EU Regulatory Framework and Funding to Combat Desertification

Micaela Falcone(✉)

Polytechnic University of Bari, Bari, Italy
micaela.falcone@poliba.it

Abstract. Due to the lack of a univocal organic approach to the desertification within the EU regulatory framework, this latter is critically examined in this paper by illustrating the strategies that guide the Member States towards an integrated solution as well as to environmental, agricultural, climatic and financial policies contributing to the management of the phenomenon. The legal implications of the regulatory gap at European level are also investigated, evaluating the effectiveness of the existing discipline, the limits and the prospects for improvement, aiming at an integrated regulatory strategy that can respond in a coordinated and sustainable way to combat the desertification.

Keywords: Desertification · Environment · Finance · European Union Law

1 Introduction

In 2009 the Commission held jointly by The Lancet and University College of London stated that "*Climate change is the biggest global health threat of the 21st century*" [1]. Soil desertification stems directly from climate change, representing one of the most urgent environmental challenges of our time, with heavy consequences on soil, bio-diversity and living communities. The term "desertification" is commonly used to describe processes linked mainly to human activities and to climate that increase problems in arid zones such as reduced food production, soil infertility, decreasing land natural resilience and worsening water quality. degradation is not limited to desert areas, affecting wide vulnerable ecosystems in mediterranean region.

Although it is not among world's regions most severely affected by desertification, EU is facing severe impacts, especially in southern regions suffering from soil degradation, water scarcity and loss of agriculture productivity, with repercussion on local economies and natural systems. About 23% of the EU territory is classified as "moderately vulnerable" and 8% as "highly vulnerable" to desertification, particularly in Italy, Hungary, Bulgaria, Spain [2].

The causes of desertification can be anthropogenic, such as improper use of water resources, fires, poor agricultural and livestock practices, urbanization and extractive activities, or natural, such as climate change, droughts and rain erosive action. Most harmful is the intensive agriculture, which causes erosion, salinization, soil compaction,

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overexploitation of water resources and excessive use of fertilizers that deteriorate water quality.

The EU does not have yet a specific legal framework dedicated to desertification, but in recent years the efforts to address it were most intensified. There are currently various directives and regulations that, while not focused on this problem, contribute indirectly to mitigating desertification through the protection of soil, water resources and ecosystems. Those EU instruments apply to various sectors, ranging from rural development and reforestation up to the Common Agricultural Policy (CAP) and European policy on biodiversity, converging in a broad strategy for sustainability and climate adaptation. Under the increasing challenges on the issue, in October 2024 the EU Council adopted conclusions urging a more decided action against desertification, land degradation and drought.

Among the Member States most exposed to the risk of desertification, Italy stands out with about 28% of the national territory classified as highly vulnerable [3].

This paper illustrates the strategies that guide member states towards an integrated and coordinated approach against desertification as well as the related binding legal instruments such as sector-specific regulations and directives. The research methodology adopted follows a holistic perspective, integrating legal, environmental, agricultural, climate, and financial dimensions to fully understand the complexity of the phenomenon. The legal implications of the current regulatory framework are then illustrated, investigating the causes and effects of the regulatory gap at the European level, to assess its effectiveness, limitations, and prospects for improvement.

2 European Strategies and Regulations on Desertification

2.1 International Framework: UNCCD Convention and Agenda 2030

As mentioned, the EU does not have specific legislation on desertification, while the contrast to this phenomenon is part of a broader legal framework involving environmental, climate, agricultural and financial policies. The commitments made by the EU are also framed within the international context outlined by the United Nations Convention for Combating Desertification (UNCCD), that imposes the prevention and management of soil degradation [4]. Signed in 1994 after the Environment and Development Summit held in Rio de Janeiro in 1992 and ratified by the EU in 1998, the UNCCD represents the main instrument for international cooperation to contrasting the desertification globally, promoting an integrated approach through measures of sustainable land management, support to local communities and integration of environmental and economic strategies. The signatory parties of the UNCCD can voluntarily declare themselves "affected by desertification," obliged to define and implement *National Action Programmes* (NAPs) to prevent, mitigate and reverse the process. Based on their self-assessment, 13 EU Member States stated such declaration. However, so far their NAPs resulted poorly effective, being scarcely integrated into national planning processes and lacking the technical and financial resources needed for implementation.

