



NEXUS-NESS

NEXUS NATURE ECOSYSTEM SOCIETY SOLUTION

Fair and sustainable resource allocation demonstrator of the multiple WEFE Nexus economic, social and environmental benefits for Mediterranean regions

GRANT AGREEMENT NUMBER 2042

Deliverable D5.2

Identification of environmental challenges and policy barriers for WEFE Nexus

V1.1 30 November 2022

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WP5 Leader FEEM, Filippo Tessari, Task 5.2 Leader FEEM, Davide Bazzana





**NEXUS-NESS - NEXUS NATURE ECOSYSTEM SOCIETY SOLUTION:
FAIR AND SUSTAINABLE RESOURCE ALLOCATION
DEMONSTRATOR OF THE MULTIPLE WEFE NEXUS ECONOMIC,
SOCIAL AND ENVIRONMENTAL BENEFITS FOR
MEDITERRANEAN REGIONS**

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Abbreviations

NEL: Nexus Ecosystem Lab

WEFE: Water-Energy-Food-Ecosystem

WP: Work Package

1. Introduction Purpose of the Deliverable

This document is the deliverable D5.2 titled “Identification of environmental challenges and policy barriers for WEFE Nexus”. The deliverable is the output of Task 5.2 “Environmental diagnosis and coherence analysis of WEFE policies” of the Work Package 5 activities of the PRIMA funded Nexus NESS project.

WP5 focuses on the challenge of quantifying the socio-environmental and economic benefits of transition policies towards a WEFE Nexus approach. The aim of deliverable D5.2 is to investigate policies and governance affecting both individual areas of the WEFE nexus as well as those that regulate and take into account some spill-over into the others. More precisely, D5.2 focuses on the role of political-institutional actors, legislations and policy instruments currently in force.

First, an institutional (macro-level) analysis of WEFE policies was conducted, examining the ‘authorising environment’ (legislation and regulations) at continental (Africa, Europe) and national scale. Then, an analysis was conducted to explore the existence of locally implemented laws and policies (at regional and sub-regional level).

This report thus identifies the dominant environmental parameters (barriers and catalysers) of current WEFE governance in each of the NELs with the (in)coherences that characterise the different institutional frameworks, highlighting (potentially conflicting) interests.

Therefore, the rest of the report is structured as follows: Section 2 describes the policy context of WEFE nexus in Egypt, while Sections 3 and 4 analyse the European countries (Italy and Spain). As the European Union plays a crucial role in shaping the overall policy and regulatory framework for the member states, a box before Sections 3 and 4 describes the main European directives and strategies. Finally, Section 5 presents the situation in Tunisia. For each country of reference (Egypt, Italy, Spain, Tunisia) are described (i) the main institutions in charge of policy-making and regulation or monitoring, and (ii) the key legislation and policies actually implemented on issues of water, energy, food and ecosystem are described.

2. EGYPT: Water-Energy-Food-Ecosystem Nexus

2.1 Water

2.1.1 Main institutions

In Egypt, there are many parties organisations responsible for water management, and there are major institutions, scientific and technical bodies, as well as monitoring parties and local units which play a key role in this context (Tayie & Negm, 2018). The **Ministry of Water Resources and Irrigation (MWRI)** is the main institution in charge of governing water resources in Egypt. The MWRI has the legal responsibility of taking the necessary measures to safeguard water resources and their quality (Mutz *et al.*, 2021). Nevertheless, Tayie and Negm (2018, p.105) point out that, in practice, the Ministry ‘*does not display major concern*’ about water quality. The MWRI delegates most of its functions related to surface and groundwater quality monitoring to the **National Water Research Center**, which monitors water quality nationally and regionally at a number of strategic locations through a national monitoring network. Specifically, the ministry is responsible for the issuance and cancellations of drainage in the Egyptian water passages, examination of the drainage water treatment facilities, monitoring the feed stations of the drinking water units, treatment of polluted water by sewage and industrial wastewater, specifications of terms and standards related to drainage in the water passages, and for the issuance and monitoring of the necessary licences required to establish any facility that exposes wastewater directly in the water passages (Tayie & Negm, 2018). Besides these responsibilities, the MWRI has also the right to establish associations for water users such as water users’ unions, water users’ organisations, and water boards (Tayie & Negm, 2018). In addition to the **Ministry of Water Resources and Irrigation**, there are other ministries and institutions that play an important role in water management: the Ministry of Agriculture and Land Reclamation since agricultural sector is the main consumer of water in Egypt, the Ministry of Environment and the Egyptian Environmental Affairs Agency which are the institutions responsible for governing the environment in the country, and the Ministry of Health and Population which plays a key role in setting quality standards related to water and drainage.

2.1.2 Key Legislation and Policies

Egypt has **not a general law** on water management; rather it has several water legislative frameworks and laws governing the sector (AbuZeid, 2020; Soulie *et al.*, 2014), among which the most relevant is **Law 12/1984** concerning the Issue of the Law on Irrigation and Drainage, and **Law 48/1982** concerning the Protection of the River Nile and Waterways from Pollution. More specifically:

- **Law 12/1984** regulates irrigation, water distribution, establishment, maintenance, and the groundwater process in the Nile region. In 2021, a new Water Resources and Irrigation Law (**Law 147/2021**) entered into force, repealing Law 12/1984. The new legislation aims to improve the management of water

resources and achieve equitable distribution to beneficiaries. It also aims to facilitate the water users' interaction with the ministry's agencies, to activate water user associations and encourage the participation of the private sector in the country's water sector: private entities are expected to assume responsibilities in the management, operation, and maintenance of irrigation and drainage systems, as well as facilities.

- **Law 48/1982** introduced to protect the Nile and water passages from pollution and amended by **Decree 92/2013**, concerns the issuance of permits for the disposal of treated liquid wastes in the water passages of the Nile as long as certain requirements are being met.

For what concerns wastewater and its use in agriculture, the aforementioned **Law 48/1982** and **Law 93/1962** on sewage waste disposal are the most relevant ones (Elbana *et al.*, 2017). Furthermore, the **Egyptian Code 501/2015** for wastewater reuse (an updated version of Code 501/2005) regulates quality criteria for reuse in agriculture, requirements for irrigation techniques and health protection, enforcements, monitoring, inspection and corrective measures (Abou-Elela, 2017). Code 501/2015 is very restrictive (Abou-Elela, 2017). For instance, it forbids the reuse of wastewater – regardless of the level of treatment – for any raw vegetables.

Efficient management of water resources has been a main concern for the Egyptian government (OECD, 2020) for a long time. Egypt introduced its first water policy in 1975, after the completion of the Aswan High Dam. Since then, a number of national water policies, strategies and plans have been developed to address the problem. Between 1997 and 2017, Egypt's water policy was developed depending on the '*allocation base*': water was distributed among various activities according to the needs of each one and according to the revenue of each single cubic metre of water, as far as the hydro budget of the country is concerned (Tayie & Negm, 2018). Nevertheless, domestic water has the highest priority over the sectors in Egypt's water policies. In case of shortages, the domestic water demand takes priority in satisfying demand over other sectors (AbuZeid, 2020).

The current **National Water Resources Plan** (NWRP 2017-2037) is based on the principle of integrated water resources management (IWRM)¹ and has '*water security for all*' as its main goal. In support to its overall purpose, the NWRP 2037 focuses on four main objectives: (i) improve water quality, (ii) increase the availability of freshwater resources, (iii) enhance management of water use, (iv) improve the enabling environment for IWRM, planning and implementation.

Egypt depends almost totally on the surface water from the Nile River, whose basin is shared by 11 countries. Despite this, there is no formal agreement among all these countries on the water shares (Zekri, 2020). Moreover, the fact that Egypt is the most downstream country on the Nile River makes it vulnerable to upstream activities. The country has water-related agreements with 5 of the 11 countries, and in 2015 a declaration of principles (DoP) was signed by Ethiopia, Sudan, and Egypt, outlining a set of principles to guide

¹ The integrated water resources management (IWRM) approach could be defined as a process "which promotes the coordinated development and management of water, land and related resources, in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystem" (Almaden, 2014, p. 474-475)

the establishment of the Grand Ethiopian Renaissance Dam (GERD). Nevertheless, several rounds of negotiations between Ethiopia, Egypt and Sudan have failed and the dispute remains unresolved (Kasimbazi and Bamwine, 2021).

At the local level, under the presidential term of Abdel Fattah al-Sisi, several water policy projects were launched. For instance, in Matruh Governorate there is an ongoing seawater desalination project.

2.2 Energy

2.2.1 Main institutions

In Egypt, the overall governance of the energy sector is guided at the strategy and policy level by the regulations and directions issued by the **Supreme Energy Council (SEC)** and is managed at the execution level by two ministries: the **Ministry of Petroleum and Mineral Resources (MPMR)** and the **Ministry of Electricity and Renewable Energy (MOERE)** (IRENA, 2018). In particular, the **SEC** is in charge of reviewing and endorsing national energy strategies, monitoring the sector's performance and energy pricing policies and approving regulations on energy pricing and incentives for energy sector investments (including promotion of energy efficiency and renewable energy investment). The **MPMR** is responsible for the overall management of all petroleum activities in the country, including exploration, mining, production and distribution of oil, oil products and gas, as well as all related services. Finally, the **MOERE** is entrusted with the overall management of the Egyptian electricity sector through its subsidiary company the Egyptian Electricity Holding Company. In the area of renewable energy, the **New and Renewable Energy Authority (NREA)**, which falls under the MOERE, plays a strategic role in implementing the government's renewable energy programs (International Trade Administration, 2021).

2.2.2 Key Legislation and Policies

The government endorsed a new set of laws and regulations to facilitate the implementation of the 2035 energy target. The most important ones behind this national energy transition are:

- **Law No. 102 of the year 1986** which establishes the **New and Renewable Energy Authority (NREA)**, which has a key role in promoting and developing renewable energy in Egypt.
- **Constitution of the Arab Republic of Egypt, 2014 (Article 32)**, according to which the State commits to making the best use of renewable energy resources, motivating investment and encouraging scientific research.
- **Renewable Energy Law (Decree 203/2014)** which supports the creation of a favourable economic environment for a significant increase in renewable energy investment in the country.

- **Cabinet Decree No. 1947 of the year 2014 on Feed-in-Tariff**, which establishes the basis for the feed-in-tariff for energy produced from renewable energy projects and encourages investment in renewable energy
- **Prime Ministerial Decree No. (37/4/15/14) of the year 2015**: Regulations to avail land for renewable energy projects.
- **New Electricity Law No. 87 of 2015** which provides legislative and regulatory frameworks needed to realise the electricity market reform targets.
- **Investment Law No. 72 of 2017** which replaced the **Investment Guarantees and Incentives Law no. 8 for 1997**. The overall aim of the new investment law is to attract new investments to Egypt by offering incentives and guarantees for investment in some specific sectors, as well as removing obstacles and streamlining the procedures of such investment (Elshazly, 2021).

Looking to the main policies in the energy sector, for decades, Egypt has relied on subsidised energy prices as a tool for social protection and wealth sharing, which has led to a rapid increase in demand (IRENA, 2018). The fiscal burden of Egypt's energy subsidies had grown continuously over two decades up to 2014 (Camos *et al.*, 2017). In 2013-14, energy subsidies (indirect, direct and cross-subsidies) accounted for 22 percent of the government budget and nearly 7 percent of Egypt's GDP (IRENA, 2018). As a result, in 2014 Egypt embarked on an ambitious energy subsidy reform programme, aiming to phase out these subsidies within 5 years (due date later extended to 8 years). Furthermore, to meet the growing demand for energy and to ensure the continuous security and stability of the country's energy supply, the Egyptian Government has developed an energy diversification strategy, known as the **Integrated Sustainable Energy Strategy (ISES) to 2035**. This new strategy involves speeding up the development of renewable energy and energy efficiency (IRENA, 2018). Specifically, the Egyptian government has set an ambitious target of achieving 42% of its energy generation capacity from renewable sources by 2035 (Salah *et al.*, 2022). In order to develop the renewable energy market, Egypt has made significant improvements to its renewable energy policy framework attracting more private investments (Gelil, 2021). The country has also adopted a set of enabling policies, including feed-in tariffs for renewable energy supplies, a net consumption measurement policy, and competitive bidding and tender procedures (Gelil, 2021).

2.3 Food

2.3.1 Main institutions

In Egypt, there are several bodies that oversee the development of the agro-food sector. These include the **Ministry of Agriculture and Land Reclamation (MoALR)**, which defines agricultural strategies and policies; the **Ministry of Irrigation and Water Resources (MIWR)**, which, together with MALR, regulates the distribution of water; the **Ministry of Trade and Industry (MTI)**, which promotes trade and industrial development; and the **Ministry of Supply and Internal Trade (MSIT)**, which is involved with the internal

market price-setting for strategic commodities, distributing subsidies and managing state-owned food enterprises (OECD *et al.*, 2021). Agricultural cooperatives play an important role in providing farmers in rural areas with information about markets, technical assistance, and supply chains for exports. However, the effectiveness of cooperatives in filling this role is questionable. One of the major limitations of the existing cooperatives structure is little flexibility in allowing cooperatives to develop independent marketing activities or to enter into contracting arrangements with the private sector (Kassim *et al.*, 2018; World Bank, 2014).

