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Desertification in the European Union: too little too late?

BY

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Glossary of Acronyms

CAP	Common Agricultural Policy
COP 12	Conference of the Parties of the UNCCD (12th Session)
DG	Directorate-General
ECA	European Court of Auditors
EEA	European Environment Agency
EEAS	European External Action Service
EGD	European Green Deal
ERDF	European Regional Development Fund
EU	European Union
EUSF	The European Union Solidarity Fund
GHG	Greenhouse Gas
GSP	Global Soil Partnership
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change
JRC	Joint Research Centre
LDN	Land Degradation Neutrality
LULUCF	Land Use, Land-Use Change and Forestry
MAP	Mediterranean Action Plan
NAP	National Action Programme
SDG	Sustainable Development Goal
SFD	Soil Framework Directive
SOC	Soil Organic Carbon
SOM	Soil Organic Matter
TA	Thematic Analysis
UN	United Nations
UNCCD	United Nations Convention to Combat Desertification
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UN-OHRLLS	United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States
WFD	Water Framework Directive

Introduction

"We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect"

Aldo Leopold, 1949

Since ancient times, men have been subduing nature and bending its forces to their will. They have been exploiting the land for millennia, determined to allow it to serve no other purposes than human ones. As a result, land has today partially lost its practical utility. For thousands of years, practices such as hunting, foraging, land clearing and agriculture have been altering natural ecosystems, upsetting the balance of nature, and transforming societies. This power of human systems to transform the Earth in a destructive way has provoked the 'revenge of nature', as already observed in the late 18th and early 19th century (UNCCD, 2017). Deforestation, increased wildfire frequency, faunal extinctions, species invasions, soil erosion and degradation are just some of the consequences of man's exploitation of land resources. Paradoxically, man seems to forget that nature does not need people, but people do desperately need nature, whose ecosystems, however, are finite.

Land has always meant property, economic benefits, and financial rewards, but it has also been celebrated for its intrinsic and inestimable value in spiritual, aesthetic and recreational terms. Before this, however, land is a crucial source of life and men, with their unsustainable practices, have dramatically contributed to its deterioration. Today, human greed and material interests have accelerated climate change and altered natural processes, thus leading to the manifestation of extreme environmental phenomena in the most varied geographic areas. A complex and widely discussed problem which is spreading more and more as a result of human misuse and over-exploitation of land, is desertification.

Desertification – namely, land degradation occurring in dryland areas – is today an escalating concern in global drylands and an important problem worldwide (Bestelmeyer et al., 2015). It has been estimated that, every minute, 23 hectares of land – that is, 12 million hectares per year – are degraded globally (Rossi, 2020). Currently, one quarter of

the world's land area is either highly degraded or undergoing high rates of degradation (Heuser, 2018). Although desertification has been uniquely associated with African countries for a long time, the issue reaches far beyond those areas and is much closer to Europe than people may think. A recent report released by the European Court of Auditors in 2018(a) declares that desertification and land degradation are current and growing threats for the European Union (EU), with significant impacts on the environment, land and soil. It further argues that, even if the objective of the Paris Agreement will be achieved – namely, to limit global warming to well below 2°C – some regions will experience a dramatic increase in temperatures. At the same time, summer precipitation on the EU's Mediterranean coasts is expected to halve, the frequency of extreme weather events will most likely increase, and soil erosion is going to intensify. All these processes will further exacerbate the risk of desertification in the EU. At the moment, thirteen EU Member States declared themselves affected by desertification and implemented National Action Programmes (NAPs) to address the problem. Combating land degradation and restoring damaged lands is an urgent priority to protect soils and all those ecosystem services which are vital to life, and, accordingly, to human well-being (Montanarella and Panagos, 2020). Over time, the implementation of measures to prevent land degradation and the adoption of restoration measures will become more difficult and costly (IPBES, 2018), which means that immediate action is needed. From its side, the EU has not yet implemented an integrated strategy or an EU-wide framework on desertification, which, accordingly, remains a cross-cutting challenge for many policy areas, including climate, environment, agriculture, and research and innovation. Today, the EU is therefore addressing the problem through a range of indirect instruments that form the so-called 'acquis communautaire' of desertification and soil protection.

This study has a double objective. First, to understand the severity of desertification in the EU; second, and most important, to evaluate whether the current measures implemented at EU level are adequate to protect soils and address the risk of desertification. Accordingly, the following research question will guide this dissertation: *Is desertification a serious threat for Europe? In this respect, are EU policies adequate to properly address the problem or more should be done to prevent land degradation?* To answer to this question, this thesis will be structured in two main parts: a review of

the extant literature on the topic and an analysis of primary data directly collected by researcher. In order to add further value to this study and provide a complete, concrete and substantial response, qualitative interviews with researchers, policy officers, experts and deputies are therefore conducted.

Through a deductive approach, Chapter 1 outlines the theoretical framework of desertification. First, it focuses on the term 'desertification', its origins and its meaning, as well as on its causes and consequence. It thus presents the current situation globally and introduces the concept of 'Land Degradation Neutrality', with an analysis on the economic cost of land degradation. Second, the study delineates the problem of desertification in the European Union, the main soil degradation processes occurring in Europe and the current and future outlook. In particular, it provides an in-depth investigation of the EU most relevant policies to address the problem of desertification, including: the Soil Thematic Strategy, the Common Agricultural Policy, the Adaptation Strategy to climate change, the Forest Strategy, and the Water Framework Directive, as well as of a range of funding programmes. Overall, the second part of the chapter explores the extent to which all these policies and strategies contribute to protecting soils and preventing land degradation in drylands.

Chapter 2 is devoted to the methodology and details how primary data has been collected. It explains the type of research carried out, the sampling method and the process of data analysis, and it underlines the reasons for each methodological choice. Lastly, Chapter 3 elaborates on the data collected through primary research and relate them with the literature review provided in the second chapter, thus comparing secondary and primary data and pointing out any similarities and eventual discrepancies.

Chapter 1 – A theoretical framework: desertification and its impacts in the European Union

1.1 The concept of desertification

For a long time, land has uniquely been considered a central component to the state as it determines, inter alia, a country's geo-political influence and the size of its territory. Today, despite it maintains its importance for the state, land is also regarded for its bio-productive value and its social, environmental, and agricultural dimensions. Land does not only contribute to human well-being, but also to the health of the planet as a whole. In this age of population explosion and global climate change, the connection and dependence of humans on land is therefore undisputable. However, soils – one of the essential components of land – are under increasing pressure, they are losing their productive capacity and they are rapidly deteriorating. Today, degradation of the Earth's land surface threatens the well-being of billions of humans. Land degradation is indeed a global relentless problem resulting from the persistent reduction of biological and economic productivity of land-based ecosystems and services (Daussa, 2009; IPBES, 2018; Zhao, 2018). In other words, this process turns a fertile land into a less fertile or a non-productive land. According to Heuser (2018), over the last forty years, 30% of the world's arable land has become unproductive. Even though the degradation of the soil may occur in almost all terrestrial biomes, drylands are particularly susceptible to this phenomenon. Drylands, which have been defined as arid, semi-arid and dry sub-humid areas characterised by extreme low annual precipitation (UNCCD, 1994), currently make up the 40% of the terrestrial land mass and are home to approximatively 40% of the global population (Orgiazzi et al., 2016; Cherlet et al., 2018; IPBES, 2018). In practical terms, it has been estimated that more than three billion people reside in these lands (Nkonya, Mirzabaev and von Braun, 2016; IPBES, 2018; Mirzabaev et al., 2019). When land degradation occurs in drylands where productivity is already constrained, it is customary to talk about *desertification.*

The term *desertification* dates back to the first half of the twentieth century. However, the concept is more deeply rooted in history. It was indeed during the era of colonialism that settlers first started to notice episodes of desiccation in Africa (Herrmann and Hutchinson,

2005; Behnke and Mortimore, 2016). The actual term was then coined in the mid-nineties to describe the transformation of productive lands into desert as a result of human activities (Helldén, 2005; Herrmann and Hutchinson, 2005). Although this idea of desertification was broadly accepted, the notion has been at the centre of a huge debate for a long time. Still today, the coexistence of conflicting definitions and discordant assessment methodologies makes desertification a controversial and ambiguous term (Verón, Paruelo, and Oesterheld, 2006; Bestelmeyer et al., 2015). Currently, the most widely accepted definition – and the one that will be taken into consideration in the development of this dissertation – is that provided by the United Nations Convention to Combat Desertification (UNCCD), which defines desertification as 'land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities' (1994, p.3). In 2005, the Millennium Ecosystem Assessment further elaborated on this definition, specifying that desertification occurs only when there is a persistent reduction in the levels of all ecosystem services over an extended period. According to the report, indeed, 'fluctuation in the supply of ecosystem services is normal, especially in drylands' (p.4). Desertification therefore implies that the soil has lost part of its capability to sustain life and support ecosystems (European Environmental Agency, 2019). When it is severe, it may result in the loss of overall land productivity (Zhao, 2018). However, it is crucial to underline that desertification is reversible. Although some academics still mistakenly refer to desertification as a permanent and irreversible form of land degradation in drylands, it has been widely demonstrated that there is scope for remedial action. Throughout this paper, the notion of desertification will therefore be conceived as a reversible form of soil degradation occurring within specified geomorphic environments: drylands.

Desertification is today an escalating concern globally. According to the IPBES Report (2018), 2.7 billion people are affected by desertification worldwide and more than one tenth of the land area globally is desertifying, with economic losses amounting to 400 billion dollar a year worldwide (Heuser, 2018). For years, desertification has ranked amongst the greatest environmental challenges, and it is currently a major impediment to meet basic human needs in arid and semi-arid regions. As it denotes an environmental crisis consisting of land degradation, desertification is potentially one of the most

threatening ecosystem changes (Millenium Ecosystem Assessment, 2005, Rossi, 2020). Accordingly, the implementation of effective actions to combat land degradation and desertification is pivotal to transform the lives of million people and ensure human well-being. To date, the UNCCD is the only universal instrument that addresses this problem and provides an international legal framework to tackle the question of soil protection. Once parties to the UNNCD have determined that they are affected by desertification, they have to develop NAPs to address the issue. These NAPs, however, do not often have the weight of legal authority. This means that, despite the UNCCD is helping to drive legislation to support soils protection, the path to achieve a proper legislative framework, a real law, is still long (Byron-Cox, 2020).

The difficulty to combat desertification is further exacerbated by the lack of a uniform criterion and a standard methodology to assess the extent of land degradation. Reducing the spread of desertification requires permanent, continuous and consistent monitoring of degradation status at all scales. However, the complex nature of these phenomena makes it very difficult to understand them, and, consequently, to monitor and design effective programs and indicators (Prince, 2016; De Oliveira Galvão, de Brito Leite Cunha and Rufino, 2020). Moreover, the absence of a universal policy to protect soils makes it even harder to assess soil degradation and the impacts of soil management on long-term changes. Although some initiatives, evaluation frameworks and assessment methodologies have been developed over time to help delineating desertification, they have often been overly simplistic, inaccurate or unhelpful. Assessments of severity are limited and not adequate (Prince, 2016) and, the ones available today are mere crude approximations with considerable uncertainties (Mirzabaev et al., 2019). In addition, the coexistence of different methodologies and different indicators lead to divergent estimates of the extent of land degradation and desertification, thus negatively affecting societal perceptions and posing limits to the application of restoration efforts. The World Atlas of Desertification (Cherlet et al., 2018) indicates that, due to the complexity of interactions between social, economic, and environmental systems, it is not yet possible to map the extent of degradation and desertification at a global scale. Great efforts must be directed more and more to overcome these difficulties and, to obtain meaningful, repeatable and comparable assessments, a centralised monitoring and evaluation system

with standardised procedures and a uniform methodology must be developed (Stavi and Lal, 2015; Stolte et al., 2015; Wunder et al., 2018; De Oliveira Galvão, de Brito Leite Cunha and Rufino, 2020).

1.1.1 Causes and Consequences

Due to the strong connection between causes, interactions and consequences at different scales, explaining the process of desertification is a quite complex task (De Oliveira Galvão, de Brito Leite Cunha and Rufino, 2020). In the early-to-mid 20th century, the onset of desertification was exclusively attributed to human activities (Helldén, 2005; Herrmann and Hutchinson, 2005; Mirzabaev et al., 2019). However, this uni-casual view proved to be invalid and, as established by the UNCCD, desertification is the combined result of complex interactions among various factors, including both human activities and climate variations. Human-related pressures include overgrazing, deforestation, unsustainable agricultural management practices, over-exploitation of natural resources, contamination from industries and removal of vegetation. Due to deforestation and overgrazing, the vegetation is lost, the fertile and moist soil remains unprotected and soil erosion increases, thus leading to land degradation. This is further exacerbated by the adoption of poor irrigation techniques that reduce the overall water supply. All these actions are detrimental for soil health and lead to its destruction and to the loss of biological productivity.

Desertification processes are also expected to intensify and accelerate as a result of climate variations (Mirzabaev et al., 2019). The rise in average temperatures will lead to an increase in the frequency and intensity of extreme weathers events, such as drought and flooding, and to a decrease in precipitation, which will contribute to the loss of soil and moisture globally. The increased occurrence and the severity of drought events, in turn, requires increased water storage and can incite the explosion of wildfires, leading to soil loss of nutrients and to increased soil erosion. At the same time, desertification itself exacerbates climate change (ECA, 2018a; Mirzabaev et al., 2019) through changes in vegetation cover, the emission of greenhouse gases (GHGs) into the atmosphere and sandstorms (Mirzabaev et al., 2019) which have a direct impact on human health.

Both climate change and human-related activities result in diminished food production, soil infertility, reduced water quality, loss of biodiversity and a decrease in the land's natural resilience (ECA, 2018a, 2018b). In turn, this may cause poverty and a loss of livelihoods, thus obliging people to migrate. According to the UNCCD, more than 135 million people will be displaced by 2045 as a result of desertification – unless the problem is not seriously tackled. This will inevitably lead to land abandonment and to more far-reaching effects, including economic and environmental consequences. In general, in dryland zones, degradation starts with an alteration of vegetation and ill soil management and ends with the loss of vegetation and soil productivity. This weakens productive capacities and limits the ability to sustain populations living there, thus leading to migration, land abandonment and desertification.

Soil is the main actor in as well as the ecosystem suffering the most from desertification processes. Both climatic variations and human-related pressures are projected to increase water and wind driven soil erosion in many dryland areas. Soil erosion is considered the main form of land degradation, represents a considerable cost for the society – amounting to 400 billion dollars annually worldwide (Dragović and Vulević, 2020) – and entails a serious decline in soil organic carbon (SOC). Considering that SOC plays a central role in maintaining and preventing soil degradation, its loss causes a decline in soil quality and structure and increases atmospheric carbon level with following negative impacts on climate change and temperature rise. Erosion can be further exacerbated by compaction – the physical degeneration process of soil – which is essentially caused by human pressures such as heavy machinery in agriculture. In turn, compaction undermines soil functions, including soil fertility, water infiltration capacity, and biodiversity. Soil salinisation – the accumulation of salt in the soil with adverse effects on plant growth and agricultural production – is also one of the most widespread soil degradation phenomena (Dragović and Vulević, 2020; UNEP/MAP and Plan Bleu, 2020) which affects soil fertility, productivity, and resilience and reduces land use options (UNEP/MAP and Plan Bleu, 2020). Often triggered by human activities such as inappropriate irrigation, salinisation is projected to increase in the near future (Mirzabaev et al., 2019) and is a major cause of desertification. Land take by urbanisation and infrastructure expansion due to population growth is also decisive to the onset of desertification (Cherlet et al.,

2018) and continues predominantly at the expenses of agricultural land (EEA, 2019b, 2019c). This process by which semi-natural and natural areas are lost due to urban infrastructure and other artificial land development is referred to as soil sealing and is an extremely serious threat as it entails the complete and irreversible loss of soil functions and negatively contributes to climate change. As a consequence of soil sealing, pollution and the risk of floods increase, water flows are disrupted, groundwater is reduced, and land is lost (Dragović and Vulević, 2020). Humans are also responsible for soil contamination and chemical degradation resulting from industry, waste disposal, illegal landfills, military activities, mining and the disposal of hazardous materials.

1.1.2 Land Degradation Neutrality (LDN)

To increase efficiency and effectiveness in combating desertification, the UNCCD has introduced the concept of Land Degradation Neutrality (LDN). Land degradation is a pervasive, systemic phenomenon occurring globally. Currently, it impacts the well-being of more than 3 billion people (Nkonya, Mirzabaev and von Braun, 2016; IPBES, 2018; Mirzabaev et al., 2019) and costs more than 10% of annual global GDP in loss of biodiversity and ecosystem services (Cherlet et al., 2018; IPBES, 2018). Accordingly, land degradation does not only threaten biodiversity and human well-being, but it also entails considerable economic losses. When it comes to land degradation, studies reveal that the cost of inaction is at least three times higher than the cost of action and that the benefits arising from restoring a degraded land are ten times higher than the costs (IPBES, 2018). It has been estimated that allowing a land to degrade and then attempting to restore it costs around USD 490 billion per year (The Global Mechanism of the UNCCD, 2016). On the contrary, preventing degradation through sustainable land management can generate up to USD 1.4 trillion of economic benefits (The Global Mechanism of the UNCCD, 2016; IPBES, 2018). As preventing desertification is strongly preferable and more cost-effective than restoring the land once it has been degraded (Nkonya, Mirzabaev and von Braun, 2016; IPBES, 2018), there is a growing emphasis on preventing and reducing land degradation and desertification (Mirzabaev, 2019). Moreover, the absence of specific targets to halt and reverse land degradation and the difficulties to measure progress encouraged the UNCCD Parties to reach a breakthrough agreement on LDN in October 2015.

The concept of LDN was first introduced during the twelfth session of the Conference of the Parties of the UNCCD (COP 12) (The Global Mechanism of the UNCCD, 2016; Wunder et al., 2018) and was initially referred to as 'zero net land degradation'. In 2015, with the adoption by the UN General Assembly of seventeen Sustainable Development Goals (SDGs) to be achieved by 2030, the notion of LDN was integrated into SDG 15, which aims to 'protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss'. In particular, LDN is included as target 15.3 which is specifically oriented to 'combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods and strive to achieve a land degradation-neutral world'. Achieving LDN does not only entail halting or reducing the loss of fertile healthy soils whenever possible, but it is also about restoring land that has already been degraded (The Global Mechanism of the UNCCD, 2016; Wunder et al., 2018). The ultimate goal is to achieve a state of no net loss of healthy and productive land (The Global Mechanism of the UNCCD, 2016) by ensuring that the extent of degraded lands globally will decrease, or at least remain stable (Stavi and Lal, 2015). This means that, in the case land is degraded as a result of human activities, then an equal amount of degraded land must be restored (Byron-Cox, 2020). Overall, the rate of land degradation must not exceed that of land restoration (Stavi and Lal, 2015; Wunder et al., 2018).

The choice to achieve LDN by 2030 has represented a turning point for the recognition of land degradation as a serious global issue. Over time, the concept has received increasing attention at the international policy level. All the parties to the UNCCD, EU included, confirmed their commitment to achieving LDN by 2030 (ECA, 2018b) by minimising land degradation trends and adopting better and more sustainable land management practices to improve soil health and quality for present and future generations. Avoiding and reversing land degradation is decisive both to reduce the risk of desertification and to mitigate climate change through emissions reduction and increase in carbon sinking (De Oliveira Galvão, de Brito Leite Cunha and Rufino, 2020). Despite being seemingly ambitious, researchers argue that LDN could be achieved if a healthy balance of biologically and economically productive land is maintained (Stavi and Lal, 2015). Moreover, achieving this goal is considered a catalyst to achieve many

other SDGs relating to poverty, hunger and food security, water, natural resources and climate (The Global Mechanism of the UNCCD, 2016; Cherlet et al., 2018).

1.2 Desertification in the European Union

Although some of the most degraded areas in the world are to be found in South and East Asia, North Africa and the Middle East (Mirzabaev, 2018), more and more dryland regions globally are suffering the negative effects of land degradation. Europe is one of these. While land degradation is affecting all EU countries, the risk of desertification is today recognised only in certain European areas (ECA, 2018a). The Mediterranean region in particular, has been identified as one of the most vulnerable areas in terms of environment linkages (Daussa, 2009) and is today known as a global desertification hotspot (Prăvălie, Patriche and Bandoc, 2017). However, desertification is also experienced by countries in central and eastern Europe. Already in 2008, the European Environment Agency (EEA) estimated that 8% of the European territories – that is, fourteen million hectares – had a sensitivity to desertification ranging from 'high' to very 'high'. If considering lands with a 'moderate' sensitivity, the amount increases to forty million hectares (EEA, 2008). In 2017, a follow-up study based on the same methodology confirmed the unfavourable desertification trend in Europe (ECA, 2018b) and showed that areas with high or very high sensitivity to degradation were significantly larger than initially estimated. In less than a decade, these territories had increased by 177000 km^2: this is 75% more than the previous assessment (Prăvălie, Patriche and Bandoc, 2017). A year later, in 2018, thirteen out of twenty-eight Member States of the EU declared themselves at risk of desertification: Bulgaria, Croatia, Cyprus, Greece, Hungary, Italy, Latvia, Malta, Portugal, Romania, Slovakia, Slovenia and Spain (ECA, 2018b). Now that these countries have voluntary declared themselves to be affected by desertification, they must draw up national action programmes (NAPs) to combat desertification (ibid.). Although the EU as a whole did not declare itself as a party affected, the European Court of Auditors (2018a) identified desertification as a current and growing threat for the Union. The situation is particularly worrying in Portugal, Spain, Italy, Greece, Cyprus, Malta, Bulgaria and Romania (ECA, 2018a), where the effects of land degradation are severe.

The most common desertification processes occurring in the Mediterranean, central and eastern European countries are the following: soil erosion, loss of SOC, contamination, salinisation, soil compaction, soil sealing, loss of soil biodiversity and landslides (ECA, 2018a; Wunder et al., 2018; EEA, 2019a; EEA, 2019b). Today, 25-30% of EU agricultural land is either losing organic carbon, suffering from nutrients surplus, is eroding, is compacted, or is suffering from salinisation. An additional 30% of non-agricultural soils are eroding ad an unsustainable level (Veerman et al., 2020). Soil salinity, in particular, is considered as one of the major causes of desertification in the EU (Stolte et al., 2015; IPBES, 2018). Due to poor irrigation practices and scarcity of precipitation (Stolte et al., 2015; Cherlet, 2018), 25% of European irrigated cropland is affected by moderate to high salinisation, which in turn leads to soil degradation and significantly reduces lands' agricultural potential (Stolte et al., 2015). Soil erosion by water is also a main trigger of land degradation. Considered as one of the major threats to soils in the EU (Montanarella and Panagos, 2018) and the most visible and economically serious form of degradation process (Cherlet, 2018), soil erosion has a detrimental impact on ecosystem services, crop production, drinking water quality, biodiversity, and carbon stocks (Panagos and Borrelli, 2017; Montanarella and Panagos, 2018). Today, erosion is affecting 25% of agricultural land in the EU (Veerman et al., 2020). This is above accepted soil formation rates, which means that soil will continue to degrade unless measures are reinforced (Maes et al., 2020). A study conducted by Panagos et al. (2018) reveals that, in economic terms, the cost of soil erosion in the EU amounts to €1.25 billion in annual agricultural productivity loss and to €155 million in GDP loss. In particular, it has been estimated that the Mediterranean area has a very high erosion rate: the soil loss of Cyprus, Spain, France, Greece, Hungary, Italy, Malta and Portugal indeed accounts for 67% of total soil loss in the EU (UNEP/MAP and Plan Bleu, 2020). Soil sealing and land take are also serious problems across the EU. Between 2000 and 2018, 78% of land take in the EU-28 affected arable lands, pastures, and mosaic farmlands (EEA, 2019c). Although some land was recultivated in that period, the amount of land taken was eleven times higher. For this reason, it is unlikely that the EU will meet the target of 'no net land take' by 2050 (EEA, 2019b), which means that land return to cultivation should be more than the amount of land taken. This objective was proposed by the European Commission (hereinafter Commission) in the EU Environment Action

Programme to 2020 (7th EAP) to mitigate the effect of urban sprawl and to support the LDN target of the UNCCD. However, slowing trends indicate that, if appropriate measures are taken, land take is reduced and land recycling increases, the targets could eventually be reached (EEA, 2019b). Overall, the European soil is seriously threatened: soil salinity and soil erosion are expected to increase in the coming future; soil contamination is already widespread and thresholds have been exceeded with 60% of Europe's land polluted by industrial activities (EEA, 2019b); SOC in cropland topsoils is decreasing (Wunder et al., 2018) with negative consequences on ecosystem services and biodiversity; pollution is diffused, with 14% of polluted sites requiring remediation (European Commission, 2020b); and land take and soil sealing continue insistently at the expense of agricultural land, thereby jeopardising the achievement of the 2050 target of no net land take (EEA, 2019b).

In the coming future, Europe will also be increasingly affected by a rise in extreme weather events such as drought, heatwaves, floods, and heavy precipitation (ECA, 2018b; EEA, 2019a, 2019b; Casajus Valles et al., 2020). Today, economic losses from extreme weather in the EU already account for more that €12 billion per year (European Commission, 2021a). These episodes will have severe implications on land degradation and water availability and will eventually determine an increase in the occurrence of desertification processes (Daussa, 2009; EEA, 2019a). The Mediterranean region, in particular, is highly vulnerable since it is predominantly characterised by an arid, semi-arid and dry-sub humid climate. However, extreme climate events are not confined to Southern Europe, but are predicted to increase in frequency over several parts of the globe, including Northern European countries. Although the agricultural sector in these countries is only marginally affected by soil erosion losses (Panagos et al., 2018), wind erosion is especially problematic in Northern Germany, the Netherlands, England and the Iberian Peninsula (Stolte et al., 2015; Montanarella and Paganos, 2018; Wunder et al., 2018). Moreover, high levels of nitrogen concentration are found in Germany and the Netherlands with subsequent considerable negative impacts on biodiversity and water and air quality. A study conducted in 2020 (Golub et al.) shows that, in the last decade, the exposure to extreme events has dramatically increased its intensity in Northern Europe. In 2018, an intensive and enduring heatwave and long-lasting droughts affected countries

in the North and Centre of Europe. Germany, for example, experienced a severe drought for more than six months. These episodes of extreme climate conditions had important repercussions on crop yields, which suffered a reduction of up to 50% in the North (Toreti et al., 2019) with serious consequences for land productivity, water availability and biodiversity conservation (EEA, 2019a). The long period of high temperatures and low precipitation in summer 2018 not only highlights the adverse impacts of climate change, but also puts emphasis on the pressing importance of desertification. The transformation of drylands into hot semi-deserts is not any longer a phenomenon confined to South Europe, but it is more and more extending northwards (ECA, 2018a). It has been estimated that droughts as severe as 2018 could become the norm as early as 2043 (Toreti et al., 2019). The frequent occurrence of these extreme weather events in countries where certain phenomena were previously anomalies shows that that the risk of desertification is increasing.