Within the EU, the Council has set up a Working Party on Desertification (WPD), the only regular forum to discuss UNCCD and desertification related issues at EU level. Furthermore, jointly with the Council and other Commission services, the European

Commission's Directorate-General for Environment (DG ENV) coordinates the EU's position for UNCCD events such as the *Conferences of Parties* (COP), which take place every second year. In addition, Ispra's Joint Research Centre (JRC) is instrumental to providing scientific background and participants in the UNCCD roster of experts.

In 2015 the UN adopted the 2030 Agenda for Sustainable Development, setting 17 sustainability goals (SDGs) to be achieved by 2030, with SDG No.15 explicitly dedicated to desertification [5–8]. By reference to it, The European Commission's Directorate-General for Statistics (DG ESTAT) issues an annual report on progresses along the SDGs, including assessment of indicators on land degradation under SDG No.15.

To implement the commitments made under Agenda 2030, in 2017 UNCCD adopted the 2018–2030 Strategic Framework, focused on achieving target No.15.3 of SDGs [9]. According to The UN 2021 Global Sustainable Development Report (GSDR) and to the most recent ASviS 2024 Report, however, at the current rate only 17% of global targets may be achieved by 2030, while 1/3rd shows no progress or even regression.

In addition, the objectives set by the actions to combat desertification agree with more recent international initiatives on climate, renewed after the momentum created by the Paris Agreement (2016) which, signed at COP 21 on Climate (UNFCCC) [10–14], also stressed the negative interaction between climate change and desertification. The recent COP 16 (Our Land. Our Future, 2024) proposed new strategies for sustainable land management, promoting greater dialogue among UNCCD Member States on the opportunity to increase political and financial commitments for the soil protection and restoration.

2.2 European Coordination Strategies

Lacking an integrated strategy within the EU, the governance of the phenomenon of desertification relies on transversal regulatory instruments, strategies and policy guidelines aimed at orienting sectoral interventions. Indeed, the Soil Protection Strategy adopted by the Commission in 2016 failed to achieve the legislative objective of an *ad hoc* directive and was withdrawn after 8 years due to the lack of sufficient majorities for approval.

Of particular relevance is the Special Report No.33/2018 of the European Court of Auditors entitled "Combating desertification in the EU: a growing threat in need of more action". It underscores the absence of a long-term vision, criticizes the fragmented approach of EU policies on the subject and highlights the factors confirming its seriousness and urgency: on one hand, the prolonged period of high temperatures and low rainfall culminated in summer 2018; on the other hand, studies conducted by the European Environment Agency (in 2008 and in 2017) and a comprehensive audit launched by the Court to monitor soil condition indicators.

A few years later, similar indications can be found in the Conclusions of the EU Council (October 2024) [15] where Member States reiterated the need to strengthen EU's action against desertification, soil degradation and drought. The Council recognized the limited progress in this area and emphasized the urgency of a more coordinated approach among existing regulatory and financial instruments. In particular, the Council recalled the objectives of the European Green Deal (EGD) and the need to enhance soil protection measures under the Common Agricultural Policy (CAP) which reaffirmed

the necessity of improving monitoring and evaluation mechanisms for soil degradation and strengthening the indicators used under Directive 2000/60/EC on water resource management and Directive 2001/42/EC on strategic environmental assessment.

Another significant aspect, in line with the cross-cutting approach introduced by the 8th Environmental Action Programme (2022) [16], concerns the reinforcement of financial resources allocated to combat desertification, to be achieved through greater synergy between EU structural funds, the LIFE Programme, the Rural Development Fund and other forms of innovative financing. Although lacking legal force, the Council Conclusions represent an important political signal, paving the way for the adoption of future and more effective regulatory instruments in this area. In this direction, the EU Soil Strategy for 2030 (2021) represents a first step toward greater coherence in the EU action. Its implementation will depend on the adoption of binding legislative instruments, including the Soil Monitoring Law [17], currently under discussion, which is part of the Strategy and aims to regulate soil monitoring and resilience.

One of the most critical issues remains the persistent lack of common and uniform indicators to map the extent of desertification and soil degradation within the EU in a coherent and comprehensive framework. Given the complexity of those phenomena, influenced by numerous interdependent factors, there is no scientific consensus on how to quantify them. Additionally, some countries, such as Italy, Spain and Romania so far, have monitored factors associated with desertification through their own self-assessment systems, providing useful data on soil conditions, but diverging from EU data collection procedures.

