

THE WATER-ENERGY- FOOD-ECOSYSTEMS NEXUS IN THE MEDITERRANEAN

A RAPID ASSESSMENT

SUMMARY OF KEY FINDINGS

Prepared in the Framework of:
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2.2

Mediterranean Coastal Zones:
Managing the Water-Food-Energy
and Ecosystem NEXUS



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Rapid Assessment of the WEFE Nexus in the Mediterranean

Regional Overview

The WEFE Nexus Concept and Interdependencies across sectors

The management of water, energy, food, and ecosystems (WEFE) in the Mediterranean is characterised by profound and complex interdependencies. Natural systems and socio-economic sectors do not function in isolation; rather, they are heavily cross-dependent. For instance, agriculture stands as the largest consumer of freshwater resources, while energy generation depends on water for hydropower, cooling thermal plants, and fossil fuel extraction. Conversely, the water and food sectors are highly energy-intensive. Approximately 25% of total energy consumption is linked to food production and supply, while up to 30% of the operating costs for water and wastewater utilities are energy-related, much more so in processes like desalination.

The WEFE Nexus approach seeks to move beyond traditional “siloed” or fragmented thinking. By adopting an integrated and coordinated strategy, countries can reconcile the conflicting interests of different sectors competing for the same scarce resources while capturing cross-sectoral synergies.

External Drivers: Climate and Socio-Economic Pressures

The Mediterranean is a global climate change “hot spot,” with warming projected to occur 25% faster than the global mean. During summers, this rate could reach 40% faster than the global average. Projections indicate that average summer rainfall will decrease by 10–15% in Southern Europe and by as much as 30% in Türkiye, while the frequency of droughts in parts of North Africa may double. These changes are expected to trigger species population declines, increased forest fires, and sea-level rises of between 40 cm and 100 cm by 2100.

Parallel to these ecological shifts are significant socio-economic drivers. The region’s population reached 542 million in 2020, an 84% increase over 50 years, with the majority of this growth occurring on the southern and eastern shores. By 2050, the urban population share is expected to reach 75%. Furthermore, the Mediterranean remains the world’s leading tourism destination; international arrivals are projected to reach 500 million by 2030, placing seasonal and localized pressure on already strained resources.

Sectoral Vulnerabilities and Security

- **Water Security:** Mediterranean water security is threatened by overconsumption and climate-driven scarcity. According to SDG 6.4.2 data, Algeria, Egypt, Jordan, and Libya face “critical” water stress, with withdrawal rates exceeding 100% of available resources. While basic drinking water access is nearly universal, “safely managed” sanitation remains a significant hurdle, particularly in Lebanon (16%), Algeria (18%), and Libya (22%).
- **Food Security:** Agriculture typically accounts for over 70% of total water withdrawals in the region. Due to low productivity and high population growth, many countries are extremely vulnerable to external food supply shocks. Jordan, Libya, Lebanon, and Montenegro import over 88% of their cereals. In countries like Albania and Mauritania, agriculture remains a vital economic pillar, contributing nearly 18% of GDP.

- **Energy Security:** Most assessed countries, excluding major producers like Algeria, Libya and Egypt, are net energy importers. Morocco, Jordan, and Lebanon rely on imports for 91-98% of their energy needs. Renewable energy (RES) shares vary significantly; while the water-rich Western Balkan countries (Albania, Montenegro, Bosnia and Herzegovina) benefit from hydropower and therefore overall RES shares ranging from 37.7% to 44.6%, fossil fuel producers like Algeria and Libya maintain RES shares below 4%.
- **Ecosystem Security:** Habitats are under threat from land conversion and pollution. Land degradation is a pressing issue in Jordan, Mauritania and Türkiye. Furthermore, some countries, including Mauritania and Türkiye, have under protected status less than 10% of their freshwater Key Biodiversity Areas (KBAs).

Nexus Interlinkages: Conflicts and Synergies

The assessment identifies several critical trade-offs. For example, declining precipitation reduces hydro-power output while the expansion of irrigation to meet food demand increases energy consumption and can lead to the loss of natural habitats.

However, the Nexus approach reveals substantial opportunities for synergy:

- **Water Efficiency as Energy Efficiency:** Addressing non-revenue water (leaks) and adopting efficient management reduces the energy required for pumping and treatment.
- **Innovative Energy Solutions:** Installing floating solar panels on reservoirs reduces evaporation and increases power output without competing for land. Using renewables for desalination helps meet water needs without increasing carbon emissions.
- **Agricultural Synergies:** The use of agrovoltatics (solar panels on farms) and precision agriculture can increase crop yields while simultaneously reducing water and energy consumption.

Institutional Findings and the Path Forward

There is a growing regional recognition of the benefits of integrated policy-making. Significant progress includes the establishment of inter-ministerial coordination bodies and the inclusion of cross-sectoral targets in Nationally Determined Contributions (NDCs) and National Adaptation Plans (NAPs). In the Western Balkans, the EU accession process has been a primary driver for enhanced policy integration.

Despite these advances, several barriers persist. Sectoral strategies often lack analysis of inter-sectoral trade-offs, and ecosystem needs are frequently given the lowest priority in resource competition. Governance is often hampered by overlapping responsibilities and a lack of harmonised, disaggregated data. Furthermore, limited financial resources remain a universal challenge.

To bridge the financing gap, the assessment among others recommends shifting harmful subsidies toward positive Nexus practices and mainstreaming donor-supported pilot projects into national legal and financial frameworks. Enhancing stakeholder engagement across both horizontal (sectoral) and vertical (administrative) levels is essential for building the local ownership necessary for long-term regional resilience.

ALBANIA

Balancing hydropower dominance with ecological integrity



Key WEFE-related challenges

Water resources are abundant in annual terms, yet highly seasonal and unevenly distributed. Albania is one of the most flood-prone countries in Europe, with floods affecting tens of thousands of people annually and causing significant economic losses.

