

### Advancing Climate Resilience in the Water Sector -Lebanon

NDC Water Sector Priorities and the National Adaptation Plan

Ms. Leya Zgheib – Climate Change Projects – Ministry of Environment

## The overall context of climate change in the Mediterranean Basin

Increasing trends for temperature irrespective the area; more pronounced increase in the summer in the eastern basin

Trends in precipitation are variable across the basin; mostly decreasing.

Droughts have become **more frequent and intense**, especially in the north Mediterranean.

Heat waves have increased in the period 2000-2020.

As a result of droughts and heat waves, **forest fires have been more aggressive and destructive.** 

Sea surface has warmed by 0.29°C–0.44°C per decade since the early 1980s with stronger trends in the eastern basin.

Sea level has risen by 1.4±0.2 mm yr-1 during the 20th century (**2.8±0.1 mm yr-1 over 1993–2018**) (see figure to the right)





 $\mathsf{MedECC}$  (2020) Climate and Environmental Change in the Mediterranean Basin – Current Situation and Risks for the

Future. First Mediterranean Assessment Report [Cramer, W., Guiot, J., Marini, K. (eds.)] Union for the Mediterranean,

Plan Bleu, UNEP/MAP, Marseille, France, 632pp

### **Climate Change Projections in Lebanon**



### Impacts on the Water Sector:

#### Hydrological Impacts

- Decreasing Runoff: Runoff may decline by up to 16.3 mm/month by 2041–2060, especially in mountainous zones.
- More Consecutive Dry Days: Up to 6 additional dry days annually projected in southern Lebanon.
- Snow Cover Loss: Earlier snowmelt reduces spring/summer water supply and shifts river flow peaks.
- Heavy Rainfall Events: Fewer overall, but increasing intensity raises flood and erosion risks in steep or degraded areas.

#### Water Resources and Infrastructure

- Groundwater Decline: Levels dropped by 30–35 meters over four decades; volume reduced by 35–40% due to overextraction, especially along the coast.
- Saltwater Intrusion: Coastal aquifers are increasingly threatened, impacting domestic supply and agriculture.
- Flood-Drought Cycle: Droughts intensify water scarcity while **flood risks grow in key river basins** (e.g., Nahr El Kabir, Upper Litani).
- Snow-to-Rain Shift: Decreases natural storage, causes earlier drought onset.

### Why do the NDCs and NAP matter?

#### **Fulfilling International Obligations**

- Lebanon is a Party to the Paris Agreement and is therefore required to:
- Submit and regularly update its Nationally Determined Contributions (NDCs)
- Develop and communicate a National Adaptation Plan (NAP)

#### More Than a Requirement, it's a National Imperative

- The NDC expresses Lebanon's strategic climate vision and high-level commitment to reducing vulnerabilities and contributing to global goals.
- The NAP translates that vision into concrete, actionable steps for building resilience across sectors.

#### Why It Truly Matters

- Provides a coherent national framework for climate adaptation and resilience
- Enables prioritized, costed, and coordinated action on the ground
- Supports policy alignment and funding mobilization
- Signals Lebanon's readiness to move from intention to implementation

### NDC and NAP Development Process

Updated 2021 NDC

#### **Sectoral Strategies:**

- Agriculture Sector Strategy (2021-2025)
- Ministry of Agriculture Strategic Directions (2025-2026)
- National Disaster Risk Reduction Strategy (2021-2030)
- National Physical Master Plan for the Lebanese Territory (NPMPLT, 2009)
- Draft High Mountains Strategic Land Use Planning (MoE, 2025)
- National Water Sector Strategy (NWSS 2025-2035)
- National Biodiversity Strategy Action Plan (NBSAP, 2025)
- Lebanon National Health Strategy: Vision 2030 2023
- Lebanon National Health Strategy: 2-year review 2025
- Sustainable Tourism Strategy (MoT/UNDP, 2024)
- National Forest Fire Strategy (MoE, 2023)



### NDC 3.0 Adaptation Priorities – Water Sector

Adaptation priority 3: Structure and develop sustainable water services, including irrigation, to improve people's living conditions

1. **Improve water infrastructure** by **rehabilitating systems**, controlling leaks, upgrading pressurized and metered networks, **reducing Non-Revenue Water (NRW)** including illegal connections to enhance resilience, efficiency, and fair water allocation.

2. Develop and implement **integrated watershed planning at the basin level**, and climate-resilient **stormwater management plans** to address droughts, increased rainfall intensity and flooding risks.

3. **Promote safe and efficient treated water reuse**, through awareness, incentives, regulations, and capacity-building, with a focus on expanding treated wastewater use for domestic, agricultural, and industrial purposes, to enhance water availability.

4. **Explore and develop alternative sources for irrigation and upgrade irrigation schemes** and water distribution networks by restoring concrete channels or installing pipes, ensuring fair water allocation.