2.3 The European Green Deal, the EU Soil Strategy for 2030, the Biodiversity Strategy for 2030 and the EU Strategy for Climate Change

In the broader and more current framework related to the *European Green Deal*, since 2019 the *Commission* has implemented several initiatives to achieve ecological transition and climate neutrality by 2050, which, indirectly, also address the phenomenon of desertification [18–23].

An integral part of the EGD is the EU Soil Strategy for 2030 [24] and the EU Biodiversity Strategy for 2030 [25], complementary and synergistic strategies that provide political and programmatic guidelines, steering the legislative action of the EU and its Member States. These strategies are based on existing legal instruments but also propose new legislative initiatives. The Soil Strategy, adopted in November 2021, is currently the main instrument to address soil degradation, including desertification and loss of soil fertility. It is linked to the objectives set by the Biodiversity Strategy, sharing the aim of preserving ecosystems and ensuring their environmental sustainability. However, while Biodiversity Strategy takes a general approach to nature conservation, the Soil Strategy focuses specifically on the quality and functionality of soils. The current legal framework for biodiversity is based on established legal instruments, such as the Habitats Directive (92/43/EEC) and the Birds Directive (2009/147/EC), while soil protection remains without a unitary and binding regulation at European level. To fill this gap, within the numerous initiatives promoted, the Soil Strategy foresees the adoption of a binding legislative proposal on soils by 2025, which aims to fill the void left by the

withdrawal of the 2006 Soil Framework Directive proposal. This represents an intermediate step towards a potential regulatory intervention that would more comprehensively regulate soil protection, establishing obligations for the prevention of degradation and for the restoration of the most compromised areas. A key element of the Strategy is the recommendation to adopt conservative agricultural practices that limit soil loss and protect its ability to absorb water and nutrients.

The Biodiversity Strategy, which aims to restore 30% of degraded ecosystems by 2030, promotes in particular the restoration of peatlands and wetlands, crucial for soil protection by maintaining moisture in arid soils, thus preventing erosion and biodiversity loss. To this end, actions such as reforestation, protection of vulnerable agricultural lands and the enhancement of natural resources are planned. Additionally, this Strategy aims at reducing land consumption by 2050 to halt the progressive loss of agricultural and natural lands in favor of urbanization and other economic activities. Monitoring soil degradation is another central objective, with obligations for Member States to collect data on soil wealth and to adopt corrective measures against degradation.

Finally, within the framework of the EGD, it is important to mention the EU Strategy on adaptation to climate change (2021) [26] which, although indirectly, pursues objectives that align with the fight against desertification through the European Law on Climate (EU Regulation, 2021/1119).

Table 1. European green deal framework

Year	Document	Regulation	Content
2019	*European Green Deal*	COM/2019/640	Ecological transition and climate neutrality by 2050
2020	*EU Biodiversity Strategy for 2030*	COM/2020/380	Aims to restore 30% of degraded ecosystems by 2030, promoting soil protection
2021	*EU Soil Strategy for 2030*	COM/2021/699	Main instrument to address soil degradation, including desertification and loss of soil fertility
2021	*EU Strategy on adaptation to climate change*	COM/2021/82	Pursues objectives aligned with the fight against desertification
2021	*European Law on Climate change*	Regulation (EU) 2021/1119	Sets climate neutrality objective by 2050

2.4 The Common Agricultural Policy (CAP) and Measures to Combat Desertification

CAP, established since the Treaty of Rome (1957), is one of EU's main policies, accounting for approximately 39% of its budget. It introduced measures to promote sustainable agriculture by encouraging practices that reduce the risk of erosion and soil degradation, with the aim of supporting farmers, ensuring food security, promoting rural development and, most important, addressing environment challenge to agriculture. Although it was not originally structured to directly combat desertification, in recent decades CAP has undergone significant evolution in terms of environmental sustainability and soil

protection, becoming a crucial policy in the fight against land degradation and desertification. Its recent reform (CAP 2023–2027) puts strong emphasis on results and performance (establishing a common set of indicators) and grants member states greater flexibility in adapting measures to local conditions. The reformed CAP covers 3 regulations, started from 1st January 2023: Regulation (EU) 2021/2115 (Strategic Plans), Regulation (EU) 2021/2116 (Financing, management and monitoring) and Regulation (EU) 2021/2117, which amends previous sectoral regulations [27, 28].