2.3.2 Key Legislation and Policies

The **Constitution of the Arab Republic of Egypt, 2014 (Article 79)** states that each citizen has the right to healthy and adequate food, and that the state must provide food resources to all citizens, ensure food sovereignty in a sustainable manner, and guarantee the preservation of agricultural biodiversity and local plants to preserve the right of future generations.

Decree Law No. 126 of 2014 establishes the **Agricultural Solidarity Fund**, responsible for providing relief to farmers whose harvests are damaged by natural disasters. National agricultural policies in Egypt have revolved around two main objectives to provide (i) adequate and affordable food to the population and (ii) adequate incomes and employment to the sizable population working in the agricultural sector (Tellioglu & Konandreas, 2017). To reach the first aforementioned goal, the Egyptian government intervenes in the agricultural sector with **costly support mechanisms**, such as food subsidies and government procurement of basic foodstuffs at higher than market prices.

The Tamween food subsidy system, introduced in the 1950s, is still one of the key elements of the country's social protection mechanism. It is characterised by **extensive government involvement** at all stages of the wheat value chain: the Egyptian government purchases almost all of the domestically produced wheat from farmers, at or above the global CIF (Cost, Insurance and Freight) price with the objective of promoting domestic wheat production; it is also the largest wheat importer from global markets in the country by far, and owns inland wheat storage facilities and public mills. The government sells domestically procured and imported wheat flour to bakeries at subsidised prices, and provides subsidies for bread to eligible consumers. In addition to wheat, the government also purchases other basic foods (e.g. sugar, cooking oil) and subsidises their consumption for eligible consumers (Tellioglu & Konandreas, 2017). Nevertheless, the food subsidy system suffers from cost inefficiencies, leakages, waste, corruption, and ineffective targeting (Tellioglu & Konandreas, 2017; Akhter *et al.*, 2001). The government has tried several times to improve the food subsidy system, but these reforms remained incomplete and were unable to address the underlying issues (Tellioglu & Konandreas, 2017).

Egypt is the largest importer of wheat in the world. The high dependence on food imports and the consequent exposure to price fluctuations have been among the main concerns of Egyptian policy makers since the 1970s (Tellioglu & Konandreas, 2017). The dramatic rise in world food prices in 2007-2008 intensified these

concerns, putting Egypt's food security and thus the social and economic stability at risk. The increased concern for food security is reflected in the emphasis placed by the Egyptian government on basic food commodities in both its 2017 and 2030 strategic development plans. For instance, in Egypt's *Sustainable Development Strategy Towards 2030* (SADS 2030), the Government highlights the importance of increasing and maintaining higher levels of self-sufficiency in strategic crops such as wheat and maize so as to achieve greater food security in these crops. However, the Egyptian government also intends to align its development goals with sustainability concerns. According to SADS 2030, sustainable agriculture implies that increased agricultural production is considered together with the efficient use of natural resources, now and in the future. Specifically, SADS 2030 mentions (i) gradual improvements of the efficiency of irrigation systems, (ii) sustainable expansion in reclaimed areas by using the water saved through more efficient irrigation, (iii) maximising returns to rain-fed agriculture through improved water harvesting techniques, (iv) maintaining and protecting agricultural land from degradation using periodical soil surveys.

Africa's agricultural policy has developed very differently from that of Europe: African countries developed their own national agricultural policies and strategies without a common agricultural policy with a shared market structure and trade rules (Arnold *et al.*, 2019). In the 1980s, many African countries, unlike developed countries, taxed their agricultural sectors rather than subsidised them. They applied overvalued exchange rates to agricultural exports, thereby depressing prices and returns to farmers, while simultaneously subsidising food imports. As a result of these policies, agriculture and the overall economy experienced low growth. However, the situation changed during the 1990s (World Bank, 2007). Rising world commodity prices, macroeconomic reforms which reduced the number of countries with overvalued exchange rates, and agriculture sector reforms all contributed to an increase in domestic prices for farm outputs and income (Arnold *et al.*, 2019).

In 2003, the African Union (AU) adopted the **Comprehensive Africa Agricultural Development Program** (CAADP), as Africa's policy framework for agricultural development. The overall goal of the CAADP is "to help African countries reach a higher path of economic growth through agriculture-led development that eliminates hunger, reduces poverty and food insecurity, and enables expansion of exports" (World Bank, 2007, p. 230). Although continental in scope, CAADP operates through integrated national and regional strategies (Arnold *et al.*, 2019, p.21). Countries signing up to CAADP committed to allocating at least 10% of public expenditure to the agricultural sector and sought to achieve 6% annual growth in agricultural output (Arnold *et al.*, 2019). In the 2014 by means of the **Malabo Declaration on Accelerated Agricultural Growth and Transformation for Shared Prosperity and Improved Livelihoods**, the Heads of State and Government of the AU reaffirmed their support to the CAADP and committed themselves to ending hunger and halving poverty on the continent by 2025. The implementation of the Malabo Declaration has been mixed across African countries. For instance, according to the latest biennial review (released in March 2022), Rwanda scored 7.43/10 and is on track to meet the Malabo goals and targets. In addition, Egypt and Tunisia, scored 6.52 and 6.28 respectively and are not on track (African Union Commission, 2022).

Apart from these African initiatives, international cooperation has played an important role in the implementation of agro-food development policies and practices in Egypt, and has involved several partners, such as FAO, IFAD and UNIDO (OECD et al., 2021). Egypt is currently implementing the Country Strategic Opportunities Programme 2019-24 in cooperation with IFAD which aims at contributing to the sustainable improvement of rural incomes and resilient livelihoods in Egypt. The country also works with FAO to fund projects aimed at increasing the resilience of agro-food systems and improving rural incomes across the country.

2.4 Ecosystem

2.4.1 Main Institutions

The **Ministry of Environment (MoE)**, together with the **Egyptian Environmental Affairs Agency (EEAA)**², are the institutions responsible for governing the environment in Egypt (Arab Republic of Egypt, 2022; Mutz et al, 2021). They are responsible for formulating environmental policies, preparing the necessary plans for environmental protection, drafting laws, and granting environmental relations between Egypt and other states, as well as regional and international organisations (Arab Republic of Egypt, 2022; Mutz et al, 2021; Esen and Barky, 2019).

2.4.2 Key Legislation and Policies

The 2014 Constitution contains special provisions for the protection and preservation of the environment in Articles 45 and 46, and lays out political and social obligations to protect the environment as a pillar of sustainable development (Samy and Lizaso, 2011).

The current environmental legislative framework was established under Law 4/1994 (Law 4 of 1994 for the Protection of the Environment amended by Law 9/2009 and Law 105/2015), and Law 102/1983 (Law No 102 of 1983 for Nature Protectorates). Specifically, Law 4/1994 represents Egypt's overall law for the protection of the environment (Mutz et al., 2021), while the Nature Protection Law 102/1983 represents the main legal instrument for establishing and managing protected areas in Egypt (Samy and Lazaso, 2011). Nevertheless, there are many other laws and decrees that address specific environmental aspects and issues. For instance, Law 48/1982 on the Protection of the River Nile and Waterways from Pollution, and Decree No. 974 of 2017 on the registration, handling and use of agricultural pesticides.

Egypt's Environmental policy seeks to achieve **environmental protection** through the establishment of proper institutional, economic, legislative and technical frameworks at the local, regional, national and international

² The EEAA represents the executive branch of the ministry.

levels. This is expressed through the seven directives of the policy statement of the ministry: (i) strengthening partnerships at the national level, (ii) supporting bilateral and international partnerships in the environmental fields, (iii) enforcing Law 4 of 1994 for the protection of the environment, and Law 102 of 1983 for Natural Protectorates and all other environmental legislation; (iv) supporting institutional strengthening and capacity building for the Egyptian Environmental Affairs Agency and Environmental Management Units (EMU's) of the governorates; (v) supporting Integrated Environmental Management Systems; (vi) integrate the use of market-based instruments in the field of environmental protection; (vii) transfer and adaptation of environmentally friendly technologies (Arab Republic of Egypt, 2022). Within this policy framework, institutional and regulatory reforms are carried out, aiming at the implementation of national environmental policy objectives and measures.

In 2016, the Egyptian government launched the **Sustainable Development Strategy: Egypt Vision 2030**. This strategy was developed in alignment with the United Nations Sustainable Development Goals and the Sustainable Development Strategy for Africa 2063, and aims to integrate environmental aspects into the various economic sectors, to achieve effective management of natural resources, preserve natural assets in Egypt, and to ensure the rights of future generations to development (Gelil, 2021). This strategy includes a number of institutional reforms, such as establishing a higher council for sustainable development, strengthening the institutional and legislative structure of water resources management systems and reforming fiscal policy to encourage sustainable consumption patterns of water and natural resources. Furthermore, Egypt Vision 2030 identifies the country's main environmental issues, which include waste management, air pollution, biodiversity conservation, marine environment protection, and climate change. This strategy also encourages the participation of the private sector and civil society, and supports Egypt's commitment to fulfil its responsibilities under international environmental conventions (Gelil, 2021).

2.5 CHALLENGES: BARRIERS AND CATALYSERS

In the spirit of cooperation, compromise and good neighbourliness Egypt should, as soon as possible, negotiate a mutually beneficial agreement on the sustainable management of the historic waterway, the River Nile, with Ethiopia and Sudan: to date, the absence of an agreement between countries inevitably leads to conflicts and unbalanced management of resources. In addition, the Egyptian government has also been trying for some time to improve the food subsidy system: however, reforms remain incomplete due to restrictive laws and difficult cooperation between the actors involved.

In spite of this, the Egyptian government has developed several strategies that aim at the country's development, including policy proposals from the African Union. The country's priorities (such as water distribution, sustainable use of resources, energy diversification and environmental protection) have been defined. Moreover, responsibilities and competencies have been divided among the major institutions, technical and scientific bodies as well as regional and local authorities.

Europe: Water-Energy-Food-Ecosystem Nexus

Water

EU water legislation is rather wide (Mutz *et al.*, 2021) and its cornerstone is represented by the EU **Water Framework Directive (WFD) 2000/60/EC** that provides a framework for the protection of European waters (surface, ground, inland and transitional). Indeed, its overall objective is to achieve good environmental status for all water bodies. Specifically, the Directive aims to prevent the deterioration and enhance the status of aquatic ecosystems, promote sustainable water use, prevent and reduce pollution, and mitigate the effects of floods and droughts. As a result, the WFD requires Member States to draw up the so-called **River Basin Management Plans** based on natural geographic river basins, as well as specific programmes of measures to achieve these objectives (Kurrer, 2021a). The Water Framework Directive is also supported by a number of more targeted directives (Kurrer, 2021a), such as the Urban Waste Water Treatment Directive, the Nitrates Directive, the Groundwater Directive, the Bathing Water Directive, the Floods Directive, the Environmental Quality Standards Directive, and the Drinking Water Directive. The **Urban Waste Water Treatment Directive (91/271/EEC)** was introduced in 1991 to protect the environment from the adverse effects of urban wastewater discharges and discharges from certain industries, such as agro-food industries. It sets out the rules for collection, treatment and wastewater discharge, introduces controls over the disposal of sewage sludge, and requires the dumping of sewage sludge at sea to be phased out. In the same year, the **Nitrates Directive (91/676/EEC)** was established with the aim of protecting waters against pollution from nitrates used for agricultural purposes. In addition, the **Bathing Water Directive (2006/7/EC)** seeks to protect human health and environmental quality by laying down provisions for the monitoring and classification of bathing waters and by making information available to the public. The **Groundwater Directive (2006/118/EC)** on protection of groundwater against pollution and deterioration, provides specific criteria for assessing the chemical status of groundwater, identifying significant and sustained upward trends in groundwater pollution levels, and defining starting points for reversing these trends. All threshold values for pollutants (with the exception of nitrates and pesticides, for which limits are set by specific EU legislation) are set by the Member States (Kurrer, 2021a). The **Floods Directive (2007/60/EC)** aims to establish a framework for measures to reduce the risk of floods. It requires Member States to assess the risk of flooding in river basins and coastal regions and then prepare maps that identify areas prone to significant flood risks as well as flood-risk management plans focused on prevention, protection and preparedness. The **Environmental Quality Standards Directive (2008/105/EC)** sets out environmental quality standards concerning the presence in surface water of certain substances or groups of substances identified as priority pollutants because of the significant risk they pose to or via the aquatic environment. Finally, the revised **Drinking Water Directive of 2020 (2020/2184)** introduces updated rules to protect human health from the contamination of water intended for human consumption and requires Member States to regularly monitor the quality of to ensure that it is ‘wholesome and clean’.

Energy

The EU general energy policy is set out in Article 194 of the **Treaty on the Functioning of the European Union** (IEA, 2020), which states that energy is a shared responsibility between the EU and its member countries. However, each Member State maintains its “*right to determine the conditions for exploiting its energy resources, its choice between different energy sources and the general structure of its energy supply*” (Article 194(2)).