Untreated municipal wastewater, industrial pollution (notably from mining) and agricultural runoff degrade surface and groundwater quality. Non-revenue water exceeds 60%, undermining service reliability, increasing energy wastage and weakening the financial sustainability of water utilities.

Agriculture is economically and socially important, providing a large share of employment and GDP. However, fragmented land holdings, ageing irrigation and drainage systems, and limited adoption of efficient technologies constrain productivity.

Energy systems are dominated by hydropower (≈98% of electricity generation), making Albania highly vulnerable to hydrological variability. Further hydropower expansion—especially small HPPs—creates tensions with biodiversity conservation and river ecosystem integrity.

Ecosystems and biodiversity are exceptionally rich but under pressure from hydropower development, deforestation, erosion, pollution and urban expansion. Although the protected area network has expanded rapidly, management capacity and enforcement remain uneven.

Key findings on WEFE policy integration

Albania has made tangible progress in operationalising WEFE-related integration. The National Strategy for Development and European Integration 2022-2030 outlines Albania's overarching development vision and key strategies. This comprehensive roadmap is aligned with the Sustainable Development Goals (SDGs) and the European Union (EU) integration process. The development of the National Energy and Climate Plan (2021) strengthened links between energy, climate and water management.

Particularly in the water sector, the IWRM Strategy addresses the considerations of further sectors, while the development of River Basin Management Plans, and formal interministerial coordination mechanisms provide a strong foundation for nexus-based planning.

However, WEFE integration remains incomplete in practice: Sectoral strategies do not always fully exploit synergies or address trade-offs, particularly between hydropower, flood management, irrigation and ecosystem protection. Rehabilitation of irrigation and drainage systems risks increasing energy demand if not paired with efficiency measures and renewables. Environmental considerations are improving but remain unevenly integrated into infrastructure and energy investment decisions.

Institutional settings and coordination

The National Water Council (NWC), chaired by the Prime Minister, is the central interministerial body for integrated water resources planning. Its executive arm, the Water Resources Management Agency (AMBU), oversees river basin planning and coordination.

River Basin Councils and River Basin Administration Offices support basin-level implementation.

The Ministry of Agriculture and Rural Development is responsible for irrigation and drainage policy, working through Regional Directorates of Irrigation and Drainage, municipalities and Water User Organisations.

The Ministry of Infrastructure and Energy leads energy policy, supported by the Energy Regulatory Authority and sector agencies. Hydropower operators play a critical role in water management through reservoir operations. The Ministry, supported by the National Agency for Water Supply and Sewerage sets policy and finances investments, while local governments are responsible for service delivery.

The Ministry of Environment oversees environmental protection, biodiversity and protected areas, supported by specialised agencies (National Environment Agency, National Agency for Protected Areas).

Integrated Policy Management Groups and thematic working groups provide structured platforms for coordination across WEFE sectors, particularly in water-related planning.

KEY DATA



Water stress
SDG indicator 6.4.2

No stress



**% of Renewable energy
in total final energy consumption** **44.6%**



% of imports in Energy use **14%**



**Agricultural sector's
share of GDP** **17.7%**

ALGERIA

Aiming for security amidst scarcity



Key WEFE-related challenges

Water withdrawals exceed renewable availability ($\approx 138\%$ of renewable freshwater resources), placing Algeria among the most water-stressed countries in the Mediterranean. Agriculture dominates water use ($\approx 86\%$), while groundwater resources—particularly in the north—are increasingly overexploited. Algeria has invested heavily in seawater desalination and is expanding wastewater treatment and reuse, particularly for agriculture.

Agriculture and food security remain vulnerable. Despite large areas of arable land, productivity is constrained by water scarcity, soil degradation and inefficient irrigation practices. Algeria remains highly dependent on food imports, increasing exposure to global market shocks.

Energy systems are dominated by natural gas, which powers almost all electricity generation and underpins water supply through desalination and pumping. While Algeria has vast solar potential, renewable energy deployment remains limited.

Ecosystems and biodiversity are under increasing pressure from groundwater depletion, pollution, salinisation, land-use change and desertification. Water quality deterioration, especially in northern river basins and coastal aquifers, threatens agriculture, ecosystems and public health.

Key findings on WEFE integration and coordination

Algeria has adopted ambitious sectoral strategies, particularly for water security (Water Strategy 2030, desalination and sanitation programmes) and energy diversification. These strategies increasingly recognise interdependencies across water, agriculture and energy.

However, WEFE integration in practice remains weak: Policy and investment decisions prioritise water quantity over water quality and ecosystem protection. Energy implications of water strategies (transfers, pumping and the vast potential of using renewable energy for desalination) are not fully internalised. Agricultural expansion and irrigation targets risk exacerbating water stress if not aligned with efficiency and renewable energy deployment.

Institutional settings and coordination

The Ministry of Water Resources leads water policy and planning, supported by specialised agencies responsible for monitoring (National Agency for Hydraulic Resources), dams and transfers, sanitation and desalination. River Basin Agencies exist, but enforcement of abstraction controls remains limited.

The Ministry of Agriculture oversees agricultural development and irrigation, supported by the National Office of Irrigation and Drainage. Coordination with water authorities is insufficient, particularly regarding groundwater management and irrigation expansion.

The Ministry of Energy and Mining dominates the energy sector, with a strong focus on hydrocarbons. New institutions have been created to accelerate renewable energy deployment, but implementation remains slow relative to targets.

The Ministry of Land-use Planning and Environment is responsible for environmental protection and biodiversity conservation, though environmental considerations are often secondary to water quantity and energy security objectives.

An intersectoral committee under the Prime Minister's Office supports implementation of the Water Strategy 2030, but broader WEFE coordination remains limited and uneven.

