Simplified Approval Process

# Annex 2: Prefeasibility study

**Project name**: WATER_RES: Enhancing the ability to address the risks of water scarcity in areas most affected by climate change and water shortage in Syria

Acted, Syria, January 2026

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## List of abbreviations

| | |
|---|---|
| % | Percent |
| °C | Degree Celsius |
| ACB | Agricultural Cooperative Bank |
| AE | Accredited Entity |
| AFM | Acted Feedback Mechanism |
| BMDA | Badia Management and Development Authority |
| BSh | Hot semi-arid / steppe climate (semi-arid, high temperature) |
| BSk | Cold semi-arid / steppe climate (semi-arid, low temperature) |
| BWh | Hot desert climate (arid, high temperature) |
| BWk | Cold desert climate (arid, low temperature) |
| $CaSO_4$ | Calcium sulphate |
| Csa | Temperate climate, dry summer, hot summer |
| Csb | Temperate climate, dry summer, warm/mild summer |
| DRD-WRD | Damascus and Rural Damascus Water Resources Directorate |
| EE | Executing Entity |
| ENSO | El Nino Southern Oscillation |
| FAA | Funded Activity Agreement |
| FAO | Food and Agriculture Organization of the United Nations |
| FGD | Focus group discussion |
| FLAT | Finance, logistics, administration and transparency |
| GCF | Green Climate Fund |
| GCWR | General Commission for Water Resources |
| GDP | Gross Domestic Product |
| GEF | Global Environment Facility |
| GHG | Greenhouse gas |
| GIS | Geographic Information System |
| GNI | Gross National Income |
| HLP | Housing, Land and Property |
| IDP | Internally Displaced Person |
| IFRC | International Federation of Red Cross |
| ILO | International Labour Organization |
| IMF | International Monetary Fund |
| IP | Implementing partner |
| IPCC | Intergovernmental Panel on Climate Change |
| IWRM | Integrated water resource management |
| KII | Key informant interview |
| $km^2$ | Square kilometre |
| LLA | Locally Led Action |
| M&E | Monitoring and evaluation |
| $m^3$ | Cubic metres |
| $m^3/s$ | Cubic metres per second |

| | |
|---|---|
| MEAL | Monitoring, evaluation, appraisal and learning |
| mg/L | Milligrams per litre |
| $MgSO_4$ | Magnesium sulphate |
| mm | Millimetre |
| MoA | Ministry of Agriculture |
| MoE | Ministry of Energy |
| MoLAE | Ministry of Local Administration and Environment |
| NaCl | Sodium chloride |
| NAO | North Atlantic Oscillation |
| NDA | National Designated Authority |
| NDCs | Nationally determined contributions |
| No. | Number |
| O&M | Operation and Maintenance |
| PMU | Project Management Unit |
| PSC | Project Steering Committee |
| PTF | Project Task Force |
| RCDA | Regional Deep Cretaceous Aquifer |
| RCP8.5 | Representative Concentration Pathway 8.5 - high-emission climate scenario |
| SAP | Simplified Approval Process |
| SdS | Sandstorm and dust storms |
| $SO_4^{2-}$ | Sulphate ion |
| SP | Syrian Pound |
| SSP2-4.5 | Shared Socioeconomic Pathways 2 - medium scenario (stabilization at 4.5 watts per square metre) |
| SSP5-8.5 | Shared Socioeconomic Pathways 5 - high-emission scenario (stabilization at 8.5 watts per square metre) |
| SST | Sea surface temperature |
| SWAcMOD | Surface Water Accounting Model |
| SWIFT | Society for Worldwide Interbank Financial Telecommunication |
| Syria | Syrian Arab Republic |
| TDS | Total Dissolved Solids |
| TWG | Technical Working Group |
| UNCCD | United Nations Convention to Combat Desertification |
| UNDP | United Nations Development Programme |
| UNEP | United Nations Environment Programme |
| UNFCCC | The United Nations Framework Convention on Climate Change |
| UNHCR | United Nations High Commissioner for Refugees |
| USD | United States Dollar |
| WASH | Water, sanitation and hygiene |
| WRIC | Water Resource Information Centre |
| WUA | Water User Association |

# 1. Executive summary

After more than a decade of conflict, Syria faces acute climate exposure combined with weakened institutional capacity for water planning and service delivery. The country is already classified as severely water-poor,[1] with a structural water deficit of approximately three billion cubic meters per year. Per-capita water availability has declined from 1,791 m³ in 1995 to 882 m³ in 2005 and is projected to approach 500 m³ by 2050, placing Syria close to absolute water scarcity.[2]