With the new National Strategic Plans (NSP), all CAP measures are consolidated into a single plan for each member State. Each country's NSP should include direct payments to farmers, market measures (e.g., support for sectors in crisis) and rural development, previously managed through *Rural Development Programs* (RDPs), less flexible [29]. Although the NSP is national, in some countries (such as Italy) the management of rural development remains at the regional level.

Through the NSPs, CAP aims at contributing better to the objectives of the EGD and the Farm to Fork Strategy [30], whose goal is to promote more sustainable and environmentally friendly agriculture. Regulatory changes and income-support measures, as well as market regulation introduced by the NSPs, significantly contribute to reducing soil fertility loss, erosion and unsustainable management of natural resources through incentives for sustainable agricultural practices such as crop rotation, permanent vegetation cover and soil protection.

The new basic income support system for sustainability has replaced the previous basic payment scheme, linked to historical entitlements, by introducing stricter criteria related to environmental sustainability, social conditionality and redistribution of support to farmers. Redistributive payments for small farms and coupled payments for specific agricultural sectors are foreseen. The main goal is to ensure greater sustainability and equity by reducing disparities among farmers and encouraging more responsible agricultural practices [31]. With the 2023–2027 CAP reform, eco-schemes have also been introduced, offering additional voluntary payments to farmers who adopt more sustainable practices compared to the minimum requirements set by conditionality. Responsible use of fertilizers, conservation agriculture systems and sustainable irrigation techniques are examples of actions promoted by the CAP that help to strengthen soil's resilience to climate stress. Another key aspect is the integration of climate change policy within the CAP, of which desertification is one of the most direct consequences. To that end, CAP provides major support for adaptation to evolving climatic conditions and promotes the introduction of drought-resistant crops and the adoption of conservation farming techniques that improve agricultural resilience and also help to preserve soil and to limit its degradation.

Despite the progress made, CAP still faces challenges in combating desertification. In particular, the difficulty in applying effective measures across all EU regions, especially in the most vulnerable areas of Southern Europe, remains one of the main issues. Disparities among regions, slow implementation of policies and limited dissemination of sustainable agricultural technologies are obstacles that must be overcome to ensure effective protection of soils at risk. The success of such measures depends on the ability of Member States to adapt interventions to specific territorial conditions, allocating more resources to areas at higher risk of desertification. Furthermore, the fragmentation

of funding programs and the need to improve coordination among CAP and other EU policies, such as those related to the environment and climate, remain central themes. To this end, greater synergy among CAP, EGD and the Biodiversity Strategy could be crucial to creating a more integrated and coherent network of policies. Despite significant progress, further efforts seem necessary to improve the effectiveness of these measures and to ensure their wider application in most vulnerable regions of the EU [32].

According to the Council Conclusions (2024), the transformation of agriculture and food systems towards sustainability should be guided by 13 principles of agroecology defined by the FAO High-Level Panel of Experts on Food Security and Nutrition [33]. CAP undoubtedly has the potential to make a substantial contribution to soil protection and desertification prevention. However, CAP faces significant political, regulatory, economic and territorial challenges like the rift recently emerged between a part of the agricultural sector seeing EGD as a threat to their economic sustainability and another part that believes these policies necessary to address the environmental and structural crises affecting EU agriculture. Recently (February 19, 2025), the European Commission presented a Vision Document for Agriculture by 2040, which does not seem to resolve the situation.

Table 2. Common agricultural policy (CAP)

Year	Document	Regulation	Content
2021	*CAP Strategic Plans*	Regulation (EU) 2021/2115	Consolidated plan for each member state to promote sustainable agriculture
2021	*CAP Financing, management and monitoring*	Regulation (EU) 2021/2116	Rules for CAP financing and management
2021	*CAP amendment*	Regulation (EU) 2021/2117	Amends previous sectoral regulations
2023-2027	*CAP reform*	COM/2017/713	Emphasizes results and performance, granting flexibility to member States
2025	*A Vision for Agriculture and Food*	COM/2025/75	Promotes an attractive, competitive, resilient, future-oriented and equitable agri-food system

2.5 Other Environmental Regulations on Natural Resource Management

Even if not explicitly addressed to desertification, the regulations for the protection and sustainable management of water resources are crucial for preventing soil degradation and the loss of agricultural productivity by creating a protective framework that helps combat drought phenomena that cause desertification. The Water Framework Directive (2000/60/EC) aims at protecting EU's water resources, including rivers lakes groundwater and coastal waters [34]. The Floods Directive (2007/60/EC) also indirectly contributes to the prevention of desertification through soil protection and careful management of water resources [35]. Water is an essential resource for maintaining soil fertility and the protection of watersheds is crucial for ensuring sustainable water supply in areas vulnerable to desertification. The measures to address periods of drought and to improve

water quality included in the directive contribute directly to mitigating the effects of desertification. However, it should be noted that, despite regulatory efforts, the situation of water resources in the EU remains critical. Recent reports highlight that only 39.5% of EU's surface waters are in good ecological status and 26.8% in good chemical status, with significant issues related to contamination and climate change [36].