1.3 European policies to combat desertification

Although the EU does not have a dedicated strategy to combat desertification or to tackle land degradation, there are several programmes, policies and action plans which address some of the causes directly associated with desertification (ECA, 2018a). Considering that desertification is the result of many interrelated problems, action is required in a variety of fields. For this reason, there are currently four main Commission services that deal with desertification in the EU: the Directorate-General for the Environment (DG ENV), for Agriculture and Rural Development (DG AGRI), for Climate Action (DG Clima) and for Research and Innovation (DG RTD). The Directorate-General Joint Research Centre (DG JRC) also plays an instrumental role in collecting and monitoring data on desertification, on soil threats and on climate. It also provides scientific background information and develops indicators for assessing and mapping land degradation (ECA 2018a, 2018b).

Despite some action has been taken at the EU level to counteract desertification, the problem is not yet effectively and efficiently addressed, according to a report launched in 2018 by the European Court of Auditors. The ECA (2018a) assessed that the Commission does not have a clear picture of the challenges posed by desertification and that the steps

taken lack coherence. It also claimed that, although the range of strategies, action plans and programmes the EU is implementing can have a positive impact in the fight against desertification, they are not sustainable in the long-term. Moreover, the NAPs implemented by the thirteen EU Member States who declared themselves affected by desertification are not effective as they are not fully integrated into national planning processes and not enough technical and financial resources have been deployed (ECA, 2018a). The report finally claimed that the Commission has not yet demonstrated tangible progress towards achieving LDN by 2030 (ibid.). This is due to the fact that the Commission and the Member States have not been able to come up with a full assessment of desertification and land degradation in the EU, and no methodology has been agreed on how to do this. It is therefore not clear how the EU will manage to achieve LDN by 2030. To improve the commitment to combating desertification, the auditors recommended to the Commission to improve understanding of land degradation and desertification in the EU, to enhance the EU legal framework for soil, and to step up efforts towards achieving LDN.

Other studies reveal the same concerns about the EU's ability to address the degradation of natural systems and call the Commission to increase action on soil. The failure to achieve the majority of the 2020 targets put forward in the Biodiversity Strategy is one of the main reasons. A decade-long plan, the Biodiversity Strategy for 2020 aimed at halting the loss of biodiversity and ecosystem services (EEA, 2019b; Maes, 2020). However, despite the significant efforts undertaken, biodiversity keeps rapidly declining across the EU and degradation of ecosystems and services insistently continues. According to the European Environment Agency (2019b), most of EU 2020 targets dedicated to protecting, maintaining and enhancing natural capital have not been achieved. The EEA (2019b) also argues that the premises for 2030 are not encouraging and that achieving SDGs related to protecting natural ecosystems, including SDG 15, will be very unlikely. Again, also the EEA calls for the EU and the Member States to step up their efforts. Lastly, requests for action on soil also come from within. The Council of the European Union (hereinafter Council) and the European Parliament (hereinafter Parliament) stress the need to address desertification in the EU and call the Commission and the Member States to make stronger commitments. In April this year, for instance, the Parliament adopted a

resolution on soil protection, which – among other things – makes a specific reference both to the problem of desertification in the EU and to the UNCCD. In particular, it underlines the necessity to better understand the processes leading to land degradation and desertification and to establish a methodology and relevant indicators to assess the extent of these phenomena (European Parliament, 2021).

Despite these pessimistic scenarios, the launch of the new ambitious European Green Deal (EGD) seems to provide the opportunity for the EU to increase actions and make progress in halting desertification. The proposal for the EGD was put forward by the President of the Commission Ursula von der Leyen in December 2019 with the main goal to make Europe the first climate-neutral continent by 2050. To achieve this objective and transform the EU's economy for a sustainable future, the Commission presented a roadmap of necessary key policies and measures. Although the EGD makes no specific reference to desertification, some of the main points of the Commission plan – such as the Biodiversity Strategy for 2030, the Farm to Fork Strategy and the Zero Pollution Action Plan – are indirectly relevant for tackling the problem. Overall, the EGD has seemingly opened a window of opportunity for the EU to develop more ambitious policies to better address those severe environmental problems, including desertification, which are currently posing serious threats to people and the planet.

1.3.1 EU Soil Policies

Soils are essential to deliver basic and valuable services: they provide food, energy and raw materials, store carbon, purify water, regulate nutrients and control pest (European Commission, 2020b). Thus, they are paramount to sustain ecosystem health and to mitigate climate change, to protect human health and to ensure food security (EEA, 2019a; European Commission 2020b). At the same time, soils are non-renewable resources in that their formation and regeneration undergo a very slow process (Stolte et al., 2015; Heuser, 2018; Rossi, 2020). This means that they must be adequately protected and conservated to ensure they can fulfil their manifold functions. However, as portrayed by the IBPES Assessment Report (2018), the Special IPCC report on Climate Change (Mirzabaev et al., 2019) and the European Environment Agency's Report (2019b), soils are dramatically deteriorating both at European and at global level. They have become

less fertile and provide scarce amounts of nutrients to plants, animals, and people with negative consequences on food production, land's natural resilience and water quality (Baritz et al., 2018). An analysis of the state of soil reveals that 60-70% of EU soils is unhealthy as a result of current management practices (Veerman et al., 2020). Today, soil capabilities are globally threatened, and considerable soil threats have been recognised at EU level. To overcome this problem, the EU has showed clear international commitments and work with its partners and the international community to address the soil- and land-related challenges. Not only the EU has committed to achieve SDG 15.3, but it is also a party under the Convention for Biological Diversity (CBD), the UN Framework Convention on Climate Change (UNFCCC), the UNCCD, and the Global Soil Partnership (GSP) – all of these calling for action related to soil and land.

To promote a sustainable use of soil and to preserve its functions at the EU level, in 2006 the Commission adopted a Thematic Strategy for Soil Protection (Wunder et al., 2018; ECA, 2019b). With this strategy, the EU first recognised the multifunctionality of soils (Montanarella and Panagos, 2018) and acknowledged that soil degradation processes can ultimately lead to desertification (ECA, 2019b). The EU Soil Thematic Strategy is based on four main pillars: raising awareness on the need to protect soils, increasing research, integrating soil protection into national and EU policies, and developing a framework legislation to protect soils. It identifies seven main soil functions and eight different types of soil threats, including soil erosion, decline in organic matter, contamination, sealing, compaction, decline in biodiversity, salinisation, floods, and landslides (Ginzky, 2018). Each threat must be managed differently with targeted action plans, and each function must be protected for future generation. The ultimate goal is to restore degraded soil, ensure the maintenance of soil quality and health in the long-term and prevent further degradation, thereby striving to achieve the UN SDGs. However, the 2006 Thematic Soil Strategy is today outdated and no longer adapted to the policy context: soils are facing ever greater pressure globally, from sealing to contamination, and they are going towards further deterioration by 2030 (EEA, 2019b, 2019c). Thus, a new policy framework based on new scientific evidence and in line with the objectives of the SDGs, the Paris Agreement and the EGD is needed to handle current environmental threats (EEC, 2019b; European Commission, 2020b; Montanarella and Panagos, 2020).

Alongside with the Soil Thematic Strategy, the Commission launched a proposal for a Soil Framework Directive (SFD) – the fourth pillar of the Soil Thematic Strategy. In order to contribute to halting desertification, the proposed directive required Member States to identify areas at risk of degradation, define targets for soil protection to implement programmes to achieve these objectives and to combat the risks (Raffelsiefen and Strassburger, 2017; ECA, 2018a; Heuser, 2018; Wunder et al., 2018). The idea was that land users who significantly hamper soil functions are obliged to take responsibility and to minimise the adverse effects (Stolte et al., 2015). However, efforts to establish a universal 'Soils Framework' were unsuccessful: despite several submission attempts, the proposal was prevented from advancing by a blocking minority in the Council, including Germany, France, the Netherlands, the UK and Austria. To understand why this has happened, it is necessary to make a preliminary remark: pursuant to Article 4 of the Treaty on the Functioning of the European Union (TFEU), the environment is a shared competence between the EU and the Member States. Soil belongs to the area of environmental policies, whose legislative proposals undergo a co-decision procedure and whose decisions in the Council are taken by qualified majority voting. Accordingly, the veto of certain countries may stop a proposal from further advancing. In the case of the SFD, the arguments leading to the veto focused on the problem of subsidiarity, limited additional value of EU action and administrative costs (Wunder et al., 2018). Pursuant to Article 5 of the Treaty on European Union (TEU),

> Under the principle of subsidiarity, in areas which do not fall within its exclusive competence, the Union shall act only if and in so far as the objectives of the proposed action cannot be sufficiently achieved by the Member States, either at central level or at regional and local level, but can rather, by reason of the scale or effects of the proposed action, be better achieved at Union level.

As the environment – and soil – is a shared competence between the EU and the Member States, the scope of action of the EU is limited by the principle of subsidiarity. According to Heuser (2018), however, justifying the refusal of the SFD by means of this principle was a false counterargument and a mere excuse. Although it might be argued that soils have a strong local dimension which requires local action, there is a whole range of reasons in favour of EU-wide measures: the multifunctionality of soil, the transboundary consequences of soil erosion and contamination; and the close link between soil

degradation and other environmental problems, including climate change (Heuser, 2018). Nevertheless, after many years that the proposal for the SFD was in abeyance, the Commission officially withdrew it in 2014. Although Member States could nationally implement voluntary instruments to address soil degradation, the withdrawal of the SFD left the EU without a legal basis to protect soils and implement effective strategies (Stolte et al., 2015; Montanarella and Panagos, 2018). The absence of an EU integrated legislation in this field has been a major limitation to effectively address the problem of desertification in Europe. Indeed, this entails that there is no legal obligation at EU level to collect or update data for monitoring desertification and land degradation (ECA, 2018a), whose status and extent is therefore unclear because of unreliable or missing information. A study conducted in 2018 (Wunder et al., 2018) concluded that the failure to adopt the SFD has represented a lost opportunity to create a common understanding and a single vision around soil protection in the EU. Moreover, the study also pointed out that even existing national legislation to protect soil failed to prevent desertification and degradation. The EEA (2019b) also confirmed that the lack of a comprehensive and coherent policy framework to protect soil in Europe is a key gap that undermines the effectiveness of the existing measures and limit the EU's ability to achieve future goals, including LDN by 2030.

Although the proposal for the SFD has been withdrawn, it is crucial to mention that there are other EU policies affecting the management and protection of soil (Raffelsiefen and Strassburger, 2017). There are indeed several EU policies, legislation and fields of environmental law that are indirectly contributing to soil protection. The 2004 Environmental Liability Directive, for instance, establishes that operators carrying out environmental damage – that is, damage to protected species, natural habitats, water and soil – are liable for remediation. The aim of the directive is therefore to establish a liability regime with regard to preventing and remedying to damages to the environment (European Commission, n.d.a; Raffelsiefen and Strassburger, 2017). The 2010 Directive on industrial emissions regulates pollutant emissions from industrial installations. It prevents and controls pollutant entries into air, water and soil with the main goal to protect human health and the environment and to ensure that the operation of an installation does not deteriorate the quality of soil. The Sewage Sludge Directive encourages the use of

sewage sludge in agriculture, but at the same time ensures that its use does not have harmful effects on soil, vegetation, animal and people (European Commission, n.d.a). Moreover, the EU has also adopted regulations on fertilisers and on mercury to protect human health and the environment and to minimise soil pollution. The Environmental Impact Assessment Directive is also relevant for soil protection, since it assesses the direct and indirect environmental effects of a project on several factors, including soil (European Commission, n.d; Raffelsiefen and Strassburger, 2017). Most importantly, the role of the LULUCF – the Land Use, Land Use Change and Forestry Regulation – is paramount in the mitigation of climate changes and to safeguard soils. This regulation focuses on the anthropological use of land and identifies agriculture, forestry and other land use – including wetlands – as a significant net source of GHG emissions. For this reason, LULUCF sets a binding commitment for each Member State to ensure that emissions from land use are compensated by an equivalent removal of CO_2 from the atmosphere (European Commission, n.d.a). Although all these policies and laws do have an effect on land and soil, they actually have different aims and scopes of action: soil is just a secondary consideration in broader environmental legislation (Heuser, 2018). This means that soil protection is only addressed as a consequence of delivering environmental objectives that are not explicitly soil focused. For a long time, the EU has therefore relied on fragmented soil's policy provisions dispersed across a variety of environmental policies and incapable to provide a coordinated and complete action to safeguard soil health and quality. The situation remained unchanged until recently. The launch of the EGD, indeed, paved the way for new ambitious objectives to protect soils.

1.3.1.1 Soil and land in the European Green Deal

Soils and sustainable land management are instrumental to achieving climate neutrality by 2050 and therefore to the success of the EGD (Montanarella and Panagos, 2020). For this reason, the Commission has incorporated soils and a sustainable soil management framework within several strategies of the EGD. Soils are explicitly mentioned in the Farm to Fork Strategy and the Zero Pollution Action Plan and are also extremely relevant for the Biodiversity Strategy and the European Climate law (ibid.). As one of the main elements of the EGD, the Farm to Fork Strategy implements measures to preserve soil quality and to limit soil contamination with the ultimate goal to ensure that food remains

healthy, nutritious, of high quality and with minimum impact on nature. For this to happen, the strategy proposes to reduce the use of chemical pesticides by 50% and the use of more hazardous pesticides by another 50% by 2030 (European Commission, 2020a). With this action plan, the Commission will also act to reduce the use of fertiliser by at least 20% by 2030 (ibid.) and to halve nutrient losses. Since the excess of nutrients is a major cause of air, soil and water pollution (ibid.), the purpose is to avoid the emission of excessive nutrients in the environment while ensuring that soil fertility does not deteriorate. To further prevent and remedy to the generation of pollution in air, water and soil, the Zero Pollution Action Plan will ideally contribute to create a toxic-free environment (European Commission, 2019b). Soil policies also play a key role in the fight against climate change. Managing soil sustainably provides multiple benefits, including the preservation and increase of soil organic matter (SOM), which is a crucial element for soil health. Healthy soils, in turn, store large quantities of carbon in the form of SOC, thereby supporting climate change mitigation and adaptation. Considering that soils are the world's largest terrestrial carbon pools and that 70 billion tons of carbon are stored in European soils, even small losses can have huge effects on GHG emissions (Heuser, 2018). For this reason, soils are an important element of the European Climate law, which includes plans to maintain wetlands and to reduce CO_2 emissions included in the agricultural sector. Finally, in May 2020 the Commission also adopted the new EU Biodiversity Strategy to protect nature and reverse the degradation of ecosystems (Montanarella and Panagos, 2020). Also in this context, the importance of preserving soils from deteriorating is undeniable: soils indeed host one fourth of the world's biodiversity. Among the soil-related targets, the strategy aims to protect at least 30% of the EU's land area, to limit soil sealing and urban spawl, to bring back at least 10% of agricultural area under high-diversity landscape features, to make sure that a minimum of 25% of the EU's agricultural land is organically farmed, to remedy to contaminated soil sites, to reduce land degradation and to plant more than three billion trees in the EU by 2030 (Montanarella and Panagos, 2020). Most importantly, as part of the Biodiversity Strategy, the EU announced the update of the 2006 EU Soil Thematic Strategy and, in November 2020, published the roadmap for a new EU strategy to combat soil degradation and preserve land resources.

The public consultation for the new Soil Strategy was launched in autumn 2020 and lasted thirteen weeks, until the end of April. Commission adoption is expected in the second quarter of 2021. The new Soil Strategy, which strives for *healthy soil for a healthy life*, builds on substantial knowledge base compiled at EU and international level. It aims to address soil- and land-related issues in order to achieve land degradation neutrality by 2030 (DG ENV, 2021). With this purpose, the EU will step up efforts to protect soil fertility and biodiversity, to reduce soil erosion, urban sprawl and sealing, to increase SOM and to restore carbon-rich ecosystems (European Commission, 2020b). Most importantly, for the first time, the strategy will provide a concrete pathway towards addressing the growing threat of desertification in the Union. To achieve all these objectives, the EU is planning to adopt sustainable soil management practices, to restore degraded soil and to improve monitoring systems to evaluate soil quality and identify contaminated sites. Alongside the other EGD initiatives, the Soil Strategy will steer action in different soil-related policy areas and will cover several key horizontal aspects, such as funding, research and international cooperation. The Soil Strategy will therefore improve the common EU policy framework with clear objectives and a targeted action plan. This will increase legal certainty for European companies and citizens and will foster a common understanding and a clear vision for soil protection and restoration in the EU (ibid.). Moreover, investing in sustainable soil management practices, in the prevention of land degradation, in the remediation of contaminated sites and in land restoration will provide a substantial return on investment as the cost of inaction considerably outweighs the cost of action (Nkonya, Mirzabaev and von Braun, 2016). The new Soil Strategy is therefore opening a new window of opportunity to strengthen and revive EU land and soil policies, which have seen little momentum after the withdrawal of the SFD proposal in 2014.

1.3.2 The Common Agricultural Policy

One of the most relevant policies for desertification is the Common Agricultural Policy (CAP) (Raffelsiefen and Strassburger, 2017; ECA, 2018a). Intensive agriculture and cropland expansion are major drivers of soil degradation and the CAP, as the key funding source and the central policy instrument for rural land management in the EU, can have positive effects on agricultural soils, thus providing solutions to land degradation. The

CAP supports farmers and improves agricultural productivity, sustainably manages natural resources, tackles climate change in the pursuit of climate change mitigation and adaptation, and maintains rural areas and landscapes across the EU. For over 50 years, the CAP has been distributing subsidies to European farmers. For the period 2014-2020, it had at its core three main elements directly relevant for soil protection: cross-compliance conditions, greening measures, and rural development programmes. The cross-compliance provision imposed conditions on farmers: in order to obtain full direct payments from the EU, good agricultural and environmental conditions must be respected. These include requirements for soil protection and to prevent soil degradation, such as maintaining minimum soil cover, managing land sustainably to limit erosion, and preserving SOM (ECA, 2018a). In addition to this, the CAP introduced a greening payment, granted upon fulfillment of certain requirements to enhance the environment and upon provision of sustainable farming practices (Stein et al., 2016; Raffelsiefen and Strassburger, 2017). Finally, each Member State was required to prepare Rural Development Programmes (RDPs) to contribute to environmental protection, climate adaptation and mitigation and thus, indirectly, to the protection of soil quality. All these instruments, by addressing the possible negative impacts of certain farming practices, may prevent damages to soil and ensure its protection.

The architecture for the CAP 2014-2020 shows the policy's potential to play a very important role in addressing desertification. However, some limitations have been identified. The current CAP grants Member States significant flexibility in applying the policy at national and regional level. On the one hand, this increases opportunities, on the other hand it adds complexity in assessing land use and land degradation. Problems incur also with the assessment of cross-compliance. Due to a lack of available information, the Commission has not been able to adequately evaluate the overall effectiveness of the measure (ECA, 2018a). Despite cross-compliance is apparently positively contributing to reducing nutrient emissions, maintaining SOM and protecting soils from erosion, there is still non-compliance by farmers and cases of infringement (EEA, 2019b). Moreover, greening is basically considered an inefficient policy instrument lacking clearly defined and ambitious targets. According to the ECA (2018a), as currently implemented, greening will most likely not provide benefits for environment and climate. The main concern is

that direct payments may intensify agricultural practices, potentially leading to SOM loss, reduction in soil water retention and land use changes. Overall, although the CAP contains some beneficial measures, there is still room for improvement, especially in the field on soil protection measures (Wunder et al., 2018). The new proposed CAP for 2023-2027, in line with the EGD, will apparently have a stronger focus on soil protection, with higher standards for soil care and quality. The sustainable management of soils will indeed be a crucial component of the nine objectives of the new CAP.

1.3.3 EU Adaptation Strategy

Together with the CAP, the EU Adaptation Strategy for climate change is considered the most relevant tool to address desertification. As climate change is an important trigger of desertification, indeed, the strategy may contribute to combat the phenomenon. Adopted by the Commission in April 2013, the EU Adaptation Strategy recognises combating desertification as one of the climate change adaptation actions to be supported (ECA, 2018a). Overall, it aims to enhance resilience and preparedness for current and future climate impacts by integrating adaptation actions into key EU sectors (IPBES, 2018; EEA, 2019a, 2019b). Unlike mitigation strategies, which limit the rate and magnitude of climate change (UNEP/MAP and Plan Bleu, 2020), adaptation entails anticipating the adverse impacts of climate change and taking action to prevent or minimise the damages that may incur (European Commission, 2013; EEA, 2019b). Although adaptation gained ground much later than mitigation, it is today relatively advanced: adaptation strategies to climate change are mainstreamed in the EU and most Member States have adopted national adaptation plans. The evaluation of the EU Adaptation Strategy launched by the Commission in 2018, indeed, received a positive response and concluded that, thanks to the strategy, considerable progress in climate-proofing key EU policies have been made. However, at national level, only eight out of the thirteen Member States who declared themselves affected by desertification had included specific actions against desertification in their climate change adaptation strategies as of November 2018 (ECA, 2018a).

Adaptation strategies are linked to the causes and the drivers of vulnerabilities and are normally focused on water, agriculture, energy, health, or buildings (Roka, 2020).

Measures such as optimising the use of scarce water resources, building flood defence, and developing drought-tolerant crops and forestry practises less vulnerable to storm and fires all contribute to prevent the risk of desertification. Of particular relevance are adaptation measures in response to extreme weather events. It has indeed been broadly demonstrated that, if no adaptation measures are taken, climate change will significantly increase the impacts of floods, droughts and wildfires (Casajus Valles et al., 2020). Considering that the occurrence of climate extremes will dramatically increase and intensify over the next years (ECA, 2018b; EEA, 2019a, 2019b; Casajus Valles et al., 2020) with severe implications on land degradation and desertification, adaptation measures will play a fundamental role in mitigating and reducing the impacts. Adaptation strategies are also crucial to protect soils functions. According to Montanarella and Panagos (2020), soils must be included in adaptation and mitigation strategies to address their full potential. In this context, ecosystem-based adaptation measures contribute to repairing ecological damage through conservation, restoration, and sustainable soil management practices. It has indeed been demonstrated that soil conservation measures such as cover crops and reduced tillage diminish soil loss, support agricultural productivity, and preserve soil fertility (EEA, 2021). Overall, adaptation to local climate variability is crucial in order to avoid, reduce or restore degraded lands and is instrumental to the achievement of land degradation neutrality in Europe (De Oliveira Galvão, de Brito Leite Cunha and Rufino, 2020). Already in 2014 at COP 12, the Parties acknowledged that the conservation, sustainable use and restoration of ecosystems as part of an overall adaptation strategy can play a significant role in combating desertification and in reducing climate extremes (EEA, 2021). The UNCCD also recognised the importance of ecosystem-based adaptation in drylands in order to mitigate droughts and prevent desertification (ibid.). Finally, adaptation practices such as retaining and restoring forest cover reduce the risk of soil erosion and forest fires and contribute to protecting biodiversity, improving water quality, increasing resilience to climate extremes and improving soil conditions. The EU Adaptation Strategy also plays a fundamental role in agricultural risk management and water use (Casajus Valles et al., 2020). Since the agricultural sector is one of the biggest contributors to climate change (Roka, 2020), the EU Member States have defined this sector as a priority in their national adaptation plans (EEA, 2019a). Practices at farm level can contribute to alleviate drought stress and to

reduce soil compaction and erosion (EEA, 2021), as well as to improve the management of soils and water. However, it remains unclear whether adaptation is happening fast enough to ensure sufficient capacity to cope with future climatic changes (EEA, 2019b).

Although the 2013 EU Adaptation Strategy was positively assessed, there is still room for improvement. As a consequence, in February 2021 the Commission adopted a new, more ambitious strategy on adaptation to climate change. The new adaptation strategy comes at a moment when there is a need to deepen and expand the Union's adaptive capacity in line with the Paris Agreement and the other European Green Deal initiatives, with particular regard to the European Climate Law. As part of the strategy, nature-based solutions will be improved and implemented on a larger scale. These are essential for sustaining healthy water, oceans and soils (European Commission, 2021a) and will provide several benefits in the restoration of soil functions, in carbon sequestration and in the maintenance of a good ecological status.

1.3.4 EU Forest Strategy

Today, forests account for 30% of the earth's land surface and cover about 45% of EU land (European Commission, n.d.b), thus making Europe one of the most forest-rich areas in the world. According to Cherlet et al. (2018), more than 25 % of all global forests are managed specifically for soil and water protection. The forest cover protects the soil against erosion and acts as a strong carbon sink, thereby serving an essential function in the prevention and reduction of land degradation. For this reason, forests play a pivotal role in combating desertification (ECA, 2018a). Furthermore, healthy tree-based landscapes contribute to disaster risk reduction by providing protection against extreme weather events such as droughts, fires, flood, and landslides (EEA, 2021). However, as a result of climate change and human activities, forest ecosystems are under increasing pressure (EEA, 2021; European Commission, n.d.b). The unsustainable exploitation of forest products such as timber and fuelwoods for economic consumption and the increasing demand for land strongly contribute to forest decline. This is exacerbated by intensive forest management practices. Moreover, changes in climate conditions are expected to increase the frequency and intensity of natural and human-induced disturbances, such as storms, fires and insect infestations (EEA, 2019b; EEA, 2021).