KEY DATA



Population % using safely managed sanitation
SDG indicator 6.2.1

<22%



Water stress
SDG indicator 6.4.2

Severe



Agricultural sector's share of GDP

12.2%



Hydrocarbons exports as % of total exports

>90%



% of Renewable energy in total final energy consumption

0.1%

BOSNIA AND HERZEGOVINA

Navigating governance complexity in a water-rich land



Key WEFE-related challenges

Water resources are generally plentiful, with high annual precipitation and dense river networks contributing to a severe flood risk. At the same time, water quality is under pressure from untreated or partially treated municipal and industrial wastewater, diffuse agricultural pollution and poorly managed landfills. More than 50% of abstracted water is lost through leakage, inadequate metering and illegal connections, leading to unnecessary energy consumption, financial losses and underinvestment in services.

Agriculture plays an important socio-economic role but suffers from land fragmentation, low productivity and limited irrigation. Most irrigation systems were damaged or abandoned during the 1992–1995 war. Climate change is expected to increase the need for irrigation, while also increasing flood and drought risks.

Energy production is dominated by coal and hydropower. Coal dependency raises concerns regarding air pollution and climate commitments, while hydropower—especially small HPPs—creates trade-offs with river ecosystems, sediment transport and biodiversity.

Ecosystems and biodiversity are exceptionally rich, but protected areas cover only about 3.5% of national territory, and many lack management plans, financing and staff. Hydropower development, pollution, habitat fragmentation and climate change pose increasing threats.

Key findings on WEFE policy integration and coordination

Policy integration is strongest in planning documents, particularly river basin management and environmental strategies, where pressures from agriculture, energy and urban development are explicitly assessed. Updated River Basin Management Plans (2022–2027) have been adopted in both entities, aligned with EU Water Framework Directive principles. Growing scrutiny of small hydropower plants has led to bans on new projects in parts of the Federation. The NECP under preparation is strengthening links between energy, climate, water and land use.

However, operational integration remains limited: Institutional fragmentation hampers coordinated decision-making and investment planning. High water losses undermine water-energy efficiency gains. Rehabilitation of irrigation systems risks increasing energy demand if not paired with efficiency and renewables. Hydropower development continues to generate tensions between energy security and ecosystem protection. Biodiversity objectives are insufficiently mainstreamed into sectoral implementation.

Institutional settings and coordination

Bosnia and Herzegovina has a highly decentralised and complex institutional framework, with responsibilities split across the state level, two entities (Federation of Bosnia and Herzegovina and Republika Srpska), ten cantons in the Federation, municipalities, and the Brčko District. Fragmentation across administrative levels often constitutes a governance barrier to coherent and unified WEFE planning and investment.

Water management is the responsibility of the entities and Brčko District. River Basin Management Plans aligned with EU directives have been developed at entity level. At state level, the Ministry of Foreign Trade and Economic Relations (MFTER) coordinates international obligations and transboundary cooperation.

Agricultural policy and rural development are primarily entity-level competences, with coordination at national level through MFTER.

Energy governance is similarly divided. MFTER coordinates international energy obligations, while entities are responsible for policy implementation. Three vertically integrated, ethnically based public electricity companies operate the system.

Environmental protection is largely an entity competence. Coordination mechanisms exist (including an inter-entity environmental body), but implementation capacity varies widely.

Coordination across WEFE sectors is mostly ad hoc, occurring through planning processes (RBMPs, environmental strategies) rather than through permanent institutional mechanisms.

KEY DATA



% of Renewable energy in total final energy consumption **37.7%**



% of imports in Energy use **23%**



Water stress
SDG indicator 6.4.2 **No stress**



Agricultural sector's share of GDP **5.0%**

EGYPT

Managing deficits under dependence on the Nile



Key WEFE-related challenges

Water scarcity is the defining challenge. Egypt depends almost entirely on the River Nile, which provides the vast majority of renewable freshwater. Available conventional water resources (≈ 59 BCM/year) fall far short of total water requirements (≈ 81 BCM/year), creating a structural deficit compensated through reuse of agricultural drainage water, wastewater and shallow groundwater. Climate change increases risks through higher evapotranspiration, sea level rise and saltwater intrusion in the Nile Delta, and uncertainty regarding upstream Nile flows.

Agriculture is by far the largest water user, accounting for around 85% of total withdrawals, yet Egypt still imports about 50% of its food. Water scarcity, land fragmentation, inefficient surface irrigation, deteriorating water quality and rising energy costs all threaten agricultural sustainability and farmer livelihoods.

Egypt has substantial fossil fuel resources and is largely self-sufficient in electricity and has a target of 42% RES installed capacity by 2030. Rapidly increasing energy use for mega-projects in desalination and water reuse provide challenges and opportunities under a Nexus approach.

Ecosystems and environmental quality are under increasing stress, particularly in the Nile Delta and coastal zones. Pollution from agricultural drainage, municipal and industrial wastewater threatens water quality, public health and biodiversity, while sea level rise exacerbates salinisation and habitat loss.

Key findings on WEFE policy integration

Egypt has developed comprehensive strategic frameworks that recognise WEFE interlinkages, notably the National Water Resources Plan (2017–2037), Vision 2030, the Integrated Sustainable Energy Strategy 2035, and major programmes on irrigation modernisation, water reuse and desalination.

However, WEFE integration in practice remains partial. Agricultural intensification and drainage water reuse increase salinity and pollution risks, with insufficient integration of ecosystem considerations. Energy implications of irrigation modernisation, land reclamation and desalination are not always systematically assessed.

Institutional settings and coordination

The Ministry of Water Resources and Irrigation (MWRI) is the lead institution for water resources planning, allocation and infrastructure management. It operates dams, canals and drainage systems and oversees water quality monitoring. Integrated water districts have been introduced at local level, assisting the management of the interplay between irrigation and drainage, and water quality. The Holding Company for Water and Wastewater provides water supply and sanitation services.

