sources (e.g. FIs), as well as by improving the conditions for accessing additional land for the purpose of agriculture.
- In order to improve the condition of farmers in areas facing natural constraints, payments derived from ANC measures should be better tailored to address the risk of land abandonment in these regions.
- Forestry and environmental measures should be adjusted to the different vulnerabilities in different regions. Environmental measures should be able to mitigate negative environmental effects of land abandonment and foster the positive ones.
- In order to improve quality of life in rural communities prevent outmigration, rural services of general interest (SGIs) and investment in rural infrastructure are essential. Therefore, it is necessary to make use of synergies between different European Structural Investment Funds (ESIF), as well as land use and regional development policies to better handle the issue of land abandonment.

The quantitative analysis of land abandonment has revealed that land abandonment has slowed in recent years, although it remains a significant challenge in many Member States and in certain types of areas. Declining land abandonment is owed not only to the continuous EU support framework and the high level of CAP support aimed at responding to abandonment issues. It also reflects the rising global concern and market changes that have taken place in part due to food security considerations following the financial crisis of 2008. Such events have demonstrated the increased risk of vulnerability across sectors. With the emergence of the COVID-19 pandemic some of these concerns have materialised and revealed the degree of uncertainty in global developments, and importance of resilience approaches in the agricultural sector. This globally relevant change in socio-political organisations has had implications in all fields of economic, social, cultural and personal lives. It has also had some short-term effects on land management. The consequence of these effects are not yet fully understood, and will only become evident in the mid- and long-term. Among others, for these reasons, land abandonment, remains a highly important challenge, despite declining across the EU.

Land abandonment affects countries and regions in different ways. As underlined in the case studies, in addition to the quantitative account of land use changes, land management decisions and adaptation choices are bound to regional and local characteristics and specifics. Across Europe, there is large-scale divergence and also small-scale discontinuities within the same regions. This is leading to land use adjustments and, at the same time, smaller internal land use changes. Often these land use developments are difficult to monitor due to their gradual occurrence and slow transition phases. All the more, it is crucial to be attentive of the "minor" land-use related developments, as they might mask long-term negative changes and may indicate irreversible effects in social and ecological terms. Building recommendations on place-specific land use developments and local communities, as exemplified by the case study analysis, provides insights into local and regional perceptions and key

implementation aspects. Placing a greater emphasis on land abandonment issues in future policy reforms, national implementation processed of EU frameworks, research and knowledge development, as well as local and regional strategy building is an on-going challenge and requirement to cope with the manifold consequences of land abandonment in European regions.

The policy recommendations were developed based on the study findings and the scenario development, while considering the possible impact of all three external factors (climate change, globalisation of markets and major health crisis) simultaneously.

The following recommendations are grouped into areas – "Farming", "ANC", "Forests", "Environmental measures" and "Rural Communities":

Recommendation to improve Farming conditions

Education and training for farmers (Pillar II/ESF)

Successfully participating in farming requires a multitude of skills. Farming relies not only specific knowledge of agriculture, but also management and entrepreneurial skills. Inadequate farm management can lead to problems such as bankruptcy. These issues cannot always be mitigated with the support of advisory services, however advisory services are an important aspect of farm management. The improvement to advisory services is one underlying recommendation. In addition to this, it is important to have a significantly greater focus on directly raising farmers' managerial and entrepreneurial skills through provision of accessible and relevant trainings, seminars, and sources of information. In this context, it is also beneficial to expand the knowledge on applying synergies with areas such as circular economy or bio economy, through improving practical links to smart specialisation hubs and incubators. These services should not focus only on increasing farm efficiency, but also target needs of small farms, farms in remote areas and pluriactivity farms. For these farms, the aspect of providing specific "services", i.e. eco-system services may be of major concern.

Improved risk measure for farming activities (Pillar II/CMO)

There are significant differences in farmers' income levels between regions, and income in the primary sector is already significantly lower than in other sectors. Further, farmers' incomes fluctuate dramatically due to unexpected production losses caused to by natural events and price volatility in agricultural markets. While Pillar I constitutes an important tool to maintain an adequate farm income levels, the lack of financial security which may drive farmers to leave the sector is also influenced by insurance and pension schemes. Thus, in order to comprehensively address this potential driver of farmland abandonment more attention should be paid to the availability, affordability, coverage, adequacy, and appropriateness of farmer insurance schemes.

Balancing support towards smaller farms (Pillar I and II)

Adequately lowering the threshold for supporting smaller farms is a persistent problem that is present despite policy efforts (including the Small Farmer Scheme in Pillar I, measures aiming to address small farmers' and business needs in Pillar II). For example, agricultural start-ups with frequently innovative ideas based on small-scale farming are unable to receive support from ESIF funds (not only CAP funds). Pillar I and II should be more attentive to all kinds of farming models and farming newcomers to support their ideas and contribute to reengage farmland or mitigate farmland abandonment.

Better access to capital

One major issue with respect to continue farming on existing farmland is (the lack of) farm succession. In many cases new farmers might be willing and able to take over, but are hindered by a lack of capital and/or willingness to hand over farmland outside the family. Moreover "new-comers" to farming may seek innovative, more "holistic"[10] farming approaches. Existing support measures are far too focused on singular production methods (the main beneficiaries of CAP payments is still the "active farmer"), which prohibits the support of outsiders, newcomers, and innovators in agricultural production and land use.