Europe, especially the Southern part, will be affected by more frequent and intense forest fires and longer fire seasons as the climate becomes warmer and the occurrence of heat waves and droughts increases (EEA, 2021). It has been estimated that the burnt area in Southern Europe could more than double over this century (EEA, 2019b). Severe wildfires, in turn, have catastrophic impacts on the ecosystem structure: they may remove SOM and result in soil erosion and in the loss of nutrients and biodiversity. This, consequently, may turn forests from carbon sinks into carbon sources. According to the Commission itself, forest fires have contributed to increase the risk of desertification (ECA, 2018a).

Climate change, human-related activities and increasing demand for forest resources may result in forest degradation, deforestation and loss of biodiversity. Deforestation – the irreversible destruction of natural woodlands as a result of human activities and natural hazards – is considered both as a type of land degradation (Cherlet et al., 2018) and as one of the main drivers of land degradation and desertification (Davis, 2016; UN-OHRLLS, 2016; ECA, 2018a; IPBES, 2018; Casajus Valles et al., 2020; Dragović and Vulević, 2020). The conversion of forested land into non-forested land has disastrous consequences on the ecosystem balance and on soil functions: it does not only destroy habitats and biodiversity (Orgiazzi et al., 2016), but it also determines the decline and possible permanent loss of soil fertility (UN-OHRLLS, 2016). Deforestation accelerates the rates of soil erosion (Orgiazzi et al., 2016; Cherlet et al., 2018; Dragović and Vulević, 2020) and reduces the forests' carbon-storage capacity, thereby affecting land productivity and possibly contributing to the onset of desertification. Forest degradation – the loss of the natural woodlands' capacity to provide their essential goods and services – is estimated to be even higher than deforestation. Both phenomena can seriously disrupt normal weather patterns thus increasing drought and crop failures, limiting tree growth and leading to rising tree mortality. Despite these events are not new, the current pace of destruction is alarming. Today, natural undisturbed forests in Europe accounts for less than 4 % of the total forest area (EEA, 2021) and less than one third of EU forest habitats is in favourable conservation status (EEA, 2019b; Maes et al., 2020). Deforestation and forest degradation threaten the EU capacity to meet its international commitments in several policy areas and are a key driver of land degradation. However, sustainable forest

land management and adaptation measures can at least partially offset the negative consequences and well-implemented forestry projects help preventing and reducing land degradation.

To protect forests and cope with the related challenges, the Commission has been implementing policies and strategies for decades. The most recent one, a brand-new EU Forest Strategy for 2030, has just been adopted by the Commission as part of the Biodiversity Strategy and is one of the flagship initiatives of the EGD. Sustainable forest management lies at the core of this strategy, which aims at strengthening forests' protection, restoration and resilience. The evidence shows that procedures such as reforestation and forest restoration can reverse the loss of tree cover and help restore soil fertility, therefore improving soil structure, reducing the risk of soil erosion and contributing to halting land degradation. Unsustainable practices and unmanaged forests, on the contrary, are one of the main drivers of desertification. Most importantly, the new Strategy stresses the strong interdependence between forests and soils: 'the soil properties and soil ecosystem services must be protected as the very foundation of healthy and productive forests' (European Commission, 2021b, p.12). Finally, as part of the Strategy the Commission will also put forward a legislative proposal to establish, for the first time, an EU-wide forest monitoring framework (ibid.), which will be paramount to ensure that forests fully deliver on their multiple functions.

1.3.5 EU Water Policies

The strong interdependence between water and soil is undisputable. Water is necessary to supply and transport nutrients for plants growth and to grow crops. In particular, groundwater – which accounts for one third of global water withdrawals – supplements surface water supplies in humid areas, often becoming the sole source of water in arid and semi-arid areas. An excessive amount of water, however, is the dominant agent in weathering processes (Orgiazzi et al., 2016), whereas a lack of water is detrimental for soil health and productivity. Soils, in turn, are key to the delivery of a wide array of ecosystem services: they protect water supplies by storing and transforming pollutants, purify water, store rain thus reducing the risk of flood, and supply water and nutrients to

plants. Simultaneously, however, soils can also transfer contaminants to water and soil erosion can alter aquatic ecosystems (European Commission, 2019a).

Despite its overwhelming importance, ensuring water availability and high-quality for all purposes is a key challenge globally and a major difficulty in combating desertification. While freshwater resources are limited, the global water use has increased by twice the rate of population growth over the past century (Cherlet et al., 2018). Moreover, Europe's waters are under pressure due to water pollution from nutrients and hazardous substances, unsustainable management practices such as over-abstraction and intensive agriculture, and climate change (EEA, 2019b). As a result of climate change, indeed, water is becoming scarcer in several parts of the EU and droughts occur more frequently, thus deteriorating water quality and quantity and increasing vulnerability to desertification. At the same time, the overuse and the unsustainable use of water reduces water supply, leading to vegetation loss and eventually to desertification (ECA, 2018). Considering the strong nexus between water and soil, effective water policies may play a pivotal role in the fight against desertification. Montanarella (2020) argues that soil and water management strategies cannot be considered separately: to mitigate environmental hazard, to foster agricultural development and to prevent land degradation, soils and water must be tackled simultaneously.

At the EU level, the most relevant policy in the field of water management and the main legislative instrument for water protection is the Water Framework Directive (WFD). Adopted in 2000, the directive committed Member States to achieve good ecological status of all water bodies by 2015. Although the directive has been successful in setting up an integrated EU-wide framework for water management in the EU and it contributed to reduce water deterioration and pollution, it has not been able to achieve its main target by 2015. At that time, indeed, just the 40% of Europe's surface water bodies had achieved good ecological status (European Commission, 2019a). From the land management perspective, the WFD has also implemented several mechanisms to prevent land degradation and desertification impacts, mainly through the river basin management plans (Stein et al., 2016). Protecting water is indeed essential to safeguard soil ecosystems and prevent their erosion and pollution. Even though the WFD does not impose any

requirement to remediate or protect soils in situ (European Commission, 2019a), it does require Member States to prevent negative impacts on water bodies by reporting on diffuse pollution which may be due to soil erosion, and by implementing the necessary measures to ensure water quality, including action on land management to reduce the risk of desertification. In this context, a key role is also played by the Urban Waste Water Treatment Directive. Implemented in 1991, this legislation, by requiring the collection and treatment of urban waste water discharges in certain urban areas, protects the environment, reduces pollution, and contribute to preventing land degradation. To keep up with the EGD and underpin all its ambitious goals, the directive will be revised and adjusted for the decades to come. One last important legislation which indirectly contribute to desertification is the Floods Directive. Adopted in 2007 following an increase in the occurrence of floods throughout Europe, the Floods Directive aims at preventing and limiting the occurrence of floods and their adverse impacts on human health, the environment, and economic activities. This legislation promotes an integrated and sustainable approach to flood risk management by improving nature's water storage capacity and by conserving water in natural systems. In this way, the severe effects of floods, as well as of droughts, are curbed (Stein et al., 2016). Although it is too early to draw conclusions on the effectiveness of the Floods Directive, the fitness check assesses that the directive has improved flood risk management (European Commission, 2019b).

1.3.6 Funds and Missions

Besides the 'acquis communautaire' on soil protection, the EU has also deployed various funds which indirectly finance measures to address desertification, such as the European Structural and Investment Fund – with the European Regional Development Fund (ERDF), the Cohesion Fund and the European Agricultural Fund for Rural Development (EAFRD) –, LIFE (L'Instrument Financier pour l'Environnement) – the instrument for the environment –, and the European Union Solidarity Fund (EUSF). Regional funds such as the ERDF and the Cohesion Fund are relevant for desertification in that they are used to finance infrastructure investments to adapt to climate change and to develop dams and irrigation systems. The EUSF, moreover, is used to rehabilitate land after emergencies, such as droughts and forest fires, which might increase the risk of desertification (ECA, 2018a). Finally, in the period 2014-2020, more than 20% of the EAFRD (above €20

billion) has been allocated by Member States to avoid pressures on natural resources. Although this does contribute to address desertification and land degradation, the exact figures of funds used to address the phenomena are not available (ibid.).

One of the most significative EU funding instruments to address desertification is Horizon 2020 and its successor Horizon Europe. As part of the Horizon framework programme there are several missions – that is, commitments to solve some of the greatest challenges globally. The Mission 'Caring for soil is caring for life' of the Mission Board for Soil Health and Food combines research and innovation, education and training, investments and demonstration of good practices, such as living labs and lighthouses, to raise awareness on the importance of soil and direct Europe towards sustainable land and soil management. The overarching goal is to have at least 75% of all soils in the EU healthy for food, people, nature and climate by 2030 (Veerman et al., 2020). In line with this, the Mission sets eight main targets, among which the reduction of land degradation, desertification and salinisation by restoring 50% of degraded lands, thus moving beyond land degradation neutrality (ibid.). Furthermore, the mission also proposes eight key soil health indicators and improved ways for monitoring the status of soils and land use systems. In this way, activities, progress and outcomes will be measurable and time bound. Overall, the mission and all its objectives will be a main driver for achieving the objectives of both the UN SDGs and the EGD and will have a direct impact on their success.

Chapter 2: Methodology

To provide an answer to the research question at the heart of this thesis, this study has so far relied on secondary data – that is, the analysis of the existing literature. The theoretical framework has shed a light on the issue of desertification in the EU and on the policies which indirectly address the problem. However, it has failed to provide exhaustive information on the adequacy of these measures to combat the phenomenon. Although in 2018 the ECA questioned their effectiveness, there are today no further studies or research which assess the current situation, especially in light of the new EGD. As a result, alongside with the secondary research, this study also took advantage of primary data to investigate the adequacy of the current policies and provide a comprehensive answer to the research question.

2.1 Qualitative research

The thesis availed of primary qualitative data. According to Corbin and Strauss (2015), qualitative research 'utilises an open and flexible design and in doing so stands at odds with the notion of rigor so important when doing quantitative research' (p.4). Unlike quantitative research, which deals with statistics and is expressed in numbers and graphs, qualitative research involves collecting and analysing non-numerical data with the main aim to search for meaning and understanding. Qualitative research is normally undertaken because of a lack of theory and undergoes an inductive process as it is the researcher who first-hand collect data to build concepts, hypotheses or theories (Merriam and Grenier, 2019). It aims at describing and explaining phenomena from the inside (Flick, 2007), through people's viewpoints (Corbin and Strauss, 2015) and thus investigates how people see things – that is, their opinions, experiences and perceptions. One of the key advantages of qualitative research lies in its flexible and open nature. As noted by Taylor, Bogdan and DeVault (2016), indeed, 'an overreliance on theory can close off important insights' (p.175). For all these reasons – and since the main objective of this thesis is to understand the severity of desertification in the EU and assess the adequacy of the existing measures addressing the problem – adopting a qualitative research is deemed to be the most appropriate approach. Through a qualitative research, indeed, it has been possible to

gather in-depth insights into the issue of desertification and to have a better comprehension of the problem through experts' experiences and perceptions.

Qualitative data can be gathered and studied in several ways: by analysing experiences of individuals or groups, by analysing interactions and communications through observation, or by analysing documents (Flick, 2007). In practical terms, this is translated into observations, interviews, focus groups and surveys. Interviews are the dominant method in qualitative research and, for the purpose of this thesis, the most appropriate tool to provide an answer to the research questions. The researcher considered that focus groups and observations would not be adequate as the first aims at generating discussions and exchange of views among groups of people to test a target audience's perceptions, whereas the second relies on observation to understand people's attitudes and behaviours. Open-ended survey questions, on the other hand, may be a valid alternative to the interviews. However, these lack flexibility and, since many people may not be inclined to take time to write down long replies, it is very unlikely to get detailed answers or explanations. In-depth interviews are therefore the most effective qualitative method to collect meaningful data and provide a deeper understanding of a phenomena – in this case, of desertification – as they enable the researcher to obtain a large number of data and a wide variety of detailed information without being too time-consuming for the interviewees.

2.2 Semi-structured interviews

In order to collect the necessary data for the research, qualitative semi-structured interviews have been conducted. The semi-structured interview 'employs a blend of closed- and open-ended questions, often accompanied by follow-up […] questions' (Adams, 2015, p. 493). The key advantage of this type of interview lies in its flexibility: semi-structured interviews involve less rigidity and more leeway than fully structured interviews but are also more organised and systematic than unstructured interviews (Luo and Wildemuth, 2017). They allow the researchers to go beyond the structured questions planned in advance and develop new spontaneous ones as the conversation proceeds. In this way, it is possible to gain a more in-depth understanding and new ideas are free to emerge during the talk. For the development of this study, questions were based on the

concepts introduced in the theoretical framework and were tailored to the participants. The researcher, indeed, did not avail of the same pre-determined set of structured questions for each interviewee. As desertification is the combined result of several interrelated issues, structured questions have been slightly modified according to the field of expertise and knowledge of the particular candidate. However, the most relevant ones were asked to each participant regardless of their field of expertise, in order to clearly define the topic of discussion and enable the researcher to generalise findings at a later stage. Furthermore, to establish a relationship and allow the respondent to feel comfortable during the interview, questions were asked from the general to the specific. Overall, semi-structured interviews have led to open conversations consisting of core questions and spontaneous dialogical dynamics.

2.2.1 Sampling Method

To select a relevant sample for the interviews, the researcher relied on its personal judgment. This technique by which samples are chosen and not randomly selected is called non-probability sampling. More specifically, this study has availed of a purposive sampling, which enabled the researcher to select the interviewees that best enabled to answer the research question and meet the research objectives based on personal judgment (Saunders, Lewis and Thornhill, 2009). Accordingly, this research study is made up only of those people deemed fit to participate. Indeed, considering the specificity of the issue of desertification and the fact that it is still a rather underdeveloped topic in the EU, not everyone possesses the expertise and knowledge to answer the questions. This has necessarily required to narrow down the sample of respondents. Moreover, to elude any sampling bias and reach a wider number of interviewees with expertise in the area of desertification, a second method was added to purposive sampling, namely snowball sampling. Snowball sampling is a non-probability sampling technique in which research participants recommend one or more potential interviewees for a research study. Although not all participants provided referrals, thanks to this system it has been possible to speed up the selection process and reach a higher number of participants to the study. Overall, by using a mix of purposive and snowball sampling, the number of 11 participants was reached. The combination of these two techniques allowed the researcher

to reach the so-called ‘theoretical saturation’, which is the moment in which data collection ceases to reveal new insights compared to what was already learned in previous interviews. Saturation is therefore a relevant criterion to establish when both data collection and analysis have been developed far enough.

Since desertification is the process of land degradation in drylands, most of the participants have been selected because of their expertise in soil and land management. However, in order to have a wider perspective and a fuller picture, the researcher also reached out to participants with different backgrounds, including biodiversity, ecosystem services, forestry, and climate change. Considering the cross-cutting nature of desertification, involving professionals with several fields of expertise played a key role and deeply enriched the value of the study. Overall, the researcher has carried out 11 semi-structured interviews with policymakers, researchers, senior experts and environmental lawyers. The majority of interviewees work for the EU, either as policy officers, or as scientific officers at the JRC of the Commission. To broaden the field of analysis, the sample also included a deputy of the UN. This has allowed for comparisons and to highlight eventual differences in perceptions between EU and UN perspectives, as well as between researchers studying the subject and officials implementing the policies.

2.3 Data Collection

The interviews were conducted by the researcher during the months of June and July 2021, either via Zoom (9 out of 11) or via phone call (2 out of 11). All the candidates were contacted beforehand via email so to allow the researcher to inform them about the study and ask for their availability to participate to the informational interview. Although it was rather difficult to find candidates both suitable and available, the overall process of data collection went relatively smoothly. All the interviews were held in English, but two in Italian and each lasted between 20 to 40 minutes. All of them were audio-recorded and fully verbatim transcribed afterwards. For the conversations held in Italian, the main findings were translated into English. On average, one interview corresponds to a transcript in the range of 1600-2600 words. The interview transcripts can be found in Appendix B. Before the interview, participants were informed on the nature and use of

the research and signed an informed consent form for their data protection. All participants were therefore aware of their right to withdraw and stop the interview at any time, as well as to refrain from answering any question which made them feel uncomfortable. To preserve the anonymity and ensure confidentiality, interviews are referenced as 'interview no. X' and respondents are referred to as P1 through P11. However, some basic information is shown in Appendix A, which provides a list of the interviews conducted with the execution date and a description of the participants' institutional role.

2.4 Data Analysis

'Qualitative analysis means making sense of relevant data gathered from sources such as interviews, observations, and documents and then responsibly presenting what the data reveal' (Caudle, 2004). Qualitative data analysis is therefore the process of examining, classifying and interpreting collected data to extract insights and discover relevant information with the main goal to draw conclusions on the research topic. To analyse the transcribed interviews, the researcher employed a thematic analysis (TA). As the name implies, this method aims at identifying patterns of meaning or themes in the interview data. TA requires involvement and interpretation from the researcher (Guest, MacQueen and Namey, 2012), who has to identify and describe those themes which are most relevant to understand the topic and respond to the research question. To identify patterns in data and detect themes, a systemic process of coding has taken place. Coding is essentially 'indexing or mapping data to provide an overview of disparate data that allows the researcher to make use of them in relation to their research questions' (Elliott, 2018). The process of coding starts with the generation of codes – that is, phrases or sentences that convey the same concept – and ends with the identification and definition of themes and the relationships between them. Overall, the adoption of a TA through coding has facilitated the study of the transcripts and smoothed the analysis process. Thanks to this methodology, it has been possible to easily identify those key words, clusters and thematic nuclei which expressed the same concept, and thus to readily identify recurrent themes and patterns of meaning.

2.4.1 Researcher Bias

Although TA has the benefit of being flexible and versatile, it is also easily subjected to bias. Despite it relies on concrete and objective information, indeed, this analysis has a highly subjective character. During a TA, researchers may – consciously or unknowingly – interpret data to support their hypothesis and ignore, or omit, those data that refute it. To avoid and minimise these biases, the researcher tried to stay as objective as possible and to consider all data, even those that contradicted the main arguments or the general belief. Hence, the researcher committed to identify themes and interpret data in the most trustworthy and accurate way, with much rigor and consistency.

Chapter 3 – Analysis of the results: understanding desertification in the European Union

The data collected through the semi-structured interviews provide deeper insights on the risk of desertification in the EU. Findings reveal new details on the current situation of land degradation in drylands and shed a light both on the main problems in implementing effective measures and on the possible solutions to achieve more concrete results. Overall, the conversations with experts and policymakers enabled the researcher to assess the risk of desertification and evaluate the adequacy of EU policies and tools. Accordingly, in-depth interviews succeeded in providing an answer to the overarching research question.

3.1. A serious threat or a fictional problem?

As repeatedly ascertained (Millenium Ecosystem Assessment, 2005; Verón, Paruelo, and Oesterheld 2006), desertification is a global pressing threat both for biodiversity and for human well-being. To what extent it is a serious risk for the EU, however, is not yet entirely clear. At EU level, indeed, there is not an integrated policy to address desertification or land degradation, which are barely mentioned in the current strategies. This may suggest that these issues are not that severe after all. However, in 2018(a), the ECA first declared that desertification and land degradation are 'current and growing threats in the EU' (p.5), and the results emerging from the interviews seem to agree with this statement. Respondents define desertification in the EU as 'a problem' (P1, P3, P4, P11) and a 'very pressing and priority topic' (P6) and argue that it 'will only become more important and more pressing […] and that will deteriorate in the future' (P4). At the same time, some interviewees also specify that 'the issue is very emerging' (P1), it is only limited to certain countries (P3, P6, P10) and it is not the main threat to soils in Europe (P1, P2, P3). Overall, although not all EU countries are currently affected by desertification, most participants consider desertification as a serious threat for the EU. The only different stance is taken by P8, a UN representative who declares that desertification does not affect the EU and that, even though there is a potential future risk, it is only a remote possibility. According to P8, in the EU, soil quality is degrading, the soil is polluted, and droughts events are increasing, but we cannot talk about desertification. Since P8 is the only interviewee not working for an EU institution, these

divergent views between P8 and the other respondents show a clear difference in perception between people inside and people outside the EU. As P2 is keen to stress, 'land degradation in the EU is of course caused by processes which are very different from what is happening in other parts of the world'. Accordingly, as also claimed by P8, it is not possible to relate the processes of desertification in the EU with those occurring in Africa, for example, where the phenomenon was originally identified. In other words, the severity level of desertification in the EU is obviously not comparable to the problem in other parts of the world. However, considering that until a few years ago the term 'desertification' was not even remotely associated with the EU and that today thirteen Member States have declared themselves affected, it is clear that things are changing and, thus, that desertification is a growing – and, according to most, a serious – threat.

3.2 Land Degradation Neutrality: between aspiration and reality

When it comes to desertification, soils play a paramount role. Protecting soils and ensuring that they are in a good quality status is indeed necessary to prevent land degradation. However, as widely demonstrated by many studies and research, European soils are undergoing a series of destructive processes. Most interviewees recognise soil contamination (P2, P11) and soil sealing – or land take – by housing and infrastructure as the main drivers of land degradation in the EU and the most serious threats to soils (P2, P5, P6, P7). To emphasise the gravity of this problem, P7 stresses that an area as large as the whole size of Berlin is sealed every year in Europe. Overall, the future outlook for soil status is not positive: every participant agreed to say that the soil is degrading, and many added that the situation is only getting worse (P2, P3, P4). For this reason, several respondents (P1, P2, P3, P4, P8) are sceptical about the possibility to achieve LDN by 2030 or the target of 'no net land take' by 2050. According to many, there are two main underlying problems which impede the achievement of these goals. First, 'nobody actually knows what [land degradation] means' (P4), 'there is no consistent definition' (P6). 'If we are not able to define what land degradation is, fighting it becomes even more complicated', argues P3. 'One of the first things policy makers should do' – P3 continues – 'is to provide precise definitions […]. That would be a start'. If a concept is not clear, indeed, it is not possible to properly identify the most suitable policies to address it. To

reinforce this point, an expert in biodiversity (P3) provides the following example: 'three-quarters of pollinators nest underground. In this case, are we talking about soil biodiversity or about pollinators?'. To ensure that the issue is embedded into the right strategy, it is paramount to have clear universal definitions.

The second core issue is the absence of an EU methodology to monitor land degradation. 'Measuring land degradation, indeed, [is] still a challenge' (P5). As already indicated in the literature review, the lack of an assessment methodology and a centralised monitoring system at EU level makes it very difficult to address the problem of desertification and to achieve the set targets. Even though there are some tools which may help – one of the most effective ones being LUCAS (Land Use/Cover Area frame statistical Survey), which gather information on land cover and land use – the problem persists. Remote sensing to map land cover can also contribute to 'assess where land is being degraded', explains an expert in earth observation (P9), but it is not entirely effective since it is possible to 'see soil properties only if there is no vegetation on the top' (P9). As a result of the difficulties to assess land degradation, one researcher affirms:

> Right now, we do not know when and how much this problem [of land degradation] will happen. Somehow, we kept addressing this issue with estimates, models, measures, or data to see when and where it is happening but, with this direction, the challenge is big (P1).

Echoing the same claim, a scientific officer and expert in the measurement of health ecosystem further argues:

> The problem for soil is that there are data gaps. […] There is not consistent monitoring. We essentially lack the basic data to make that assessment. […] For soil, I think that the incentive is not there, there is no specific policy demand or policy request. In most […] countries – and certainly at EU level – there is no sort of legal requirement to restore soils, to bring them in a good condition (P5).

The biodiversity scientific officer (P3) explains that, although researchers at the JRC of the Commission have been trying to unify the monitoring systems at EU level for a long time – since to date every country has its own soil monitoring system –, the situation is

harder than expected. ‘The problem is that many countries are reluctant to share their soil and land data’ (P3).

Despite the scepticism around the objectives of LDN and ‘no net land take’ and the problems with defining and monitoring land degradation, these targets hold a key role. As expressed by a senior expert, indeed:

> It is not the fact that you know that it will be achieved that justifies the target. Without the target, then basically the trend will go worse and worse. You set the target, you aim at this target – maybe we make it, maybe not – but the fact that there is a target allows […] to have a whole narrative and concentration of energies towards that [as well as] money and political attention, which give the change to improve the situation (P6).

These targets are therefore definitely important as they represent the willingness to address and remedy to a problem. Nonetheless, if there is no agreement on the meaning of land degradation and no complete and relevant mapping of the soil, they will merely remain ‘many fine words’ and ‘talk shops’, as in the words of P3 and P2 respectively. The same goes for the concept of ‘desertification’, which lacks a unique universal comprehension and whose mapping and assessment are not yet possible (Cherlet et at., 2018). According to Behnke and Mortimore (2016), despite decades of debates and a plethora of definitions, the exact meaning of ‘desertification’ is still not clear today. This ambiguity with the concept of desertification is underscored by several respondents (P6, P7, P9, P11) and a high-level deputy at the European External Action Service (EEAS) comments: ‘the term desertification does not make immediate and full justice to the extent of the problem, at least for the perception in the Western world […], in Europe in particular’ (P11). Consequently, only once these terms will be clearly defined and understood, it will be possible to set specific goals, try to measure them and develop some targeted policies designed to improve the situation over time (P3).

3.3 Soil policies: an important legal gap

Despite its very cross-cutting nature, desertification is an issue predominantly related to soil and land management. Effective soil policies are indeed paramount to protect soils and prevent their degradation, but the current EU policy on soil – the Soil Thematic

Strategy – is outdated and not adequate to address the current threats. While the strategy has been in place for over fifteen years, soils are facing ever greater pressure and are going towards further deterioration. According to most interviewees this is due to the absence of a legally binding instrument to protect soils. As confirmed by most participants, the failure to approve the Soil Framework Directive – namely the fourth pillar of the Soil Thematic Strategy and the first policy approach of soil protection at EU level – has been a major limitation to prevent land degradation and desertification. 'If the soil is not regulated into a specific framework, unfortunately land degradation will continue', argues one researcher (P1). Reinforcing this view, a policy officer commented:

> I think that, for sure [the Soil Framework Directive] could have made a difference because, mostly now, we do not have a legally binding overarching instrument to protect soils and to make sure that Member States take action to restore and prevent soil degradation (P4).