The Ministry of Agriculture and Land Reclamation leads agricultural policy, land reclamation and farm-level water management, supported by research and extension institutions such as the Agricultural Research Centre.

The Ministry of Electricity and Renewable Energy oversees energy policy and planning, supported by the New and Renewable Energy Authority, the Egyptian Electricity Holding Company and the electricity regulator (EgyptERA).

The Ministry of Environment and the Egyptian Environmental Affairs Agency (EEAA) are responsible for environmental protection, pollution control and biodiversity conservation.

A permanent inter-ministerial committee, chaired by MWRI and involving key sector ministries and selected governors, provides a formal coordination platform, particularly for Nile management and major water projects.

Institutional roles and responsibilities are not always clearly delineated, leading to overlaps between planning, regulation and operations. Decentralisation and participatory approaches (e.g. water user associations) are progressing but uneven.

KEY DATA



Water stress
SDG indicator 6.4.2

Extreme



Agricultural sector's share of GDP

11.4%



Share of fossil fuels in primary energy

89%

JORDAN

Engineering resilience at the edge of scarcity



Key WEFE-related challenges

Jordan is among the ten most water-scarce countries in the world, with per capita availability of around 61 m³/year. Climate change is expected to reduce freshwater availability by a further 15% by 2040. Groundwater accounts for about 60% of supply, but most basins are overexploited or at critical levels. Surface water availability from the Jordan and Yarmouk rivers is highly constrained by upstream abstractions, making supply unreliable. Almost half of supplied water is lost through non-revenue water. Treated wastewater already provides around 18% of national water supply, mostly reused in agriculture in the Jordan Valley.

Agriculture and food security are structurally constrained. About 90% of Jordan's land is arid, and the country imports nearly 100% of its cereal needs. Agriculture remains a key livelihood sector, but water scarcity, land degradation and climate variability limit productivity. Roughly 20–25% of irrigation water already comes from treated wastewater.

Energy dependence is extreme: Jordan imports around 96% of its energy, with energy imports representing about 20% of GDP. While renewable energy deployment has accelerated, energy costs remain a major constraint for water pumping (especially from the Jordan valley to higher elevations), desalination, wastewater treatment and irrigation.

Ecosystems and biodiversity are under pressure from water abstraction, pollution, overgrazing, urban expansion and climate change. Degradation of rangelands, wetlands and unique ecosystems (e.g. the Dead Sea basin) undermines ecosystem services that support water regulation and agricultural resilience.

Key findings on WEFE integration and coordination

Jordan is among the most advanced countries in the region in recognising and operationalising WEFE Nexus principles at the strategic level. The Water Strategy 2023–2030 explicitly prioritises the WEFE Nexus, calling for integrated planning, joint projects and institutional coordination. Green Growth and Energy Strategies further reinforce this approach.

However, WEFE integration in practice remains partial: Large-scale water supply solutions increase energy demand, requiring faster renewable energy integration. Coordination between water and agriculture institutions remains uneven, particularly at local and farm levels. Ecosystem protection is recognised in strategies but not yet systematically embedded in water and agricultural decision-making.

Institutional settings and coordination

The Ministry of Water and Irrigation (MWI) leads water policy, planning and sector coordination. The Water Authority of Jordan (WAJ) is responsible for water supply, wastewater services and water resources management, while the Jordan Valley Authority (JVA) manages water, land and irrigation in the Jordan Valley.

The Ministry of Agriculture oversees agricultural policy, irrigation water use at farm level and rural development, supported by the National Agricultural Research Centre (NARC).

The Ministry of Energy and Mineral Resources leads energy policy, supported by the Energy and Minerals Regulatory Commission and sector operators (NEPCO, distribution companies).

The Ministry of Environment is responsible for environmental protection, biodiversity conservation, climate policy and green growth, supported by institutions such as the Jordan Environment Fund.

Coordination is supported through interministerial committees, basin-level mechanisms, and the Ministry of Planning and International Cooperation, which plays a key role in aligning donor-funded projects with national priorities. The 2023–2030 Water Strategy proposes establishing a formal WEFE Nexus Council, representing a significant step towards institutionalised integration and a flagship institutional model for the region.

KEY DATA



Water stress
SDG indicator 6.4.2

Severe



Population % using safely managed sanitation
SDG indicator 6.2.1

>85%



% of imports in Energy use

97%



Agricultural sector's share of GDP

5.2%

LEBANON

Cascading challenges amidst a national crisis



Key WEFE-related challenges

Lebanon has 40 rivers and significant groundwater resources, but suffers from high physical losses, widespread pollution and weak regulation. Illegal groundwater abstraction is extensive, and a comprehensive national water balance is still lacking.

Wastewater management is a critical bottleneck: only about 19% of generated wastewater is treated, while untreated discharges pollute rivers, coastal waters and aquifers. Seawater intrusion is increasing in coastal aquifers.

Agriculture is highly water-dependent and accounts for around 61% of total water withdrawals, yet domestic agrifood production satisfies only about 20% of national demand. Traditional irrigation practices, weak extension services, rising input costs and climate variability undermine productivity.

Energy insecurity is a central cross-cutting challenge. Lebanon imports almost all of its energy, and the collapse of the electricity sector has led to widespread reliance on private diesel generators. The financial crisis heavily impacts the ability of water authorities to pay their energy costs. Energy shortages directly affect water pumping, irrigation, wastewater treatment and food storage, reinforcing WEFE interdependencies. At the same time, decentralised solar PV deployment has expanded rapidly, offering new nexus opportunities such as the potential to stabilise water pumping and irrigation during grid failures.

Ecosystems and biodiversity are exceptionally rich but heavily threatened. Pollution, groundwater overexploitation, uncontrolled urbanisation, agricultural expansion, deforestation and climate change are degrading terrestrial, freshwater and marine ecosystems, weakening their capacity to support water regulation and food production.