Generally speaking, EU energy policies are designed to ensure that citizens can access secure, affordable and sustainable energy supplies (Magagna *et al.*, 2019). Among the main initiatives to date is the **Energy Union Strategy**, published on 25 February 2015, which focused on energy security, completing the internal market, energy efficiency, decarbonization, as well as research and innovation (Erbach, 2015). In November 2016, to implement the Energy Union Strategy, the Commission proposed the “**Clean Energy for All Europeans**” package (IEA, 2020), which consisted of eight legislative proposals covering governance (Governance of the Energy Union Regulation ((EU) 2018/1999)), electricity market design (the Electricity Directive ((EU) 2019/944), the Electricity Regulation ((EU) 2019/943), and the Risk-Preparedness Regulation ((EU) 2019/941)), energy efficiency (Energy Efficiency Directive ((EU) 2018/2002), Energy Performance of Buildings Directive ((EU) 2018/844)), renewable energy (Renewable Energy Directive ((EU) 2018/2001)) and rules for the regulator (Regulation (EU) 2019/942 establishing ACER) (Ciucci, 2021). Under **Regulation (EU) 2018/1999** on the governance of the energy union, each Member State is required to produce a 10-year integrated **national energy and climate plans (NECP)** for the period 2021-2030 (which must be renewed every subsequent ten-year period) and to submit a progress report every two years. NECPs outline, among other things, how EU countries intend to address energy efficiency, renewables, and greenhouse gas emissions reductions. Nevertheless, Regulation (EU) 2018/1999 was amended by **Regulation (EU) 2021/1119** (known as the “*European Climate Law*”), which sets a binding EU target of a national net reduction in greenhouse gas emissions of at least 55% (compared with 1990 levels) by 2030, and undertakes to set a climate target for 2040 within six months of the first global stocktaking under the Paris Agreement. Basically, the European Climate Law writes into law the goal set out in the European Green Deal. Indeed, on 14 July 2021, the Commission adopted a package of proposals “**Delivering the European Green Deal**”, which aims to reduce net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels, and to make Europe the first climate-neutral continent by 2050. This large package consists of a revision of all existing EU acts on climate and energy, including the **Renewable Energy Directive** (COM(2021)0557), the **Energy Efficiency Directive** (COM(2021)0558) and the **Energy Taxation Directive** (COM(2021)0563), and new proposals such as the **regulation on the deployment of alternative fuels infrastructure** (COM(2021)0559), the **ReFuelEU Aviation Initiative** (COM(2021)0561) and the **FuelEU Maritime Initiative** (COM(2021)0562) (Ciucci, 2021).

Food

The EU's **Common Agricultural Policy** (CAP), launched in 1962, is a set of laws adopted by the EU to provide a common, unified policy framework for agriculture. Article 39(1) of the **Treaty on the Functioning of the European Union** (TFEU) lays down the CAP's specific objectives, namely (i) to increase agricultural productivity by promoting technical progress and ensuring the optimum use of the factors of production, in particular labour; (ii) to ensure a fair standard of living for farmers; to stabilise markets; (iii) to assure the availability of supplies and (iv) to ensure reasonable prices for consumers. Since its emergence, the CAP has undergone several reforms, which reflected the changing needs of farmers and society, increased the efficiency of its measures and made possible to better respond to the new challenges faced by European agriculture (Simonaitytė & Ribašauskienė, 2021).

The CAP is divided into **two pillars**, which cover three main areas of action: direct support (I pillar), market measures (I pillar), and rural development policy (II pillar). While the first pillar is entirely financed by the EU (through the European Agricultural Guarantee Fund – EAGF), the second pillar is co-financed by EU funds and regional or national funds.

On December 2, 2021, the agreement on reform of the CAP was formally adopted. The **new CAP**, which will apply in full in 2023, contains a number of policy reforms aimed at enhancing the contribution of agriculture to EU environmental and climate goals, providing more target support to smaller farms, and allowing greater flexibility for Member States in adapting measures to local conditions (DG AGRI, 2022). Moreover, the new CAP will be a key tool in reaching the ambitions of the **Farm to Fork** and **biodiversity strategies**.

Indeed, one of the key initiatives included in the **European Green Deal** is the **Farm to Fork Strategy** which aims at shifting the EU food system towards a sustainable model. Specifically, the Strategy, which was presented by the Commission in May 2020, outlines a 27-point action plan covering four primary policy domains: (i) ensuring sustainable food production; (ii) stimulating sustainable food processing, and wholesale, retail, hospitality and food service practices; (iii) promoting sustainable food consumption and facilitating the shift towards healthy, sustainable diets; and (iv) reducing food loss and waste (OECD, 2021). The Farm to Fork Strategy includes several agriculture-specific targets, including halving the use of pesticides and fertilisers, increasing the share of farmland under organic farming to at least 25%, and reducing nutrient loss by at least 50% (OECD, 2021).

Another key element of the Green Deal is the **Biodiversity Strategy**, a long-term plan for protecting the environment and reversing the degradation of ecosystems (EEA, 2022). The Biodiversity Strategy also contains agriculture-specific targets, including reversing the decline of pollinators and establishing biodiversity-rich landscape features on at least 10% of farmland (OECD, 2021).

Ecosystem

EU environmental policy is based on **Articles 11 and 191-193** of the **Treaty on the Functioning of the European Union** (TFEU) and rests on the principles of precaution, prevention, rectifying pollution at source, and on the ‘polluter pays’ principle (Article 191(2)). More specifically, the **precautionary principle** aims at ensuring a higher level of environmental protection through preventative decision-taking in the case of a serious environmental risk that has not been established with full scientific certainty (EU, 2016); the **prevention principle** aims to prevent environmental damage rather than to react to it; the **rectification at source principle** means that environmental damage should be at its source rather than remedy its effects (Lavelle & Wentworth, 2018). Finally, the **polluter pays principle** requires those responsible for environmental damage to pay for or bear the costs of their actions (Kingston et al., 2017).

Multiannual **Environmental Action Programmes** (EAPs) set out forthcoming legislative proposals and goals for the EU environment policy. On May 2, 2022, the **8th EAP** entered into force, which will guide EU environmental policy until 2030. Following the European Green Deal, the new programme aims to accelerate the transition to a climate neutral, resource-efficient economy, recognizing that human wellbeing and prosperity depend on healthy ecosystems (DG ENV, 2022). It also calls for the active engagement of all stakeholders at all levels of governance, to ensure that EU climate and environmental laws are effectively implemented (DG ENV, 2022). The programme forms the EU’s basis for achieving the United Nations 2030 Agenda and its Sustainable Development Goals (DG ENV, 2022).

In 2011, the EU committed itself to halting the loss of biodiversity and ecosystem services by adopting the **EU Biodiversity Strategy to 2020**, which reflects the commitments made within the UN Convention on Biological Diversity, to which the EU is a party (Kurrer, 2021b). In May 2020, the European Commission adopted its **Biodiversity Strategy to 2030**, which is a key pillar of the European Green Deal as well as the proposal for the EU’s contribution to the upcoming international negotiations on the global post-2020 biodiversity framework. The EU has also the largest coordinated network of protected areas in the world, the so-called **Natura 2000**, established in 1992 to protect Europe’s most valuable and threatened species and habitats, listed in the **Nature Directives** (i.e. **Birds Directive** and **Habitats Directive**) (EEA, 2021). Besides the Birds and the Habitats directives, there are other directives that reflect the EU’s efforts to stop the loss of biodiversity and ecosystems, including the **Water Framework Directive** (aimed, among other things, at protecting and enhancing the status of aquatic ecosystems) and the **Marine Strategy Framework Directive** (aimed at protecting the marine ecosystem and biodiversity).

In addition to the Biodiversity Strategy to 2030, another strategy at the heart of the European Green Deal is the **Farm to Fork Strategy**, which aims to shift the current EU food system towards a sustainable model. Indeed, among the main goals of the Strategy is to ensure that the food system will have a neutral or positive environmental impact, help mitigate climate change and adapt its impacts, and reverse the loss of biodiversity.

3. ITALY: Water-Energy-Food-Ecosystem Nexus

3.1 Water

3.1.1 Main Institutions

The governance of water sources in Italy is characterised by a very **complex multilevel model** (Re *et al.*, 2020; Rossi, 2020). This complexity is mainly due to a historical process that has developed specific bodies for regulating and managing each specific sector (Rossi, 2020). In addition, the legislative framework as well as the transfer of many relevant tasks and responsibilities from the central government to the regions have made the situation even more complex (Rossi, 2020).

The **Ministry for Ecological Transition (Ministero della Transizione Ecologica, MiTE)** is the main institutional body responsible for water policies. It is in charge of establishing the country's water policy guidelines, enforcing most of the rules on water resource planning, water use and water quality standards, and setting the general quality objectives of the country's integrated water service through the collaboration of regions and consumer associations (Re *et al.*, 2020; Rossi, 2020). The Ministry also has the task of guiding and supervising the activities of the **Institute for Environmental Protection and Research (Istituto Superiore per la Protezione e la Ricerca Ambientale, ISPRA)**, the national parks and the marine protected areas (MiTE, 2022).

In addition to the MiTE, there are at least three other ministries that play an important role in water resources management: (i) the **Ministry of Sustainable Infrastructures and Mobility**, responsible for activities related to transport, viability and logistics on the Italian territory including navigation, safety, maritime and inland waterway transport; (ii) the **Ministry of Agricultural, Food and Forestry Policies**, responsible for agricultural development and irrigation programs; and (iii) the **Ministry of Health**, responsible for the quality of drinking water.

Another key actor is the aforementioned **ISPRA**, a research organisation in charge of helping the public administration in a variety of commitments, e.g., the synthesis of the planning provisions provided by the river basin authorities and the preparation of guidelines for the planning of qualitative water protection measures (Rossi, 2020; MiTE & ISPRA, 2022). Furthermore, the **Authority for Regulation Energy Networks and Environment (Autorità di Regolazione per Energia Reti e Ambiente, ARERA)** carries out an important supervisory function over the companies for management of municipal water services, while the **National Association of Italian Municipalities (Associazione Nazionale Comuni Italiani, ANCI)** cooperates with ARERA in monitoring and elaborating data on water pollution, municipal water services, environmental costs and investments, as well as disseminating environmental information to the public in accordance with agreements drawn up with the Ministry for Ecological Transition.

The **District Authority** has responsibilities for: (i) drawing the district plan (and the plans required by the EU Directives) and the programs of actions, (ii) checking coherence between the objectives of the district plan and European, national, regional and local planning and programming measures on soil protection, to fight desertification, protection and management of water resources and (iii) the analysis of the impacts of human activities on surface and groundwater resources, as well as an economic analysis of water uses (Rossi, 2020). A citizen participation body has recently been introduced through the **River Contract**, which can contribute to the definition and implementation of the district plan in the areas of water resources protection and management, river basin development and hydraulic risk defence, as regulated by Article 59 of Law 221/2015 (Rossi, 2020).

At the regional level, the **regional government** is responsible for the devolvement and planning of water policies. Specifically, the regional government is in charge of (i) preparing the **Regional Water Protection Plan** (PTA); (ii) identifying the **Optimal Territorial Areas** (ATO); (iii) organising regional services; (iv) establishing bodies to ensure the quality of the water service to the citizens of the region; and (v) regulating the duties of the for water management bodies in agriculture and industry sectors (Rossi, 2020; CoR, n.d.-a).³

The **Regional Agencies for Environment Protection** (Agenzia Regionale per la Protezione ambientale, ARPA) carry out monitoring and advisory functions on several aspects of water resources and hydrogeological risk. The **Permanent Conference for relations between the State, the Regions and the Autonomous Provinces of Trento and Bolzano** is the primary instrument for resolving the possible conflicts between the central government and regional governments, including those on water and soil management issues.

Provinces should be responsible for controlling discharges into surface water bodies but their actual responsibilities are not clearly defined (Rossi, 2020). At the *local level*, the **Governing Bodies of the Areas/Field** (EGA) are the authorities to which the exercise of the powers of the municipalities (falling within the ATO) in the field of water resource management is transferred, including water infrastructure planning (ARERA, 2017). Among their various tasks, the EGAs are responsible for drawing up and updating the ATO plan⁴, organising the **Integrated Water System** (IWS) and assigning the service to an operator (which can be a private company, an in-house public company, or a company based on a public-private partnership). However, in several cases, municipalities continue to provide water supply, sewage and waste-water treatment services, since the plants were not transferred to the management body of the ATO (Rossi, 2020).

3.1.2 Key Legislation and Policies

Over the last three decades, thanks to a reform process started by the **Law No. 36/1994** (the so-called “Galli Law”) and continued with **Legislative Decree No. 152/2006** (the so-called “Environmental Code”), the Italian

³ Most of these tasks are generally carried out by the **Department for Territory and Environment (or other equivalent name)** (Rossi, 2020).