Support in farming should therefore become more open to other beneficiaries and target groups. Access to capital should be facilitated through venture capital, crowd funding or other alternative public-private financing formats.

Better support in accessing land (CAP, national and regional policies)

Supporting new entrants into farming and expanding the diversity of farming and agriculture requires ensuring access to land, and in some cases, necessitates increases in the amount of land used for the purpose of active agriculture. In many cases, the obstacles to obtaining land are financial and concern ownership rights. These can conflict with spatial planning concepts. Both the CAP as well as national and regional policies should strive towards exploring and alleviating any such obstacles. This applies in terms of granting access to land for new entrants. Farm succession outside the family as well as leasing land for agricultural use should be facilitated. The possibility to fund working capital as granted under the Omnibus Directive (Directive (EU) 2019/2161) does not fully cover this aspect, as it is not implemented homogeneously in all Member States. It may actually result in counterproductive effects of accumulating agricultural land in institutionalised farming (land grabbing).

Recommendation to improve the conditions for areas of natural constraints (ANC)

Enhance the capacity of areas of natural constraints (ANC) measures to cope with land abandonment issues (Pillar I and II)

The ANC measure is directed toward farmers in areas that face significant specific and natural constraints. In order to improve targeting, and the effectiveness of the ANC measure and instrument, payment volumes might be adjusted to take into account the risk of land abandonment, or the intensity of land abandonment, in the regions eligible and between the beneficiaries eligible for support. Applying this approach, ANC payments can be allocated with the consideration of land abandonment in a certain region, resulting in improvements to the effectiveness of the funding in counteracting land abandonment and mitigating its negative effects.

[10] „holistic" in the sense of combining food production with other forms of agricultural produce (e.g. raw materials for bio-economy/circular economy).

Recommendation to improve the conditions of forests farming

Allocations of the forestry measure (Pillar II)

It is important to ensure that the regions applying the forestry development and viability measure (EAFRD Measure 08) are those which can benefit most from the measure, and from improvements to forestry. Measure 08 supports the improvement of the viability of forests, and in practice, this measure has a different level of significance and intensity across different regions. Afforestation can contribute to mitigating climate change effects, protecting ecosystems and biodiversity in abandoned areas. This is particularly the case in regions which have deforestation, and when implemented between agricultural parcels, as forested green belts. Therefore, programming of this measure should be tailored to the different relevant vulnerabilities and needs in distinct regions. This is particularly important considering the impacts of climate change as well as mitigating negative effects of land abandonment.

Recommendation to adapt environmental measures

Environmental measures adapted to the effects of land abandonment

Land abandonment may have dual, positive and negative, effects on environment depending on the local specificities. These dual effects call for respective CAP measures to include environmental considerations in their design that can be adjusted to the effects of land abandonment. Land management systems should recognise when negative effects should be mitigated and when positive effects should be fostered. Through integrating more fundamentally important environmental practices, such policies should be able to nurture beneficial outcomes of ceasing the use of land for agricultural purposes.

Recommendation to improve Rural Communities

Improvement or rural services of general interest (SGIs) and infrastructure (Pillar II/ERDF)

Land abandonment is partly driven by a low quality of life experienced in specific rural areas which contributes to the depopulation of rural areas and to the perceived of unattractiveness of agricultural professions. In order to counteract these perceptions, it is necessary to intensify the support to rural services of general interest (SGIs) as well as rural infrastructure that contributes to improving living conditions for farmers and rural populations.

Exploring synergies between funds (ESIF)

There are important overlaps between different ESIF funds. Examples of these overlaps include EAFRD and ERDF or ESF in terms of SGI and infrastructure provision, and EAFRD in terms of training and education. These overlaps should be made explicit and should address the various contributions available from the different funds.

Such an approach would involve incorporating appropriate programming provisions that would allow combining funding sources for linked objectives and topics through the coherent and comprehensive preparation and detailing of the instruments contained within the diverse EU-funds. Problem issues like generational renewal, marginalization of remote areas and biodiversity decline are all related to

land abandonment and would require such a joint strategic approach. If this were incorporated, funds would have a higher impact as their resources would be combined to target common and systematic problems.

Land use and regional development policies (national and regional strategies)

Last but not least, it is necessary to highlight the importance of land use and regional development policies in the context of land abandonment. Land use, thus also land abandonment, is dependent on development policies. As a result, either the mitigation of land abandonment, or the mitigation of negative economic, social and environmental effects of land abandonment, can equally be addressed by regional policies. Adequate land use planning aligned with regional development policies may contribute to supporting agriculture and thereby mitigating land abandonment. Conversely, in cases where land abandonment results from a necessary or targeted encouragement of reducing agricultural activities in the region, appropriate policy support addressing the consequences of this policy direction should follow.

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This study examines the phenomenon of land abandonment, its consequences and mitigation. Using quantitative data, the possible future development of land abandonment, its historical evolution and state of play are outlined. Desk research and case studies are used to determine the drivers of the phenomenon, its effects and mitigation options among European policies, particularly the CAP. Three scenarios of future land use change are developed based on the findings of an internal workshop to help formulate conclusions and policy recommendations.

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