Key findings on WEFE policy integration

Lebanon's policy framework increasingly recognises WEFE interlinkages, particularly in water, agriculture, energy and climate strategies. The Water Code (2018) and updated National Water and Wastewater Sector Strategy explicitly promote IWRM and acknowledge agriculture and energy dependencies. The National Agriculture Strategy 2020-2025 and biodiversity strategies also highlight resource efficiency and climate resilience.

However, WEFE integration in practice remains weak: Energy-water-agriculture synergies (e.g. renewable-powered irrigation, wastewater reuse) remain largely pilot-based. Environmental considerations are insufficiently mainstreamed into water, agriculture and energy investments. The ongoing economic and governance crisis prioritises short-term service survival over strategic integration.

Institutional settings and coordination

Lebanon's challenges are exacerbated by chronic governance weaknesses, prolonged economic and financial crisis, and political instability.

The Ministry of Energy and Water (MoEW) is responsible for water resources management, policy and large infrastructure. Four Regional Water Establishments (RWEs) manage water supply, sanitation and irrigation services. The Litani River Authority manages the country's largest river basin and related irrigation and hydropower schemes.

The Ministry of Agriculture leads agricultural policy, irrigation use at farm level and natural resource management, supported by institutions such as the Lebanese Agricultural Research Institute and the Green Plan.

MoEW also oversees the energy sector. Electricité du Liban (EDL) remains the dominant utility, while decentralised solar PV has emerged as a critical complementary source. The Lebanese Center for Energy Conservation supports energy efficiency and renewable energy initiatives.

The Ministry of Environment is responsible for environmental protection, EIAs/SEAs, biodiversity and climate policy, while forest management and fisheries fall largely under the Ministry of Agriculture.

Formal WEFE coordination remains weak. Existing mechanisms include the Council of Environment, coordination structures for the development of the NDC, and a non-institutionalised WEFE Interministerial Group led by MoEW (facilitated by GWP-Med), which provides a potential entry point for formal coordination but currently focuses mainly on project identification.

Key challenges include institutional fragmentation and overlapping mandates while many coordination bodies foreseen in laws and strategies are not fully operational.

KEY DATA



Population % using safely managed sanitation
SDG indicator 6.2.1

<22%



Agricultural sector's share of GDP

4.1%



% of imports in Energy use

98%



% of Renewable energy in total final energy consumption

6.7%

LIBYA

Dependence on a finite inheritance



Key WEFE-related challenges

Libya is one of the driest and most water-scarce countries in the world. Annual water demand (~1 BCM) far exceeds natural recharge (~250 MCM), and nearly 95% of water use depends on non-renewable fossil aquifers, notably through the Great Man-Made River project, as Libya has no perennial rivers. Water infrastructure is highly vulnerable to grid stability and physical security. Over-abstraction, seawater intrusion and rising temperatures are increasing salinity risks for groundwater and soils.

Agriculture is the largest water user (~85% of demand) but contributes little to GDP and domestic food supply. Limited arable land, water scarcity and high irrigation costs have lead Libya importing over 90% of its food, making food security highly sensitive to external shocks.

Energy is dominated by oil and natural gas, which generate up to 90% of national revenues. Electricity generation is almost entirely fossil-fuel based, while renewable deployment remains limited despite high solar and wind potential.

Ecosystems and environmental protection are weak. Desertification, land degradation, water pollution and coastal ecosystem pressures are increasing, while protected areas cover only a very small share of national territory and are largely unmanaged.

Key findings on WEFE integration and coordination

Libya has high awareness of WEFE interlinkages, particularly the dependence of water and food security on energy availability. A Water Resources Management Strategy is under preparation, and strategic visions such as Ihya Libya Vision 2030 acknowledge sustainability challenges.

However, WEFE integration in practice remains very limited. Prolonged instability has shifted focus to short-term service provision rather than long-term sustainability. Environmental considerations are weakly integrated into water, agriculture and energy planning. Wastewater reuse, renewable-powered desalination (the primary long-term alternative to declining fossil aquifers) and efficiency measures remain under-developed.

Institutional settings and coordination

Libya has formal sectoral institutions, but their effectiveness and coordination have been severely constrained by conflict, fragmentation, infrastructure damage and limited capacities.

The Ministry of Water Resources, building on the former General Water Authority (GWA), is responsible for planning and managing surface and groundwater resources. The General Desalination Company and the General Company for Water and Wastewater manage desalination and WSS operations respectively.

The Ministry of Agriculture, Animal and Marine Resources oversees agricultural development and irrigation management, with limited scope given water scarcity and low production levels.

The Ministry of Oil and Gas and the National Oil Corporation (NOC) dominate the energy sector. Electricity generation, transmission and distribution are managed by the General Electricity Company of Libya, while the Renewable Energy Authority of Libya promotes RES deployment.

The Ministry of Environment and the Environmental General Authority (EGA) are responsible for environmental protection, EIAs and monitoring, though enforcement and implementation remain limited.

Formal WEFE coordination mechanisms are largely absent. Integration across water, agriculture, energy and environment is weak and largely unoperationalised.

KEY DATA



% of Renewable energy
in total final energy consumption

3.1%



Population % using safely
managed sanitation
SDG indicator 6.2.1

<22%



Water stress
SDG indicator 6.4.2

Extreme



Share of non-renewable
fossil water

95%

MAURITANIA

Where development and climate pressures collide



Key WEFE-related challenges

Mauritania faces severe and structural WEFE challenges, driven by extreme aridity, climate change, low levels of socio-economic development and limited access to basic services.

Renewable water resources are limited and highly unevenly distributed, with the Senegal River accounting for the majority of surface water availability, while large parts of the country remain chronically water-stressed. Less than 60% of the population has access to safe drinking water, and sanitation coverage is particularly low in rural areas.