⁴ The ATO plan is the planning tool for defining the quality objectives of the Integrated Water Service and the infrastructure interventions needed to meet them.

water policy has been profoundly innovated (Boscolo, 2021; Rossi, 2020). One of the key factors in promoting this change has been the need to adapt the Italian legislation to the European Directives (Rossi, 2020). In particular, **Law 36/1994** recognized the public nature of all water resources (surface and groundwater) and initiated a profound process of modernization and reorganisation of the Italian water sector. Among the main innovations introduced by this law, there is the unification of all the different water services (supply, sewage, and waste-water treatment) into a **single IWS** and their redistribution over the ATOs (Parisio, 2021). Although the Galli Law was formally repealed by **D.Lgs 152/2006**, its fundamental principles were retained (Parisio, 2021).

Today, the EU **Water Framework Directive (WFD) 2000/60/CE** is the reference legislation for managing water and drinking water in Italy (Re *et al.*, 2020). This Directive was transposed into Italian legislation with the abovementioned Legislative Decree 152/2006. The **Environmental Code (EC)** replaced all previous water legislation, with the aim of creating a single, comprehensive legislative framework for water protection and use, while implementing several EU regulations, including the **Water Framework Directive (WFD)**, the **Drinking Water Directive (DWD)** and the **Nitrates Directive (ND)**.⁵ In Italy, however, the path towards full implementation of these EU directives has been far from easy, due to institutional conflicts, poor environmental objectives, and extensive use of derogations and exemptions (De Santis and Fermeglia, 2021). The EC also divided the national territory into eight **River Basins Districts** (Law 221/2015 reduced the number to seven), each managed by its own **River Basin Authority**, and established the relevant **Management Plans** aiming to achieve efficient, cost-effective and sustainable water management. Moreover, transposing the **European Urban Wastewater Directive (91/271/EEC)** into Italian legislation, the EC requires regional governments to adopt regulations and incentives to promote water recycling and reuse of treated wastewater (Re *et al.*, 2020). Furthermore, within the Italian legislative framework, the **Ministerial Decree of 2 May 2006** establishes discharge limits for wastewater, measures for the prevention of water pollution, and the technical rules for the reuse of urban and industrial wastewater (Re *et al.*, 2020), while **Ministerial Decrees of 7 April 2006** and **25 February 2016** set standards for wastewater from agronomic activities (De Santis & Fermeglia, 2021).

At the **local level**, each region has adopted a **water protection plan** (Piano di Tutela delle Acque (PTA)), that is an implemental tool based on the management plan of the River Basin to which the region belongs. The PTA includes a series of measures to achieve the qualitative and quantitative goals required by the Environmental Code and the Water Framework Directive (Re *et al.*, 2020).

⁵ See Section Water for the regulation in the European Context.

3.2 Energy

3.2.1 Main Institutions

As of 2021, the **Ministry for Ecological Transition** (*Ministero della Transizione Ecologica* - MiTE) is in charge of managing energy policy, after their transfer from the **Ministry of Economic Development** (*Ministero dello Sviluppo Economico*, MSE). The responsibilities of the MiTE, among many others, include defining the **National Energy Strategy** (SEN), setting national energy policy objectives and related measures, managing relations with international organisations and with the EU in the energy sector.^{6,7}

The **Interministerial Committee for Economic Planning and Sustainable Development** (*Comitato Interministeriale per la programmazione economica e lo sviluppo sostenibile*, CIPESS), is a governmental body chaired by the President of the Council of Ministers and is responsible for the coordination and horizontal integration of national policies. Among its many competences, there is the approval of updates concerning the National Action Plan for the Reduction of Greenhouse Gas Emission Levels and the National Infrastructure Plan for the Recharging of Electrically Powered Vehicles.

The **ISPRA** as well as the **National Agency for New Technologies, Energy and Sustainable Economic Development** (*Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile*, ENEA) are in charge of providing data, information, and technical and scientific support. ISPRA is also responsible for reporting national emissions to the European Union and the United Nations Framework Convention on Climate Change (IEA, 2016). The **Authority for Regulating Energy, Networks and Environment** (*Autorità di Regolazione per Energia Reti e Ambiente*, ARERA) is an independent administrative authority which carries out regulatory and supervisory activities over the sectors of electricity, natural gas, water services, waste cycle and district heating (ARERA, 2021). Another key actor is the **Regulatory Authority for Electricity, Gas and Water** (*Autorità per l'energia elettrica, il gas e il sistema idrico*, AEEGSI), that is an independent regulatory authority also tasked with regulating and overseeing the electricity, natural gas and water sectors.

The **Energy System Operator** (*Gestore dei Servizi Energetici*, GSE) is a state-owned company that promotes and supports renewable energy sources and energy efficiency in Italy. Specifically, the company works to foster sustainable development by providing support for electricity generated from renewable sources and by undertaking awareness-raising actions for environmentally efficient energy use (IEA, 2016).

⁶ For a complete list of the competencies of the Minister for Ecological Transition see **Decree Law No 22/2021** <https://www.gazzettaufficiale.it/eli/id/2021/03/01/21G00028/sg>

⁷ Prior to the adoption of the SEN in 2013, all the regions and autonomous provinces developed and adopted their own Regional Energy–Environment Plans, which outline regional energy policy objectives and their impact on greenhouse gas emissions (IEA, 2016; OECD, 2013).

3.2.2 Key Legislation and Policies

Italy's energy policy is **strongly-pro renewables** (IEA, 2021). As an EU member state, Italy was required to prepare a **National Energy and Climate Plan (NECP)**, a 10-year plan for the period 2021-2030. The country's final NECP set very ambitious targets for renewables by 2030, with the goal of reaching **30% in total energy consumption** and **55% in electricity generation** (IEA, 2021). The starting point for the drafting of the NECP was the **2017 National Energy Strategy**, the ten-year plan that the Italian Government drew up with the aim of making the national energy system "*more competitive, more sustainable and more secure*" (MISE & MATTM, 2017, p.3). Moreover, several other laws have recently been introduced into the Italian legislative framework to stimulate energy transition, improve energy efficiency and fight climate change (Bosetti, 2022). For instance, **Decree Law No. 34 of 19 May 2020** (the so-called *Decreto Rilancio*) introduces a significant tax deduction (up to 110% of the costs) to prompt a substantial increase in the energy efficiency of buildings. This incentive is also recognized for the installation of photovoltaic systems and electric vehicle charging points (Bosetti, 2022). **Legislative Decree No. 73 of July 2020** transposes the **Energy Efficiency Directive (EU) 2018/2002** into Italian legislation, making several amendments to **Legislative Decree No. 102 of 2014** (which transposed the previous Energy Efficiency Directive 2012/27/EU), including amendments to national energy saving targets. In addition to the abovementioned legislation, which can also positively contribute to climate change mitigation, additional initiatives have been adopted for this specific purpose (Bosetti, 2022). For example, the **National Forestry Strategy 2019-2039** aims to offset emissions from agriculture and the use of forests and pastures, whereas **Legislative Decree No. 47 of 9 June 2020** transposes the Directive (EU) 2018/410, which concerns the Emissions Trading Scheme (ETS) and establishes rules for reducing emissions from aviation.

3.3 Food

3.3.1 Main institutions

The Italian **Ministry of Agriculture, Food, and Forestry Policies** (Ministero delle Politiche Agricole, Alimentari e Forestali, MiPAAF) is responsible for drawing up agricultural, agri-food, fisheries and aquaculture, and forestry policies, as well as coordinating the national policy with European and International standards. It represents Italy within the European institutions for the negotiation of the Common Agricultural Policy (CAP). In its activities, the MiPAAF relies on the work of several important related bodies: the **Agricultural Payments Agency** (Agenzia per le Erogazioni in Agricoltura, AGEA), that is responsible for coordinating and paying out subsidies established by CAP; the **Council for Agricultural Research and Economics** (Consiglio per la ricerca in agricoltura e l'analisi economica agraria, CREA), that is a research organisation dedicated to the agri-food supply chains; the **Institute of Services for the Agricultural and Food market** (Istituto di Servizi per il Mercato Agricolo Alimentare, ISMEA), that is a public economic

entity which carries out informative, insurance and financial services and constitutes forms of credit and financial guarantees for agricultural enterprises; and the Italian Telematic Commodity Exchange (Borsa Merci Telematica Italiana, BMTI), an agency in charge of managing the trading platform of the Italian Online Commodity Exchange: the regulated online market for agricultural, agro-energy, agri-food, and fishery products, and logistics services.

In agriculture, **Regional authorities** are responsible for all the issues not expressly attributed to the State, including the regional plan for agriculture; quality control over agricultural products; and the protection and promotion of the rural territory, irrigation and rural facilities (CoR, n.d.-b).

3.3.2 Key Legislation and Policies

As mentioned above, the CAP is the common policy for all EU countries in the area of agriculture. Regarding its first pillar (i.e. direct payments to farmers), Italy will spend 25% of its direct payments budget on 5 **eco-schemes**⁸ to support farmers in adopting agricultural practices beneficial for the environment and climate. On the other hand, rural development (second pillar) in Italy is implemented through 22 **Rural Development Programmes (RDPs)** — one at national level and 21 regional RDPs. In addition, a national rural network programme supports activities of pooling and transferring knowledge among the different actors of rural development. Specifically, the **National Rural Development Programme (NRDP)** outlines the priorities for Italy for the use of approximately € 2.9 billion of public expenditure (€ 1.3 billion from the EU budget and € 1.6 billion of national co-financing) for the period 2014- 2022. To address the RDP needs, three aspects were identified and selected as rural development priorities: (i) food chain organisation, including processing and marketing of agricultural products, animal welfare and risk management in agriculture; (ii) restoring, preserving and enhancing ecosystems related to agriculture and forestry; (iii) resource efficiency and climate (European Commission, 2021a).

Furthermore, the Italian **National Recovery and Resilience Plan** (Piano Nazionale di Ripresa e Resilienza, PNRR), approved in January 2021, includes the component "*Sustainable Agriculture, Green Enterprises and Circular Economy*", which "*aims on the one hand at achieving an agri-food sector that is sustainable, by improving the logistics and competitiveness of farms and their climatic-environmental performance, on the other hand at developing production plants for secondary raw materials and at modernising and constructing new plants*" (PNRR, 2021, p.24). Specifically, the sustainable agriculture component accounts for a total budget of € 2.5 billion (OECD, 2022).

Within the Italian legislative framework, **Article 44 of the Italian Constitution** provides that the law is to impose obligations and constraints on private ownership of land, set the property size limit according to the region and agricultural area, promote land reclamation, the conversion of *latifundia* and the reorganisation of

⁸ The 5 eco-schemes identified in the Italian CAP Strategic Plan are: (i) Grassing of tree crops, (ii) Protection of olive trees of particular landscape value, (iii) Extensive forage systems, (iv) Specific measures for pollinators, (v) Specific measures for pollinators (Andrés *et al.*, 2022).

farm units. The law also assists small and medium-sized farms and includes special provisions for mountain areas.

Other relevant legislations are **Law no. 590 of 1965** and subsequent amendments, which provide the right of first refusal for farmers in case of a land sale, and **Law no. 232 of 2016** (2017 Budget Law), which abolished the so-called agricultural income tax for 3 years. With this measure, farming income and income from land ownership is not included in the IRPEF (Personal Income Tax) taxable income of farm workers and agricultural entrepreneurs (MEF, 2016).⁹

At local level, Tuscany implemented the **Rural Development Programme (RDP)**, formally adopted by the European Commission on 26 of May 2015, that outlines the regional priorities for using the nearly € 1.25 billion of available public funds for the period 2014-2022 (more than € 537 million from the EU budget, including nearly € 709 million of national co-funding). Among the priorities of the rural areas there are: the persistent loss of business activity, labour migration, and demographic changes. On the top of these, the main environmental challenge in Tuscany remains the adaptation of agriculture and forestry to climate change. In addressing these challenges, the regional RDP will fund actions under six rural development priorities: (i) knowledge transfer and innovation in agriculture, forestry and rural areas; (ii) competitiveness of agri-sector and sustainable forestry; (iii) food chain organisation, including processing and marketing of agricultural products, animal welfare and risk management in agriculture; (iv) restoring, preserving and enhancing ecosystems related to agriculture and forestry; (v) resource efficiency and climate; (vi) social inclusion and local development in rural areas. Special emphasis has been placed on priorities (ii) and (iv) (European Commission, 2021b).

3.4 Ecosystem

3.4.1 Main Institutions

The State has exclusive legislative power in the field of “protection of the environment and ecosystems” (Italian Constitution, Article 117, paragraph II, letter s), however, specific management competences in various sectors are transferred to the Regions and other Local Bodies (MATTM, 2010). Specifically, the **Ministry for Ecological Transition** is in charge of implementing environmental policy. As noted in the previous sections, the Ministry carries out numerous functions that cover several areas, including the protection of biodiversity, ecosystems and the marine-coastal heritage, the safeguarding of land and water, policies to fight climate change and global warming, sustainable development, energy efficiency and circular economy, integrated waste cycle management, and the environmental assessment of strategic works. It also has the task of guiding and supervising the activities of **ISPRA** (MEF, 2022).

⁹ IRPEF exemption for farmers was extended to 2021 (MEF, 2021).