The project focuses on the Barada and Awaj basin, with targeted interventions in Eastern Ghouta, where climate and water stresses are most severe. This strategically vital basin supplies nearly all freshwater for the Damascus metropolitan area and supports surrounding peri-urban and rural agriculture. It accounts for less than five percent of Syria's renewable water resources while hosting approximately 30 percent of the population.[3] Water demand is dominated by inefficient irrigation practices, while domestic use represents an estimated 38 percent of total consumption, underscoring the basin's high social vulnerability to water shortages.[4]

Climate projections indicate worsening conditions across the basin. By 2040–2059, mean annual temperatures are projected to rise by 1.7°C to 2.3°C, while precipitation is expected to decline by 4.1 to 5 percent under medium (SSP2-4.5) and high-emission (SSP5-8.5) scenarios respectively. Extreme events will intensify, with the number of hot days exceeding 40°C projected to increase from 11 up to 21 days per year,[5] and longer dry spells, intensify evapotranspiration, reduce groundwater recharge, and accelerate depletion of already stressed aquifers.

Municipal systems in the basin are highly sensitive because they rely on winter precipitation, snowmelt recharge, and spring- and groundwater-fed supplies (notably Ein al-Fijeh spring), while downstream peri-urban areas such as Eastern Ghouta face compounded vulnerability. Conflict-related damage, high non-revenue water (estimated at 33 percent pre-conflict), proliferation of illegal wells (over two-thirds of existing wells), degraded infrastructure and limited cost-recovery further constrain reliable service delivery and sustainable abstraction.

In this context, coping mechanisms remain largely reactive and unsustainable, characterized by unregulated groundwater abstraction and inefficient irrigation practices that further degrade water resources. Limited financial and technical capacity constrains systematic climate adaptation planning at national and local levels.

This pre-feasibility study was developed in 2025 by Acted to inform the design of the project *"Enhancing the ability to address the risks of water scarcity in areas most affected by climate change and water shortage in Syria."* It draws on stakeholder consultations with national and local authorities, including the Ministry of Local Administration and Environment (MoLAE), sector institutions, academia, and communities in Eastern Ghouta. The study supports preparation of Syria's first bilateral GCF funding proposal under the Simplified Approval Process (SAP). Given its focus on capacity building, small-scale rehabilitation, demand management, and nature-based solutions with minimal environmental risk, the project is classified as Category C.

[1] Isayed A., Menendez-Aguado J.,M., Jemmali, H., Mahmoud N., (2024), Water Poverty Index over the Past Two Decades: A Comprehensive Review and Future Prospects—The Middle East as a Case Study. Available here.
[2] Rida, F., Aw-Hassan, A., Bruggeman, A., (2004), The impact of food and agricultural policies on groundwater use in Syria. Available here.
[3] Arraf, F., (2019), Causes of Decreasing Water Balances in the Barada Awaj (Damascus) Drainage Basin until the Uprising in Syria. Available here.
[4] Baba, A., Karem, R., Yazdani, H., (2021), Groundwater resources and quality in Syria. Available here.
[5] World Bank Climate Change Knowledge Portal, (2025), Syrian Arab Republic. Available here.

The project introduces a paradigm shift from fragmented, reactive responses toward locally led, anticipatory, and scalable climate-resilient water management. It integrates institutional strengthening and community empowerment through three components:

**Component 1:** will strengthen capacities of key national and local institutions such as Ministry of Local Administration and Environment (MoLAE), Ministry of Energy (MoE), General Commission for Water Resources (GCWR), Damascus and Rural Damascus Water Resources Directorate (DRD-WRD), as well as community-based governance structures such as Water User Associations (WUA) and a local civil society organization (CSO). Public institutions will be supported to improve data collection, processing and use this to make climate-risk informed decisions on water management. Their capacity to secure future financing through evidence-based design of programs will also be strengthened. Community-bases structures (i.e. WUAs) will be capacitated to act as liaison between local governments and community members, helping cascade down climate-related information for users, and feed up community/user feedback to inform national planning processes. Multi-stakeholder climate forums and strengthened NDA capacity will support national policy uptake, learning and long-term climate finance, embedding evidence driven decision-making.

**Component 2:** This component directly improves climate resilience and water security for vulnerable communities by climate-proofing existing boreholes and water networks that are critical water infrastructure and supporting demand management at household level. Strengthening O&M, and cost recovery systems supported by smart metering will sustain service delivery. Further, this component will support water efficient fixtures and promote grey-water recycling at household level to improve circularity in water use and curb demand. The interventions will be guided by data and governance systems established in Component 1 while real-time data will produce feeds directly into decision-support dashboards and local water management plans. Key beneficiaries include vulnerable households, water utility staff, and communities in Eastern Ghouta.