Agriculture and livestock dominate water use, accounting for around 88% of withdrawals, and are central to livelihoods and food security. The sector is highly vulnerable to drought, desertification, flooding and rainfall variability. Mauritania is heavily dependent on food imports and aid.

Energy access remains limited, with only about 50% of the population connected to electricity. Energy demand is growing rapidly, while reliance on oil products and traditional biomass remains high. Limited and unreliable energy supply constrains water pumping, sanitation services, irrigation and food processing. Expansion of renewable energy is a strategic priority but remains at an early stage.

Ecosystems and natural capital are under severe pressure from desertification, overgrazing, deforestation, water pollution, mining activities and climate change. Expansion of livestock herds and cultivation into marginal lands has accelerated land degradation and biodiversity loss.

Key findings on WEFE policy integration

Mauritania has adopted several sectoral strategies—including on water, rural development, food security and energy—that recognise climate risks and resource constraints. There is also growing recognition of the need to integrate desertification control, pastoral systems and water management under a nexus-oriented approach.

However, WEFE integration remains very limited in practice. Key challenges include weak regulatory and enforcement capacities across sectors, limited data availability and monitoring systems, strong dependence on external financing, leading to project-based and short-term interventions, insufficient consideration of ecosystem impacts in agricultural expansion, livestock management and water infrastructure development.

Despite these constraints, international support and ongoing reforms offer opportunities to embed WEFE Nexus principles more systematically. To ensure long-term sustainability, WEFE coordination needs to move from the current “donor-supported” model to an institutionalized one.

Institutional settings and coordination

As the only Least Developed Country in the broader Mediterranean region, Mauritania faces weak institutional capacities. Mauritania's WEFE governance framework is fragmented and capacity-constrained, with sectoral institutions operating largely in isolation and limited mechanisms for integrated planning.

The Ministry of Water and Sanitation leads water resources management and service provision, supported by the National Water Resources Centre (CNRE) for monitoring and data collection.

The Ministry of Agriculture oversees agricultural development, while the Ministry of Animal Husbandry manages livestock policy, reflecting the importance of pastoral systems. Coordination between crop, livestock and water management remains weak.

The Ministry of Petroleum, Energy and Mines is responsible for energy policy and planning, supported by the Energy Regulatory Authority and the national electricity company.

The Ministry of Environment and Sustainable Development and the National Agency for Environmental Protection oversee environmental policy, biodiversity conservation and pollution control, with limited enforcement capacity.

Formal WEFE coordination mechanisms are largely absent. Integration across water, agriculture, energy and environment occurs mainly through donor-supported projects rather than institutionalised national processes.

KEY DATA



Population access to safe drinking water

<60%



Agricultural sector's share of GDP

18.6%



% of Renewable energy in total final energy consumption

23.8%

MONTENEGRO

Harnessing abundant water for sustainable energy and biodiversity



Key WEFE-related challenges

Montenegro is among the most water-rich countries in Europe, yet faces significant seasonal and spatial water stress due to its karstic geology, uneven intra-annual flows and climate variability. Surface waters are under pressure from hydromorphological alterations caused by hydropower development. Water supply systems suffer from very high non-revenue water (over 60%), leading to inefficiencies, increased energy consumption and financial losses. Tourism-driven peak seasonal demand coincides with low hydrological flows.

Agriculture remains an important livelihood sector in rural areas, but irrigation is currently limited. Future expansion of irrigated areas could increase pressures on water resources and water quality if not carefully managed.

Energy production relies heavily on hydropower, complemented by coal-based thermal generation and growing wind capacity. Hydropower contributes significantly to renewable energy targets but is increasingly exposed to hydrological variability and has notable impacts on river ecosystems.

Ecosystems and biodiversity are a major national asset, but threatened by uncontrolled urbanisation, tourism development, land-use change, pollution and climate-induced wildfires.

Key findings on WEFE policy integration

Montenegro's EU candidate status has been a key driver towards Nexus-like thinking and planning. The development of River Basin Management Plans aligned with the EU Water Framework Directive, the Water Management Strategy (2017-2035) and alignment with the European Green Deal have helped incorporate cross-sectoral considerations, particularly regarding hydropower, agriculture, protected areas and water quality.

The preparation of the National Energy and Climate Plan (NECP) has strengthened links between climate, energy, water and land use.

However, important challenges remain:

High water losses and low efficiency in water supply systems undermine water-energy synergies.

Hydropower planning does not always sufficiently account for cumulative ecological impacts and competing water uses.

Institutional settings and coordination

Montenegro has a relatively well-structured institutional framework, strengthened by its EU candidate status, which has encouraged cross-sectoral coordination and alignment with EU acquis.

The Ministry of Agriculture, Forestry and Water Management (MAFWM) is responsible for water policy and management, through its Water Directorate, which leads planning, regulation, flood protection and EU harmonisation. River Basin Management Plans have been developed in line with the EU Water Framework Directive.

MAFWM also oversees agriculture and rural development, while the Forest Administration manages forest resources, which play a key role in ecosystem services and climate mitigation.

The Ministry of Energy leads energy policy, supported by regulatory and operational bodies including REGAGEN, EPCG, the transmission system operator CGES, and the electricity market operator COTEE.

The Ministry of Ecology, Sustainable Development and Northern Region Development coordinates environmental protection, biodiversity and climate policy, supported by the Environmental Protection Agency, the Environmental Protection Fund, and the Public Enterprise for National Parks.

Cross-sectoral coordination has been strengthened primarily due to the EU accession processes, especially through river basin planning and strategic environmental assessments.

KEY DATA



% of Renewable energy in total final energy consumption **39.6%**



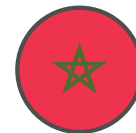
% of imports in Energy use **28%**



Water stress SDG indicator 6.4.2 **No stress**

MOROCCO

Balancing scarcity with a green energy vision



Key WEFE-related challenges

Morocco faces structural water scarcity, with water availability having declined to about 600 m³/capita/year in 2024. Climate change is expected to further reduce precipitation and increase the frequency and severity of droughts. Water quality deterioration due to untreated domestic wastewater, industrial effluents and diffuse agricultural pollution represents another major challenge.