Regional authorities are responsible for all the administrative functions not expressly conferred to the State, such as the definition of environmental action priorities; coordination of environmental interventions; the distribution of funds; zonings of high risk of environmental crisis areas (Article 73 and 74 of Legislative Decree 112/1998). **Competences shared between the central government and regions** include information and education, promotion of clean energy and sustainable development policies, emergency decisions to prevent environmental damage, protection of the coastal environment and environmental impact assessments (CoR, n.d.-c).

In addition, **provincial authorities** are responsible for the licensing, monitoring and provisioning of services in the environment, and for natural parks. At the bottom level, **municipal authorities** are in charge of environmental controls, sewerage, refusing collection and disposal, participation in the zoning of high risk of environmental crisis areas; local parks and gardens, and the supply of water and gas (CoR, n.d.-c). **Local authorities share competences with regional authorities and the central government** on noise and air pollution; soil protection; water pollution, and water management (CoR, n.d.-c) whereas shared competencies with regional authorities are the protection and observation of coastal areas; the control over wild fauna commerce and detention; Forestry, and water management (CoR, n.d.-c).

3.4.2 Key Legislation and Policies

The **Environmental Code** (Legislative Decree 152/2006) contains the essential bulk of Italian environmental laws and is composed of six parts: Part I defines the application scope and lays down common provisions; Part II defines and regulates the procedures related to the Strategic Environmental Assessment (VAS), Environmental Impact Assessment (VIA) and Integrated Environmental Authorization (IPPC); Part III deals with soil defence and combating desertification, protection of waters from pollution and management of water resources; Part IV is devoted to waste management and the rehabilitation of polluted sites; Part V addresses air protection and reduction of polluting emissions in the atmosphere; and Part VI finally comprises those rules laying down provisions on the payment of compensation for damage to the environment.

In 2010, as a party to the Convention on Biological Diversity (CBD), Italy adopted the **National Biodiversity Strategy** for the period 2011-2020 that is a 10-year framework for action to ensure real integration between the country's development goals and the protection of its biodiversity heritage. In particular, Italy identified three strategic objectives to be reached by 2020: (i) ensuring biodiversity conservation, (ii) reducing the nationwide impact of climate change on biodiversity, and (iii) integrating biodiversity conservation into economic and sectoral policies (MATTM, 2010). In 2021, the Ministry for Ecological transition began the process of defining the new National Biodiversity Strategy for 2030.

By the “Report on the State of Natural Capital in Italy”, MiTE is also committed to enhancing natural capital through various activities, including the promotion of sustainable tourism, especially in protected areas; the

development of the socio-economic Atlas of Italian protected areas, including the Natura 2000 network¹⁰; the mapping and assessment of the conservation status of ecosystems at the national scale and at the regional level; and the preliminary study “National Parks: from natural capital to environmental accounting”, aimed at setting up an environmental accounting system in the protected areas (MiTE, 2019).

A major step towards stronger environmental protection was made in February 2022, when with the amendment of Articles 9 and 41 of the Constitution, the protection of the environment, biodiversity and ecosystem became part of the fundamental principles.¹¹ Moreover, the amended Article 41 affirms that health and the environment are paradigms to be protected by the economy, as are safety, freedom and human dignity. It also states how institutions, through laws, programs and controls, can direct public and private economic initiative not only towards social but also environmental purposes (ISPRA, 2022).

3.5 CHALLENGES: BARRIERS AND CATALYSERS

In Italy, bureaucracy, institutional conflicts and extensive use of derogations or exemptions in the implementation of policies and EU directives have led to long paths towards full implementation of new regulations. This, plus the comprehensive multilevel model in which legislation is organised complicates considerably the enforcement process. However, it should be emphasised that it is precisely due to the complexity of the system and the fact that many competences are delegated from the top down (specifically, from the national to the regional and local level) that many local initiatives have been able to take place, taking care of what are strictly local needs. For example, regional authorities are responsible for regional plans for agriculture. The recent amendment of the Constitution of Articles 9 and 41, which integrated the protection of the environment, biodiversity and the ecosystem as part of the fundamental principles, emphasised a greater commitment of the Italian state to the environment.

¹⁰ Natura 2000 is the largest network of protected areas in the world, extending across all the EU countries, both on land and at sea.

¹¹ Indeed, Article 9 is part of the fundamental articles of the Italian Constitution and already contained the protection of the nation’s landscape heritage and historical and artistic heritage., however, With the amendment, the protection of the environment, biodiversity and ecosystems was also added together with the explicit , and a principle of protection for animals was explicitly specified.

4. SPAIN: Water-Energy-Food-Ecosystem Nexus

4.1 Water

4.1.1 Main Institutions

The **Secretary of State for the Environment**, within the **Ministry of Agriculture, Food, and the Environment (Ministerio de Agricultura, Pesca y Alimentación, MAPA)**, has the main role in directing and coordinating national environmental policies, including those related to water resources (Osbek et al., 2013). Despite this, competencies on freshwater management are, in general, highly decentralised. For example, marine and inter-regional waters are managed by the central authority and intra-regional waters by the autonomous regions (MAPA, 2022).

However, in order to ensure cross-cutting coordination of water policies between state and local actors, a **National Water Council** has been established: it acts as advisor of the Ministry of Agriculture, Food, and Environment on water planning and management, since here ministries, agencies and sectors are represented. Hence, when state authorities have to make decisions regarding fresh water, they have to consult the National Water Council before.

In addition, at the national level approval of river basin management plans (**RBMPs**) and flood risk management plans (**FRMPs**) – that are usually prepared by regional or basin authorities – takes place. Furthermore, state authorities are responsible for managing conflicts between River Basin Authorities and other national-level issues described in the National Hydrological Plan (European Committee of the Regions, 2022).

The **River Basin Authorities** act at regional level where the authority over water is divided into major catchment areas and **River Basin Districts**. If a river basin crosses a regional border it falls under the jurisdiction of the central state and the water is administered by a River Basin Authority (Osbek et al., 2013); while if a river basin area does not cross a regional border, it is administered by an autonomous water authority. Spain has nine autonomous Regional Water Agencies and sixteen River Basin Authorities which are scattered among eight autonomous regions.

River Basin Authorities usually have no say on land use regulation or nature protection in the remainder of the catchment area – every inter-regional water basin has its own state-run River Basin Authority with a headquarters in the catchment area –, but they manage large-scale water utilities such as agriculture or power generation, plan and build infrastructure according to the requests of the central government and assist municipalities in implementing water-related projects.

If River Basin Authorities are responsible for *inter-regional* River Basins, under the authority of the national government, regional authorities are responsible for *intra-regional* River Basins (Osbek et al., 2013).

At the local level, **municipalities** manage urban water supply and wastewater treatment and, if applicable, contract day to day management to private or semi-public enterprises. They define the regulation and price to be paid for water users and undertake urban planning and civil protection plans related to flood risk (European Committee of the Regions, 2022).

Lastly, the authority over the coastline – coastal and marine water resources – is shared because spatial planning in the littoral zone is in charge of the autonomous regions and the municipalities, while the award of concessions comes under the authority of the **Directorate General for Coastal and Marine Sustainability**.

4.1.2 Key Legislation and Policies

According to Spanish law, water is a public domain over which the state has ultimate authority (Osbek et al., 2013): it is prohibited to make use of water resources without the authorization of the State. The legal framework used by the national government to set the direction of water management in terrestrial areas is the **National Water Law**¹² (1985, amended in 1999 and 2003) which defines water services as all activities related to water management that enable its use, such as extraction, storage, conduction, treatment and distribution of surface or groundwater, and the collection and treatment of wastewater, which subsequently is discharged in surface waters (EurEau, 2020). It is worth noting that the activities of protecting people and properties against flooding are included in this definition and that the treatment of wastewater to be reused, meeting quality standards for each authorised use, could be added to the listed activities too. In addition, National Water Law contains the basic regulations on and planning for surface water and groundwater including the implementation of the Water Framework Directive (WFD - 200/60/EC). It is important to consider, however, that the autonomous regions have their own **Regional Water Laws** for the intra-regional basins, adapted to their specific conditions but, of course, in line with the National Water Law and the WFD. For example, according to the National Water Law, River Basin Authorities have to develop **Drought Management Plans** and, in cases of towns exceeding 20,000 inhabitants, the public administration, responsible for urban supply, is required to develop **Emergency Plans for Droughts Situations**.

Furthermore, since Spain is one of the few countries to provide by law for a national water strategy, there is a **National Water Plan** (first drafted in 1933, later updated in 2001) (Lopez-Gunn et al., 2012) that sets and defines several objectives including coordinating of RBMPs, solving national water problems and establishing conditions for the transfer of water.

The **2012 Law on Urgent Environmental Measures** consolidated the Water Law and introduced measures to speed up the development of the RBMPs. The adoption of RBMPs in Spain is a legally binding process that results from a broad process of consultation with stakeholders.

¹² Following the adoption of the Water National Law, all waters became public and exclusive rights to water use have to be obtained through legal provision or administrative licence. Previously, groundwater could be privately owned. Now, owners of these waters can continue with this regime by declaring their existence to the Basin Authority, or by switching to a public regime. Private waters, however, do not enjoy the administrative protection enjoyed by public waters (OECD, 2015).

In 2007 the Spanish Council of Ministers approved a **Sustainable Development Strategy** whose main environmental concerns included elements related to water stress, water quality, and the unsustainable use of natural resources in general. This document proposes to replace traditional supply approaches with demand management strategies in order to ensure greater sustainability and quality of water resources. An element of key importance in this regard is the Action Program for Water Management and Use (**AGUA program**) – already launched in 2004 – which aims to achieve greater local or regional self-sufficiency and avoid large-scale transfers between regions (OECD, 2015).

In addition, in order to achieve good environmental and chemical status of its water bodies, Spain implemented a **National Sewerage and Wastewater Treatment Plan** in 1995. This plan corresponded to the EU Urban Wastewater Treatment Directive (91/271/EEC) and was later revised to comply with the WFD.

The Royal Decree 1620/2007 set out the legal regime for the reuse of treated water in Spain, specific for irrigation. Article 273, Royal Decree on the Hydrological Plan (RDPH) determines the conditions and procedures for the concession of water reuse. The authorisation or granting of waste water for irrigation can only be carried out if it is demonstrated that its use is for irrigation and does not conceal any disposal.

To combat water scarcity, a **National Irrigation Plan** was adopted between 2002 and 2008 with the main objective of improving and consolidating the infrastructure for irrigation water distribution and application.

Lastly, since Spain shares transnational watersheds with Portugal and France, some agreements were necessary: with Portugal, Spain signed the **Albufeira Agreement** (1998) to improve the management of shared water resources. The agreement aims to improve administrative and legal coordination in transboundary basins, in order to ensure additional water quality.

4.2 Energy

4.2.1 Main Institutions

In the energy sector, at the national level, the **Ministry for the Ecological Transition and the Demographic Challenge (Ministerio para la Transición Ecológica y el Reto Demográfico, MITECO)** holds the basic competencies. It develops the national energy and mining policy, along with measures aimed to secure energy supply: this is done by ensuring proper regulation on the sector, analysis and monitoring of the market, together with mining expertise, all within the framework of the ecological transition.

Additional MITECO competencies are related to legislation: (i) legislation overseeing tariff structure, energy product prices, levies, and tolls (ii) legislation for energy conservation, promotion of renewable energy, and support for new energy technologies, and (iii) legislation and actions related to the demographic challenge (MITECO, 2022).

High officials of the ministry are the **Secretary of State for Energy** and the **Secretary of State for the Environment**. The former is responsible for the development of the government's energy and mining policy, and it ensures not only energy supply but also the regulation of energy tariffs, taxes, and prices. In addition, it

is in charge of processing carbon emission subsidies, following the guidelines established by the European Union and it solves files and subjects related to mining rights, research and exploitation of hydrocarbons (IEA, 2021).

Under the Secretary of State for Energy there are different institutions which hold competencies in various areas; among them, there are the **Just Transition Institute** which is tasked overseeing the economic transition of the regions where coal-fired mines and power plants are closing, and the **Energy City Foundation**, which develops research and innovation programs related to energy and the environment, thereby also contributing to economic development.

The latter operates through the **Office of Climate Change**, which advises various government bodies on climate change issues, and the **National Climate Council**, which coordinates the development of central government climate change policies and measures. The National Climate Council promotes information gathering, analysis, preparation, and implementation actions (IEA, 2021).

The **National Commission of Markets and Competition (Comisión Nacional de los Mercados y la Competencia, CNMC)**, the **Nuclear Safety Council (Consejo de Seguridad Nuclear, CSN)** and the **National Statistics Institute (Instituto Nacional de Estadística, INE)** operate at the central level too.

The CNMC is an independent regulatory body that reports directly to the Spanish parliament (IEA, 2021). Among its authorities on energy, there are some important roles such as supervising and controlling the proper operation of energy markets and calculating network access tariffs according to transmission and distribution costs. The Commission operates also at the EU level: it cooperates with other regulators through the Council of European Energy Regulators and the Agency for the Cooperation of Energy Regulators on developing network codes and implementing the internal electricity market (IEA, 2021).

Even if the CSN is directly accountable to the Spanish parliament, it has authority over matters of nuclear safety and radiation protection.