The European Commission emphasizes the need for more sustainable and integrated management of water resources to effectively address desertification and other related environmental issues [37]. An interesting case study is represented by the recent RAINS project, a European initiative launched in January 2025 that aims to improve the resilience of the agricultural sector to water scarcity. Coordinated by 16 institutions from six European countries, the project focuses on finding practical solutions to increase the efficiency of water and nutrient management in agriculture. Through the testing of ten innovative solutions, including new irrigation techniques and advanced technologies, the RAINS project aims to improve water efficiency by 50% on a test area of 12,700 hectares across over 20 EU regions. The project involves more than 500 farmers in the transition to more sustainable irrigation practices and expects significant economic and environmental benefits, with an estimated saving of 6.1 billion euros and 244.3 million liters of water by 2050 [38].

The Directive on ambient air quality and cleaner air for Europe (Air Directive) (2008/50/EC) [39] and the Directive on the conservation of natural habitats and of wild fauna and flora (Habitat Directive) (92/43/EEC) [40] also provide useful regulatory tools against desertification. The Air Directive has an indirect impact on soil protection as it limits the emission of air pollutants responsible for acidification processes and the deposition of harmful substances. In particular, the reduction of particulate matter and NOx helps mitigate chemical degradation of soil, preserving its fertility and reducing the risk of erosion. Furthermore, improving air quality promotes vegetation growth, essential for stabilizing soils in areas at risk of desertification.

The Habitat Directive, on the other hand, plays a more direct role in preventing soil degradation through protection of natural ecosystems. The establishment of the Natura 2000 Network requires Member States to adopt specific conservation measures for sensitive habitats, many of which address the fight against soil loss and desertification.

While not explicitly addressing desertification as such, Air and Habitat directives provide essential regulatory tools to counteract its main triggering factors. The reduction of air pollution and the protection of natural ecosystems represent complementary strategies to agricultural and climate policies, helping to strengthen the European territory's ability to adapt to environmental challenges.

Also relevant is EU Regulation No.2018/841, which contributes to EU climate goals by requiring Member States to monitor and report greenhouse gas emissions from land use and deforestation [41]. It establishes rules that account for emissions resulting from land use, land use change and forestry. Another relevant aspect of this regulation is the focus on reforestation and sustainable forest management, which play a crucial role in moisture retention and soil protection against erosion, closely linked to desertification. In this regard, the recent Regulation (EU) 2023/1115 - EUDR (*European Deforestation-free Products Regulation*) also contributes to combat global deforestation and forest

degradation resulting from unsustainable production and consuption patterns within the EU [42, 43].

Finally, Regulation (EU) 2024/1991 on the restoration of nature, which entered into force on August 18, 2024 [44], represents a significant step towards reversing biodiversity loss and increasing EU resilience to the effects of climate change.

Table 3. Other environmental regulations and documents

Year	Document	Regulation	Content
1992	*Habitats Directive*	Dir. 92/43/EEC	Protects natural habitats and species
2000	*Water Framework Directive*	Dir. 2000/60/EC	Protects EU's water resources
2007	*Floods Directive*	Dir. 2007/60/EC	Prevents and manages flood risks
2008	*Air Directive*	Dir. 2008/50/EC	Limits air pollutant emissions
2009	*Birds Directive*	Dir. 2009/147/EC	Protects wild birds and their habitats
2018	*EU Regulation on greenhouse gas emissions*	Reg. (EU) 2018/841	Requires monitoring and reporting of greenhouse gas emissions from land use
2023	*European Deforestation-free Products Regulation (EUDR)*	Reg. (EU) 2023/1115	Combats global deforestation and forest degradation
2024	*Regulation on the restoration of nature*	Reg. (EU) 2024/1991	Reverse biodiversity loss and increase EU resilience to climate change
2025	*Report on Water Directive*	SWD (2025)34	Water Framework Directive Report
2025	*Report on Implementation*	COM/2025/2	Report on the Implementation of the Water Framework Directive and the Floods Directive