**Component 3:** enhances the climate resilience of agricultural production and local ecosystems and strengthens Components 1 and 2 by aligning farmer decisions. It supports local extension services and nurseries under the management of Ministry of Agriculture (MoA), and farmers to scale up uptake of efficient irrigation, climate-adapted practices, use of drought-resistant crops, and small-scale water harvesting. Locally led financing options for the adoption of these practices will help creating lasting impacts, reinforcing the paradigm shift. Ecosystem-based measures, such as infiltration trenches and re-vegetation, will improve ground water percolation in farming communities and soil management. By integrating farmers into planning, Component 3 ensures agricultural needs and innovations are embedded in coordinated, climate-resilient water governance. Key beneficiaries include smallholder farmers, farmer associations, extension and public nursery workers, and agri-businesses.

Implemented over five years by Acted Syria in partnership with MoLAE, the project will strengthen water security and climate resilience for approximately 198,620 people in the target area. The pre-feasibility assessment confirms that without GCF investment, the basin's fragile water systems will be unable to meet basic needs under future climate conditions. By mobilizing climate finance, the project will secure critical water resources, protect livelihoods, and establish a replicable adaptation model for conflict-affected and water-scarce contexts.

# 2. Country overview

## 2.1 Geography and soil of Syria

Syrian Arab Republic (Syria) is in Western Asia located on the eastern coast of the Mediterranean Sea. The country lies between latitude °32.19 and °37.25 North, and the two longitudes of: °35.43 and °41.25 East. It shares borders with Türkiye in the north, Iraq in the east and southeast, Jordan to the south, Israel and Lebanon in the southwest and west respectively. The total surface areas of Syria is 185,180[6] square kilometres ($km^2$) with only a small proportion (0.84 %) consisting of water bodies. Syria’s geography can be divided into four geographical regions: a mediterranean climate along western coastal plains, parallel mountain ranges and highlands running from north to south, vast interior plains with a semi-arid climate, and desert regions stretching across the central and southeastern parts of the country.[7]

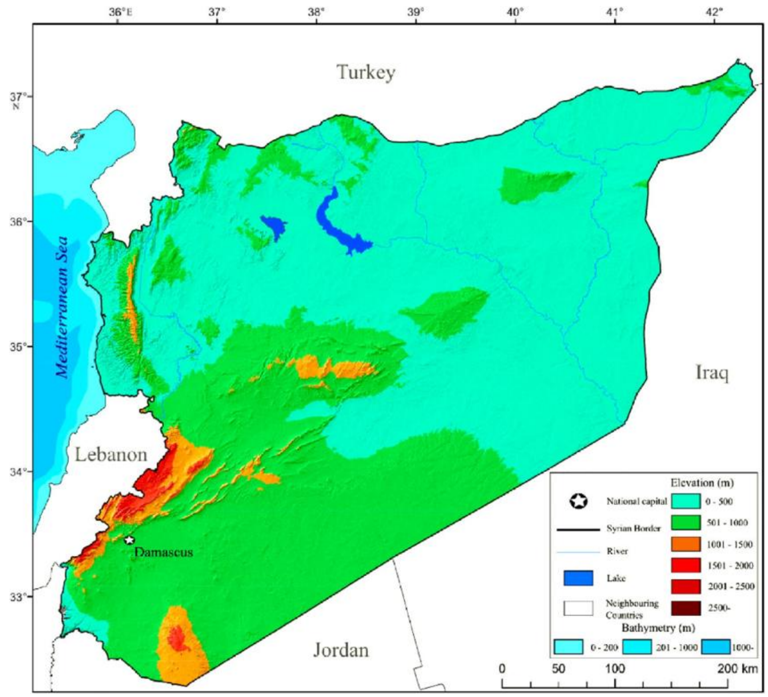


Figure 1: Topography map of Syria[8]

This geographic diversity means rainfall varies dramatically across the country. Over 60 percent of Syria receives less than 250 millimetres (mm) of rain annually, with the least in the central and eastern desert regions and the most in the mediterranean coast and highlands.[9] This rainfall pattern underpins Syria’s historic division into agriculturally productive zones and marginal rangelands. Approximately 33 percent of Syria’s land was arable (pre-conflict), mainly in the northwest and along the rivers, while 44 percent consisted of steppe pastures in the dry interior and only a small fraction (3%) was forested.[10] Furthermore, the country's small Mediterranean coastline re-