Lastly, the INE deals with different fields such as the economy, society and the environment, among others, in order to facilitate decision making.

Energy competences are concentrated at the national level and guide the formulation of energy policy. Nevertheless, minor competencies are also present at regional and local levels. These include the development and the implementation of national legislation, and the planning in the field of sustainable energy and energy efficiency within the frame of national plans (IEA, 2021). Provinces are in charge of securing coordination and provision of municipal services, while municipalities are responsible for public lighting and fostering energy efficiency at local level.

4.2.2 Key Legislation and Policies

Spain's 2050 climate neutrality target calls for renewable energy to provide 100% of electricity and 97% of the total energy mix. The country's energy policies focus on massive deployment of renewable energy, energy efficiency, electrification, and renewable hydrogen (IEA, 2021).

Currently, the Spanish legal framework for energy and climate is based on renewable energy, also seen as an opportunity to stimulate the economy by creating jobs, modernising industries, supporting vulnerable groups and increasing research, development and innovation.

As part of the European Union, Spain is asked to reach the European targets by 2030 which include: a minimum 40% reduction in GHG emissions, a minimum 32% share of renewable energy, a minimum 32.5% improvement in energy efficiency and a 15% interconnection target (European Commission, 2014).

In order to achieve these targets, the Spanish government has adopted for the period 2021-2030 the **National Energy and Climate Plan (NECP)**, which has been submitted to the European Commission in 2020. This document aims to define a number of policy actions in different sectors which are meant to support the country's climate targets.

Policies defined in the document include increasing renewable energy installations and increasing the use of renewable gas in the power sector, modal shift and electrification in the transportation sector, renovation and increasing the use of renewable heating in the residential and commercial sectors, promoting energy efficiency and fuel switching in the industrial sector, and improving energy efficiency in the agricultural sector (IEA, 2021).

Spain's commitment to energy policies also finds space domestically where in January 2020, the government issued the **Climate Emergency Declaration** which has defined thirty action areas to reach the climate neutrality goal. The main pillars of this declaration are three: (i) the Climate Change and Energy Transition Law; (ii) the Just Transition Strategy; and (iii) the Long-Term Strategy. A supplemental National Energy Poverty Strategy was adopted too.

Approved by the government in May 2020 to then be debated in Parliament, the **Climate Change and Energy Transition Law** puts the fight against climate change and the need for energy transition at the centre of the economy and society. Its goals are very similar to those defined by the NECP and include achieving at least 70% renewable energy in electricity by 2030 and 100% by 2050, at least 35% renewable energy in final energy consumption by 2030, and reducing primary energy consumption by at least 35% (IEA, 2021). Indeed, renewable energy as well as energy efficiency are placed at the centre of the energy transition.

The **Just Transition Strategy** is based on the idea according to which it is important to optimise the outcomes that could possibly derive from the ecological transition. For this reason, it includes measures to promote job opportunities in the energy transition, supported by a vocational training framework, active labour policies, support measures for the most vulnerable, and economic stimulus plans for the regions most affected by the energy transition.

Then, the **Long-Term Strategy** defines a pathway that will achieve an energy system almost entirely based on renewable energy and plans the transition to climate neutrality in 2050. The document includes intermediate milestones for 2030 and 2040, capturing the benefits from the energy transition and supporting the transformation and competitiveness of the economy.

To conclude, the **National Energy Poverty Strategy** has been adopted in 2019 as a tool to address and analyse the concept of energy poverty from a global perspective.

4.3 Food

4.3.1 Main Institutions

The **Ministry of Agriculture, Fisheries and Food (Ministerio de Agricultura, Pesca y Alimentación, MAPA)** is the competent Department responsible for proposing and for carrying out the government on agricultural, livestock and fishing resources, the agri-food industry, rural development and food (REF, website).

The structure of MAPA aims to provide an appropriate response, from an organisational point of view, to the framework in which agriculture and fisheries policies will develop, as well as the food policies it is charged with promoting. Within this framework, the Department is responsible for proposing and implementing government action on primary production and agricultural markets, health of agricultural production, food industry and rural development, sectoral and rural land innovation and forestry policies; planning and implementing policies on marine fisheries in external waters and aquaculture, management of the fisheries sector, the basis for marketing and processing of fisheries products, and participation in planning fisheries research policy (**Royal Decree 904/2018** of July 20, art.1).

In addition, it is in charge of representing the State in the international organisation corresponding to its matters of competence, without prejudice to the competence of the Ministry of Foreign Affairs, European Union, and Cooperation. It coordinates the actions, the cooperation and the agreement in the design and application of all the policies that affect the scope of competences of the Autonomous Communities and of the remaining public administrations, promoting their participation through the appropriate bodies and instruments of cooperation (**Royal Decree 904/2018** of July 20, art.1).

This Ministry works through three bodies with the rank of undersecretariat: the General Secretariat for Agriculture and Food, the General Secretariat for Fisheries and the Undersecretariat for Agriculture, Fisheries and Food.

The **General Secretariat of Agriculture and Food** is the Ministry's governing body, directly responsible for the Common Agricultural Policy (CAP),¹³ rural development policy, forestry policy, irrigation policy, and the development of multilateral relations in the areas of agri-food policies, innovation in agriculture, food and

¹³ A detailed explanation of the CAP can be seen in the box "Europe"; subsection "Food" above.

forestry, and rural areas and the food system. It is also responsible for the formulation, proposal, and execution of the Ministry's policies on food industries and markets, agricultural and livestock resources, animal and plant health, and bilateral and multilateral relations in agribusiness (**Royal Decree 904/2018** of July 20, art. 2).

The **General Secretariat of Fisheries** is responsible for the planning and execution of marine fisheries policy in external waters and aquaculture; it is also responsible for the management and coordination of Community funds for fisheries, as well as institutional relations with professional organisations and other representative bodies of interest in the fisheries sector (Royal Decree 904/2018 of July 20, art. 7).

The **Undersecretariat for Agriculture, Fisheries and Food** supports the MAPA coordinating the implementation of measures in exceptional situations in the agri-food sectors, involving the need to define actions of a financial, labour, or fiscal nature (**Royal Decree 904/2018** of July 20, art. 10).

The Spanish state's responsibilities in the area of agriculture are divided between the central government and regional governments, the so-called "*Autonomous Communities*". The Spanish Constitution states that the Autonomous Communities may assume responsibilities for "agriculture in accordance with the general management of the economy"; and reserves to the state the "bases and coordination of the general planning of economic activity" (Reus & Casla, 2010). Thus, the general rule is that agricultural policies are a regional responsibility, with two main exceptions: when the issue affects more than one region and if the issue is related to the Common Agricultural Policy (CAP) of the European Union.

At the local level, provinces have to secure coordination and provision of municipal services.

4.3.2 Key Legislation and Policies

According to article 130 of the Spanish Constitution "*The public authorities shall attend to the modernisation and development of all economic sectors and, in particular, those of agriculture, livestock raising, fishing and handicrafts, in order to bring the standard of living of all Spaniards up to the same level*" (Spanish Constitution, art. 130).

In order to achieve these goals, the national food policy strategy aims to improve the marketing and quality of agri-food products. Key aspects of this policy, that help to define the rules of the economic sector, are support for the values of agri-food quality and organic farming as well as balance in the value chain.

In order to increase the effectiveness and competitiveness of the agribusiness sector, the Spanish government in the summer of 2013 adopted two different laws: **Law 12/2013**, of August 2, on measures to improve food chain operations, and **Law 13/2013**, of August 2, on promoting the integration of cooperatives and other associative entities of an agribusiness nature. Moreover, Law 12/2013 has created the **Food Information and Control Agency** with the task of monitoring non-compliance and proposing sanctions. It is its responsibility to correct imbalances in trade relations by companies operating in the food chain.

As part of the European Union, Spain is one of the countries that benefits most from the **Common Agricultural Policy** (CAP), both from the 1st Pillar devoted to direct payments and financing of market measures and the 2nd Pillar that is about Rural Development (RD) (European Commission, 2022).

The RD Regulation for the period 2014-2020 addressed six economic, environmental, and social priorities, and programmes contain clear targets setting out what is to be achieved (European Commission, 2019). In Spain, the European Rural Development policy has been implemented through the adoption of a national Rural Development Programme (RDP) and seventeen regional RDPs, one for each of the Spanish regions.

The **National RDP** focuses on three priorities. First of all, enhancing the economic performance and the competitiveness of agricultural cooperatives; secondly, promoting an efficient use of natural resources, combating climate change, and preserving rural heritage; and thirdly fostering innovation and collective approaches in the agricultural sector (European Commission, 2019).

The National RDP addresses the challenges – from an agricultural and rural point of view – that can be tackled at national level taking into account the repartition of competences between the national and the regional authorities defined by the constitution.

The European Commission in 2021 has integrated the previous RD Regulation, extending it until 2022. According to it, the national framework must ensure a consistent approach to rural development by specifying common and mandatory elements for all regions. In particular, several measures of interventions are planned, including establishment of farm management, farm support and farm advisory services; investments to improve the overall performance and sustainability of farms and infrastructure; and investments in forestry; agri-environmental payments for commitments that go beyond mandatory requirements and promote changes in farming practices; organic farming; and support for the establishment and operation of operational groups for agricultural productivity and sustainability (European Commission, 2021).

4.4 Ecosystem

4.4.1 Main Institutions

At national level, the **Ministry for Ecological Transition and Demographic Challenge (Ministerio para la Transición Ecológica y el Reto Demográfico, MITECO)** is the main regulatory body in environmental issues. It is responsible for the proposal and the execution of the Government's policy on climate, energy and environment, the transition to a more ecological production and productive social model. In addition, it follows the elaboration and the development of the Government policy against the country's demographic challenges. In particular, it acts in the following areas: energy, biodiversity, quality and environmental assessment, coast and marine environment, water, climate change and environmental education. It is also responsible for adopting basic legislation on environmental protection; legislation on mountains, logging, and livestock routes; and the one for mining and fuels (MITECO, 2022).

The **Local Autonomous Regions** have the possibility to develop and enforce their own environmental legislation and local authorities also have environmental protection powers (Almenar *et al.*, 2019).

In general, in environmental matters, regional authorities have the following tasks: establishment of nature parks; autonomous waste programs; permitting, monitoring, inspection, and legal authority to impose sanctions

on waste generation and management activities; issuance of permits for the transfer of waste to and from non-EU countries and within the national territory; monitoring, inspection, and legal authority to impose sanctions within their competencies; residual competence in the waste sector; mountain and forest exploitation; and mineral and thermal water management.

At the local level, **provinces** are responsible for coordinating and providing municipal services.

Municipal powers, which are exercised according to conditions defined in regional and state laws, include: waste recovery and treatment; monitoring, inspection, and legal authority to impose penalties within their powers; wastewater treatment; and strategic environmental action plans.

4.4.2 Key Legislation and Policies

The **Spanish Constitution**, at article 45, recognizes and defends the right of everyone to enjoy an environment suitable for personal development, as well as the duty of citizens to preserve the ecosystem. It also clarifies that it is the duty of public authorities to safeguard the use of natural resources, relying on essential collective solidarity (Spanish Constitution, art. 45).

The article thus provides the legislative basis for setting limits and conditions on the activities of individuals and businesses. Failure to comply with environmental law results in administrative or criminal penalties, although many violations are not prosecuted due to lack of resources and difficulty in discovering violations (Almenar *et al.*, 2019).

In any case, the 1995 Spanish Penal Code was amended to include within it the **Environmental Crime Directive** (2008/99/EC), thus adding new crimes against the environment. Indeed, most Spanish environmental laws derive from the transposition of European legislation and policies implemented by the government aim to address environmental challenges, derived from the complexity of the system that is important for human well-being.

In 2015, the OECD's Environmental Performance Assessment of Spain Report acknowledged many of the progress Spain has made in the environmental field in recent years: for example, a less carbon, energy and resource intensive economy, and the expansion of natural and protected areas (OECD, 2015). The results highlighted by OECD in 2015 derive from various legislation, adopted over the years, by the Spanish government.

First of all, the government has focused on environmental assessment, that is, preliminary research aimed at identifying, predicting, and assessing the environmental impacts of a plan or project, before it has been carried out. In this regard, the basic legislation is **Law 21/2013, of December 9**, which implemented a broad procedural reform of this legal instrument on prior control in order to simplify and expedite procedures, thereby strengthening environmental protection.

Among the various actions taken by the government to protect the environment, there is a plan adopted by the Ministry of Agriculture, Food and Environmental Affairs, the **National Air Quality and Atmospheric Protection Plan 2013-2016** (PLAN AIRE), which aims to promote measures intended to improve and protect

the environment. In order to implement PLAN AIRE, the government between 2013 and 2014 has adopted four different Royal Decrees providing concrete measures, including economic and financial support (La Moncloa, 2022).

For what concerns ecosystems, the **Spanish National Ecosystem Assessment (SNEA)**, which began in 2009, completed its biophysical assessment in 2012. It included an assessment of the condition of Spanish ecosystems and biodiversity, a future scenario exercise, and an explicit spatial analysis of biodiversity, ecosystem services, land use change, and socioeconomic variables (La Moncloa, 2022).