Agriculture is the largest water user, accounting for almost 90% of total withdrawals, while contributing significantly to employment and GDP. Groundwater overexploitation, estimated at 10% above average annual recharge, has led to sharp declines in water tables and increasing salinization in coastal aquifers.

Morocco imports around 90% of its energy needs. At the same time, the country has emerged as a regional leader in renewable energy development. Plans for “green hydrogen” (requiring desalinated water) is an emerging Nexus dimension that should more carefully assessed.

Ecosystems and biodiversity are under increasing pressure from land-use change, water abstraction, pollution, overgrazing and coastal development. Protected areas cover less than 4% of national territory.

Key findings on WEFE policy integration

Morocco has established strong sectoral strategies and clear long-term visions for water, agriculture, energy and sustainable development. The National Sustainable Development Strategy 2030 provides an overarching framework that explicitly promotes integration across sectors.

In practice, however, WEFE policy integration remains partial:

- Policy coherence is improving, particularly at the water-climate-agriculture interface.
- Coordination mechanisms exist at central level (notably through HCEC), yet operational integration at regional and basin levels is uneven.
- Synergies such as renewable energy for desalination and irrigation efficiency, or wastewater reuse for agriculture are recognised but only recently being systematically scaled.
- Trade-offs—especially between agricultural expansion, groundwater sustainability and ecosystem protection—are not always explicitly addressed in planning and investment decisions.

Institutional settings and coordination

sanitation.

The Ministry of Agriculture, Maritime Fisheries, Rural Development and Water and Forests oversees agricultural policy, irrigation development and water use efficiency, supported by specialised agencies such as the Agency for Agricultural Development and the National Office of Agricultural Consulting.

The Ministry of Energy Transition and Sustainable Development (MTEDD) is responsible for energy policy, with key implementing bodies including ONEE (electricity) and MASEN (renewable energy development).

MTEDD, through its Department of Sustainable Development, coordinates environmental protection and biodiversity policy, with regional environmental services and observatories supporting decentralised implementation.

Cross-sectoral coordination is observed through the Higher Council for Water and Climate (HCEC) which provides strategic guidance on water-climate interactions and resource allocation across sectors, and the Interministerial Water Commission which supports coherence and monitoring of water-related policies across ministries.

The Ministry of Equipment and Water leads national water policy, supported by Hydraulic Basin Agencies implementing integrated water resources management at basin level. The National Office of Electricity and Water (ONEE) manages drinking water supply and

KEY DATA



% of imports in Energy use

91%



Agricultural sector's share of GDP

12%



Population % using safely managed sanitation
SDG indicator 6.2.1

8.4%

PALESTINE

Resource management under severe constraints



Key WEFE-related challenges

Water scarcity is the most critical challenge. All surface and groundwater resources are shared, with access highly constrained. Per capita water availability is among the lowest in the region, with average domestic consumption in the West Bank around 70 litres

per day. In Gaza, overexploitation of the Coastal Aquifer has led to 90–95% of groundwater being unfit for human consumption. Water quality deterioration is severe, particularly in Gaza, due to inadequate wastewater treatment, damaged infrastructure and chronic underinvestment. High network losses, illegal connections and ageing systems further exacerbate scarcity.

Palestine is highly dependent on imported electricity, primarily from Israel (up to 99% in the West Bank). The inability to power cold storage or modern irrigation due to import restrictions constitutes a severe energy – food security challenge.

Agriculture and food security are highly vulnerable. Limited access to land and water, movement restrictions and high input costs constrain productivity. Agriculture now contributes less than 4% of GDP.

Ecosystems and natural capital are under pressure from groundwater depletion, pollution, land degradation, urban expansion and occupation-related infrastructure. These pressures undermine ecosystem services that are essential for water regulation, soil protection and agricultural resilience.

Key findings on WEFE policy integration

Palestine has adopted sound sectoral policies and strategies, including the National Water Policy (2013–2032), wastewater strategies, agricultural resilience frameworks and renewable energy and energy efficiency plans that increasingly recognise interlinkages across WEFE sectors.

However, severe restrictions on access to water, land and energy infrastructure constrain policy implementation and financial dependence on donor funding favours short-term, fragmented interventions rather than systemic solutions.

Since October 2023, the humanitarian, infrastructure and institutional situation—especially in Gaza—has deteriorated dramatically, with profound impacts on all WEFE sectors. Damage to water, sanitation, energy and food systems has further reduced resilience and reversed previous development gains. Future WEFE interventions will need to combine emergency response, recovery and long-term nexus-oriented resilience building.

Institutional settings and coordination

Palestine fundamentally faces restricted access to natural resources, limited sovereignty and prolonged political instability that limit the scope for integrated planning and management.

The Palestinian Water Authority (PWA) is responsible for water policy, planning and regulation. The Water Regulatory Council oversees service provision and tariffs, while utilities and municipalities manage operations. However, in the West Bank, major water projects and management measures require approval through the Israeli-Palestinian Joint Water Committee, significantly limiting autonomous decision-making.

The Ministry of Agriculture leads agricultural policy, rural development and food security initiatives, supported by NGOs and civil society organisations that play a critical complementary role, particularly in land reclamation, water harvesting and farmer support. The Palestinian Energy Authority oversees energy policy and planning, with supporting institutions for regulation and renewable energy promotion. The sector remains financially weak and structurally dependent on external suppliers.

The Environment Quality Authority (EQA) is responsible for environmental protection, climate change adaptation and biodiversity conservation, working in partnership with other ministries, academia and civil society.