2.6 Financial Measures

The EU has not established a fund dedicated exclusively to combating desertification, but it has developed a series of cross-cutting financial instruments contributing, directly or not, to soil protection. These instruments operate in different regulatory areas, reflecting EU integrated approach to environmental protection by the intersection of agricultural, climate, cohesion and research policies. Among the main funding mechanisms is the LIFE Program, adopted by Regulation (EU) No. 2021/783, which represents the EU's primary tool for financing environmental projects (a package of investments totaling over €290 million, mobilizing an overall investment of approximately €560 million, with projects in almost all Member States) [45]. Under the subprogram "Mitigation and Adaptation to Climate Change", LIFE finances interventions aimed at combating the effects of desertification, with particular attention to the sustainable management of water resources and the restoration of degraded ecosystems.

In addition to LIFE, a key role is played by the European Agricultural Fund for Rural Development (EAFRD) (established by Regulation EU No.1305/2013 and later governed by Regulation EU No.2021/2115), which introduces "eco-schemes" as tools to stimulate environment friendly farming practices. Specifically, the financial support provided by EAFRD is aimed at promoting conservative agricultural techniques, reforestation actions

and sustainable soil management practices, key measures to prevent land degradation in the most vulnerable areas. In this context, EAFRD sets eligibility criteria for projects and investments such as those related to irrigation and reforestation, including conditions aimed at ensuring the sustainability of these initiatives.

Further resources are allocated through the European Structural and Investment Funds, including the European Regional Development Fund (ERDF) and the Cohesion Fund (CF), governed by Regulation (EU) 2021/1058 [46]. Both funds can provide essential support for infrastructure projects aimed at preventing soil erosion and managing water resources, particularly with regard to the southern regions of the EU, more exposed to soil desertification.

In parallel, the InvestEU Program, established by Regulation (EU) 2021/523, provides guarantees for private investments in the environmental sector, promoting the development of innovative solutions for land management [47]. Horizon Europe, EU main research and innovation program, also plays an important role in funding studies and projects aimed at combating desertification by promoting the development of advanced technologies for water management and the restoration of degraded soils [48].

In this perspective, a significant contribution also comes from the *Innovation Fund*, financed through the EU Emissions Trading System (ETS) and aimed at supporting advanced technologies for climate change adaptation, with potential applications in the regeneration of degraded soils.

Moreover, the role of funding linked to the Next Generation EU (NGEU) programming should not be overlooked. This economic recovery package, introduced in response to the COVID-19 pandemic crisis, foresees significant investments in the ecological transition: 8 billion euros allocated to the FEASR for the period 2021–2027 [49]. These additional funds help to support rural areas in implementing structural changes necessary to achieve the objectives of the EGD and to foster the transition.

Satellite remote sensing, intelligent water resource management systems and conservation agriculture techniques are essential tools for preventing soil degradation, but their implementation requires significant investments and specialized skills, which are not always evenly distributed among Member States. Further opportunities may arise from intensifying monitoring and prevention measures by using digital technologies and GIS systems to map vulnerable areas and respond promptly, avoiding costly and delayed interventions. Other financial instruments can be complementary. For instance, although primarily aimed at sustainable management of marine resources, the European Maritime and Fisheries Fund (EMFF), regulated by Regulation (EU) 2021/1139, includes specific measures for protecting coastal ecosystems and combating erosion, a phenomenon often linked to desertification in some Mediterranean regions. The EU Solidarity Fund (EUSF), established by Regulation (EC) 2012/2002, can also provide resources for emergency interventions in cases of extreme drought, although its scope is limited to natural disaster situations.

The EU's commitment to combating desertification is not limited to the European territory, it extends to international actions. Through the new Neighbourhood, Development and International Cooperation Instrument (NDICI – Global Europe) [50] (which under the Multiannual Financial Framework 2021–2027 has incorporated the former European

Development Fund, EDF), EU contributes to supporting projects in third countries, particularly in Africa and Mediterranean areas, to combat land degradation and promote the sustainable management of natural resources.

Particular attention should be given to the support for the outermost regions of the EU (i.e., France: Guadeloupe, French Guiana, Martinique, Réunion, Saint Martin and Mayotte; Spain: Canary Islands; Portugal: Azores and Madeira) [51] which, due to the limits linked to isolation, insularity and particular environmental vulnerability, benefit from specific measures through the POSEI Program. This program provides financial resources for the protection of local ecosystems and for adaptation to climate change, addressing the specific needs of territories highly exposed to land degradation phenomena.