Because of the absence of a directive to protect soils from deterioration, indeed, Member States are not forced to take action on their territory and to set obligations: they are 'free to do what they want' (P3). This, in turn, entails a distortion of the internal market. As exemplified by one scientific officer 'if in one country you have more permissive legislation for soil contamination than in another one, polluting industries may move to the country where legislation is less stringent' (P2). One policy officer reflects on another important issue:

> If you have a European framework, not only you have a bigger political support for taking actions at regional level, but usually you also have more money. The legislation does not mean that there is just an obligation to do things. When there is a legislation, you can link this to a lot of possibilities which are relating to funding. […] If we had a framework legislation, you would not only have countries adopting the legal initiatives, but you would have a lot of commitment, of money, and, of course, this has a big impact (P6).

Hence, a legal framework at EU level would not only be important to protect soils, but also to avoid business relocation and to have the chance to devote more financial resources to soil programmes. Overall, all interviewees – to a greater or lesser extent – agreed to say that the absence of a soil directive has most likely contributed to soil degradation and represents a 'an important policy – or legal – gap' (P4). This therefore

confirm previous results reported in the literature as several authors (Wunder et al., 2018) and the EEA (2019b) also consider the detrimental effect of not having a suitable soil legislation. Moreover, the very recent Parliament resolution also recognises the inherent transboundary effects of soil degradation and calls the Commission to come up with a strong proposal to protect soils. Finally, this lack of a directive has been further exacerbated by the fact that the EU has not declared itself affected by desertification:

> There is no way that we can put up any land degradation targets and programmes as the UNCDD is doing in the most affected countries, for example. And we will not launch an EU-wide land degradation restoration target or something similar. This is not possible because there is absolutely no political support in the Council to do that: you will never find a majority in the Council that will accept to declare the EU as affected. Now, the only other way is what we are currently doing, which is to embed some measures into other packages (P2).

3.3.1 The decisive role of the Member States

The discussion about the failure of the SFD provided the impetus to reflect on the reasons why legislating on soil protection is such a challenging process. Some interviewees point out that, at EU level, there are today legal frameworks on water, air, waste and even on noise (P6, P7). As a consequence, 'it is very strange that soils, that maybe is even more important […] is not European-wide protected, regulated', commented a senior expert (P7). One interviewee (P8) defined the failure to achieve a European soil framework as a 'battle of principle' since water and air have already been protected for many years. However, there are very known reasons for this. The main problem is that, in addition to its cross-cutting nature, soil is strictly related to the concept of belonging. In the words of the interviewees, soil is often considered 'a matter of national competence' (P4, P5), 'property' (P2, P3, P7, P10), and 'land use' (P6). This is the main reason why the SFD has been rejected for many years until it was lastly withdrawn by the Commission. 'Member States will never accept anything that enters into sovereignty, subsidiarity, or private ownership' comments a soil expert and scientific officer (P2). As a matter of fact, the five Member States who blocked the proposal – namely Germany, France, the Netherlands, the UK, and Austria – invoked the principle of subsidiarity as primary argumentation, arguing that soil 'is not a topic for the EU' (P2), but 'it is a matter of national competence, and the EU should not interfere with that' (P4). However, if

Member States think so, 'then, for sure, it proves they have not taken enough action at national level either', argues a policy officer (P4) considering that soils keep on deteriorating. Behind this argumentation – claims a senior soil expert (P7) – there was also the fear that additional legislation on environment protection may hamper some development goals, including urban development, which involves building infrastructures and housing areas on fertile lands and flatlands. As repeatedly ascertained, indeed, soil sealing is widespread within the Union. Another interesting point to take into consideration is that most of the countries who blocked the directive already had legislations on soil protection at national level. From their perspective – recounts a scientific officer (P2) – an EU legislation was not necessary since they had already implemented national laws to protect soils. However, P2 continues, 'if you want the EU, you must accept a common legislation'.

Overall, 'what is missing', comments P2, 'is the recognition, in legal terms, that soil functions deliver goods that are relevant to the public, to all citizens. Essentially the concept – like air and water – that there is a dimension that goes beyond private property rights'. The important of the directive on Member States is further explained by a policy officer on soil and land management:

> Such a directive at the EU level could help to make sure that all Member States do the same and that they are all forced to take action on their territory and to set an obligation. For example, that they at least monitor the situation and they try to see where there is a problem on that territory, where the problem is most pressing and then, based on such an assessment, they would take appropriate action to address that problem (P4).

As it often occurs, however, although the Commission proposes ambitious goals, these are often lowered because of pressures from the Council, the Member States, and other lobbies (P1). The Commission and the Parliament, indeed, have always been favourable towards an EU soil legislation, but 'the problem lied with the Member States and the specific countries', recounts P4. As a matter of fact, not only some nations prevented the adoption of the legally binding framework to protect soils, but – as explained above – they are often also unwilling to share soil data, thus limiting the work and cooperation in this field. It is therefore clear that

> The absence of a regulatory instrument at the European level has not facilitated the mainstreaming of the problem and the common understanding, but, on the other side, this is also a reflection of a certain situation at the political level that is not very much conducive to that approach (P11).

3.3.2 Beyond the soil directive

Despite the undisputable importance and the necessity of an EU-wide legally binding framework for soil, some forward thinking interviewees are not convinced that this would be sufficient (P2, P3, P7, P8, P9). 'I don't think that having a directive per se means that we make progress' states a researcher, 'that being said, I think it becomes even harder without one' (P9). The main problem, according to many, lies in the reluctance of Member States to cooperate on soil at EU level. 'If these are the premises, the situation will not change much even with the directive', comments P3 when talking about Member States unwillingness to disclose data on land degradation. The UN representative (P8) also confirms that a legislation on soil per se will probably not significantly change the current state of soils in the EU. However, P8 takes a completely different stance from any other interviewee:

> The soil is already covered by the legislation on agriculture, forests, biodiversity. Soil is the result of many other things and therefore, its protection would have not improved much [with the directive]. What is really lacking is, as always, the real implementation of the environmental directives. Accordingly, should we really implement the directives on pesticides, on water, on biodiversity and so on, at that point, the soil quality would really improve (P8).

The main idea that P8 promoted during the interview was that, regardless of how positive a soil framework directive could be, the EU should first work in order to optimise and fully implement its current policies and measures. Were it done, the status of European soils would probably be much better today.

Moreover, considering Member States' scepticism and lack of willingness to adopt a soil directive, some interviewees stress the importance of raising awareness. It is necessary to 'create awareness among decision makers' declares the EEAS deputy (P11). Desertification, indeed, is a complex phenomenon which may not be immediately visible or understandable. Consequently, it may not be considered as a problem and, in turn, be

easily ignored. According to P11, if there was an increased awareness among policy makers, there would be a stronger focus on the problem and more efforts to address it. Echoing the same idea, a senior soil expert (P7) argues 'when we start to speak about soil protection at the European level, we need also to think how to reach those people that actually make decisions on municipal level' because it is at the local level that soil sealing decisions, for example, actually happen. The very first step should therefore be raising awareness at regional and sub-regional levels. This pressure from EU researchers to increase the attention on soil is explained by the fact that soil has been a widely ignored topic for decades and this, obviously, has not helped in developing a legal framework at EU level. Moreover, the underlying belief is that if both citizens and decision makers were more conscious about the importance of soils, a directive could be more readily acceptable. In the words of P7, 'legally binding laws will be more successfully implemented or prepared with the better understanding of soil importance'. On the same lines, an environmental lawyer exemplifies:

> We have an example of energy, which was also seen as an area of national competence, but now there is a policy on energy. Why? Because there was a crisis […] and then suddenly it was agreed that something needed to be done. […]. Unfortunately, we might need a crisis to realise that soil needs to be protected' (P10).

Men tend to always underestimate their impacts on nature until they see the disastrous consequences. To avoid repeating the same mistakes and prevent a future soil crisis, raising awareness on soil importance could therefore be the right direction.

3.4 The potential of the European Green Deal

As widely explained in the theoretical chapter, the concept of soil indirectly recurs in several EU policies and strategies. Due to its cross-sectoral nature, indeed, it is very difficult, if not impossible, to isolate it from the other strategies. The CAP, the water policies, the Forest Strategy and the Adaptation Strategy all play a fundamental role in preserving soil quality and functions and, accordingly, in combating desertification. The relevance of EU environmental strategies for soil maintenance and the interconnections between soils and other natural ecosystems have also been confirmed by most interviewees. In particular – as already mentioned – the UN representative (P8) stresses

the importance of EU environmental policies and claims that the environmental directives currently in force at EU level play today a very important role, even more than a soil directive per se may actually play. The underlying reason is that 'soil quality has deteriorated because there is much more land occupied and covered by harmful materials but, all in all, soil is the last [ecosystem] on which you can act upon since it is not possible to do extensive reclamation' (P8). With the launch of the EGD, it 'is again the same: you have soil as a cross-cutting issue that will be part of many, actually of most, of the strategies' comments a researcher (P2). However, a policy officer adds that 'the climate agenda starts to be finally linked to soil' and this is extremely important because 'people only understand climate [and, accordingly] if you don't have [soil] under the climate action, people say it is not important' (P6). Other interviewees focus on the importance of the EGD in creating synergies between different areas and 'interactions between soils and ecosystems' (P5): the EGD 'is a great opportunity to push the connections and the links among different files' (P11), comments a deputy at the EEAS.

To be aligned to the objectives of the EGD, several policies will be revised, some already have, and new ones will be adopted. As mentioned in the first chapter, the Soil Thematic Strategy will be entirely updated, and a new soil Strategy is expected to be released in the second half of the year. It is worth underlining that, for the first time, this Strategy will be part of the EU Biodiversity Strategy. Soil, indeed, was barely considered in the Biodiversity Strategy for 2020, argues a soil researcher (P3). In the words of a soil expert:

> [The new Soil Strategy] will be embedded into the EU biodiversity strategy, which includes very ambitious restoration targets. So, you will have soils within the EU biodiversity strategy aiming towards mandatory restoration targets. That may be a way to address land degradation in the EU. Indeed […] we are preparing for this strategy – which will probably not be a directive – but there will be of course a restoration target and [the current draft] is explicitly mentioning that this contributes to respond to the assessment by the ECA (P2).

An expert on ecosystems further explains that the Commission is currently developing a legally binding law to restore ecosystems, including soils. 'That means that, by the end of this year, the Commission will propose to the Member States a regulation or a directive on how to restore ecosystems and how to restore soils' (P5). Another crucial part of the Biodiversity Strategy is the new Forest Strategy. A senior expert and policy officer on

forest protection states that the role of forests in the fight against desertification is fundamental as 'soil contains the majority of the carbon that is absorbed by forests' (P6). P6 explains that unsustainable management practices, particularly in Nordic countries, lead to huge emissions and to soil loss as trees, together with stumps and roots, are brutally cut. The new recent Forest Strategy devotes particular attention to this relationship between soil and forests and 'recognises the close connection between soil restoration and tree planting in urban areas, in agroforestry and in degraded land' (P6). For this reason, 'next to the forest strategy there will be the staff working document on the three billion trees the Commission wants to plant […] to restore soils' (P6). Overall, the policy officer has a positive view of the new strategy:

> It is the first time it is put on the table that a forest is not just a silviculture, but it is climate and biodiversity. Although the text was changed a lot before it was adopted – it was much stronger in draft – this message comes up and we also have a commitment to do a binding legislation on monitoring. […] It announces that the Commission will assess and come up with a regulation on monitoring […]. So here and there you will see that there are announcements of legislation. It is not a directive and it is not binding, but if you do what is written there, we will have a legislation. (P6)

An environmental lawyer (P10) puts emphasis on the importance of the Urban Wastewater Treatment legislation to tackle desertification and recounts that the new revised version will be mirroring the Spanish one. Spain, one of the EU countries most affected by desertification, 'in 2007 had already adopted a specific legislation that was going beyond [the EU legislation on Urban Wastewater Treatment]' (P10). The basis for changing the legislation, explains the lawyer, lies in that climate change is accelerating and extreme weather events are extending northwards, as also stated by the ECA (2018a). For the same reason, the adaptation strategy to climate change has also been revised and the new one adopted in February this year. In the words of P8, this 'is the most relevant strategy for soil' and currently 'it is getting a good response'. A scientist also confirms that 'soil is crucial for climate change' (P2) and maintains that 'things will be mostly happening […] in the agricultural sector, where there is now a big driver coming from researchers in agriculture because [of] the mission on soil health and food'. P2 further discusses that initiatives such as the carbon farming, which will provide 'a financial incentive to farmers to limit GHG emissions but at the same time also to increase stock

of carbon and soils', the Farm to Fork Strategy 'which covers all the aspects of ensuring that we all have healthy food, starting from healthy soils', and the Zero Pollution action plan, which deals with the issue of soil contamination, are essential elements of the EGD and contribute to preserving soils.

'We will profit from the EGD', comments a soil expert (P1). 'It is certainly really really important' (P6) and all 'these new tools represent great opportunities' (P11) argue the policy officer on forest and the EEAS diplomat respectively. As it results clear from their words, the importance of the EGD is undisputable, as well as its relevance for soil and, accordingly, to fight land degradation and desertification at EU level. However, according to most interviewees (P1, P2, P3, P4, P6, P10, P11) the main problem persists: the new Soil Strategy will most likely not become a legally binding instrument. Despite the EGD has a huge potential, 'the lack of a proper strong instrument that identifies the protection of soil as a strong priority is playing in the other direction' (P11). The policy officer on soil and land adds:

> [These tools] are mostly strategies, so documents or communications from the Commission. In that sense, they are non-binding. […] The Soil Strategy will address the problem of desertification, but it will always be in a non-binding way. A strategy also looks mostly at the action of the Commission itself, while we need all actors to be involved and certainly also the Member States. With the strategy, we cannot really force Member States to take action in a legal way. (P4)

Although there are no doubts that the EGD holds a key role and will contribute to soil safeguard, the lack of a soil directive will continue to remain a major obstacle. The policy officer on forest protection recalls a sentence pronounced by the director of the EEA: "the biggest failure of environmental policy is the fact that we do not have a framework for forest and soil".

3.4.1 Soil: a complex argument

From a policy perspective, soil is a very hard subject to tackle. Traditionally, it was considered an agricultural topic (P2). It is only very recently that the DG environment has taken over soil and embedded it into several policies and strategies. Furthermore, as

explained before, soil is strongly related to the concept of property and belonging and, therefore, legislating on soils entails several issues from a legal point of view. Finally, soil and land are finite, non-renewable resources. Considering how much time it takes to build up a soil ecosystem and human increasing ambitions to subdue land to their power, the loss of soil is today much more drastic than in the past. For this reason, developing policies and measures to protect soils is more important than ever, but, due to soil transversality, it also turns out to be very complex. Two interviewees (P1, P3) make a very important point: if the organically farmed land in the EU increased to 25% – as planned by the Farm to Fork Strategy – would it then be possible to produce enough for the population? The same reasoning applies to the envisaged reduction of nutrient losses by 50%. P1 underlines that this is very important as soils, seas and rivers would be healthier and less polluted by nitrogen, which is a serious problem for Northern Europe where large quantities of fertilisers are used. At the same time, however, the EU may not be able to maintain the same production levels and this, in turn, would imply for the EU relying on exportation. Thus, it will probably not be possible to have an entirely organically farmed land or to completely eliminate the use of pesticides while assuring excellent levels of production to sustain the whole population. The system would then become untenable and larger economic issues would come into the play. 'It is all about compromises' comments P3, 'the ideal world does not exist'.

3.5 Towards a brighter future

Despite the absence of a framework directive still remains the major impediment to soil protection, the situation is slightly improving. As explained by some interviewees (P3, P7, P10), until quite recently soil was a completely neglected topic, even by agricultural ministries. Today, 'things are changing' comments a senior expert with more than forty years of experience on soil science (P7). 'Hopefully, the situation will gradually improve in ten/twenty years', P7 continues. This breakthrough in the state of affairs is the result of several small advances over time. First, citizens are increasingly more aware of soil's importance, there is more interest towards soil, and the overall perception has changed as a result of climate change and of the rise in extreme weather events in the EU. The Soil Thematic Strategy has positively contributed to these achievements and, in particular, to

raise public awareness. Despite the failure to adopt the Soil Framework Directive, indeed, 'the other three pillars – research, integration in other legislations and awareness raising – have been […] rather successful', observes P2. P7 further elaborates on this and stresses the importance of language and communication: 'it is very important to address people […] in their own language. Even those messages about soil protection would be much more appreciated in national languages and, of course, much better understood'. Another significative signal of change is the Parliament Resolution on soil protection. As the Parliament represents the peoples of Europe, this Resolution demonstrates that there is a growing push from the ground to act on soils (P3). The senior expert on soil (P7) admits 'this is the document I was waiting for twenty/thirty years', and states 'with the declaration of the European Parliament and the pure intention to support this legislation (i.e.: the EU-wide legal framework for soils), obviously something will happen'. The EGD itself, in spite of its limits, is contributing to changing the situation. In the words of a researcher (P3):

> The environment is today one of the priorities of the European Commission, which was not the case until two years ago. […] It is too soon to say where this will lead, but there is the will to change things, and this is already a good start. I don't know if the Commission will make it, but it is not just the Commission that must act.

As underlined before, the role of the Commission is limited by the Member States in the Council. In this regard, one researcher even points out that it may be possible to 'have changes due to the changes in the political panorama' (P2). In Germany, for instance, there will be elections and the Green party, which has traditionally been supporting soil legislation at the EU level, may have a big success. Considering this and the UK withdrawal from the EU, the situation may today be different would a soil directive be proposed.

The prospects for the future are therefore promising and most interviewees believe that considerable progress may occur in the coming years. Many even have a clear idea on the possible actions the EU could take to improve the current situation and address desertification because – as claims the environmental lawyer (P10) – 'not everything that can be done is done'. Several interviewees underline the importance to clearly define 'desertification' at EU level and 'to make sure that this is immediately understandable

and tells the European consistency' (P11), as well as to develop an harmonised way and an EU methodology to measure the phenomenon. Two researchers (P2, P7), moreover, stress the importance to act locally. A high-level scientific officer (P2) believes that creating some demonstration areas – for example through lighthouses and living labs as proposed within the mission on 'Soil Health and Food' – might have several and concrete possibilities of success.

Conclusion

The aim of this research was to inform on the problem of desertification in the EU and to provide new insights on its severity and on the measures to combat it. The theoretical framework has amply illustrated the current situation in the EU and – in the absence of an integrated strategy – the policies which indirectly contribute to counter the phenomenon. Most importantly, the data collected through the qualitative interviews have disclosed important details which it was not possible to detect from the literature review. This has allowed for a deeper understanding of desertification, its implications, and its interactions with the various European policies. Upon careful examination of the theoretical framework and the interviews, a number of meaningful conclusions can be drawn.

First, desertification is an extremely complex and multifaced issue. Several ambiguities surround the issue of desertification, and, despite decades of debates and a myriad of definitions, its meaning is not yet well outlined and universally comprehensible. The same lack of clarity is reflected in the systems to monitor desertification and land degradation which are limited and not adequate for mapping degraded and susceptible land at national level, much less in the EU. These problems are widely recognised by EU researchers and policy officers, but remain today unsolved and represent a major limitation to protect soils from deterioration and, consequently, to achieve certain objectives, such as LDN and 'no net land take'.

Second, desertification is a considerable threat for the EU. While often associated with processes occurring in geographical areas distant from Europe, it is undeniable that the phenomenon is increasingly affecting the EU. The literature and the research findings have provided sufficient information to suggest that desertification is today a threat in the EU, exacerbated by human unsustainable practices and by climate change, whose impacts know no borders. Although it does not affect EU countries in their entirety, and it is definitely not as severe as in other part of the world, the problem for Europe is absolutely real and, with the looming threat of global warming, the risk is ever more pressing.

Third, the current EU policies are not adequate to address desertification and prevent land degradation within the Union. From an objective perspective, the literature review has illustrated, with substantial data and concrete information, which EU policies play a role in the fight against desertification. The findings outlined in Chapter 3 have completed this study by providing a more subjective perspective founded on the views and experiences of EU policy officers and senior experts. On this basis, it is concluded that the major obstacle to successfully cope with desertification in the EU is the absence of a legally binding framework to protect soils. Other environmental policies may indirectly contribute to their safeguard and to tackling desertification, but they basically have different aims and scopes of action and soil only remains a secondary consideration. Moreover, as widely demonstrated in the literature review and further emphasised by the interviewees, several of the discussed environmental policies are not achieving the expected outcomes. However, it is worth underlining that, pursuant Article 4 of the Treaty on the Functioning of the European Union (TFEU), the environment is a shared competence between the EU and the Member States, and this entails that the role and powers of the Commission are limited by EU countries. Consequently, although today it is not possible to state that EU measures to combat desertification are adequate, this is a problem that cannot be exclusively attributed to the Union. The goodwill of the Commission and the Parliament is there: it is at national level that a change of mindset is urgently needed.

To conclude, this dissertation has demonstrated that – in spite of the recommendations from the European Court of Auditors and the European Environment Agency – the threat of desertification is still not properly addressed by the EU: soils are not well protected at EU level and desertification is barely taken into account. However, there is still time and scope for remedial action. A new awareness on soil importance has grown over the years and the EGD, together with the new mission on 'Soil Health and Food', are powerful catalyst to change.

Limitations and Future Research

Although it was possible to provide a clear answer to the overarching research question, the results must be interpreted in light of some limitations. First, the sample size and the

sample profile. As the study focuses on the issue of desertification in the EU, most interviewees have been selected based on their current working position at the Union or because of their expertise in EU matters. To understand the topic from a broader perspective, the viewpoint of a UN officer has also been included. However, the research findings underlined a great divergence between EU officials and the UN representative. This therefore paves the way for further analysis. Considering the small sample analysed, it is likely that an investigation on a larger and more extended sampling could identify more respondents with a similar perspective to the one of the UN delegate. Accordingly, further research should pay particular attention to this aspect and consider the underlying reasons why there are different interests and opinions between the EU and the UN in conceiving desertification as a problem in the EU.

The second major limitation is due to time constraints. The time available to investigate this research problem and collect data was obviously limited. More time would have most likely enabled the researcher to reach a higher number of interviewees. However, this problematic was further compounded by difficulties in finding available people for the interview. Due to time constraints and to a low response rate, the researcher was not able to include wider perspectives, such as that of the civil society. Consequently, a possible recommendation for future studies is to broaden the scope and sphere of research and consider new perspectives.

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Appendix A: List of Interviewees

Interview n°	Participant	Working Position		Date
		Role	**Field of expertise**	
Interview no.1	P1	Scientific officer at the JRC of the European Commission	Land Resource Management	24/06/2021
Interview no.2	P2	Scientific officer at the JRC of the European Commission & UNCCD expert	Land Resource Management, Soil & Agricultural Science	28/06/2021
Interview no.3	P3	Scientific officer at the JRC of the European Commission	Soil Biodiversity	30/06/2021
Interview no.4	P4	Policy officer at the European Commission (DG ENV)	Land Use and Management	02/07/2021
Interview no.5	P5	Scientific officer at the JRC of the European Commission	Ecosystem Services and Biodiversity	06/07/2021
Interview no.6	P6	Senior expert and official at the European Commission (DG ENV)	Forest protection and Bioeconomy	15/07/2021
Interview no.7	P7	Senior researcher, Member of the Alpine Soils Partnership	Soil functions, Land Use and protection	16/07/2021
Interview no.8	P8	Program Coordinator at UNDP* and Programme Officer at UNEP**	Climate change adaptation, sustainable development	16/07/2021
Interview no.9	P9	Scientific officer at the JRC of the European Commission	Earth Observation, climate change effects	21/07/2021
Interview no.10	P10	Law & Policy Consultant, EU Policy Coordinator	EU environmental law, legal and policy analysis	22/07/2021
Interview no.11	P11	Deputy at the European External Action Service	Economic and global issues	23/07/2021

* United Nations Development Programme
** United Nations Environmental Programme

Appendix B: Interview Transcripts

INTERVIEW NO.1 (P1)

1. **How do you experience the current situation of desertification in the EU?**

It is a problem. There is a political and a scientific dimension. The scientific one is "here": we have seen an increase of temperatures in the last years, long periods of extreme heatwaves. I remember the 1987-1989, we had waves, but now these heatwaves are very prolonged, with long dry periods. This happens especially in the Mediterranean, where we definitely see this kind of changes. But this is even a more complex problem, because, if we have these kinds of phenomena, then the soil is very dry, the plants suffer a lot and become dry as well. This is mainly the problem. However, this is not only Mediterranean, but it occurs also in other countries such as Slovenia, South France and others. This is the scientific context. We try to see how the developed data index measure is changed. Now, let's look at the political policy context of the European Union. In 2018, there was an extended documentation from the European Court of Auditors – the official board of the EU – that in practice assesses how we (the European Commission or the European Parliament or the European Council) help the Member States in developing well some policies. In other words, if we do properly our job. In 2018, they assessed if the EU and the Member States were addressing desertification in a very proper way. Unfortunately, it is not the case. When I was in Ispra, the European Court of Auditors visited us for three/four days, and we had many discussions. They also visited many other countries and they saw that this issue is not addressed well, not enough, in the policy. There is no currency a European policy that addresses desertification. There are no specific actions on behalf of the Commission. There are various things here and there. For example, the Common Agricultural Policy. The main strategy is to finance the farmers, try to preserve climate and to conserve soils but there is no discussion against desertification.
So, when the European Court of Auditors published the report, it made some recommendations to the EU and in particular to various DGs, specifically environment, saying that they should address the issue of desertification and encouraging Member States and the Commission to take some actions. The DG ENV was preparing some actions to see how to better address the issue into various policies. The publication of the new Soil Thematic Strategy is in progress (in September/October). Now there are some discussions on how to better address also the issue of desertification, but, as I said, there is not yet any specific policy to address this issue. The issue is very emerging to my side. I deal with this issue and I see that there are very big pressures: we have the increase of temperatures, long dry periods, less rainfall (when the rainfall comes is in a very short period and this provokes a lot of disasters, such as floods), we also have a lot of extreme events. We see these pressures: for example, these events are more frequent and the vegetative area is suffering more.

2. **As concerns the European Court of Auditors report: it said that the Commission does not have a clear picture of the challenges and the steps lack coherence. In response, the European Commission itself acknowledged that desertification was not well addressed in the EU. There is also a report of the European Environment Agency that argues that the premises for 2030 are**

not encouraging and that achieving the SDGs (including the SDG 15) will be unlikely. There are therefore not many positive views for the future. From your experience, what kind of progress have been made after the report was released?