Moreover, biodiversity is protected by **Law 42/2007 of Natural Heritage and Biodiversity** which establishes a series of instruments for the knowledge and planning of natural heritage and biodiversity, such as the **Spanish Inventory of Natural Heritage and Biodiversity**, the **Strategic Plan of Natural Heritage and Biodiversity**, and the **Guidelines for the Management of Natural Resources**.

All these strategies aim to establish a general framework for national policy by diagnosing the current state of Spanish biodiversity and identifying the processes and industries that are causing its deterioration. Finally, they define guidelines for future plans and measures that should be adopted immediately by national, regional, and local governments and society as a whole.

Lastly, on climate change, Spain's commitment was such that it was able to complete the Kyoto Protocol targets (2008-2012). Recently, in May 2021, **Law 7/2021, Climate Change and Energy Transition**, was adopted: it enshrines into Spanish regulations the target of reaching climate neutrality by 2050 at the latest.

4.5 CHALLENGES: BARRIERS AND CATALYSERS

Spain's commitment to the environment is evident in the many laws and policies adopted by the government: numerous sustainability programmes have enabled the country to complete the Kyoto Protocol targets. Furthermore, a fundamental element of Spanish policy is the vision of sustainability also as an opportunity to create jobs, stimulate the economy and support vulnerable groups by implementing research and development. Environmental competences are decentralised and this allows local authorities to adopt more territorial policies, however the strong decentralisation also makes it difficult to prosecute violations of environmental law. In particular, although the Spanish Constitution provides for the duty of citizens to preserve and take care of the environment, those who do not comply with this obligation are unlikely to be punished due to the lack of resources and due to the difficulty the Spanish system has in detecting violations.

5. TUNISIA: Water-Energy-Food-Ecosystem Nexus

5.1 Water

5.1.1 Main Institutions

Since 1975, the **Ministry of Agriculture, Water Resources and Fisheries (Ministere de l'Agriculture des Ressources Hydrauliques et de la Pêche, MARHP)** is the main responsible for public domain management, mobilisation and development of water resources, water management projects and agricultural withdrawals as well as water resources supply for domestic and other uses (MARHP, 2022). The MARHP acts with the support of two bodies, the **National Water Council** and the **Commission of the Public Water Domain** (Closas *et al.*, 2018). In particular, the National Water Council, created in 2010, assists the MARHP in defining general principles for the mobilisation and enhancement of water resources. Thus, it is a strategic advisory body composed of representatives from various ministries, companies, and national organisations (OECD, 2014).

Even if since the creation of a national corporation in 1947, governance of the water sector has been highly centralised (Touzi *et al.*, 2010) and the main component of the public water domain is undertaken by the Ministry of Agriculture, some competencies in the control of water are shared with other ministries and bodies. From the side of the ministries, there are the **Ministry of Public Health** which is responsible for water control, the **Ministry of Equipment, Territorial Planning and Sustainable Development** responsible for flood management in urban areas and the **Ministry of Economy and Finance** which works through the **Secretariat for Development and International Cooperation**. On the other side, there are two historic public operators, the **National Water Operation and Distribution Company (Société Nationale d'Exploitation et de Distribution des Eaux, SONEDE)** and the **National Office for Water Sanitation (Office National de l'Assainissement, ONAS)** which are in charge of water services since 1968 and sanitation services since 1974 (OECD, 2014), respectively.

Moreover, within the MARHP, several technical departments are involved in the management of water resources and the most important are: the **General Directorate of Water Resources (Direction Générale des Ressources en Eau, DGRE)** which is in charge of supervising water resources and manage them, granting authorizations for water use and abstraction; the **General Directorate of Dams and Major Hydraulic Works (Direction Générale des Barrages et Grands Travaux Hydrauliques, DG BGTH)** which undertakes the study, design and operation of dams; and, the **General Directorate of Rural Engineering and Water Exploitation (Direction Générale du Génie Rural et de l'Exploitation des Eaux, DGGREE)** which oversees the development of publicly irrigated areas, the supply of drinking water in rural areas, the promotion

of water savings and the associative management of water resources (Closas *et al.*, 2018), not controlled by the SONEDE.

At regional level, the MARPH is represented by the **Agricultural Development Regional Offices (Commissariat Régional au Développement Agricole, CRDA)**, established in each of the 24 governorates. The CRDAs, which bring together the main services provided by the Ministry of Agriculture, have financial autonomy and are in charge of implementing national agricultural and hydraulic policies within the governorate, including the development of irrigated schemes and agricultural water management. In addition, they manage hydraulic equipment, they oversee the distribution of agricultural water to farmers and they recover waste water and transport it to irrigated lands. The CRDAs finally are in charge of water control and soil conservation (OECD, 2014).

At the local level, the **Agricultural Development Groups (Groupements de Développement Agricole, GDA)** are the main formal mechanisms for user participation in water management. They have a management contract with the government (OECD, 2014), they are involved only in the supply and management of drinking water systems in rural areas, and are responsible for water quality and conservation.

5.1.2 Key Legislation and Policies

Since water is a central resource not only for agriculture but also for tourism, urban supply and industry, water policy occupies a prominent place in Tunisia's social and economic development. Policies adopted since the 1960s have sought to define a policy more focusing on demand management rather than on resource mobilisation (Closas *et al.*, 2018). For this reason, the legislative and regulatory framework has undergone several reforms focusing on the water sector and water conservation.

The **1975 Water Code** (Law 75-16 of March 31, 1975, amended in 1987, 1997 and 2001) regulates the allocation of water resources. By including several articles for the protection and conservation of water resources (Hamdy *et al.*, 2014), it is the main legal instrument for the water sector. The Water Code governs several principles, the most important of which are: (i) water is a public resource and there can be no private ownership of it; (ii) the administration plays a leading role in planning, mobilising, monitoring and controlling water both quantitatively and qualitatively; and, (iii) it is necessary to strive for maximum efficiency from each cubic metre of water, avoiding waste and degradation of the resource. The latter principle has been adopted nationwide and for all sectors involving water use (Hamdane, 2019). The Water Code therefore converted all private property rights to water into rights of use as a consequence of the institution of nationalisation of water resources. It also authorised the state to control all resources, their allocation among sectors and between regions, and this, without any reference to society (Hamdane, 2019).

In addition, Tunisia's **Constitution** officially recognized the right to water: article 44 states that “*the right to water is guaranteed. It is the duty of the state and society to preserve water and rationalise its use*” (Tunisia’s Constitution, art. 44).

As already mentioned, the Water Code was amended several times. The 2001 amendment (**Amendment to the Water Code, 2001**) placed emphasis on improving the availability of water resources through the development of unconventional sources such as desalination. This amendment also introduced the concept of water conservation and maximising the value of water production (OECD, 2014).

Moreover, the Ministry of Agriculture, with regard to the water sector, published the **Water Master Plan** with which different strategic options were identified.

First of all, the study "**Water Economy 2000**" prepared in 1990-95 under the supervision of the General Directorate of Research and Hydraulic Works of the Ministry of Agriculture, proposes a water resource management strategy capable of meeting the national demand in the coming decades (OECD, 2014).

Then, the **ten-year strategy for water resource mobilisation** (1990-2000) aimed to mobilise all the country's water resources to meet the country's drinking water needs and the water needs of agriculture, industry and tourism in the next decade. Water resources were to be mobilised through the construction of infrastructure such as large-scale dams, wells, floodwater spreading and groundwater recharge systems, and water and soil conservation works. In addition, the strategy is designed to provide drinking water to all Tunisians, to expand the irrigated area, and to protect water resources from pollution, flooding, and soil conservation and drought effects (OECD, 2014).

The **Water Sector Strategy to 2030** takes stock of the quantity and quality of the country's water resources and the state of water infrastructure, such as dams and canals (OECD, 2014). This strategy considers the technical, economic, institutional, and legislative factors involved in water management and the risks associated with floods and droughts. It also envisions a greater role for the private sector in the construction of public works (dams, reservoirs and wells) and maintenance of drinking water and irrigation systems (OECD, 2014).

5.2 Energy

5.2.1 Main Institutions

The **Ministry of Energy, Mines and Energy Transition (Ministère de l'Énergie, des Mines et de la Transition Énergétique, MEMTE)** manages the Tunisian electricity sector, and is responsible for the electricity infrastructure, planning and implementation of national policy in the field of electricity, energy efficiency and renewable energy (IRENA, 2021). As it is also responsible for regulatory oversight, MEMTE monitors and analyses supply and demand developments working with the support of a number of directorates charged with carrying out specific activities in the energy sector (IRENA, 2021).

Under the Ministry, the **General Directorate for Electricity and Renewable Energy** oversees issues related to renewable energies and carries out the main task of implementing state policy in the renewable energy sector, considering requests for private production and self-consumption of electricity from renewable sources too. Then, the Minister decides on the granting of authorizations based on an advisory opinion from the

Technical Commission for the Private Production of Electricity from Renewable Energies (Commission Technique des Energies Renouvelables, CTER) (AfDB, 2021). CTER is also responsible for verifying the feasibility of developing private renewable projects on lands belonging to the state domain and it also examines all queries and concerns relevant to the production of electricity from renewable energy resources (IRENA, 2021).

Based on the Ministry, the **Interdepartmental Commission for Independent Electricity Production** (Commission Interdépartementale de la Production Indépendante d'Electricité, CIPIE) oversees calls for tender, contract negotiations and proposal of advantages to be granted to concessionaires of independent electricity production projects (AfDB, 2021). The **High Commission for Independent Electricity Production** (Commission Supérieure de la Production Indépendante d'Electricité, CSPIE) decides on the procedures for selecting the concessionaires of independent electricity production projects and the advantages to be granted to them (AfDB, 2021).

In addition, there are the **General Directorate for Hydrocarbon Energy**, which is found to be responsible for implementing state policy in the hydrocarbon sector and the **Directorate General for Strategy Supervision and Coordination**, which is responsible for developing programs and strategies, as well as national and sectoral policies, related to the energy sector, along with action plans to ensure better resource management (IRENA, 2021).

Finally, the **Directorate General of Manufacturing Industries** implements government policies related to industry, including the development of an enabling environment for the promotion of the renewable energy industry (IRENA, 2021).

It was not until the creation of the **National Agency for Energy Management (Agence Nationale de Maîtrise de l'Energie, ANME)** that the energy management policy, initiated in the mid-1980s, has completely materialised. It is a non-administrative public. It is responsible for designing and managing energy efficiency and renewable energy development programs. Its mission is to implement the state's energy management policy through the study and the promotion of energy efficiency, renewable energy and energy substitution (AfDB, 2021). ANME is also in charge of proposing regulations and managing the Energy Transition Fund (Fonds de transition énergétique, FTE). Its responsibilities also include managing specific renewable energy programs and developing awareness and training campaigns for renewable energy deployment (IRENA, 2021).

In addition to overseeing the ANME, the Minister also controls the other major energy agency, the **Tunisian Company of Electricity and Gas (Société Tunisienne d'Electricité et du Gaz, STEG)** (Keskes *et al.*, 2019). STEG is Tunisia's historic electric utility which since 1962 has held a vertically integrated monopoly about the transmission, distribution, and marketing of electricity in Tunisia.

5.2.2 Key Legislation and Policies

Given the energy security challenges and the vulnerability to volatile international energy prices, Tunisia has recently decided to embark on an energy transition process as part of its wider sustainable economic and social development strategy (IRENA, 2021).

Indeed, the recent legislative framework has as main elements renewables and energy efficiency which thus, have become a key part of the country's recovery plans.

The energy transition of the country is based on different elements, such as the diversification of the energy mix and the integration of renewable energies, the strengthening energy efficiency, the rationalisation of the energy subsidy and the enhancement of the grid and the interconnections (IRENA, 2021). In addition, the system is also based on the implementation of an energy management strategy that includes increasing two components: (i) energy efficiency and the development of renewable energy, with a 30/30 target to reduce primary energy demand by 30% in 2030 compared to the trend scenario; and (ii) renewable energy at 30% of electricity production of electricity production by 2030 (IRENA, 2021).

The **Tunisian Solar Plan (TSP)** for the year 2030 is a renewable energy development project elaborated by the ANME in 2015 and officially adopted by the government in 2016. The TSP is the operation tool to implement the strategy to increase the share of renewable electricity and it foresees a 30% share of renewables in the electricity mix by 2030 (ANME, 2022). The TSP was firstly launched in 2009 but its actual version derives from several improvements made over the years to reflect Tunisia's national strategy and targets. To achieve the country's upgrade goals, the TSP has set a target for the total installed renewable energy capacity at 1,860 megawatts by 2023 and 3,815 megawatts by 2030. The targets, as previously mentioned, were updated to reflect Tunisia's commitment to reduce the country's carbon emissions by 41% from 2010 levels by 2030 compared to an unconditional target to reduce carbon intensity by 13%, as pledged in its determination at the national level under the Paris Agreement. Most of the country's mitigation potential comes from the energy sector, 68% of which is from energy efficiency and 32% from renewable energy (IRENA, 2021).