Although the EU spending programmes make funding available for projects addressing desertification, the global amount of EU funds planned and used to that aim is not available, due to the multiplicity of funding and the variety of initiatives that prevent a precise mapping.

Table 4. Financial measures

Year	Financial Instrument	Regulation	Description
2002	*EU Solidarity Fund (EUSF)*	Reg. (EC) 2012/2002	Provides resources for emergency interventions in case of extreme drought
2013	*European Agricultural Fund for Rural Development*	Reg. (EU) 1305/2013	Promotes sustainable agricultural practices and soil management
2021	*LIFE Program*	Reg. (EU) 2021/783	Financing environmental projects, including interventions against desertification
2021	*European Structural and Investment Funds*	Reg. (EU) 2021/1058	Support for infrastructure projects to prevent soil erosion and manage water resources
2021	*InvestEU Program*	Reg. (EU) 2021/523	Guarantees for private investments in the environmental sector
2021	*Horizon Europe*	Reg. (EU) 2021/695	Funding studies and projects on desertification and water resource management
2021	*Next Generation EU (NGEU)*	Reg.(EU) 2020/2094	Investments in ecological transition and support for rural areas
2021	*European Maritime and Fisheries Fund (EMFF)*	Reg. (EU) 2021/1139	Protection of coastal ecosystems and combating erosion
2021	*POSEI Program*	COM/2016/797	Financial support for protecting local ecosystems and adapting to climate change in outermost regions
2021	*Neighbourhood, Development and International Cooperation Instrument (NDICI)*	Reg. (EU) 2021/947	Support for projects in third countries to combat land degradation
2024	*Innovation Fund*	C/2024/8011	Support for advanced technologies for climate change

3 Regulatory Gaps and Legal Implications

The lack of specific legislation on desertification at the European level raises several legal issues concerning key aspects of EU law. First, the implementation of international obligations arising from the UNCCD, as the EU's fragmented regulatory framework on the matter complicates the alignment of international commitments with the Union's internal policies. The difficulty in harmonizing these obligations results in a lack of coherence in national and regional policies, potentially causing conflicts between the international commitments undertaken and the measures adopted at the national level. This scenario entails the risk of a lack of coordination, which could undermine the overall effectiveness of global and regional efforts to combat desertification.

Another issue concerns the absence of clear unambiguous regulation creates uncertainty regarding the division of competences among the EU and the Member States, particularly in a context were managing the factors responsible for desertification affects multiple intervention sectors falling under both exclusive and shared competences of the Union. In the absence of dedicated sectoral EU legislation, Member States have a certain degree of autonomy in adopting measures against desertification, but the resulting fragmentation of national regulations could lead to an inconsistent application of countermeasures, undermining the overall effectiveness of EU action and distorting competition conditions among States with different levels of regulation.

The heterogeneity of the measures adopted so far also limits the full application of the Principle of Solidarity (Articles 2 and 3 TEU) [52–54], which obliges Member States to cooperate in addressing common challenges and, from an environmental perspective, to ensure the necessary support to the most vulnerable regions. The absence of binding legislation on desertification hinders the concrete application of this principle, leading to fragmented interventions. Integrating the fight against desertification - which affects European regions unevenly - into the Cohesion Policy *(*Articles 174 -178 TFEU*)* could facilitate the development of targeted regional strategies, contributing to the effective and sustainable management of soil through a fair distribution of resources and adaptation measures.

Another issue, concerning a different aspect of protection, relates to the direct implications of desertification on human rights, such as the right to a healthy environment and food security, protected by the Charter of Fundamental Rights of the European Union *(*Articles 35, 37 and 38) [55]. The absence of a precise legal framework obstructs the establishment of clear legal responsibilities for the protection of these rights in cases of environmental damage resulting from desertification.

The lack of specific legislation on desertification also complicates the consistent application of the Environmental Liability Regime established by Directive 2004/35/EC which, in application of the Polluter pays Principle (Article 191 TFEU), sets out the principles of prevention and remediation of environmental damage [56]. Desertification, as a phenomenon affecting large areas and involving complex impacts, could fall within the scope of environmental damage. However, the absence of sectoral legislation, the lack of a uniform EU definition of "soil degradation," and the ambiguity of the concept of "environmental damage" when applied to cumulative phenomena - such as

desertification, which often occurs on a large scale with long-term effects - risk weakening its enforcement, resulting in difficulties in obtaining compensation for damages and ensuring environmental restoration.