The DG ENV tries to address this issue. In practice we try to deal with it. We try to build a land degradation index/indicator to measure it, because right now, we don't know when and how much this problem will happen. Somehow, we kept addressing this issue with estimates, models, measures or data to see when/where it is happening, but with this direction the challenge is big. This land degradation indicator will try, somehow, to address this issue. Not to forget, that there was a Desertification Atlas to raise awareness. It has maps, loss of productivity, loss of soil organic carbon, proxies to help understand where there the problem is. So, there is this Atlas which tries to raise public awareness even though is not political and does not relate with policies. Another thing that we should not forget is that, since last year, the Commission published the European Green Deal in which you can see many actions – of course, it is quite ambitious – in different directions. For example, there is action to plant more than tree billion trees and the action to protect our land in terms of percentage of the areas with some landscape features. So, there are some specific actions which may help to face the problem, but they don't address desertification. My personal experience is that you have to set specific targets – this means numbers (e.g.: "by 2030 I should address this issue there and there by x% doing this and that"). These targets and numbers address some sporadic actions here and there that may help to address the issue. Well, the EU faces other challenges in the European Green Deal. The biodiversity issue is addressed quite well. They also address the Zero Pollution Action Plan – the EU Communication in which it says how to reduce pollution, mononuclear losses and pesticides to increase organic farming and all these staff that can be addressed as ambitious targets of the EGD. But desertification is an issue, is smaller.

3. **From your words I get that, in your opinion, an EU integrated policy on desertification could be a realistic solution to address the problem?**

Yes, yes, it could be. It would be important to raise this issue in the Communications, in the policies or to include it in other policies, but as a specific goal to address the problem because now it is not addressed. It is just addressed indirectly by other actions.

4. **I saw that just 13 Member States declared themselves affected by desertification, but the EU has a whole did not.**

Yes. There is a problem currently, they (Member States) should do something as well, but the EU as a whole does not address adequately this problem. But neither the Member States. They just recognise the problem, but they don't do regulations.

5. **In 2014, the Commission finally withdraw the proposal for the Soil Framework Directive, which would have been very important in order to create a legal basis to protect soils. Do you think that the absence of a soil framework has been a major impediment to prevent further degradation? Despite the several measures, the trend shows that land degradation is increasing, not declining.**

Yes. This was the critical point. We had the Soil Thematic Strategy, this was already fixed. We also had other stuff to address the new challenges that the ecosystem is facing, but we did not buy the law. We did not buy the regulation which said what to do, where to do and how to do. But Member States should do some action. In the Soil Thematic Strategy we have four pillars: to integrate soil protection in other policies, to increase awareness (which has happened quite a lot since last year), to do further research on the topics related to better assessment of the soil and a soil legislation. But the fourth pillar, which was the binding one linked to create and propose a framework directive with some specific targets, was not approved in 2007. It was blocked by five Member States: Germany, France, the Netherlands, UK and Austria. It was a blocking minority which allowed the Commission to withdraw the Framework Directive. It was blocked for different reasons such as the issue of subsidiarity. This decision to not create a Soil Framework Directive, something that was binding, was a critical one. The main problem was that it was something very ambitious.

6. **Even if the Soil Thematic Strategy was implemented in 2006, soils are still facing ever greater pressure and are going towards further degradation. In your opinion, why was it not successful the strategy to deal with the problem of land degradation?**

As you may know, the Commission also has another ambitious target. It has five targets. Their names are "missions", missions that address future environmental problems. One of these five missions is "Soil Health and Food Security". We worked on this and the first assessment of this mission was to see how much of our soil is unhealthy, which is 70%. It is a very high number. The mission says that it will be reduced by x% by 2030. As we said, we have an increased land degradation that was the result of not having something binding. We don't have a binding law, a binding regulation. We don't have something that prohibits either the farmers or the citizens to pollute the soils. We see some small improvements in the Common Agricultural Policy from 2014 and onwards, where there was an increase in some environmental conditions. These were some guidelines for farmers to respect some environmental conditions. One was to keep the soil organic carbon, not to reduce it. This is important for soil productivity and to prevent soil erosion. But there was not linked conditionality, which means that the farmers were aware of Common Agricultural Policy, but even if they did not respect, if they did take into account their soils, this would have not been taken any seriously. These were, we can say, good advice. It is mainly relevant to regulatory issues. If the soil is not regulated into a specific framework, unfortunately land degradation will continue.

7. **I also have a question related to the Green Deal. We already talked a bit about it. There are all these new tools – such as the Farm to Fork Strategy, the new Adaptation Strategy, the CAP, the Biodiversity Strategy, the Forest Strategy and especially the new Soil Strategy – that the EU is going to implement to prevent land degradation. Do you see their potential to address the problem even in the long-term?**

Yes, if they become binding. As we said, there are these tools and those applied targets to reduce degradation. I give you an example. To reduce by 50% the excess of fertilisers is very important. In this way, you will not have any more soils polluted by nitrogen, your

seas and rivers polluted because the nitrogen goes to the sea, you will not have all the nutrification in many areas such as the Netherlands – and North Europe in general – where they use quite a lot of fertilisers. But the question is: if you reduce by 50%, will you be able to produce the same production? This is the big question. Another example. We have to increase organically farmed land by 25% - this is another objective of the EU Green Deal and a nice one, because now organically farmed land is less than 7%. But, if we increase organically farmed land from 7% to 25%, will we be able to produce enough for the population? Or are we going to export the products from somewhere else, such as from Brazil or the US? This is another big question. Right now, what we do here is to draw up scenarios and try to see if we reduce by x% the fertilisers, will our farmers be able to produce the same or what will be limit in order to avoid these issues. These are very ambitious goals. We will profit from the EU Green Deal.

8. **Do you think it will be possible then to remedy to the damages and that it is not too late yet?**

No, it is never too late. It depends on how much the political will is. Let's look at the Common Agricultural Policy. I don't know if the CAP has a framework of 6/7 years. The previous one of 2014-2020. We, as European Commission, proposed in 2018 a new Common Agricultural Policy to be in place from 2021. However, it is not in place. Why? Because the Commission proposed some ambitious environmental policies to link farmers to some conditions to protect soil, water, air, climate change, but all of our proposals for the new CAP are not yet voted by the Parliament and are not taken by the Council. We are still in a discussion. Member States want more flexibility, less laws and restrictions because politically they want to support their farmers as well. But we know that this is the problem. I gave you this example because this is what happens. We propose quite ambitious stuff but then we have to lower our ambitions because the Council, the Member States or other lobbies put some pressure.

9. **What do you think about the objective of the Land Degradation Neutrality and land take?**

This was a very ambitious objective but, as I said, this will not be able to take place. By 2030 we should have Land Degradation neutrality. My personal opinion on this is that we will not yet catch this objective. We have to do something of course, we have to run in order to get somehow a convergence to achieve these objectives. A lot has to take place, starting from the new Soil Thematic Strategy or other binding laws that go in the direction of soil protection.

INTERVIEW NO.2 (P2)

1. **How do you experience the current situation of desertification in the EU?**

The European Court of Auditors is looking into this issue of desertification in the EU. There is a crucial issue: officially, the EU is not affected by desertification. This is because the EU is ratifying the UNCCD and has declared itself not affected. The Convention works in a way that when a country ratifies the Convention has to declare

whether it is affected or not. The odd thing is that while the EU has declared itself as not affected, several Member States of the EU have declared themselves as affected. For example, Italy, Spain, Portugal, Greece and so on. There is a little bit of a contradiction here and there and this was the main point of the audit by the European Court of Auditors. This is more the legal formal aspect. Then there are also substantial aspects that you should consider. From a substantial point of view, the is EU affected by desertification. I think there is no doubt because there are several indicators that tell us that extensive areas of the EU are affected by desertification. When you understand desertification a little bit broader than just the definition that you find in the UN Convention – so not only in arid, semi-arid and dry sub-humid areas – land degradation is obviously widespread in the EU in this wider sense. The only issue is that land degradation in the EU is of course caused by processes which are very very different from what is happening in other parts of the world. While the UN Convention was designed essentially responding to an issue of degradation in Sub-Saharan Africa, we have in the EU processes which are very different, which are linked to our history of having a long history of industrialisation and urban development. The two main drivers of land degradation in the EU are essentially soil contamination and land take, or soil sealing, by infrastructure and housing. There have been several assessment and official scientific studies – for example by the Intergovernmental Technical Panel on Soil, which I have been chairing for several years in the past, or by the European Environment Agency – that have documented that there is serious issue in the EU about soil contamination and soil sealing. Now of course there are many other processes as well: soil erosion, loss of soil organic carbon, soil compaction. You will find plenty of data about this. This is the substantial part, but there is a big gap between the reality and what then politically has been accepted to be declared.

2. **In 2014 the European Commission finally withdraw the Soil Framework Directive and this left the EU without a legal basis to protect soils. To what extent was the absence of a soil framework a major impediment to prevent the further development of land degradation? Do you think this has really worked against the possibility to prevent the phenomenon from further spreading, especially considering that the trend of land degradation is increasing?**

The Soil Framework Directive was one of the four pillars of a package that we presented in 2006 called the EU Soil Thematic Strategy. The other three pillars – research, integration in other legislation and awareness raising – have been, I would say, rather successful. But still, as you said, indicators tell us that things are not getting better. Actually, things are getting worse. So, something is missing. I think what is missing is the recognition, in legal terms, that soil functions deliver goods that are relevant to the public, to all citizens. Essentially the concept – like for air and water – that there is a dimension that goes beyond private property rights. The main problem with soils is that most of the soils in the EU are under private property. And if you legislate on private property, you need to justify why you want to impinge into private property rights. We have tried to explain in the Soil Thematic Strategy and in particular in the Soil Framework Directive, that there are aspects of the framework soil functions that go beyond the private property. What was written in the proposal for the Directive was that Member States would delineate areas where these functions are at risk of different processes. For example, delineate areas where there is a risk of soil erosion. In those areas, Member

States would have had the obligation to implement those measures to reverse or to limit this degradation process. This is of course something that would very much enter into the private property rights because you would put a line – so you would have areas which are within a problem area and areas which are outside the problem area. For the ones inside, there will be some obligations to change land and soil management practices. This is the background of all of this. The reality is that in the Council discussions – as you know we have a co-decision process between Parliament and Council – a blocking minority of five Member States prevented our proposals to be approved. These five Member States, led by Germany together with France, UK, the Netherlands and Austria, have blocked under several argumentations. The first one was subsidiarity – the issue that soils don't move. So, why would there be the need to have transnational legislation on soil if soils don't move? The argumentation was "it is not a topic for the EU". Actually, in federal countries like Germany and Austria, there is even the argumentation that it is not a topic for the national government, but it is a topic only for the local/regional government. There is a big battle going on in Germany and Austria about competence about soil. In Italy we have similar discussions as well. The other argumentation was of course cost. One of the elements of the Directive was that there is a big heritage in Europe of early 3 million contaminated sites. Somebody must pay to clean up these contaminated sites. There is a polluter pays principle, so who pollutes, pays. Unfortunately, in Europe we have a lot of sites where the polluters disappear, the so-called orphan sites. There are sites which are polluted but nobody knows who the responsibility is. I give you an example. There is a huge issue about former military sites especially in new Member States coming from the former Eastern bloc. There is a huge heritage of mining sites which are abandoned. Somebody has to pay for it and of course the big concern was that, as usual, probably the richest countries would pay, so Germany very first. This is another blocking element. The third point was of course – and it is true – that most of the countries that were blocking the Directive were also the countries who have owned national legislations on soil protection. There is a national legislation in Germany, one in Austria, in the Netherlands, in France. They were saying "why do we need an EU legislation if we already have a national one". But you can say this, of course, for any legislation. If you want the EU, you must accept a common legislation. This is also our Commission main argument, because our main argument is that without the soil Framework legislation you will have a distortion of the internal market because obviously if in one country you have more permissive legislation for soil contamination than in another one, polluting industries may move to the country where legislation is less stringent.

3. **As you were mentioning before, in 2018, the European Court of Auditors reported that 'the Commission does not have a clear picture of the challenges posed by desertification, and the steps taken lack coherence'. One year after, the European Environmental Agency argued that premises for 2030 are not encouraging and that achieving SDGs related to protecting natural ecosystems (including SDG 15) will be very unlikely. From your experience, after the report was released, were there improvements? Because the Commission actually acknowledged that the risks of desertification and land degradation could have been better addressed. Do you think this has been done after the report was released?**

That's a problem. Of course the report by the ECA has some legal aspects that needs to be taken into account and the Commission has an obligation to respond. And we are responding. We will release methodological guidelines on how to delineate land degradation in the EU. We will do some things, enough to respond. What will not happen is a change in fundamental things that may allow to really address the issue. Starting from the fact that, as a result of not declaring the EU as affected by desertification, there is no way that we can put up any land degradation targets and programmes, as the UNCCD is doing in most affected countries, for example. And we will not launch an EU-wide land degradation restoration target or something similar. This is not possible because there is absolutely no political support in the Council to do that. You will never find a majority in the Council that will accept to declare the EU as affected. Now, the only other way is what we are currently doing, which is to embed some measures into other packages. This is what we are doing by revising, - actually by designing an entirely new Soil Strategy. By the way, it will be called Soil Strategy and not Soil Thematic Strategy. This will be embedded into the EU biodiversity strategy, which includes very ambitious restoration targets. So, you will have soils within the EU biodiversity strategy aiming towards mandatory restoration targets. That may be a way to address land degradation in the EU. Indeed, in the current draft, we are preparing for this strategy – which will probably not be a directive – but there will be of course a restoration target and it is explicitly mentioning that this contributes to respond to the assessment by the ECA.

4. **Do you think that the new EU tools such as the Green Deal (e.g: the Farm to Fork Strategy, the new Adaptation Strategy, the CAP, the Biodiversity Strategy, the Forest Strategy and especially the new Soil Strategy) have the potential to prevent land degradation and desertification in the long term?**

The problem with soils is that it is a very cross cutting issue. It is not like air and water, with a clearly defined policy-making area. Soil is traditionally not be considered as an environmental topic, but as an agricultural one. The big player on soil has always been the agricultural policy, not the environmental policy. It is only very recently that DG Environment, our environmental policy-making collogues in the Commission, has taken over soil compared to the very old Common Agricultural Policy of DG AGRI. Now, in the European Green Deal this is again the same, so you have soil as a cross-cutting issue that will be part of many – actually of most – of the strategies. Soil is crucial for climate change, for example, so you will have the big program that is now starting of the carbon farming initiative of the European Commission. Carbon farming is essentially providing a financial incentive to farmers to limit GHG emissions but at the same time also increase stock of carbon and soils by organic meta-accumulation. Or you will have the Farm to Fork Strategy, which is in the hands of DG SANTE and covers all the aspects of ensuring that we all have healthy food, starting from healthy soils. It also deals with the issue of soil contamination, which is also part of the Zero Pollution Action Plan, which is again an element of the EGD. As I said, soil is also embedded in the EU Biodiversity Strategy which is again a part of the EGD. It is in many elements, it is a cross-cutting issue. If you ask me where things will be mostly happening, I think it will be mostly in the agricultural sector, where there is now a big driver coming from researcher in agriculture because we have now the mission on soil health and food. The Commission launched a series of missions and this idea of the mission on soil health will be certainly influencing a lot of what we do. It will be a combination of many actions. One thing is sure: there is very

much attention of the agenda of many policy areas. One is also sure: Member States will never accept anything that enters into sovereignty, subsidiarity, private ownership. You will not have, for sure, a directive in the model of what we have been proposing in 2006. What you will have is a series of measures that will improve the situation, hopefully, but not something that says "soils are not only private property rights, are also something that is relevant to all of us and so we will legislate about this". This will not happen because this will not be accepted by some Member States. Of course things can change. There will be elections in Germany, so you will have probably a big success of the Green party, which has been traditionally supporting soil legislation at EU level. You may have changes due to the changes in the political panorama. But not dramatic changes, I don't think so.

5. **In how far could an EU Integrated policy on desertification be a realistic solution towards securing environment and biodiversity? There is also for example the target of Land Degradation Neutrality by 2030, but as far as I read no one is very positive about its achievement.**

The problem with those targets is that they are not binding. SDGs are very nice hot air and people love to talk about it because it is a job to many people. It all "bla bla", like climate change is all "bla bla", like many of these things are all talk shops because there is a huge community that leaves of these talk shops. By the way they are the most affected by covid pandemia because of course not having the possibility to travel and talk is disrupting the entire system. I don't think this is the way. I think the way is probably more awareness raising, education, financial incentives, local dimension. I believe very much, for example, in what is proposed to be done within the mission. We are proposing now to create hundreds of lighthouses and living labs. With lighthouses and living labs are essentially demonstration areas and farms where you show that farming can be done differently. I think that this is the dimension that has much more possibilities of success. I am always citing when I talk about success stories and legislation on soil the US Soil Conservation Act. In the thirties in the US there was a huge issue of soil degradation called the "dust bowl" with tremendous erosion processes that were thriving mass migration and ruining farmers and so on. In 1925, the US passed a law, a soil protection law, called the US Soil Conservation Act. The essence of that act was to create local soil conservation districts, so local communities that would act against soil degradation locally. In the sense of sitting together with some experts that explain what to do in order to change the situation. The success has been enormous because soil erosion in the middle east of the US decreased dramatically over the last 50 years. It is a success story. But, of course, the political situation at the time was very different. That was the time of the big deal of Roosevelt, to create soil conservation districts you needed people, and so they hired thousands of civil servants that would go in the field and explain to farmers what to do. It was another historical period, but this is a good example of a success story. I think that repeating this in Europe would require creating demonstration farms, lighthouses, living labs, local communities being active. It is a very capillary, detailed work and not big strategies, but really going on the ground and try to act locally, otherwise I don't see much hope.

INTERVIEW NO.3 (P3)

1. **In quale modo percepisci l'attuale situazione della desertificazione in Europa?**

Allora, come ti ho già detto, io all'interno del gruppo del suolo io mi occupo di biodiversità. Sicuramente la desertificazione è una delle minacce alla biodiversità. Se parliamo di desertificazione parliamo essenzialmente di cambiamento climatico perché le due cose sono, per quanto mi riguarda, correlate. Quindi, con l'aumento delle temperature aumentano i periodi di siccità e quindi aumenta il rischio di desertificazione. Ovviamente la vita nel suolo per sopravvivere, per vivere ha bisogno di acqua e quindi anche questa ha un impatto sulla biodiversità. E' un problema reale in Europa[1], ovviamente. Al momento abbiamo fatto delle mappe sui rischi della biodiversità in Europa e possiamo dire che sicuramente è un problema, soprattutto per i paesi del sud Europa, quindi Portogallo, Spagna, Italia, Malta, Cipro, Grecia, dove appunto il caldo si fa sentire maggiormente. Ovviamente, nel nord Europa, questo è un problema meno sentito. Quindi sì è un problema reale, assolutamente. Non credo però – questa è una mia opinione -che sia il problema principale dei suoli in Europa, per lo meno dal punto di vista della biodiversità. Però quello della desertificazione è sicuramente un problema a livello europeo.

2. **In termini di biodiversità: ho visto che la Strategia per la Biodiversità per il 2020 non è stata valutata positivamente. Ci sono infatti tanti obiettivi che non sono stati portati a termine, non sono stati raggiunti. Cosa pensi a riguardo?**

Intanto c'è da dire che la biodiversità del suolo non era praticamente menzionata nella strategia del 2020. Quindi, di fatto, il suolo era forse menzionato una volta ma non in relazione alla biodiversità. Quella strategia aveva poco a che fare con il suolo. Di fatto, l'impatto che ha avuto sul suolo e sulla sua biodiversità è stato veramente minimo se non per il fatto che, appunto, il suolo è un ecosistema che si trova dove c'è una foresta, dove c'è un campo agricolo, dove c'è un pascolo e quindi, se tu vai a mettere dei target su questi altri ecosistemi, in modo indiretto vai anche ad avere un effetto sul suolo. La strategia per il 2020, però, non prevedeva delle misure specifiche per la protezione del suolo. Quindi di fatto si può dire poco sulla strategia del 2020 per la biodiversità riguardo quello che è stato l'impatto che ha avuto sul suolo.

3. **Vari report, tra cui quello della Corte europea degli Uditori e quello dell'Agenzia europea dell'Ambiente, affermano che le premesse per il 2030 non sono molto positive. Altri studi, inoltre, – ed è anche emerso dalle varie interviste condotte fino ad ora - affermano che l'assenza di una direttiva, di un qualcosa di vincolante anche a livello nazionale in termini di protezione del suolo sia uno dei maggiori impedimenti per prevenire la degradazione del suolo. Ti trovi d'accordo con quest'affermazione?**

Sì, sì concordo. Il problema di tutti questi documenti politici è che non sono vincolanti dal punto di vista legale e quindi propongono delle linee guida, ma non sono delle direttive. Sono strategie, dei piani, che però di fatto non hanno nulla di vincolante dal

[1] It is a real problem in Europe.

punto di vista legale, e quindi poi gli stati membri sono liberi di fare quello che vogliono[2]. Quello che manca, e che servirebbe all'Europa per garantire una protezione del suolo, è sicuramente una direttiva sul suolo. Perché questa diventerebbe poi vincolante per gli stati membri. Come abbiamo una direttiva sull'acqua e sull'aria, ne servirebbe una sul suolo. La storia è che questa direttiva era stata proposta, ma è stata poi cancellata perché cinque stati membri non erano favorevoli. Adesso uno di questi cinque stati membri non c'è più – ossia la Gran Bretagna – e quindi ora vedremo se questa nuova strategia per il suolo su cui stiamo lavorando adesso sarà poi da input per una nuova direttiva. L'argomento suolo oggi è cambiata, la percezione è cambiata, però tutt'ora quando si parla di suolo si parla di qualcosa che uno si sente proprio, quindi gli stati membri, le diverse nazioni fanno fatica ad accettare l'idea di una direttiva. Più che l'aria e l'acqua, il problema è che c'è proprio un'idea di proprietà dietro, qualcosa di intrinseco. Il suolo è un argomento molto difficile da trattare dal punto di vista politico. Uno dei meriti della passata strategia del suolo è stato aver creato una maggiore consapevolezza nei cittadini. La strategia del suolo non è riuscita a portare a termine una direttiva, anche se era uno dei suoi obiettivi, però un altro dei suoi pilastri era proprio quello di aumentare la consapevolezza – raising awareness – nei cittadini. E sicuramente questa consapevolezza negli anni è aumentata. Adesso, il movimento, l'iniziativa di raccolta di firme per il suolo, l'interesse che c'è nei confronti del suolo e quindi la pressione sulla politica affinché faccia qualcosa è aumentato. Questo potrebbe essere il motore per poter consentire veramente la creazione di una direttiva del suolo. Però non possiamo sbilanciarci per adesso.

4. **Quindi, il fatto che non sia stata sviluppata questa direttiva per il suolo è uno dei motivi che ha portato ad un incremento della degradazione del suolo?**

Sì, certo, perché non avendo dei vincoli legali, gli stati membri sono liberi di fare quello che vogliono e quindi di fatto le priorità diventano altre e il suolo passa in secondo piano. La mancanza della direttiva è sicuramente una delle ragioni per cui lo stato del suolo in Europa invece di migliorare va peggiorando.

5. **Il nuovo Green Deal e quindi tutte le nuove strategie annesse – tra cui anche quella del suolo –potrà in qualche modo riuscire a migliorare la situazione in maniera concreta, oppure no?**

Penso di sì proprio per la ragione che dicevo prima, perché c'è una spinta dal basso e molto più alta rispetto al passato. E' evidente anche dal fatto che il Parlamento europeo adesso ha adottato questa risoluzione che chiama la Commissione europea ad agire sul suolo e, di fatto, il Parlamento europeo sono i cittadini europei. Questo dimostra che, dal basso, la pressione nei confronti della Commissione affinché agisca sul suolo sta aumentando e quindi, inevitabilmente, la porterà a dover agire. Se gli strumenti messi in atto fino adesso – come la strategia dal produttore consumatore, la Farm to Fork Strategy, la nuova strategia per la biodiversità o quella del suolo che stiamo preparando adesso – saranno gli strumenti adeguati, non lo so. Spero di si, però ripeto, sono strumenti non vincolanti questi e quindi con tutti i punti interrogativi del caso. La verità è che se vogliamo ottenere qualcosa l'unico strumento possibile è una direttiva. Spero che questi strumenti portino alla direttiva, però, ad oggi, non lo possiamo dire.

[2] Member States are free to do what they want.

Tuttavia, sebbene la direttiva sia sicuramente uno strumento che serve, non è che, fatta la direttiva, sarebbe tutto a posto per il suolo. Questo sarebbe solo l'inizio, poi ci sarebbe tutto il problema di cosa mettere dentro quella direttiva, che obiettivi porsi, quindi stabilire dei numeri concreti, e capire come monitorarla. Uno dei problemi del suolo, infatti – e uno dei problemi della biodiversità del suolo – è come monitorarla. Ad ora, in Europa non c'è un sistema di monitoraggio della biodiversità del suolo. Sta nascendo, lo stiamo mettendo a punto con LUCAS. Sicuramente la direttiva può essere uno strumento che smuove, ma non è la soluzione di tutti i mali. E sicuramente, affinché una direttiva sia poi efficace, ci vuole uno sforzo da parte di tutti, da parte della Commissione sicuramente, ma anche da parte degli stati membri, che molto spesso sul tema suolo (proprio, forse, per le ragioni che ti dicevo prima) non è che siano poi così collaborativi. Per esempio, una delle questioni che noi stiamo cercando da diverso tempo di mettere a punto è quella di cercare di unificare i sistemi di monitoraggio del suolo su scala europea perché ogni paese di fatto ha il proprio sistema di monitoraggio del suolo. Il problema è che molti stati sono riluttanti all'idea di condividere i dati del suolo, e se queste sono le premesse, anche con la direttiva non si va tanto lontani[3]. C'è bisogno di un cambio di mentalità di visione appunto poi credo che le richieste dal basso e l'interesse crescente, possano essere la molla che fa scattare e cambiare qualcosa in futuro. Bisognerebbe provvedere e non lasciare tutto un 'bla bla bla', solo tante belle parole[4] scritte, ma si devono concretizzare nei fatti, questa è una speranza ecco.
Quando si parla di suolo, gli interessi in gioco sono molti. C'è tutta la parte dell'agricoltura, ad esempio. Ora è stata approvata la nuova CAP. Per il suolo, o perlomeno, per la biodiversità del suolo, bisognerebbe fare tutta agricoltura organica, però non si può pretendere che tutta l'Europa si converta all'organico. E' una questione di compromessi[5]. Ora vogliono portare al 25% la quantità di agricoltura organica a livello europeo. Questo è parte della Farm to Fork Strategy. E' un inizio, però è ovvio che il mondo ideale non esiste[6], anche perché poi il sistema diventerebbe insostenibile, probabilmente non sarebbe in grado di produrre tutto il cibo necessario. L'agricoltura biologica probabilmente non sarebbe in grado di soddisfarci. Quindi poi entrano in gioco questioni economiche con il discorso delle importazioni. Finisce che l'Europa diventa completamente dipendente da altri.