The considerable amount of installed renewable energy capacity needed to meet the targets set out in the TSP will require, in addition, an extensive private investment support. Thus, a new law relating the production of electricity from renewable energies was adopted by the Parliament in May 2015: **Law No. 2015-12** establishes a legal framework that is conducive to promote private investment in renewables in order to contribute to the 30/30 objective of the Tunisian Solar Plan. The purpose of the law is to put in place a legal regime for the implementation of electricity generation projects based on renewable energy sources, either for self-consumption, for the needs of local consumption or for exportation. Nowadays, it is one of the most important texts on renewable energies in Tunisia. (Keskes *et al.*, 2019).

Furthermore, **Law No. 2015-12** calls for a national plan to produce renewable electricity within five years from the date the law entered into force. The national plan will have to be data driven; include a holistic evaluation of different renewable energy technologies; and ideally consider a mix of renewable power

generation assets that include utility-scale power plants, remote decentralised grids, and residential distributed systems. With respect to utility-scale generation targets, the zones currently allocated for concessions could be a starting point. A comprehensive least cost assessment for the development of generation assets, however, is yet to be developed, in addition to a corresponding assessment of the cost of reinforcing the electricity grid. **Law No. 2015-12** has been amended in 2019 with **Law No. 2019-47**: the new version provides the right for companies that adopt renewable energy for self-generation, to sell electricity to other consumers or companies and to use the national grid to transport electricity (IRENA, 2021).

5.3 Food

5.3.1 Main Institutions

Despite some efforts to privatise extension services, the **Ministry of Agriculture, Water Resources and Fisheries (Ministere de l'Agriculture des Ressources Hydrauliques et de la Pêche, MARHP)** together with the **General Directorate of Rural Engineering and Water Exploitation (Direction Générale du Génie Rural et de l'Exploitation des Eaux, DGGREE)** and the **General Directorate of Agricultural Production (Direction Générale de la Production Agricole, DGPA)**, is the official body responsible for all the aspects related to the development of the agricultural sector in Tunisia.

In particular, the MARPH is responsible for preparing agricultural development plans and sectoral programs for the development of agriculture and fishing, for drafting legislative and regulatory texts to promote agriculture, for monitoring means and modalities to achieve self-sufficiency and food-security, and for supporting the export efforts of agricultural, fisheries and forestry products (REF website MARPH).

The DGPA, which supports the work of the Ministry, is in charge of programming, supervising, and organising agricultural campaigns. Moreover, it coordinates the various stakeholders in the agricultural sectors and it contributes to the preparation of development plans related to agricultural production, especially in strategic sectors.

At national level, in addition to government agencies, several private research institutions also collaborate with the ministry. Among the others there are the **Institution of Agricultural Research and Higher Education (Institution de le Recherche et de l'Enseignement Supérieur Agricoles, IRESA)** and the **National Institute of Agronomy of Tunisia (Institute National Agronomique de Tunisie, INAT)**.

IRESA is a national-level organisation responsible for agricultural research and higher education in Tunisia. Although it does not directly provide extension services to farmers, IRESA plays an important role because its mandate includes promoting agricultural research by creating links between agricultural research and higher education institutions on the one hand and agricultural extension and producers on the other (G-Fras, 2022). One IRESA directorate is responsible for disseminating innovations and creating links between research and extension. In addition, all seven regional directorates of IRESA, called **Agricultural Research and**

Development Poles (PRRDs), created in 1995, are in contact with extension institutions in their respective regions.

INAT is the leading institution of higher education in agriculture. It does not provide extension services *per se*, but it is important for extensions through its academic programs in agricultural science and training programs for farmers, e.g., the National School of Veterinary Medicine is part of it. The institute has many hectares of farmland, used for research and other agricultural operations (G-Fras, 2022).

Regional Agricultural Development Commissions (CRDAs) are responsible for dissemination in their respective regions. CRDAs are responsible for assisting regional-level extension staff in planning and organising activities through the provision of transportation and equipment, technical support, and follow-up. At regional level **Regional Directorates** have to implement national policy concerning agricultural issues.

5.3.2 Key Legislation and Policies

In general, Tunisia's agricultural policy has been designed to ensure the food security of the population. Indeed, over the past four decades, modernization of agriculture and isolation from external competition have enabled Tunisia to substantially increase production, yields, and self-sufficiency rates in products such as cereals, vegetables, oil, and livestock products. This type of policy, for quite some time, had several objectives: first, to reduce the exposure of Tunisian products to unstable food prices in the world market, and second, to avoid the risk of food supply shortages for consumers (Chemingui & Thabet, 2001). In this regard, **Law No. 94-86** and **Law No. 92-117** regulate market distribution channels and retail services, and consumer protection, respectively.

However, things have changed. Since the 1980s and the implementation of the **Agriculture Structural Adjustment Program**, Tunisia's agricultural sector has undergone a series of reforms aimed at liberalising the sector, with the goal of bringing the country into the globalisation process following various free trade agreements (Figuerola *et al.*, 2018). Nevertheless, this policy has led to the elimination of agricultural support and the reduction of subsidies: as a result, this situation has caused yields of some crops and livestock production to decrease, and natural resources have diminished (Figuerola *et al.*, 2018).

Even for this reason, over the past two decades, Tunisia has pursued an agricultural development strategy geared toward economic growth and social stability. The goals were sustainable productivity, access to foreign markets, as well as improvement of farmers' living conditions (World Bank, 2006).

A program of particular emphasis on the agricultural sector is the **Agricultural Sector Adjustment Program** (ASAP). ASAP provides recommendations based as much on the International Monetary Fund as on the World Bank, and acts as an advocate for state disengagement from support to the agricultural sector (Dhehibi & Elloumi, 2012).

One of the fundamental problems that can be found in agricultural policies concerns the lack of consideration of resource availability: **Tunisia's 2016-2020 Agricultural Strategy** supports the development of organic

production areas primarily for export but without considering available resources such as water, energy, and arable land (Keskes *et al.*, 2019).

In early 2019, another breakthrough in the sector came with the **Food and Feed Safety Law**, passed with the aim of harmonising Tunisian legislation with the European Union's food directives (178/2002, 852/2004, 853/2004, 183/2005, 882/2004, and 854/2004) (Fas, 2019). The purpose of this law is (i) to guarantee food and feed safety to ensure a high level of protection of human and animal health and safety; (ii) to protect the economic interests of consumers; and (iii) to develop exports (Article 1, Law on Food and Feed Safety). The law also establishes the general principles and obligations governing food safety; the obligations of food and feed business operators; and the general rules of official controls (Article 2, Law on Food and Feed Safety). To date, a single national food safety authority, responsible for reviewing all previous food laws and to harmonise the evolving legal framework, has not yet been established.

5.4 Ecosystem

5.4.1 Main Institutions

Environment policy is established and implemented at national level by the **Ministry of the Environment and Sustainable development (Ministère de l'Environnement et du Développement Durable, MESD)**. It is responsible for implementing the policy of the government on environmental protection, the rationalisation of exploitations of natural resources, safeguarding nature, and the promotion of the quality of life (MESD, 2022). It aims thus to protect human health, biodiversity, fight against pollution and to support various economic sectors. Its role covers not only environment and sustainable development, but also prevention of hazards, ecotourism, biodiversity, urban environment and regional environment.

In addition, the MESD proposes legislation related to environmental protection and nature conservation: all draft laws related to the economy, social and environmental issues must be approved by the **Commission For Sustainable Development and Rights of Future Generations**, which precisely must be consulted (MESD, 2022). The minister also works to improve the environmental situation and living environment, prevent, reduce or eliminate hazards that threaten people, protect the environment and natural resources, and promote spaces reserved for the development of biodiversity. It seeks to implement good environmental governance in all areas of activities and natural resources.

Part of the MESD is the **National Council against Desertification** which was set up to coordinate national action against desertification.

The **National Agency of Environmental Protection** (Agence Nationale de protection de l'environnement, ANPE), established by Law No. 88-91 of August 2, 1988 is in charge of managing MESD programs in the fight against pollution by regulating economic activities and their discharges and ensuring compliance with environmental regulations.

At the national level, the **Tunisian National Commission for Sustainable Development (Commission Nationale du Développement Durable, CNDD)** operates too. It was created in 1993, two years after the establishment of the Ministry, with the aim of setting an institutional framework for environmental protection. With the passing of the time, its role has changed and nowadays it elaborates the national sustainable development strategy and analyzes the implementation of national sustainable development policies (MESD, 2022).

The CNDD has thus been entrusted with missions that should lead to the readjustment of national development programs and their harmonisation with the goal of sustainable development. It has the task of developing and implementing a national strategy for sustainable development as well as working for the integration of environmental issues into policies. It is then concerned with preserving the rights of future generations by guaranteeing them a healthy and liveable environment; it puts an end to non-rational ecological production and consumption patterns; it seeks to achieve self-sufficiency and food security; and it ensures judicious use of natural resources, particularly water resources.

Finally, it prepares appropriate measures to reduce pollution and encourages the participation of interested groups, local authorities, organisations and individuals in decision-making, at local, regional and national levels (MESD, 2022).

In March 2018, the government has established a special management unit, the **Objective Management Unit (Unité de Gestion Par Objectif, UGPO)** especially dedicated to climate action within the Ministry of Environment: the UGPO is tasked to conclude cooperation and partnership agreements with public and private bodies at national and international levels (UNDP, 2021).

5.4.2 Key Legislation and Policies

Environmental protection in Tunisia is ensured by a fairly broad legal framework that reflects, on the one hand, a political concern about issues related to natural resource management and, on the other hand, confirms the country's commitment to the rational and sustainable use of the heritage for future generations (REF website). In particular, since the 1990s several texts have strengthened the legislative framework and regulated environmental protection in all its forms, including the fight against pollution.

For example, **Law No. 95-73** of July 24, 1995 regulates water and soil conservation; while **Law No. 96-29** of April 3, 1996 establishes a national emergency response plan to combat marine pollution events. In addition, **Law No. 96-41** of June 10, 1996 regulates the control, management and disposal of waste and **Law No. 2007-34** of June 4 deals with air quality. The adoption of these texts has been largely influenced by the provisions of international conventions ratified by Tunisia (CDCS, 2022).

Moreover, in order to rationalise the use and exploitation of natural and biological resources, especially in semi-arid regions characterised by very fragile ecosystems, the country has gradually created a legal arsenal perfectly adapted to these circumstances (Convention on Biological Diversity, 2022). This legislative framework is constantly being revised and supplemented with new provisions for the sustainable management

of natural resources and biodiversity. In the past decade, for example, a number of new measures have been adopted.

To date, therefore, Tunisia has different legal instruments. The **Forestry Code** (Law No. 88-20, enacted in 1966 and revised in 1988) establishes that the right to use public forest land is strictly controlled and granted only to people living in the forest and for their personal use; a permit, valid for five years, must be obtained. Extraction of forest material for construction use is allowed even if the material is later sold. As for private land, logging and clearing of forest land is allowed only after obtaining a permit. Other provisions of the Code concern national parks, hunting, the protection of dunes, grasslands, fauna and flora, and aquatic areas (Law No. 88-20, Forestry Code, 1988).

The **Code on the Conservation of Water and Soil** (Law No. 95-70, 1995) has established the framework for soil protection. Article 5 of the Law states the principle of taking into account the agricultural environment and ecological balance, according to the concept of sustainable development. Similarly, Article 20 requires the use of publicity and consultation, in particular through the creation of water and soil associations (MARH, 2019).

Law 94-122 relates to the **Spatial Planning and Urbanism Code** according to which land development, as well as equipment and infrastructure projects that may affect the natural environment because of their size or due to their impact, are subject to an environmental impact study, and final approval for projects will be given by the relevant government agency, subject to authorization by the Ministry of Environment and Spatial Planning (Article 11, Law 94-122; MARH, 2019). Furthermore, **Law No. 83-87** protects the farmland from the excess of urbanisation and sets the rules and the permission necessary to change the status of agricultural land (MARH, 2019).

Despite the fact that the **2015-2020 National Plan** has placed green economy and combating climate change as a top priority, and despite the efforts made by the country toward ensuring environmental protection and management (CDCS, 2022), issues such as erosion and desertification, drought, and other direct or indirect threats, still remain unresolved. For example, Tunisia's terrestrial biodiversity is severely affected by climate change, rising temperatures and decreasing rainfall are putting a strain on ecosystems and species.

The country is currently finalising the adoption of an **Environmental Code** that will strengthen and provide for concrete solutions to these issues (CDCS, 2022).

5.5 CHALLENGES: BARRIERS AND CATALYSERS

One of the strengths of the Tunisian legislative system is the constant revision and implementation of new policies aimed at developing sustainable management of natural resources and biodiversity. For example, the legislative and regulatory framework of the water sector and its conservation has undergone several reforms. However, the numerous changes have not always achieved their intended objectives. For example, despite the



existence of a plan to combat climate change by 2020, the country's efforts have not been efficient in protecting the environment from issues such as soil erosion and desertification.

The fact that competences in the environmental field are still highly centralised certainly does not help the implementation of *ad hoc* policies towards the specific problems encountered in the territory. On the contrary, policies that are too general have often led to a reduction in support and in subsidies, resulting in a decrease in natural resources.

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