Furthermore, the absence of a clear legal framework inevitably reduces the possibility of resorting to the Court of Justice of the European Union (CJEU), which plays a central role in the interpretation and application of EU's law. Through its case law, the Court could effectively contribute to resolving issues related to Member States' responsibilities in implementing environmental policies about desertification and ensuring that the law is applied uniformly and consistently, thereby enhancing environmental protection and safeguarding citizens' rights.

Finally, the lack of a coherent legal framework risks to undermine the effectiveness of European environmental governance and to limit the access to funding, creating disparities among Member States, particularly those most vulnerable to desertification. The absence of a robust legal framework to address this phenomenon also makes it difficult to monitor and assess progress, thereby impairing the EU's ability to respond to environmental challenges in a cohesive and strategic manner.

In this context, the legal implications of desertification provide numerous points for meditation, both in terms of regulatory gaps and regarding the possibility of greater involvement of the CJEU in monitoring and enforcing EU policies to prevent desertification and soil degradation. The absence of norms explicitly addressing desertification as an autonomous phenomenon - merely regulating related aspects - thus raises a series of complex legal questions that range from systemic levels to practical aspects, weakening its ability to respond in a coherent and integrated manner to one of the most pressing environmental challenges of our time.

4 Conclusions

Despite the lack of specific legislation, the EU has progressively developed a complex indirect regulatory framework to combat desertification and soil degradation. The results, however, remain uneven, particularly in the most vulnerable areas such as the southern regions. Although the European regulatory approach - through integrated policies and financial instruments - has laid the foundations for addressing this phenomenon, significant challenges persist. One main limitation of the current system lies in the difficulty of reconciling the need for unified regulation with the necessity of specific provisions for different environmental sectors. Soil management is closely interconnected with water resource protection, biodiversity conservation and climate change mitigation, yet each sector presents technical and regulatory peculiarities requiring tailored measures. The plurality of legal instruments and their partial overlap reflect not only a coordination issue, but also the complexity of a phenomenon that encompasses environmental economic and social dimensions.

Moreover, beyond legal aspects, the effectiveness of desertification countermeasures is influenced by numerous technical, institutional and social factors. Disparities in access to advanced technologies and modern environmental monitoring systems affect the ability to prevent soil degradation, determining the success or failure of the adopted policies. Social awareness and local community involvement also play a crucial role. However,

economic pressures related to intensive agricultural expansion, real estate speculation and increasing competition for natural resources can hinder the adoption of long-term soil conservation strategies. Gender-related factors are also significant, as in the most underdeveloped rural areas, inequalities persist among genders in access to land ownership, financing and technical training.

At the institutional level, multilevel governance and the fragmentation of competences among the EU governance, the Member States, and local administrations add further complexity. Additionally, the availability of funding and economic incentives varies significantly across Member States, creating disparity in the implementation of soil protection strategies.

The absence of a unified legal framework and the lack of integration among policies at national, regional and European levels are main obstacles to establishing an effective strategy against desertification. Improved coordination between European financial instruments and national and local environmental policies could allow more rational use of resources, ensuring timely interventions and avoiding late and fragmented measures.

In this context, the recent call by the EU Council for the Commission to develop a comprehensive action plan to combat desertification represents a significant step towards greater coordination. For this plan to yield tangible results it will be necessary to strengthen the governance of financial resources and to ensure that European policies on desertification are more effectively integrated into the Union's environmental and climate objectives.

Lastly, the second Report on zero pollution monitoring and outlook, published on March 2025 by the European Commission and the European Environment Agency, highlights that, despite progress in reducing air pollution, more decisive actions are needed to achieve the zero pollution targets by 2030 [57].

In summary, although progress has been made, the lack of effective coordination among various measures and the persistence of sectoral approaches limit the ability to structurally combat the phenomenon of soil desertification. Future opportunities lie in strengthening cooperation across different levels of government, increasing commitment to soil protection and promoting sustainable development models that integrate environmental, agricultural and climate policies. The harmonization of European rules to contrast desertification, while desirable, must necessarily contend with the plurality of interests and regulatory domains involved as well as with the need to maintain a balance between regulatory specialization and institutional coordination. Only through an integrated and multidimensional approach will it be possible to develop truly effective strategies for soil protection and desertification prevention.

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