6. Come sta progredendo l'Unione Europea nel raggiungere la "Land Degradation Neutrality" entro il 2030 e la "land take" entro il 2050? Raggiungerà, a tuo parere, questi obiettivi?

Non penso che li raggiungerà, perché, innanzitutto, non lo stiamo monitorando. Magari si raggiungerà ma non lo sapremo. Nel senso, come la monitoriamo questa cosa? Bisognerebbe partire da oggi – e forse è già troppo tardi – e capire quanto "land take" è in corso adesso e poi vedere se da qui al 2030 le cose cambiano, migliorano o peggiorano, però bisogna farle queste cose. Di fatto, per dire, all'interno del gruppo "soil" del JRC al momento non c'è nessuno che si occupi di questo argomento. Poi le risorse sono quelle che sono. Io non dico che non si raggiungerà, non lo so, bisogna monitorarlo. Poi è

[3] The problem is that many countries are reluctant to share their soil and land data and, if these are the premises, the situation will not change much even with the directive.
[4] Many fine words.
[5] It is all about compromises.
[6] The ideal world does not exist.

possibile che lo si raggiunga, però l'arco di tempo è troppo breve e, appunto, prima che la macchina si metta in movimento ci vuole tempo. La prima cosa che bisognerebbe fare è iniziare a monitorare questa cosa che mi sembra non in corso al momento.

7. **A tuo parere, una politica integrata sulla desertificazione o la degradazione del terreno possa essere una soluzione realistica per far fronte al fenomeno?**

Ma in qualche modo c'è – la Soil Thematic Strategy – però siamo sempre lì, bisognerebbe poi convertirla in azioni concrete, in fatti. Sicuramente è meglio che essere nell'ombra, nel senso, solo il fatto di essere menzionati, avere una politica dedicata al suolo è già qualcosa, è già un inizio rispetto al fatto che il suolo venga completamente ignorato, com'era fino a poco tempo fa.
Se vogliamo essere sinceri, si dibatte ancora su cosa sia la "land degradation". Cosa vuol dire "land degradation"? C'è una definizione riconosciuta a livello mondiale? Per quanto ne so io, no. Per uno è una cosa, per un altro un'altra cosa. Non riusciamo neanche a definire cosa sia la "land degradation", combatterla diventa ancora più complicato[7]. Lo stesso discorso vale per la biodiversità del suolo. Secondo me, una delle prime questioni che la politica dovrebbe risolvere, è quella di dare delle definizioni precise[8], che probabilmente non accontenteranno tutti, perché ci sarà sempre qualcuno a cui la tua definizione non va bene, però sarebbe un inizio. Nomi e cognomi: cos'è la biodiversità del suolo, cos'è la land degradation. Se parti da questo, allora poi si possono porre degli obiettivi, dei target e si può anche cercare di misurarli dal momento che si sa cosa sono. Poi si possono quindi decidere delle politiche volte a migliorare questa situazione nel tempo, si possono fare degli impact assessment e capire se le scelte politiche hanno un effetto su questo qualcosa di misurabile, però devi capire cos'è questo qualcosa. Ed è uno dei problemi che, secondo me, per quanto riguarda alcune componenti del suolo, è fondamentale (es: la land degradation, soil sealing, soil biodiversity). Ad esempio: ci sono tre quarti delle specie di insetti impollinatori che fanno il nido nel suolo. In questo caso si parla di biodiversità del suolo o di impollinatori?[9] Li proteggiamo con un tipo di politica o con un altro? Questo fa la differenza, però bisogna mettersi d'accordo. Quindi, definizioni. Anche sul concetto di desertificazione sussiste questo problema. Quando posso affermare che un'aerea si sta desertificando? In base a cosa lo dico? In base alle caratteristiche della vegetazione, del suolo, del clima o perché tot di giorni all'anno ci sono temperature di un certo tipo? Se non ci si mette d'accordo, non si va da nessuna parte. Continueranno a rimanere tante belle parole.

8. **Pensi che sia troppo tardi per cambiare questa tendenza e risolvere il problema della desertificazione/ degradazione del terreno? Soprattutto considerato che in realtà il problema si sta diffondendo anche verso il nord Europa, dove ci sono fenomeni di siccità sempre più ricorrenti.**

Penso che la cosa si possa risolvere. O per lo meno attenuare. Risolvere sarebbe forse una visione troppo ottimistica, proprio per le ragioni che abbiamo detto fino ad adesso e la questione è molto complicata, però sicuramente si può fare qualcosa per migliorare questa

[7] If we are not able to define what land degradation is, fighting it becomes even more complicated.
[8] One of the first things policy makers should do is to provide precise definitions.
[9] Three- quarters of pollinators nest underground. In this case, are we talking about soil biodiversity or about pollinators?

tendenza. Magari non si può sistemare tutto, ma sicuramente qualcosa si può fare. Lo stesso EGD può avere tutti i limiti del caso e non si sa dove porterà, però sta di fatto che ha cambiato la prospettiva. L'ambiente è ora diventato una delle priorità della Commissione europea, cosa che fino a due anni fa, nel 2019 con Junker, non era. C'era solo economia e lavoro, adesso invece la situazione generale è cambiata. Poi dove tutto questo porterà è troppo presto per dirlo, però la volontà di cambiare le cose c'è e quindi è già un buon inizio.[10] Non so se la Commissione ce la farà, ma non è solo la Commissione che deve agire. Lo sforzo dev'essere più allargato.
E' stato fatto molto da parte della Commissione, del JRC almeno, sulla parte del suolo. A parte la serie di atlanti che è stata pubblicata, c'è anche il sistema di monitoraggio LUCAS che è notevole. LUCAS raccoglie ogni 3 anni circa 20/25 mila campioni in tutta Europa. Adesso, nel 2018, abbiamo raggiunto l'analisi della biodiversità attraverso il DNA. Tutto questo è qualcosa che davvero solo la Commissione poteva permettersi di fare – e non sono dal punto di vista economico. Se pensiamo che il suolo è passato dal non essere minimamente considerato, all'essere presente in tutte le strategie, è anche grazie a quello che ha fatto il JRC nella Commissione.

INTERVIEW NO.4 (P4)

1. **How do you experience the current situation of desertification in the EU?**

I don't know how much you are aware of the policy developments, but an important milestone was an Audit by the European Court of Auditors in end of 2018 on desertification. The Court was quite critical for the way desertification – and also land degradation in general – is addressed at EU level and they made a couple of recommendations to the Commission, mainly about improving the monitoring and developing a common methodology to monitor desertification because desertification is a complex phenomenon because it is a combination of several land degradation processes that come together and therefore you need first to agree on what it actually is and what it actually means. However, we actually don't have this at EU level. The Court also said that the Commission should see if enhanced better legal protection of soil and land at EU level is possible and also assist Member States with best practices and exchange of knowledge and so on. Another important stream of work is at the global and international level, as you are probably also aware. The UNCCD at the EU level is dedicated uniquely to combat desertification, but then at global level, under that Convention, the EU also has certain obligations. The EU is a party to the Convention but also all the Member States individually are a party and either they are regular party or they can also choose to declare themselves as affected by desertification. 13 Member States have done that and then they have additional obligations such as to come up and develop National Action Programmes to combat desertification. So, 13 Member States have done that, but currently the EU as

[10] The environment is today one of the priorities of the European Commission, which was not the case until two years ago. There was only economics and work, today, instead, the general situation has changed. It is too soon to say where this will lead, but there is the will to change things, and this is already a good start. I don't know if the Commission will make it, but it is not just the Commission that must act.

a separate party has not yet declared itself as affected. While this is of course the case for many countries, it is not for others. This is a bit the policy context.

2. **Would you define desertification as a serious threat for the EU?**

I think it is. The problem will only become more important and more pressing because, as you know, an important factor in all of this is climate change. Climate change is not changing favourably for the moment. It will likely only become worse. What we see is that certainly in the South, and also in the east, desertification is increasing. But it is also linked to other problems, such as with water provision. Even in Belgium – although you cannot say that Belgium is desertifying – but even here, in a relatively cooler country, we have problems with the provision of water because the groundwater layers and aquifers are depleting and the same is happening also in the South I think. This is often a problem, it is also a problem of illegal groundwater extraction. Also, because of climate change, farmers need to start to increasingly irrigate and to water their crops. Often, to do that, they abstract groundwater and this also can increase this problem. I think it is an important problem that is for sure not yet solved, but that will only become more pressing and that will deteriorate in the future.

3. **The withdrawal of the Soil Framework Directive in 2014 left the EU without a legal basis to protect soils. To what extent was the absence of a soil framework a major impediment to prevent the further development of land degradation and desertification?**

Yes, indeed the absence of the SFD impeded to prevent land degradation. It is always difficult to say what would have happened if this SFD would have been implemented, but I think that, for sure, it could have made a difference because, mostly now, we do not have a legally binding overarching instrument to protect soils and to make sure that Member States take action to restore and to prevent soil degradation. Some Member States think that soil protection is a matter of national competence and that the EU should not interfere with that. This means that, in their opinion, it is up to them to take action, but if you then have a look at the situation on the ground, we can only see that the situation is deteriorating since years and it is only becoming worse. This means that, if they think that it is a matter of national competence, well then for sure it proves they have not taken enough action at national level either. What we see is that the way Member States address soil degradation in general is quite uneven: you have some Member States that have quite comprehensive legislations, real soil acts – so separate laws at national level to protect soils –, but most countries do not have that and certainly not countries to the East, where we have the impressions that not much is happening in some countries. Therefore, such a directive at the EU level could help to make sure that all Member States do the same and that they are all forced to take action on their territory and to set an obligation. For example, that they at least monitor the situation and they try to see where there is a problem on that territory, where the problem is most pressing and then, based on such an assessment, they would take appropriate action to address that problem. I certainly think that this would help. What we can also say is that – I don't know if you are aware of that – but the European Parliament recently, on the 28th of April, adopted a resolution on soil protection. I don't know exactly if and what they say on desertification, but if I remember correctly there is a reference also to the UNCCD and probably also to desertification.

What they said in that resolution is "well, Commission, indeed you proposed the SFD so many years ago, it failed, now it's time for you to convex within the EU proposal". This is a bit the situation. Of course, the Commission has always been favorable towards EU soil legislation as well as the Parliament – because the Parliament back in 2006 immediately adopted the text of the proposal in first reading –, but the problem lied with the Member States and with the specific countries.

4. **How do you assess the potential of the EU, with its tools such as the Green Deal (e.g: the Farm to Fork Strategy, the new Adaptation Strategy, the CAP, the Biodiversity Strategy, the Forest Strategy and especially the new Soil Strategy) to prevent land degradation and desertification in the long term? Where do you see the strengths and weaknesses in it to tackle the problem?**

I think it also comes back to your previous question. The tools that you mentioned are mostly strategies, so strategy documents or communications from the Commission. In that sense, they are non-binding. What we do not yet have is really an EU soil legislation and I think that this could make a big difference. I think there is an important policy– or legal – gap – that we have for the moment at EU level. Indeed, also these strategies and also the soil strategy that will be updated in the 2nd half of the year – probably somewhere after summer, in September or October – it will address the problem of desertification but it will always be in a non-binding way. A strategy also looks mostly at the action of the Commission itself, while we need all actors to be involved and certainly also the Member States. With the strategy, we cannot really force Member States to take action in a legal way so I think, indeed, that's an important gap.

5. **In this sense, it will then probably be hard to achieve LDN by 2030. I talked with some researchers, and they were telling me that it is hard to achieve it especially because there is not yet a methodology to assess land degradation.**

Yes. This is something for sure that we will try to address in the soil strategy because this is also what the Court of Auditors asked. Even for me, land degradation neutrality is a nice concept, but nobody actually knows what it means. Everybody has a different opinion about it, it does mean that you can compensate land degradation if it happens, where can you compensate if that's possible and so on and so on. So, it is true that we need at EU level an EU methodology. At UN level you also might be aware that there is a simplified methodology to measure LDN but it is based on three sub-indicators only – land use land cover change, carbon stocks and now I don't remember the third one –, while in my opinion it is much more complex. For example, what is missing in the methodology is that there is nothing on chemical quality. Pollution is not accounted in that methodology, so there are also flaws there and this methodology is not perfect. It is also what this methodology says – that this is a minimum, these are three indicators and that you can add more and more indicators to make the picture more complete. This is certainly something that we will try to address in the soil strategy because it is important that we bring together all the Member States and that at least they agree and that they don't oppose later in case we would make an assessment of desertification and land degradation and progress towards LDN. Therefore, we first need to agree on what we actually mean with these concepts.

INTERVIEWEE NO.5 (P5)

1. **How do you experience the current situation of desertification in the EU?**

I find it difficult to answer. I mean, if I look the work that we published, so the "Mapping and Assessment of Ecosystems and their Services: An EU ecosystem assessment", then I think that in terms of soil and desertification we have sort of three very important indicators that could say us something: soil organic carbon is an important parameter, and then soil erosion and in terms of climate, we also worked on drought and extreme droughts or water availability in general. We know that these variables are decreasing but the change goes very slow. It is not fast in matter of decades, but the trend is still negative. So, I mean, I would say that on average, in Europe, the outlook for soil is not very positive and climate change will very likely make the problem worse, especially the fact that you have these extreme droughts and given that ecosystems are much limited by water, this is going to be a serious problem in particular in the Mediterranean, Central and Eastern Europe. If you would take these three parameters together, then clearly we have to do something to better protect soils so that there would be a conclusion. More specific, if you look at soil erosion we know, based on the data that we have, that the erosion is higher than the actual soil formation so even if we have been able to sort of reduce the level of soil erosion, maybe by taking measures and so on, soil erosion is less in terms of problem than there used to be 10/20 years ago. The absolute level of erosion is still too high, and it is higher than the formation of soil, so that means that we are losing soils through erosion, we are losing carbon in the soil mostly because of our practices and soils are getting drier because of climate change. The outlook is not good I would say.

2. **Would you define desertification as a serious threat for the EU?**

I would consider it indeed as a serious threat in particular in areas where the combination of these three variables together is declining. If these three variables together are declining, then there is a serious threat indeed.

One of the problems for regions in western northern Europe is that, even if there is a certain amount of rain, for instance say that you have a regime of at least 600mm of rain annually, urbanization is also increasing across Europe, soil sealing, which also means that an increasing amount of water is not available for the soil anymore but it is just run off to rivers and is sort of lost as available water in the soil also for ecosystems. That's particularly evident in heavily urbanized regions like Belgium, the Netherlands, West Germany and these regions are also experiencing more drought problems even if at first sight there is sufficient rainfall. The poor management of soil and the rapid increase in soil sealing make the problem worse.

3. **I know that one of the main problems with land degradation is the difficulty of assessing it. For this reason, it is also hard, according to many, to achieve LDN by 2030, since we cannot really assess which progress have been made. How do you think this problem might be solved? Which instruments should be developed? How should Member States contribute?**

Typically, in this area the EU and the Member States work together on these issues. I don't think there should be a division but rather a collaboration. Measuring land degradation indeed might be still a challenge. I know the convention on it, I'm not following any work on land degradation, but I have expertise in how to measure degradation of ecosystems as a whole and there, we developed a sort of framework to do that within the UN – it's called ecosystem accounting – so it's a way to measure ecosystems as a whole and to statistically report on that. For ecosystems like forest or grassland and so on you would come with a system that tries to measure the total extent, the total service area, what is their quality and what are ecosystem services, but in particular on quality. If you would extend that to land degradation, then it's important that you measure sort of 5 or 7 key characteristics of an ecosystem which you can also translate to soil. You would need to know something about abiotic systems, so what is the physical and chemical quality of a soil, and you would need to know something about its biotic quality so how is it with soil biodiversity, how is it with a sort of structural component of the soil root systems and so on, and how is it with soil functions. I think these 5 elements would need to be part of a measurement framework for land degradation. Each of these would have to have indicators which clearly link to the quality of soil from low to high. So, typically, you could say something on the water content of soil, the nutrient content of soil, soil diversity – what are the key species of a soil and if they are present – I think it would have to contain SOC or structural parameters and something that also allows you to look at the function of soil as a system typically like soil respiration or something. If you take these things together, that would be a first step to measure actually the quality of the soil. The second step is what you need and I think what would be important also as a common strategy for the EU and member states is to identify soils which we still think are in a good or healthy status. If we can do that – I am thinking maybe of soils in primary and old growth forests or specific ecosystems that have been protected, nature reserves where soils have been kept intact or have been undisturbed by people – than we have a reference system actually and if we measure the variables that I just said in those reference systems, then you would have a better understanding of when a soil is in a good situation/health/condition so that you can compare other soils with that reference situation and sort of make a decision. And the you can say "at this stage and at this value of indicators we identified our soil as been degraded and it needs to be restored, whereas here we find it still in a sufficient quality". This is something that we are developing for ecosystems to look if a forest is healthy or not or is a grassland in a good condition or not and you can easily extend that concept to soil.

4. **Why such a system has not been developed so far?**

I think that, to some extent, this is a system which is for instance in place for the measurement of freshwater quality in Europe, for example, under the WFD a sort of system has been developed. We have reference situation like an undisturbed lake or a river high in the mountains which is not disturbed and these are our references: we measure the quality of the river there, the chemical quality and the species, the fish and the macro invertebrates in there and then we use that as the "top" and we measure other points and compare them with the reference to see. It's a bit the same of what a doctor does, he investigates you, he takes your weight and height to determine your body mass index and if it is lower than 90 or higher than 25 you are outside the reference, so maybe you have a problem and you can investigate further. The problem for soil is that there are

data gaps, so we know things about SOC and soil erosion, but soil erosion is already mostly based on modelling not really on a measurement network; for SOC there is a measurement network but maybe not for soil chemical quality, certainly not for soil biodiversity. There is not consistent monitoring. We essentially lack the basic data to make that assessment. This is under development, but for soil I think that the incentive is not there, there is no specific policy demand or policy request. In most of the soil in many countries – and certainly at EU level – there is no sort of legal requirement to restore soils, to bring them in a good condition, whereas the WFD or some of the biodiversity policies, like the habitats and the birds directive, they are mandatory for countries, which have to follow these rules very specifically. Of course, this is a much more powerful way to impose countries to ensure that the quality of water, nature remains sufficiently high. For soil we simply don't have this.

5. **So, do you think that the absence of a Soil Framework – of a legally binding law such as those for air and water – to protect soils has been a major limitation to protect our soils?**

It is. Absolutely.

6. **Do you think it will be possible to have this?**

An important policy principle of the EU is the principle of subsidiarity, and the Member States often invoke this principle to say "no, soil is really a matter of national competence", or even in Belgium or in Italy, regions could say "no this is really a regional competence and we don't want any interference from the EU on soil". On the other hand, the times are also changing, there is climate change, there is a biodiversity crisis, and an important policy of the EU is the EGD which has to transform the EU in the next decades and this is not only in terms of decarbonizing the economy, but also in terms of restoring our ecosystems. The Commission is now developing a legally binding law on ecosystem restoration and soil will be part of this. That means that by the end of this year, the Commission will propose to the Member States a regulation or a directive on how to restore ecosystems and how to restore soil. There's not going to be a target for soil at this stage, but there's going to be an article that probably will say "we have to start monitoring our soils, so that we can start identify and understand the problem, that we can map where soils are really degraded and where, in a second step, you will have to take the necessary steps to restore degraded soils". This is work in progress and I think we will see by the end of 2030 that there's probably some legal obligations and a target for soil degradation. I think that the problem cannot be always ignored. I think this is coming.

7. **Do you personally believe that it will be possible to remedy to the damages or it will be hard to impede the further expansion of the phenomenon, at least in the EU? Is it too late to overcome the problem?**

No no, I think remediation is possible. The problem with soil is that it is really costly and also requires to think about how to finance that.

8. **What do you think is the role of ecosystem services such as water, forests and so on in the fight against desertification and land degradation? For example,**

to what extent is water scarcity a real threat for soil? Or deforestation? Do you think that policies on forests, water or agriculture should have a clearer focus to fight desertification?

I never thought it like this because I'm an expert in ecosystems and how to measure the health of ecosystems. What we always say as an important condition is that your ecosystem can only be healthy if the soil is healthy. Then we don't sort of turn the logic around but it makes sense that you say "you also need a good quality of your system before the soil can be in a good quality". Obviously, forests and vegetation in general have an important function for maintaining a good soil through the production of hummus, the soil system, the root system, the sub Mediterranean habitats they provide in root systems and so on. This sort of interaction between soils and ecosystems is important and I think that in the new thinking and policy on biodiversity this is recognized, but indeed how to sort of put it in a measurement system is not so evident. Also, from ecosystem services we do a lot of work on that, I did a lot of work on that, but also mostly from an ecosystem perspective and not necessarily focused on soils. So, we always investigated what is the contribution of the entire ecosystem in delivering a sort of soil response if they are specifically related to soils like the prevention of soil erosion or the maintenance of a good soil quality. My perspective on this is that I have always considered soils as a part of the ecosystem, just like above ground biomass, and even part of the water and the atmosphere is all part of the ecosystem. I am afraid I cannot fully reply to your question.

INTERVIEW NO.6 (P6)

1. **How do you experience the current situation of desertification in the EU?**

It depends, first of all, on how you define desertification. I think that in the EU it is certainly a very pressing and priority topic, but limited to certain countries. It is not yet a topic which has reached the highest political level. Of course, when you think about desertification, it immediately comes to your mind Spain, Greece, Portugal, Italy, but although there start to be some climate change related issues in the North of Europe, of course it is difficult to talk about desertification. However, if you have a wider perception of the definition, which includes, for example soil erosion – which is a huge problem in Ireland and in many northern countries – or soil disturbances, or forest fires – we had huge forest fires in Sweden in 2019 –, so if desertification is intended as the loss of the organic soil, for different reasons, then definitely this is a topic. The problem with the EU is that everything which is connected to soil is immediately connected to subsidiarity and member states competences, even if it's not true because the EU has competence on soil under Article 191, but there is this perception that this is something to be dealt at local or regional level, and not European level and so on. This is a bit the introduction.

2. **Would you define desertification as a serious threat for the EU?**

Yes, yes, yes, absolutely.

3. **In how far do you think that the absence of a Soil Framework - legally binding law such as those for air and water- has been detrimental to achieve soil protection and to prevent land degradation?**

It is certainly decisive, because if you have a European framework not only you have a bigger political support for taking actions at regional level, but usually you also have more money. The legislation does not just mean that there is an obligation to do things, because when there is legislation you can link this to a lot of possibilities which are related to funding. Typically, for instance, there is a lot of money in the CAP that can be spent for greening agriculture but if you don't have a standard of desertification, then people would say okay this is not an issue. If we had a framework legislation saying "okay soil has to have this standard everywhere", you not only have countries adopting the legal initiatives but you will have a lot of commitment, of money, and of course this has a big impact, yes.

4. **How do you assess the potential of the EU, with its tools such as the Green Deal (e.g: the Farm to Fork Strategy, the new Adaptation Strategy, the CAP, the Biodiversity Strategy, the Forest Strategy and especially the new Soil Strategy) to prevent land degradation and desertification in the long term? Where do you see the strengths and weaknesses in it to tackle the problem?**

I think that it is certainly really really important, in particular because the climate agenda starts to be finally linked to soil, because it was decisive the IPCC Report, the Special Report on Soils that was issued last year, so that is one thing. Everything is unfortunately connected to climate. People only understand climate and even there they do not want to do anything but if you don't have it under the climate action people say it is not important, this is why biodiversity was completely neglected in the last years. Now that there is this close link to biodiversity in the EGD, then biodiversity starts to be considered more and also the new forest strategy which is very much biodiversity oriented. Soil is basically the same thing because it is not only the fact that, I mean it goes in two directions because climate change is compromising soils so Eu countries does there's no food anymore?? And that's a huge issue and at the same time, soil is a way to remove carbon. Healthy soils remove carbon, so I think that as a nature-based solution, soil and land degradation is going to be priority under the EGD. The question is to what extent this is understood because there is a lot of superficiality in the political narrative. The key to your reply would be what the soil strategy will say and whether we will be able to have the legally binding instrument that we are working on under the biodiversity strategy

5. **So, as far as I understand, if there is not a legally binding law, a framework to protect soils, it will actually be hard to work on this problem of land degradation and desertification?**

Yes, as a true European environmental lawyer believing in common action, absolutely yes.

6. **What is the role of forests in the fight against desertification?**

Fundamental. Tomorrow we will have the new Forest Strategy published and there is a whole paragraph or two about the relationship between soil and forest, so you can quote this in your thesis as a really fresh thing. It think it is fundamental because one of the reasons why there is this completely new approach to forest is that soil contains the majority of the carbon that is absorbed by forests. This carbon is released when the trees are cut because people don't pay attention to how they do the harvesting, particularly in Nordic countries where there are these huge machines that cut everything, stumps and roots, and the soil is all lost. There is a first dimension which is fundamental in forest and is the way in which you treat forests because you may have very well huge emissions from forests just because you harvest the trees, that is one thing. The second thing is the preservation of the soil via trees that is recognized and it is why next to the forest strategy there will be this staff working document on the tree billion trees the Commission wants to plant in particular in degraded lands to restore soils and so on. Of course not in peatland or in wetlands where the soil does not need trees, but there is a very close connection between soil restoration and tree planting in urban areas, in agroforestry and in degraded land. So, having the agenda on soil forest is really very strong. I don't if you read about it, but I have quite a few scientific articles on how important it is to manage the forests sustainably in order to protect the soil. This is of course related to the protection function of forests because forests had never a huge protection function not only because of the heat that you say, but also for the landslides and so on. Healthy soil with healthy forests is fundamental to keep the mountains where they are so that they don't fall down.