While sectoral roles are defined, coordination across sectors is often project-based, donor-driven and short-term, with limited capacity for basin-scale or long-term integrated planning.

KEY DATA



Per capita water availability
in litres/day

70



Electricity imports
in West Bank

99%

TUNISIA

Facing the threshold of extreme scarcity



Key WEFE-related challenges

Renewable water resources have fallen below 419 m³/capita/year and are projected to reach around 300 m³/capita/year by 2030, placing Tunisia well within the category of extreme water scarcity. Climate projections indicate continued temperature increases and declining precipitation, intensifying drought risk and desertification.

Agriculture is the dominant water user, accounting for around 80% of total withdrawals. Rainfed agriculture predominates, while efficiency in irrigated agriculture remains low and the use of treated wastewater is minimal. Overexploitation of groundwater and soil degradation further threaten long-term food security.

Tunisia relies on imported fossil fuels for more than half of its energy supply, and electricity generation is almost entirely gas-based. Despite its vast potential, renewable energy use remains minimal. Ecosystems and natural capital are under severe pressure from land degradation, overgrazing, erosion, desertification and pollution, reinforcing negative feedback loops within the WEFE Nexus.

Key findings on WEFE policy integration

Tunisia has adopted ambitious strategic frameworks that provide a strong basis for WEFE integration, notably the Water 2050 Strategy (the primary vehicle for future WEFE integration), the IWRM Plan 2023-2028 and the National Ecological Transition Strategy (2023). These documents explicitly recognise resource limits, climate risks and the need for multisectoral planning.

However, sectoral policies largely prioritise short-term needs and crisis management rather than systemic trade-off analyses and responses.

Renewable energy solutions for irrigation, wastewater treatment and desalination remain underdeveloped.

Institutional settings and coordination

The Ministry of Agriculture, Water Resources and Fisheries (MAWRF) is the central authority for water resources management, irrigation and rural water supply. The National Water Operation and Distribution Company (SONEDE) manages drinking water production and distribution, while the National Office for Sanitation (ONAS) is responsible for wastewater collection and treatment.

MAWRF also leads agricultural policy, irrigation development, fisheries and rural development. Agriculture is therefore institutionally closely linked to water management, though often from a sectoral productivity perspective.

The Ministry of Industry, Energy and Mines oversees energy policy, supported by the National Agency for Energy Conservation for energy efficiency and renewable energy promotion. The state utility STEG dominates electricity and gas transmission and distribution.

The Ministry of Environment and Sustainable Development leads environmental protection, climate policy and sustainable development, supported by agencies such as the National Agency for Environmental Protection and the National Commission for Sustainable Development (NCSD).

Beyond the operations of the NCSD, WEFE coordination mechanisms remain limited. Decision-making remains largely centralized and sector-driven, with exceptions mainly in project-based cases. Coordination among institutions is fragmented, with overlaps, data-sharing gaps and limited stakeholder engagement.

KEY DATA



Population % using safely managed sanitation
SDG indicator 6.2.1

>85%



Agricultural sector's share of GDP

10.1%



Energy dependence ratio

50%



Key WEFE-related challenges

Climate change projections for Türkiye indicate significant temperature increases and potentially sharp reductions in surface water availability—up to 35% by 2050 and over 50% by 2100 in worst-case scenarios—posing major risks to agriculture, ecosystems and energy production. The transboundary influence of Türkiye as an upstream country (Euphrates/Tigris) is a key Nexus dimension affecting regional food and energy security.

Agriculture dominates water use, accounting for around 74% of total freshwater withdrawals. Expanding conventionally irrigated agriculture intensifies pressure on water resources, especially in arid and semi-arid regions.

Energy demand has more than doubled since 2000, while import dependency has increased to about 72%. Hydropower contributes roughly 20–25% of electricity generation, making energy security sensitive to hydrological variability and droughts.

Ecosystems and biodiversity are under pressure from irrigation expansion, dam construction, land degradation, pollution, overgrazing and urbanisation. Wetlands, steppe ecosystems and riparian habitats are particularly vulnerable, while climate change exacerbates existing stresses.

Key findings on WEFE policy integration

Türkiye has made notable progress towards policy integration, supported by basin-scale planning, drought and flood management plans, and a comprehensive Water Efficiency Strategy (2023–2033) which promotes reuse and non-conventional water sources. The new Water Law is expected to further clarify cross-sectoral water allocation and governance.

Nevertheless, policy alignment is incomplete, particularly regarding hydropower development, irrigation expansion and ecosystem protection.

Large-scale regional initiatives (e.g. the Southeastern Anatolia Project) demonstrate integrated planning in principle, but face challenges related to resource allocation, prioritisation and downstream impacts.

Implementation gaps persist at regional and local levels due to administrative silos and competing sectoral objectives.

Institutional settings and coordination

The Ministry of Agriculture and Forestry (MAF), through the General Directorate of Water Management, leads national water policy and IWRM implementation. The State Hydraulic Works (DSİ) acts as the national investment agency for dams, irrigation, flood control and hydropower, while Special Provincial Administrations manage water services in non-metropolitan rural areas.

MAF is also the central authority for agricultural policy, irrigation development and drought management, supported by bodies such as the General Directorate of Agricultural Research and Policies, irrigation unions and agricultural credit cooperatives.

The Ministry of Energy and Natural Resources oversees energy policy, including hydropower, renewables, energy efficiency and nuclear power development, in coordination with DSİ for hydropower projects.

The Ministry of Environment, Urbanisation and Climate Change leads environmental protection, biodiversity conservation, pollution control and climate policy, supported by provincial directorates and specialised agencies.

The inter-ministerial National Water Board represents a significant step towards cross-sectoral WEFE integration being explicitly mandated to formulate water policies that address the considerations of all sectors and related supply–demand trade-offs.

KEY DATA



Agriculture water withdrawals

74%



Energy dependence ratio

75%