5. **Develop cost-effective wastewater treatment** and reuse plants to preserve surface and groundwater quality, and enhance water pollution prevention measures, prioritizing nature-based solutions in rural areas.

### **NDC 3.0 Adaptation Priorities – Water Sector**

Adaptation priority 3: Structure and develop sustainable water services, including irrigation, to improve people's living conditions

6. Enhance water storage capacities through expanding surface water storage and enhancing natural groundwater recharge (i.e. gabion walls, check dams, riverbeds, and flood plain vegetation zone restoration, and terracing).

7. Set up an Integrated Hydrological Information System (IHIS) at the Ministry of Energy and water, including real-time data collection from meteorological, hydrometric, snowpack and rainfall, and groundwater monitoring stations. Ensure all monitored data is shared, digitized and integrated into the IHIS platform.

8. Design and implement a comprehensive water quantity and quality monitoring framework covering surface water, groundwater, and irrigation networks. This framework should include the installation of bulk flow meters, hydrometric stations, spring flow monitoring, and snowpack assessment tools, ensuring real-time data integrated into a national digital water monitoring system at the Ministry of Energy and Water.

9. **Rehabilitate spring catchments** and outflow systems and **improve river embankments** to optimize water availability from springs and stormwater.

Adaptation priority 3: Structure and develop sustainable water services, including irrigation, to improve people's living conditions

#### 1. Prioritize nature-based solutions for wastewater treatment in rural areas

• Update the NWSS baseline on rural wastewater and evaluate nature-based options (e.g., wetlands, reed beds); pilot and monitor selected solutions.

### 2. Mobilize funding and investment for the phased implementation of NWSS wastewater treatment plant priorities

• Engage with climate financiers for co-funding WWTPs and develop investment briefs for decentralized, low-cost treatment solutions.

#### 3. Improve and implement national standards for treated wastewater reuse

• Conduct a regulatory review of wastewater reuse standards and establish a multi-agency working group for implementation.

Adaptation priority 3: Structure and develop sustainable water services, including irrigation, to improve people's living conditions

#### 4. Explore and develop alternative sources for irrigation and upgrade irrigation schemes.

• Assess irrigation demand and losses; construct 35 hill lakes; upgrade networks with piped/concrete systems; deploy a citizen leak-reporting app.

#### 5. Rehabilitate spring catchments and outflow systems and improve river embankments

• Update hydrogeological assessments; rehabilitate 2 priority spring catchments; install protection measures in sensitive zones.

6. Develop financial tools and water economic policies (e.g., tariffs, water metering) to ensure the sustainability and financial balance of water services

• Update financial assessments of Water Establishments; tailor tariff models; study feasibility and timeline for macro- and district metering.

Adaptation priority 3: Structure and develop sustainable water services, including irrigation, to improve people's living conditions

7. Strengthen operational governance and management of irrigation and domestic water supply schemes to reduce non-revenue water and enhance system efficiency

• Audit schemes for losses and governance gaps; set up or strengthen water user associations; implement smart meters and SCADA systems; install water-efficient appliances in 5 pilot areas

8. Enforce Water Law 192/2020 and implement articles pertaining to polluting water bodies based on the polluter-pays principle

• Complete assessments of pollution sources; update standards and monitoring protocols; equip MoEW and WEs with mobile labs; develop emergency plans; implement decentralized WWTPs in Naher El Kaleb.

9. Enhance water storage capacities through expanding surface water storage and enhancing natural groundwater recharge

• Identify priority recharge/storage zones; design and build gabions, check dams, terracing; integrate into land-use plans; study land-water-agriculture synergies.

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#### **10.** Develop water management information systems to improve data availability

• Digitize current data flows; develop Water Management Information System (WMIS) integrating real-time data; create data-sharing protocols and governance frameworks.

#### 11. Upscale the capacity of relevant institutions personnel

• Assess capacity gaps; deliver training on digital tools, NRW, and monitoring; establish a training platform with academic partners.

### 12. Ensure policymakers understand the significance of integrating climate change adaptation into broader development strategies

• Produce policy briefs/dashboards; conduct dialogues with ministries and MPs; support inclusion of water-climate risks in public planning; enroll officials in CCA courses.

Adaptation priority 3: Structure and develop sustainable water services, including irrigation, to improve people's living conditions

13. Set up an Integrated Hydrological Information System (IHIS) including real-time data from meteorological, hydrological, snowpack, and groundwater stations

• Upgrade/install telemetry-based stations; design IHIS platform; link with early warning tools; rehabilitate non-functional stations and expand coverage.

14. Develop climate-resilient stormwater management plans to address droughts, increased rainfall intensity and flooding risk in coordination with DRR

• Draft stormwater plans with pre-, during-, and post-crisis measures; train MoEW, WEs, and municipalities on implementation.

#### 15. Design and implement a national water quantity and quality monitoring framework

• Standardize water indicators; equip field units with labs/sensors; publish annual monitoring reports feeding into MoEW sector reviews.

# Thank you!

Email: leya.zgheib@undp.org