7. **How do you evaluate the EU's progress towards achieving LDN and land take? Many people to whom I talked argued that one of the main problems with land degradation and desertification is not only that a clear definition of the terms is missing, but also that there are serious difficulties in assessing land degradation and degradation.**

The point is not whether LDN will be achieved or not but is "what if we don't even set such target". We are working with trends and targets and the specific targets, most of the time they are not complied with. For example, we had the target of reversing biodiversity loss by 2020, which is completely missed. Land take continues very strongly in Europe, although there is much more consideration. I think that you need the target independently: it is not the fact that you know that it will be achieved that justifies the target. Without the target then basically the trend will just go worse and worse. You set the target, you aim at this target – maybe we make it maybe not – but the fact that there is a target allows for what I was telling you before, to have a whole narrative and concentration of energies towards that and money, and political attention which gives the chance to improve the situation. If you ask me, "can it be achieved", I agree with you, that there is no consistent definition, we don't know exactly what degradation means, we don't have one unique definition, we don't have a mapping of the soil because it is very diverse. I agree also with what you said that it is probably reversible. If you see this guy in Australia, a professor that puts the cows in the desert and then after a few months the desert is no longer a desert. I think that, despite these difficulties, you need a process and for a process you have to start and set some definitions, but what is important is to get the things in

motion and, if you don't have these targets and agreed definitions, you are not going anywhere.

8. **How do you assess the new Forest Strategy?**

The forest is a very difficult world, it's corporation where there is a huge conflict of interests between the economic operators and the public sector particularly because the environment and agricultural ministries basically do the interests of the forest stakeholders and not the interests of the public in many countries. This is very clear in the Nordic countries where forests is basically managed totally unsustainably and even the environment ministries of Sweden and Finland said that. I think that with this new forest strategy it is the first time it is put on the table that a forest is not just a silviculture, but it is climate and biodiversity. Although the text was changed a lot the text before it was adopted – it was much stronger in draft – this message comes up and we also have a commitment to do a binding legislation on monitoring. This was a huge fight because Member States are still saying that it is not a EU competence on forest but there are very good court cases and there is obviously a competence on forest. If you look at the starting situation I think that this forest strategy is very good. I mean, it could have been much better, but it's going to be a change.
It is a communication, but it announces legislation on monitoring and planning. It announces that the Commission will assess and come up with a regulation on monitoring with a system on certifying close to nature forestry, which will have to be a regulation. So here and there you will see that there are announcements of legislation. It is not a directive and it is not binding, but if you do what is written there, we will have a legislation.

9. **Do you think there should be a legal framework also for forests? Like for example, the one we have on air or water?**

Yes, absolutely. Why shouldn't we have a legal framework on biodiversity? We have it on air, on water since 1975 and the WFD since 2000, we have it on waste, we have it on noise, but on biodiversity we only have the protected areas, we have natura 2000, but there is no agenda or directive on the protection of biodiversity. Why? And then forest, which is a large part of biodiversity, is the one of the missing parts and the other one is soil. The director of the EEA made a speech a couple of years ago at the EP and said "the biggest failure of environmental policy is the fact that we don't have a framework for forest and soil", although we have regulated everything else.

10. **Why do you think Member States are so reluctant to give to soil and forests this "status"?**

For forests is because 40% of forests are public and there is a conflict of interests in the Member States so basically they are making money and they are managing these forests the same people who then make the policy. So there is a huge conflict of interest and the second one is because the forests' owners are very powerful. In many countries there are big noble landowners, latifondisti and so on and they are very politically influential. And then also because they have lived in their bubbles, nobody has disturbed them for many years. You know how many people are convinced that there is no EU competence on

forest? There is EU competence on forests. For soil is more – there is some similarity – but is more also because soil is considered land use and land use is considered subsidiarity and people see the quantitative aspects, they don't see the qualitative aspects. It's protection of soil is protection of the environment so obviously is environmental policy which is competence of the EU. These are the two main problems: the corporation of the interests and the subsidiarity. It is not a good moment for Europe anyway because the rural areas are anti-Europe and this is also another aspect that we have the anti-Europe in the rural areas. One of the reasons why the Swiss were so strongly against this forest strategy was because their rural areas are turning around against Europe and they are afraid that then there would be extreme right parties who win the elections and then they may collide the Union. This is the same in Poland, in France – France also with the rural areas are strongly against Europe. The governments are very careful. Instead of setting the pace, the government say "go in that direction as well", which is wrong.

INTERVIEW NO.7 (P7)

1. **How do you experience the current situation of desertification in the EU?**

Personally, I always had problems with the term desertification because it's so broad and not much focused to soils. That means that I always misinterpret this desertification in terms of converting fertile soils to a desert. I understand this political term and for me the situation is improving. Finally. I will focus on soils, I don't want to speak of other types of desertification. I understand this desertification as a very much political term that helped to be broad on the agenda. From my point of view, since it's almost forty years that I work in the soil business, I'm very happy that finally things are changing. I worked also for the JRC sometimes, with *P2*, and I remember how disappointed we were in 2006 when the Thematic Strategy for soil protection was blocked by some countries and in 2014, with another failure. But now, the Global Soil Partnership with the very intensive support of the European Commission to the FAO, the European Soil Partnership, sub-regional soil partnerships. Finally, things are changing, including legislation. Hopefully, the situation will gradually improve in 10/20 years.

2. **The withdrawal of the Soil Framework Directive in 2014 left the EU without a legal basis to protect soils. Was the absence of a soil framework a major impediment to prevent the further development of land degradation and desertification?**

Yes. I can further explain my personal view. I remember some discussions. I do remember many people, many soil scientists discussing from 1995 when we completed the first soil map of Europe and then when *P2* came to work for the JRC. There was always a strong will in this small group in Ispra – Soil Action & the institute for sustainability, it was renamed several times. There was always a clear view, a clear picture of what is needed, what was needed and what is still needed. I remember those expectations from many people, from European countries, those representatives who were participating in meetings of the European Soil Bureau Network (ESBN), all those disappointments and so on. Since we know that for some other directives – like nitrates – it was very strange that the soil, that maybe is even more important, for my point of view, is not European-

wide protected, regulated. Of course, there are very known reasons for that. Soil is property and nobody wants any country to interfere with his/her property. It was also very disappointing that those countries that already had developed a soil protection strategy or some kind of - Germany like soil protectional, Dutch people, Austria and others – these countries refused the soil thematic strategy, they blocked it. The major reason for this was the problem of market, of common European market, of opportunities, of competing on this market and son on. What was very crucial, this soil protection strategy was so easily pushed aside at the time that the soils were not recognized successfully, as they should be recognized – so as key media, key natural resource even for drinking water, for food, for fibers, for forests, for biodiversity, for carbon sequestration, for climatic change and so on. That is why even myself I need some more to raise awareness on the importance of soil with a very clean purpose to put a… from lay people, to politicians, that this legislation is somehow pushed through. In majority, all countries in Europe they did not implement national legislation on soil protection because it was not needed in the European context. On the same side, the European level was blocked from influential levels societies namely from selected countries. My country is small, is not very influential in Europe, that's true, but I understand, and I noticed the thinking of people from the ministry of agriculture or for environment protection. They said "yes we have so many problems, Europe is not asking for this, Europe is asking for something else, let's do that because it's mandatory, we will protect soils later". This was one reason. The second reason was that nobody wanted additional environment protection legislation because of hampering of some development goals. What is the main development goal? To build on fertile land, on flatland. In my country flatlands are very scarce. Our geological situation is that the main drinking water we get is in these lowland areas. The water is purified through the soil. At the same time, all factories, all urban developments, or big infrastructure developments require flatlands. Here now we are facing the ideas of developing countries by additional housing areas, by highway; on the one side factories, on another side sustainable agriculture, protecting soils because of soil ecosystem services. It's a mixture of everything.

3. **At the beginning you said that the situation on soil is improving and things are changing. Did you say this because of the work you are doing or, for example, because of the EGD? Do you think that the EGD has the potential to do something?**

Yes. Personally, I am quite unhappy. I am supposed to retire in 4 years. By the end of my active life, things started to happen. 10 years ago, when we started to talk soils with the ministries, even with the ministry of agriculture etcetera, everyone said "no no no, it's too plane, in terms of soils, they are everywhere, so why should we protect soils, it's not so crucial, we need to discuss other things". Even the soil research was completely neglected in the past – not completely, but very much – on national levels and at the European level, but now the situation changed. Last 5 years – from 2015, the international year of soil and so on – things are developing. The very last declaration of the EP on soil protection: that is the document I was waiting for 20/30 years. Just imagine, people speak about pure waters, mountains, air, biodiversity. This nexus of everything, soil, it was not existing. Maybe I can draw your attention to booklets we have produced with the European money. I proposed a project which is completed in the framework of Alpine states. How to raise awareness on soil protection not on country level, not on European level, but on regional

and sub-regional levels. By regional levels I mean like European Alps, or regions like parts of Italy. Very important historized soil awareness to led decision makers think about soil importance on municipal level because soil sealing decisions actually happen there, on the very local level. Actors by actors, square meter by square meter, how to treat soils, which soil is better than the other, which soil cannot, must not, should not be sealed. When you speak about desertification, it is true that we are speaking about the organic matter decline, the soil is becoming the source of atmospheric carbon, we are talking about soil contamination, soil pollution, we are talking about erosion. Well, these problems persist in Europe, but the major problem I see personally is soil sealing.
Just to make decisionmakers at lower levels aware of the importance of soil protection we produced a booklet on "Ecosistema del suolo e delle Alpi". What is really important, what we found out in our project, is that people happily live in Europe. It's a nice place, many countries, many languages, many cultures, virtually no borders and so on. Everyone somehow respects or not the European community, but people prefer to talk in their own languages. It is very important to address people in national language, in their own language. Even those messages about soil protection would be much more appreciated in national languages and, of course, much better understood. That's why when we start to speak about soil protection at the European level, we need to think how to reach those people that actually made decisions on municipal level.

4. **Do you think it will be possible to really make a difference, to really help soils without a legal framework, legally binding laws at national level?**

No, no, but the legally binding laws will be more successfully implemented or prepared with the better understanding of soil importance.

5. **So, in your opinion, it would importance, first, to raise awareness on citizens?**

Sure. And when Europe starts to speak about the awareness, definitely English is not the right language. In the project we had a very nice experience with regione Valle D'Aosta, so those urban planners, when they understood, they saw, they started to think how to protect soils in those narrow valleys, how to stop erosion or how soil protection can mitigate some floods events and so on.

6. **Can you tell me of your work at the Alpine Soil Partnerhsip?**

Well, the Alpine Soil Partnership is a one of the main products of our project. Actually, in the project we initiated. We had two major projects/products: the platform which is in national languages, where we tried to prepare some scientific but very understandable information on soils and these booklets and leaflets and etiquette, so what to do and what not to do within a certain sector like tourist sector, like urban planning, agriculture, forestry. Everything was prepared here and the Alpine Soil Partnership is surprisingly still active although there is virtually no funding anymore and, even better, Germany, Switzerland and Austria decided to support financially the Alpine Soil Partnership because the intention of the Alpine Soil Partnership on one side follows the European Soil Partnership or Global Soil Partnership initiated by the FAO and, of course, on the other side it is very much aligned to work group six of EUSALP and, of course, maybe the most important – the Alpine Convention, you know the organization, they established

the working group soil. It did not exist in the past. So, now, the countries that belong to the Alpine convention, they are sending representatives to discuss soil protection in Alps, in Alpine area and how to better implementing the binding international law which is the soil conservation protocol of the Alpine Convention which is a binding international law to protect soil, ratified in all Parliaments of Alpine Countries but Swiss Parliament. We know how it works the ratification in Switzerland, they do not ratify, but they implement it. In other countries, it is sometimes the opposite.

7. **Do you think the measures are adequate so far in terms of soil protection or you think that they should do more?**

If Europe is serious with the environment protection, definitely we need directives on soil protection. I remember also discussions with these colleagues at the FAO and Ispra, that the Alpine Soil Convention Conservation Protocol should be kind of modelled, should be further on developed, but with the declaration of the European Parliament and the pure intention to support this legislation obviously something will happen and I think that it will happen in two years or something. This is my personal view on this timeline.

8. **Before you were saying that, in your opinion, the most serious threat to soil is soil sealing. So, do you think that the objective of land take by 2050 is achievable?**

It must be because the rate of sealing was enormous last 15/20 years. I think it's really terrifying because they don't seal soils on slopes, they seal the best soils in lowland. They are sealing the whole size of Berlin every year in Europe.
Usually, we agriculture people talk about population growth because of the food. At the moment, there is enough food in Europe, maybe even too much, frankly speaking, because we waste it. But there are other important things, so other ecosystem services, they were completely neglected in the past, so the soil science is nowadays fighting also for better recognition of soil ecosystem services, not ecosystem services something like you know well, we have clean air, and nice view and everything and pure water and we mitigate this carbon released from traffic, but definitely, we need those deep fertile soils to perform ecosystem services, not only food production.

I remember those times when we started to talk about soils and people were disgusted "this is just dirt, what you are talking about, speak about something fancy, about butterflies, pandas". This is still very present now, people are so selective, they pick up just nice species to protect but those very basic that makes our life on terrestrial ecosystem possible, soil, it was not recognized in the past. That's why I'm positive, because of the very big changes in the last five years and because of the declaration of the EP which is a big step forward. But still, a directive is definitely necessary. It is very much needed. Why? Because countries will not allow that they are somehow restricted, so equal opportunities, that's why this soil protection should be also regulated, because this soil protection regulation will of course change some development plans.

People are not much sensitive for soil degradation also because the soil is still very much linked to food. Normally, in Europe, thanks God they go to store and they buy food in any quantities and we eat too much. It was very interesting for me, last year at the

beginning of Corona crisis, suddenly it was extremely important "oh my gosh, there is no more certain types of cheese in the store". People got scared easily about food and certainly started to discuss soil protection because of food production on national level because this is strategically important and so on. So, when the crisis was passing, this discussion was slowing down gradually. We are very sensitive to what we think we need and we do not see that some obvious things should be actually there, some more planning and strategic environment protection.

You cannot own the air, you cannot own water – you can, but not in the way you can own the land. The major business they do is turning agricultural land to housing areas.

INTERVIEWEE NO.8 (P8)

1. **Come percepisci l'attuale situazione di desertificazione in Europa?**

Parlare di desertificazione nel territorio dell'Unione mi sembra una parola forte, perché non è che ci siano deserti, c'è una degradazione della qualità del suolo, che è un po' diverso. Anche perché se pensi la copertura forestale è in realtà cresciuta, quello che c'è un consumo di suolo dato dalle urbanizzazioni sempre più estese e c'è una degradazione della componente della qualità del suolo data dagli inquinanti e dalle attività passate. Quindi questo è un problema importante, perché io ho fatto dei progetti in Serbia ed in Albania dove c'erano un sacco di miniere che poi sono state abbandonate non sono state chiuse in maniera propria e quindi quel suolo è altamente inquinato, c'è tutto il problema di Marghera, il terreno è inquinato e quindi sostanzialmente inutilizzabile, quindi deserto, ma non è deserto come il Sahara, come l'estensione del Sara o di altri deserti.

- **Vari studi dimostrano che nell'Unione Europea, ad esempio in Spagna o in Italia, ci siano casi di desertificazione anche abbastanza seri**

Nel sud perché c'è una siccità crescente o meglio un andamento delle precipitazioni diverso, però la desertificazione è un'altra cosa. Non è proprio il problema dell'Unione la desertificazione.

- **Quindi parleresti più di altri problemi del suolo e non di desertificazione di per sé nell'ambito dell'Unione europea, corretto? Tredici stati membri tuttavia si sono dichiarati a rischio di desertificazione**

Ma è dettato dai cambiamenti climatici, dalla siccità, ma non è che sia una cosa di domani, è una cosa in prospettiva. Quello che è più immediato è un impoverimento, un deterioramento della qualità del suolo.

2. **Quindi valuteresti il rischio di desertificazione come serio per l'Unione Europea oppure no?**

No, tendenzialmente basso. Sapendo che il rischio è considerato la combinazione di possibilità e quindi di tempo.

3. **Nel 2006 è stata adottata la Soil Thematic Strategy e come quarto pilastro e c'era l'idea di sviluppare una legislazione sul suolo, così come c'è una legislazione per l'acqua e per l'aria, e di fare quindi una legge che fosse vincolante dal punto di vista legale per la protezione del suolo. Cinque stati membri, però, si sono opposti. Nel 2014 la Commissione ha quindi ritirato la proposta di legge. Secondo te, questa mancanza legislativa ha contribuito al deterioramento dello stato dei suoli? Perché, ad ora, la tendenza è abbastanza negativa, di base la qualità del suolo sta peggiorando, non migliorando.**

L'ho seguita e mi sembrava una battaglia di principio[11], perché onestamente avendo protetto l'aria e l'acqua perché non il suolo. D'altra parte, il suolo è già coperto dalla normativa sull'agricoltura, sulla deforestazione sulla biodiversità. Il suolo è il risultato di tante altre cose quindi tutto sommato non è che la sua protezione sarebbe migliorata se avessimo definito cos'era il suolo. Quello che è carente, se vogliamo, è come sempre la vera attuazione delle direttive ambientali. Per cui se davvero attuassimo la direttiva sui pesticidi, la direttiva sulla qualità dell'acqua, sulla biodiversità eccetera, a quel punto la qualità del suolo migliorerebbe.[12]
Le acque puliscono il suolo. Quindi, tutto sommato, la qualità del suolo è peggiorata perché c'è più suolo occupato e ci sono più coperte di materiali dannosi, ma tutto sommato è l'ultimo su cui puoi intervenire, non puoi fare bonifiche estese[13].

- **Quindi secondo te una legge sul suolo in realtà, una direttiva vincolante che imponga agli stati membri di avere delle leggi sulla protezione del suolo potrebbe essere una cosa positiva?**

Sì, ma non è che cambia la vita a nessuno. Mentre la qualità dell'acqua, dell'aria, della biodiversità e dell'agricoltura hanno tutte un riflesso sul suolo, una specifica sul suolo rischia di andare a duplicare tutte queste.

4. **Il Green Deal europeo ha in programma tantissime strategie: c'è quella nuova per l'agricoltura, per la biodiversità, per le foreste, per l'adattamento climatico e anche la nuova strategia del suolo. Tutti questi strumenti pensi in complesso che possano aiutare a proteggere il suolo nel lungo termine?**

Bisogna vedere cosa riuscirà a passare. Non so se hai visto già la levata di scudi che c'è stata ieri. E' stata approvata la strategia forestale, ma quella sull'energia, il pacchetto Fit for 55, è stato affossata da molti stati membri, mentre la strategia sull'adattamento climatico è stata lanciata e tutto sommato sta ricevendo una risposta buona. Quella non dovrebbe avere grossi problemi ed è quella che ha più rilevanza sul suolo[14]. Così come quella sulla biodiversità che dovrebbe uscire tra poco.

[11] Battle of principle
[12] The soil is already covered by the legislation on agriculture, forests, biodiversity. Soil is the result of many other things and therefore, its protection would have not improved much [with the directive]. What is really lacking is, as always, the real implementation of the environmental directives. Accordingly, should we really implement the directives on pesticides, on water, on biodiversity and so on, at that point, the soil quality would really improve.
[13] Soil quality has deteriorated because there is much more land occupied and covered by harmful materials but, all in all, soil is the last on which you can act upon since it is not possible to do extensive reclamation.
[14] Is the most relevant strategy for soil

5. **Nel 2018, la Corte Europea dugli Uditori aveva lanciato un report sulla desertificazione dicendo che la Commissione non ha un'immagine chiara della desertificazione in Europa e che gli step mancano di coerenza. La Commissione stessa aveva detto che il rischio di desertificazione poteva essere affrontato meglio a livello europeo. L'Agenzia Europea sull'Ambiente ha anche detto che le premesse per il 2030 non sono incoraggianti e che raggiungere gli SDGs sarà improbabile. Tu cosa diresti a riguardo?**

Siamo un po' indietro. Stavamo andando bene e poi il covid ha un po' fermato su alcuni. Siamo lontanini su altri. C'è ancora tempo onestamente, ovviamente questo "boost" con il Recovery Fund dovrebbe dare un'accelerata nella direzione giusta, siccome 1/3 dei soldi deve andare verso il Green deal, in teoria dovrebbero esserci risorse aggiuntive per andare nella direzione giusta. Devo dirti la verità che come dire, che sì, è giusto che l'Europa ci pensi, ma non è solo il problema dell'Europa. Alla fin fine le percentuali eccetera, sono misere. Questa è una cosa su cui dobbiamo anche ricordarci che sì è importantissimo fare uno sforzo qui, ma se lo stesso sforzo ti costa miliardi. Il protocollo di Kyoto di compensare da qui o là, non era studio, perché alla fin fine siamo tutti nella stessa barca. E' più grande, ma è sempre la stessa.
Secondo me una cosa che devi guardare è cosa fa l'UE verso l'esterno, perché la desertificazione in Unione è un conto, ma aiuta i paesi esterni? Il problema è che, soprattutto sui problemi ambientali, è bene avere una legislazione interna, ma bisogna anche avere una dimensione esterna, che in alcune cose è importante – tipo l'adattamento – in altre dovrebbe diventare un principio per cui io non compro e non importo e non autorizzo l'importazione in EU di cose che non sono con gli standard europei e prodotti in maniera sostenibile, non solo il risultato. E a quel punto bisogna dare degli incentivi e dei sussidi a che vadano a migliorare gli standard. Vediamo la fatica che fanno i paesi dei Balcani, che sono proprio alla porta, a raggiungere l'aquis communauteire sulla base ambientale, che è molto molto costosa.

6. **Dal punto di vista delle Nazioni Unite, l'Unione Europa non viene quindi considerata come un'area a rischio di desertificazione?**

Nono, allora diciamo che c'è la Convenzione, ci sono state le tre Convenzioni di Rio. Quindi c'è stata la Convenzione sul Clima, la Convenzione sulla Biodiversità e la Convenzione sulla Desertificazione, che diciamo è un po' la "sorella povera" delle tre, detta proprio volgarmente. Tant'è che all'inizio si chiamava Convenzione Africana sulla Desertificazione, perché si pensava che il problema fosse solo là. Poi è un po' cambiata, adesso le tre, hanno capito tutti che il grosso tema d'ingresso è il cambiamento climatico e quindi si stanno reindirizzando a lavorare tutte e tre insieme sull'impatto del cambiamento climatico e il ruolo del suolo e della desertificazione sullo stesso. Tu lo sai che se pianti degli alberi nel deserto, solo perché li hai piantati lì pioverà di più, quindi è un circolo virtuoso. Quindi, questo fa bene, da una parte recuperi suolo e dall'altra parte reduci CO2 e abbassi le temperature. Poi c'è ovviamente tutta la parte di recupero del deserto, c'è un'iniziativa che è il Great Green Wall di fare un muro verde sul Sahara, che è un'iniziativa delle Nazioni Unite, c'è tutto quello che fa il Work Food Program, che è il programma alimentare mondiale a Roma, che stanno facendo tutta una serie di interventi per favorire l'agricoltura nel deserto con micro-oasi e già queste migliorano. Le tecnologie ci sono, quello che serve sono i soldi e ovviamente uno non vede l'impatto della desertificazione fino a che non vedi che ti piove sabbia quando sei a Roma o a

Milano. Diciamo che questo è un po' più lontano da noi e quindi, come tale, magari non beneficia della stessa attenzione.
La parola in sé, in Europa, non è "conducive" a dire "oh cacchio mi devo muovere". Poi ripeto, non c'è desertificazione. C'è un rischio, futuro, ma non è che abbiamo le dune da nessuna parte. Il modo per renderla rilevante è parlare di degradazione del suolo, che poi porta ovviamente alla desertificazione, però diciamo che è il risultato alla lunga.
La desertificazione è un processo reversibile, tant'è che ci sono le condizioni per contrastarla, non solo per limitarla, se no non è molto vantaggioso far tutto sto casino solo per fermarla. C'è la possibilità, tant'è che ci sono tante iniziative, come il Great Green Wall eccettera, che puntano a riqualificare i suoli. Quello che è interessante è che la desertificazione porta a migrazioni. Quello è l'argomento su cui l'Unione si aggancia sempre per interesse. Si parla di "displacement" di persone che dall'interno vanno verso il mare, le coste, o le grandi città, che sono già di loro ai limiti. Ed è la regione per cui la strategia sull'adattamento, quella precedente dell'Unione Europea, era tutta sulle aree costiere, l'80% parlava di questo sostanzialmente e quindi questo è l'interesse politico.

INTERVIEW NO.9 (P9)

1) **How do you experience the current situation of desertification in the EU?**

Instinctively, I associate desertification with arid climates just because deserts are arid but, as soon as you broaden to land degradation, then climate falls away because I associate land degradation with a mix of bad land management – first and foremost – compounded by changing climate patterns and because we constantly and increasingly work into adapt our land management so maybe even techniques that worked to prevent degradation won't be appropriate anymore but need to be adapted. Personally, I do my research on forest, so, in my own work, the natural association is that of removal of tree covers – vegetation in general, particularly trees – who have the capacity to retain soil, manage our water flows through soils, who often tend suffer from a much more intensive use of the land, which can lead to over exploitation of resources, ultimately abandonment.

2) **Do you see desertification as a serious threat for the EU?**

Yeah, I do. We had colleagues during a study on 'where different vegetation zones would occur if you do right' and, not surprisingly, as things get warmer, vegetation zones move upward and northward to try to keep their niche, but basically what you see in part in the Mediterranean you will get areas that get less and less suitable for true government of landscapes. In that sense, you can rely on them as an agent to prevent degradation and desertification. So, for sure, I think there was also an interaction there with choice of species, in forestry for example, that are not suitable to maintain soil functions and restore functions then they get associated with water nutrient recycling. To put it simply, business show that towards the end of the century, you are getting Sahara-like conditions in Southern Europe, so the threat is absolutely real.

3) **The withdrawal of the Soil Framework Directive in 2014 left the EU without a legal basis to protect soils. To what extent was the absence of a soil**

framework a major impediment to prevent the further development of land degradation and desertification?

It's a bit hard for me to say. I explain why. Within the Commission at the JRC we provide scientific support to the policy process, but we are not tight to a single policy. At JRC we are a bit distant from that. I don't have much experience with actual policy making process and the process context. There isn't a policy on soils per se, but there's the CAP for example. So, if the argument would be 'to prevent degradation or desertification we need a policy, a binding one', then my question is 'do you see that the Union already has a version (a directive), for example, in agriculture'. I should then see less soil degradation in agricultural land where we actually have a strong instrument at the European level. You probably know better than I, but I guess no, I guess we are necessarily not doing much better in our agricultural land. I'm in a way distant from the policy process, but I don't think that having a directive per se means that we make progress. That being said, I think it becomes even harder without one. I would also send a message. One thing is the message, to say, we value this as something that needs to be tackled Europe-wide and that's important and the other side is what you do of course, what you put in the instrument and that's the level of politics I have less experience with.

- **Many soil experts, on the other hand, argued that the absence of a directive has been detrimental to prevent land degradation, because Member States had no obligations to protect soils. What would you say about this?**

I would subscribe to that. If I draw an example linked to the legislation that I am more familiar with, like the Habitats and Birds Directive and there if I do the experiment 'what would the situation be if these directives were not there', for sure it had been detrimental. So yes.

4. **Can you tell me about your work with remote sensing?**

Sure. Remote sensing encompasses a little the way you measure the properties of an object, in our case the land surface, from a distance, most often the term is used to embed those observations from satellites or aircrafts. So, we put the camera on the satellite or on an aircraft and then you measure. Typically, you measure by images but there are other types of course. So that's a very broad field of application which is going quickly because there's more and more of those instruments, in the space particularly, and the access to them becomes easier and the computing part processes then. So, it is used to map what is on the land, is used to look at the rivers, the maps of the crowds, the river forecast, so we draw graphs to look at divergences. Most relevant to the questions you are asking, there are satellites (remote sensing) to map land cover and changes in land cover. To a certain degree you can assess where land is being degraded through that, through just technologies.

- **One of the main problems people mention when talking about land degradation and desertification is the difficulty in assessing and measuring land degradation, especially referring to the target of LDN.**

Through remote sensing, do you think it could be possible to at least partially solve the problem?

It helps. That's the right way to put it, I think. Then, it would depend on how you define land degradation. I don't know what the working definition is, if there one, but you have to keep in mind – for example in the context of forests – that there are many things about forests you can see that way, but there are many things you cannot easily see. For example, for forest biodiversity demand of deadwoods – that is in the forest and is very important – so we can miss out by the way important factors. Think about land, we can see soil properties only if there is no vegetation on top. Of course soil properties are extremely important to the outlook of the ecosystem. The main advantage of the tool is that it can cover very large areas, so you see everything. Depending on the sensor type and how you measure it – problems with crowds or not, for example –, that is how you map the whole planet every day. That's also complement very well techniques that are more spot-based, sample-based that can get to a level of details very roughly.

- **Did you notice any particular/relevant change in the land over time?**

I'm studying forests and mostly of the northern latitudes – so boreal and other forest areas in the North – and there we see from remote sensing, for example, the Tundra – the polar region where you still have vegetation – you see the greening. It was one of the only sort of science of ecosystems responding to climate change. Of course the warming is going just in the polar region and there most ecosystems are temperature-limited with some of the temeperature restrictions being released. We see from satellite (Northern Alaska, northern Canada, northern Siberia) that there was greener. There's has been decades of studies to understand what's actually going on, what does that mean on the ground. Is it a new type of plants, is it the same plants going better, is it less watery maybe and so on. Then, as you move South to this border region, so think maybe of the big forest of the Siberia and Canada/Central Alaska where actually at the end of those you see where they go brownies, you see that the trees are struggling to keep up because they are not adapted to the warmer temperatures. So, there are bio scale processes going on. Another one that there's lot of literature on is the Sahel – that's maybe closer to your domain – where big questions about the the greening of the Sahel as well related to patterns of climate, but that's already going back decades. It was one of these first big applications of satellite data showing changes in vegetation.

5. **What is the role of forests and the forest ecosystem in soil preservation? Especially considering that deforestation is considered one of the main causes of land degradation and desertification**

It protects soils, but it creates soils, and it maintains soils. Carbon nutrients come from the vegetation and a little bit of deposition and then we have some rare but locally important processes. For example, the study from the Amazon where phosphorus is limited, might be actually transported from the river ecosystem, so it is brought from the ring of mountains and then goes downstream and then it is actually moved to the animals that live there from land and water who might be actually responsible for bringing some of the phosphorous out of the rivers system onto the land. That's more local. But I still see it as a cycling agent. I mean, it's the vegetation as a whole and forest, in particular,

they ensure that nutrients keep cycling through the system or, if you take in another way, you bake it and then whatever exports nutrients, you've lost it. Maybe it's a bit like a bicycle. As long as you pedal it's incredible stable, physic-wise is amazing but once you stop the bike, it falls over. It maintains the system on different time scales. Building up a forest or a soil ecosystem takes time and, if we compare to how we live now, building up a soil or a forest is consistently much longer time scales, which also makes the loss of it so much more drastic because we know that even in a lifetime we don't do much.

INTERVIEW NO.10 (P10)

1. **How do you perceive the current situation of desertification in the EU? Do you perceive it as a serious threat?**

I think it is a threat for some countries. Member states have acted upon at least in some areas and then other haven't because it is not an issue for them. One important legislation is the legislation on Wastewater Treatment and this is a legislation that has evolved in order to ensure that the water that is used is treated and reused for other purposes. So, if you analyse the report from the Commission on the transposition and implementation of that legislation, you see that there are certain countries like Spain, Cyprus, Greece, Italy (Italy I'm not sure) [*sentence not finished*]. From 2007, Spain had already adopted a specific legislation that was going beyond and actually enabled the use of the water that had already been used and treated to be used for cropping, for example. That goes beyond. The difficulty is that, if you use water and you put it for irrigation, if it has chemicals or if has something not properly treated, it can contaminate food and then go to people and to the environment. The Spanish legislation was a little bit going beyond the existing legislation and now the revised version has been mirroring the Spanish one. So, from that point of view, I think that desertification is a threat according to them, to the legislation, which says that for some countries it is a threat, in other countries it is not perceived as a threat.

- **Considering that extreme weather events are moving north more and more, do you think the threat could become wider?**

This is the basis of changing the legislation in the EU actually. The fact that there is climate change, that you will need to get ready before it comes really really bad. Obviously, here, the measures and the solutions that are provided, are to reuse the water. I think that's good, but there are others issues that can be solved, for example rationalising the use and this could also be done by keeping forests close to the rivers so that then the humidity is maintained. Sometimes there might be reforestation of the riparian river/habitat with forests. I think there are more things that could be done to stop drought, but this at least is one measure. I think there are limitations on the mechanisms that are taken because the EU does not have competence on the forest, so they can say to the Member states that forest fires should be avoided, for example, but if they don't say how … I mean they cannot do more than that. There is no competence on land planning and then the EU proposed to adopt a soil directive and it has never been adopted. All this implies that there is a threat but not everything that can be done is done. From my side.

2. **From a legal point of view, why do you think it is so hard to have a directive for soils?**

Because countries see land as their property. It is like land planning: there is no way. I don't know how the Habitats Directive was adopted, because all the Member States were saying exactly the same: 'this is about land planning, this is my own competence'. Suddenly it was adopted because of 1992 Summit on environment etc., and it's hard to be implemented but it has been implemented. I think with the soil, Member States see it as their own property and then letting it go is difficult. However, we have the example of energy, which was also seen as area of national competence and now there is a policy on energy. Why? Because suddenly there was a crisis. There was a member State who was without energy and too much dependence on certain sources and then suddenly it was agreed that something needed to be done. Unfortunately, we might need a crisis to realise that soil need to be protected. But there are some projects that have been done. Member States are very jealous of their competence, that's the issue.

3. **In how far do you think that the absence of a Soil Framework has been detrimental to achieve soil protection and to prevent land degradation?**

I think it is one of the reasons. I do. I'm a lawyer and my reasoning is legal. To me there are two main problems: one is a lack of information, lack of knowledge. I think that if we had a legislation, we would have information because we would have reporting from Member States, but I think that also for the legislation we need background information that is shared by member States etc. and compiled at EU level. I think that there has been for a long time an ignorance or 'not even thinking about soil protection', it was not an issue, it was not considered. We looked at over the soil, but never the soil. We looked at water, at forest, at protected areas, but the quality of the soil is a new thing and probably we lack a little bit of information on the problems and the solutions. I don't think there are so many activities anyway from Member States although we talk about desertification, we've been talking about desertification for years, we have the Convention on Desertification in 1992 as well.

4. **So even though there is the Green Deal with these new tools, these are still 'only strategies' and probably not much is going to change in terms of soil, right?**

Yes.

5. **Do you think soils should be considered more in the current strategies considering its cross-cutting nature? For example, with more precise and focused targets?**

I think that I would continue trying to adopt the legislation. Maybe a new impact assessment could be done now. Because I mean, now the proposal for the soil directive is kind of old, we did not have that much information at the time, maybe now there has been more information, more research on soil quality at least. For me, I would say to trying to develop a project on an impact assessment of a directive, for a new proposal, that would look into the competence and make clearer the point on the need of a collaborative way

to deal with soil protection. I think it would be useful clarifying the impacts of droughts in the south of Europe, but also in the North. I think that, if it is based on evidence, then I think Member States might be more willing. And, also because at the moment where the soil proposal was presented there was not that much evidence and the Member states were not so much convinced of climate change, but now it's a fact. That is linked to the reasons or the need for dealing with soil. Another issue is agriculture: it used to be a very strong policy, now it's getting less budget, less attention, we don't need that much, I mean, we still need agriculture of course, but we don't need so much production, input, fertilisers etc. in the ground. Trying to develop a policy that plans how to use that land that might not be dealt with anymore or that may not be used for agriculture or that might change in the way it has been used, might be another way to approach and justify the need for the directive.

INTERVIEW NO.11 (P11)

1. **How do you perceive the current situation of desertification in the EU?**

As an introductory remark, I can say something on the basis of my experience in the European Commission and in the European External Action Service having worked on desertification for some years in the European Commission in DG-Development, which was the department in charge of the file for quite some time. The issue of desertification is probably, in terms of semantic, if we may start with that, is probably immediately associated to countries that are outside the European Union. Maybe not immediately perceived, at least in the Northern hemisphere, as a real problem. When you talk about something else, like, for instance, sustainable land management or soil degradation, maybe this can have a more direct linkages and impact at the European Union public opinion level. Maybe this is something that is more immediately understandable in order to translate certain phenomena like land degradation or soil erosion at the European continental level. So, this to say that probably the term – and this if I remember correctly was also something that has been discussed for quite some time at the international level – the term desertification, the use of this term, does not make immediate and full justice to the extent of the problem, at least for the perception in the Western world I would say, in Europe in particular. So, this I remember is a topic that we have been discussing also with colleagues for quite some time in order to present the topic and to make sure that a certain awareness could be created about phenomena. So, in the EU, in the Commission were I've been working on this file, we have been always trying to translate the term desertification into land degradation phenomena and sort of expanding it in order to make sure that it is not immediately perceived as a sort of desert, the deserts surrounding us, which, for Europe – except for certain parts/zones in some southern European countries – is a sort of very limited phenomenon. This was one aspect, and at the same time it is also important trying to explain that in the European external dimension, so foreign policy approach. Desertification could have also been a topic that one could use when establishing or working within the Rio Convention Summit so, basically, full implementation of the Convention itself when linking to a sort of separate dimension that is basically the external policy. Whenever you talk about development with certain African countries, for instance, this is a crucial phenomenon and threat and it is posing a risk to livelihoods in areas that are in Sub-Saharan Africa, for instance, extremely wide.

So – sorry for the sort of very wide and open introduction – but I think that it is very important to characterise the term in order to make sure that this is immediately understandable and tells the European consistency. So now, this being said, I think that ,if we use the term sustainable land management or soil degradation for Europe, I think that this is a way to facilitate the understanding of problems that are code probably with other labels and with other terms, with other definitions at European level. This to say that the current situation of land degradation and soil degradation in Europe is for sure a significant problem. And I think that we are probably realising this more and more now that we are trying to propose – for instance with the very recent EGD – the interconnected approach that took other files, like for instance biodiversity, climate, water or pollution, and allows to bring back in the conversation this dimension that for various reasons – political, historical, cultural – have been somehow let aside and a bit forgotten. I think that this can bring us a little bit to other topics that are probably relevant in this conversation and that's basically the fact that if you look at the Desertification Convention, there has been always, within Europe, a distinction between Southern countries considering themselves affected, and others who are considered not to be affected but that are probably going to be affected or are in the process of becoming affected if you look at the various scientific or technical parameters that would identify a country as affected by desertification itself. This is to say that, in Europe, we have suffered from a dichotomy at political level between two groups of Member states – I mean I'm simplifying but basically the northern and the southern countries – who have been very much closer to the problem that Spain, Greece, southern Italy, or southern part of France and being more sort of familiar and sort of aware of certain processes that were probably not known or immediately inteligible to the northern countries. So, I think that the wider categorisation of affected or non-affected countries is an important element that also affects the perception of the problem. Now, I think that, probably, one of the avenues that one has to start work on or probably continue to work on at European level is basically continuing the explanation and the exercise of establishing those links among categories and phenomena that up to now have been probably dealt and covered in a non-connected fashion. So, basically, dealing with soil degradation per se, water in another silos or climate or biodiversity. Now I think that, with the EGD we are starting to understand that these phenomena are very complex but interconnected. I think that science has a role to play and I think that the work that colleagues at the scientific-technical level are doing in various commission department – notably the JRC of the European Commission – is extremely important because the factual basis and the scientific and technical grounds are, I think, of enormous importance in fully understanding the phenomena and then of course, on this basis, to find and get some political solutions. I mean, the legislative work at the European Commission level in relation to the various soil strategies or soil framework directives – we can probably touch that afterwards with your second question – is a capacity aspect that needs to be carefully taken into account because the basis with which the legislators – the European Commission, the Council or the European Parliament – will have to define certain categories or certain actions are of course of extreme importance. So, science should remain the basis and allow decision makers to take full decisions as everywhere, so I think that's basically the problem. So, yes, this to say that then this – and this is what I wanted to say basically to go a little bit into more the political dimension – is basically to say that this sort of divide among affected and non-affected European countries has influenced very much the dynamics of the political discussions. In normative terms, I think that this has also influenced very much certain

decisions or certain difficulties of blocking of certain legislative acts at the level of the Member States with a certain political resistance to act and to take certain measures. For example, I think one of the most problematic of these issues is the issue of contaminated soils so I think that is very much related to pollution, the cost of inaction, the responsibility, the liability. I mean, you open a series of questions and problematics that are extremely big and of course may worry very much also decision makers, especially when and this is also a related aspect of the work that needs to be done. So you start doing a certain categorisation in order to understand soil erosion or soil contamination or land degradation around the EU. I think, if I'm not mistaken, colleagues working in the scientific department of the European Commission and all around the Member States have been trying to push this effort in order to say 'okay but before acting we need to understand exactly what is the extent of the problem'. So, you carry out a certain degree of researching certain areas and then you identify certain problems. That's the first step and then of course you need to create awareness among the decision makers. This is something that needs to be sort of acted upon. And, of course, to the perception of the problem, given the difficulty and the complexity of these phenomena, these things may not be immediately visible as, I don't know, climate change or, to another extent, biodiversity, or threats, or disappearing of species, or other things that may be more visible. That's part of the problem but at the same time also potentially part of the solution in order to be able to probably shape a different approach there because we have understood that the purely regulatory binding approach has not be sort of watching entirely. Probably, more clever ways could also allow tackling the problem at the European level. Now, for instance, the biodiversity strategy, the revision of the biodiversity strategy and other approaches that have allowed the introduction of – or at least the attempt to introduce – certain quantitative targets, could allow again soil protection to gain against some sort of momentum in the overall process. I think that's something that should be part of the equation, but it may possible require some time.

2. **Many of the people I talked to have arisen your same issue about the importance to understand these phenomena in order to better understand them. Some also underlined how important it is to have a methodology to assess them. What would you say about this?**

If I may just draw a parallel, I think that for climate and for biodiversity – if I remember correctly – a big part of negotiations some time ago was at international level. But I think that, what the climate convention has managed – we are on different grounds and I think the measurability aspect is somehow different – but I think the good thing about the overall climate awareness that has been sort of created is basically that you have figures that can be immediately visible and understandable. If you talk about the minus 55% GHG reduction objective within a certain time scale, I mean this is immediately understandable to everyone. This is possible because you have tools, and you have measurements. So, I think that the idea of utilising and going through the approach that scientific and experts are pushing to say "we need a coordinated way or harmonised way to measure the phenomenon' is the right one and should be the one that finally could help in sort of framing in a more consistent and coherent way the problem. I think that you have a point when you say that this may face a certain degree of resistance from Member States. As usual, whenever there is an attempt to centralise or to control from Brussels certain phenomena, we see a resistance from the Member States. In the case of soil and

land, I can understand that this is even more considered as a strict and close sort of prerogative and power of the Member states. I mean, the control of your territory is one of probably the most central prerogatives that countries consider for themselves. So, in a way, I can understand that trying to harmonise and identify a categorisation of what is to be considered the degraded soil or degraded land may be something that certain member States at least perceive as an attempt to take responsibility and powers out of the central structure. These are well known dynamics at the level of Member States. The story of the SFD – the resistance by Member States of the European wide targets – is in itself very much pertinent in this regard. There is a declaration that has been made at the top of the Commission which says that there will be a soil strategy very soon, hopefully in 2021 as part of the EGD, but, of course, we are not embarking again in the development of a directive establishing binding or regulatory commitments, so we are taking another argument for that. This can be of course a limiting factor, but at the same time also an opportunity because you have also, with the EGD, a great opportunity to push also the connections and the links among different files. The division in which I work in the EEAS at this stage is called 'global issues' on environmental and economic aspects. Very soon, as of September, we will change name and we will be split into divisions. One is going to be called 'the green transition'. This is to say that there is an increasing awareness and possibly this topic could be covered all together and establish appropriate links beyond climate and biodiversity. To go back to the monitoring/reporting, verification as it is sort of quoting the climate, but I think there is an increasing trend in expanding this to other areas, biodiversity I think is a good example. Biodiversity has suffered until now from a lack of clear quantitative indicators, we're moving into that with these sorts of objectives (e.g.: 30 by 30 objective). The EU has of course been among the pushers in that direction. But I think that if we manage to bring this conversation also into the soils there could be also advantages. I don't see other ways of moving it to this because of floods and harsh methodological phenomena like we are experiencing also in Europe, but the trends are likely to demonstrating in the long term that this is also a result of climate change and global warming. This would expose also the public opinion and also have an indirect effect on the way public powers and regulators react to certain phenomena in order to make sure that these are controlled. Possibly not yet in terms of having a European fully shared and regulatory approach, but possibly moving into something that is more in synchronicity with these phenomena and these trends. So, moving into the measurement approach, assessing the figures, understanding where the threats are and due to which phenomena, and possibly at the end come to an agreed definition and inventory of soils for Europe. Not in the next few years, but it is possible to come in the future.

3. **To what extent was the absence of a soil framework a major impediment to prevent the further development of land degradation and desertification?**

Not an easy question to answer. In some areas Member States have accepted the EU to act basically under the principle of subsidiarity. That's one of the greatest battles: whenever the Commission or higher instances at the European level decide to act on a certain area, you have to demonstrate why this is useful. In our impact assessment, whenever we decide to start working on a determined area you have always a standard question which is basically 'what is the reason for the EU to act in this area? Why do you consider that the problem is not just a national problem?'. So, that's a bit the sort of difficult answer to be provided and whenever you try to provide an answer to them, for

sure, one of the immediate elements that you try to look at is 'has the fragmentation of the 27 different approaches in the EU helped in making progress?'. In some cases, you may decide that the problem is sort of different at the national level and that you may require different solutions that left to the choices of the governments. We are increasingly looking at the environmental phenomena, aware of the fact that there is a transboundary nature of these things. Soil is probably a little bit different, but if you look at water, climate, pollution, there are no boundaries. For soil is a little bit different, soils are very often considered the physical element on which you build boundaries. In that case, there is greater awareness and resistance from the national point of view to allow a unified European approach. For sure, in some cases, looking at the history of European legislation, a top-down approach, basically Brussel says 'we need to act because there is a problem' and, depending on the political and historical circumstances, this has worked. This has worked because in some cases the recognition of the problem due to a various or different circumstances has evolved and allowed certain public opinion stances – environmental organisations making campaigns, intervening and framing the problem as an European one. For soil, I think we are not yet there and possibly there is still some resistance but, I think a clever way to do it could also be to move. We understand that a purely regulatory approach of an harmonisation at the European level is probably not going to work in the immediate, but in the long term, if you manage to establish certain links with climate and biodiversity and pollution, I think that you may be able to identify new avenues. So, possibly, the absence of a soil framework directive has for sure not helped in sort of facilitating this process of harmonisation but there is also the other side of the coin, this aim that the EU established a framework at the European level whenever there are certain conducive elements that allow you to do so. If there is a very strong resistance that remains there, I think it's pointless pushing in that direction. Maybe it could require some time and some work at the scientific and technical level to demonstrate that similar exercises – like working on a soil catalogue and soil inventory for the European territory – may be useful if you start to explain or to gather data that demonstrate the importance of a soil directive. The problems that Germany is experiencing with soil degradation are probably similar to the ones of north Finland or Greece, but to a different extent of course. The absence of a regulatory instrument at the European level probably has not facilitated the mainstreaming of the problem and the common understanding, but, on the other side, this is also a reflection of a certain situation at the political level that is not very much conducive to that approach. I think it is a limit of extra inclusive nation whereby you are not allowed to legislate at the European level because there are wide differences in approaches at the level of the various Member States and different interests at stake. Something we are not mentioning: soil degradation is the consequence of certain industrial activities, soil contamination, pollution on one side, but also the elephant in the room is the CAP. So, strong linkages with an approach until now – I mean, we are starting now to introduce certain environmental performance standards and criteria into the CAP but the avenue is still a long one. If you look at the discussions that are going on the reform of the CAP at the moment, certain declarations of the European Commission Vice President Timmermans – he is the file order of the EGD – he has been recognising at different times that the difficult and very important battle is the one sending the reform of the CAP. There you have a model that has historically, since the WWII, functioned to ensure full security in the EU, certain supply of food stuff for the European citizens and so on. Now we are moving into something else with the EGD. There are linkages there. You also have to take all these elements into consideration

when looking at certain objectives, so I think that's also very important. Soil degradation, land contamination are the result of other phenomena, other trends that are sort of generated by certain political industrial choices at the European level. So, in a way, this is the sort of side effect, the drawback that we are experiencing. One cannot refrain from considering these elements in a sort of rural coordinating approach. We are little by little stuck into the achievements with the previous CAP reforms: making sure that some environmental responsibility is also taken at the level of farmer, of producer associations, agriculture. These are starting to gain ground in the European society. We are not yet there, and the movement should continue, but I think that the EGD has sort of reinforced this approach. However, there are battles that need to be fought at the European continental level. Contamination, liability, responsibility, penalty, and insurances at the very end have to be part of the equation which is not an easy one to solve.

4. **How do you assess the potential of the EU, with its tools such as the Green Deal (e.g: the Farm to Fork Strategy, the new Adaptation Strategy, the CAP, the Forest Strategy and especially the new Soil Strategy) to prevent land degradation and desertification in the long term? Where do you see the strengths and weaknesses in it to tackle the problem?**

We touched a little bit upon this topic in the previous questions, but yes, I think that, as we said, drawing some lessons from the past in order to avoid the difficulties, and the blocking of certain proposal we have experienced in terms of regulatory approach, has probably not entirely worked. A new soil strategy that could – in the new current political content – establish all the appropriate links with the other headings that we have mentioned. There is an important element which we have not highlighted. If the strategy is framed in such a way that utilises the international dimension as a potential driver for action at European level, basically this I think would facilitate moving the debate into a more comprehensive discussion. The alignment of the potential general objectives – without being of course quantitatively stringent – but at least moving this discussion and establishing the links, for instance with the SDGs at international level, saying 'we have a general commitment in reaching certain targets as far as land degradation or desertification is concerned' could possibly help to frame the discussion and the debate in another context. At the same time, of course, very important is the Paris Agreement, making sure, for instance, that healthy soils are considered to that angle as sort of helpful tools – for carbon caption, storage, carbon sinks. This is also very much related to the Forest Strategy. So, in a way, translating and explaining the role that good soils and healthy soils as sustainable management of land could also play in this endeavour. At the same time, of course, making sure that all the appropriate links among these very complex constructions and architectures that we are trying to put together under the EGD are clearly explained. I think that the Zero Pollution Action Plan, as part of the New Biodiversity Strategy, is also another dimension extremely important. Of course, pollution prevention acts as a strong driver provided that all these elements are clearly spread out. I would say that these new tools represent great opportunities. I think that it is clear and everyone is becoming aware of that. I see that, for instance, environmental organisations are giving up and preparing to work in these areas and making sure that these linkages are properly defined and established. But at the same time, of course, the lack of a proper strong instrument that sort of identifies the protection of soil as a strong priority is also playing in the other direction. So, in a way, you are mainstreaming the soil

dimension and the land degradation and desertification problem into some other things, but at the same time there is no more visibility for that if it is done elsewhere and you lack a sort of element that could talk to the public opinion and say ‘okay we are determined to take action because a fragmented approach at the European level does not make sense anymore’. Probably we are still lacking this sort of political top message and I think that, the recent declaration about the fact that ‘no we’re not going to introduce a binding measure at the level of soil’ is already somehow an indicator of weakness in a certain direction because it demonstrates that, for the moment, there is no sort of political willingness to take strong action. But we’ve seen this in the past and these periods and situations may change. Different political consistencies, different sensitivities at the level of governance, unexpected elements – natural elements and factors that may influence the decision making, such as floods and damages –, the fact that the EU understands that soil protection is an essential element of its policy, and preventing action is something that should be more and more considered when looking at how to address certain consequences or situations at the level of territories of the Member States.