[6] World Bank, (2023), Surface area (sq.km). Available here.
[7] Syrian Arab Republic, Ministry of state for Environment Affairs, (2010), Initial national communication of the Syrian Arab Republic: Submitted to the United Nations Framework Convention on Climate Change. Available here.
[8] Torma, C.,Z., (2023), Climate of Syria based on Cordex simulations: Present and future. Available here.
[9] Khaldoon, M.,A., Berndtsson R., (2011), Syrian water resources between the present and the future. Available here.
[10] Food and Agriculture Organization of the United Nations, (2003), Syrian agriculture at the crossroads. Available here.

mains exposed to projected sea level rise which poses risks to coastal (and most forested) areas.[11] Over the past decades, environmental degradation has accelerated due to both unsustainable resource use and the impacts of conflict. Even before the war, Syria faced serious land degradation challenges such as deforestation, overgrazing, soil erosion, and desertification.[12] The conflict, which started in 2011, greatly compounded these issues. Wartime fuel shortages and poverty led to widespread tree cutting for firewood, while military operations and wildfires ravaged remaining forests. An estimated one-third of Syria's forests have disappeared since 2011, representing a loss of biodiversity and natural carbon sinks. Additionally, frequent sandstorms in the arid steppe, driven by strong winds and the loss of vegetative cover due to drought, now damage crops and contribute to soil erosion and sand encroachment.[13] The war has also seen targeted destruction and neglect of environmental infrastructure. Irrigation canals, reservoirs, and rangeland management systems fell into disrepair, exacerbating problems like salinization and soil fertility decline.

## 2.2. Administrative system and governance

Figure 2: Administrative map of Syria[14]

Syria is a unitary republic administratively divided into 14 governorates (muhafazat). Each governorate should be overseen by a governor appointed by the central government. These governorates are further subdivided into districts (manatiq) and sub-districts (nawahi).[15] However, in certain regions, including parts of northeast Syria, local governance structures currently operate with varying degrees of autonomy outside direct central government administration. While Syria's legal framework provides for local administration councils, effective decentralization has remained

[11] Met Office, (2025), Climate risk report for the Middle East and North Africa (MENA) region, Available here.
[12] Syrian Arab Republic, Ministry of state for Environment Affairs, (2010), Initial national communication of the Syrian Arab Republic: Submitted to the United Nations Framework Convention on Climate Change. Available here.
[13] Soniak, M., (2017), Giant Middle East dust storm caused by a changing climate, not human conflict. Available here.
[14] United Nations High Commissioner for Refugees, (2021), Syrian Arab Republic: Administrative map. Available here.
[15] International Labour Organization, (2025), The Constitutional Declaration of the Syrian Arab Republic. Available here.

limited and uneven, largely due to the protracted impacts of conflict and constraints in institutional capacity. Although Legislative Decree 107 (Local Administration Law) of 2011 introduced reforms intended to enhance local governance and autonomy, its implementation has been patchy, particularly in areas affected by conflict.

The government changes in 2024 represent a step towards stability for the country. However, the context is still transitional, where administrative roles and coordination mechanisms continue to evolve. The setup and functioning of governance structures at both central and local levels are under clarification, and institutional capacities vary significantly across regions. In practice, local governance structures differ, with some areas not yet fully integrated under unified administrative arrangements. The new administration has expressed its commitment to addressing governance challenges, and Syria continues to work toward improving transparency and institutional capacity. Syria ranks 177 out of 180 countries in 2024 on Transparency International's Corruption Perceptions Index, highlighting the need for future reform.

## 2.3. Demographic profile

Syria has an estimated population of approximately 25.6 million people as of 2025[16,17] with one million refugees returning to Syria post December 2024,[18] mostly from the neighbouring countries.[19] An estimated 438,000 residents in Syria are Palestinian refugees, while 16,077 residents are refugees and asylum seekers registered with United Nations High Commissioner for Refugees (UNHCR), primarily from Iraq.[20] Given the data gaps, lack of recent census and surveys due to the decade of conflict, all demographic models rely heavily on extrapolations and assumptions.


Figure 3: Distribution of population by governorate[21]

[16] United Nations World Population Prospects, (2025), Population Syrian Arab Republic. Available here.
[17] International Organization for Migration, (2025), Syrian Arab Republic — Population Mobility and Baseline Assessment — Round 10, Available here.
[18] United Nations High Commissioner for Refugees, (2025), A million Syrians have returned home by September 2025. Available here.
[19] United Nations High Commissioner for Refugees, (2025), Syria governorates of return overview for October 2025. Available here.
[20] United Nations High Commissioner for Refugees, (2025), Operational Update February 2025. Available here.
[21] World Bank, (2022), The Welfare of Syrian Households after a Decade of Conflict. Available here.

The conflict impacted the distribution of the Syrian population across governorates. At the end of 2025, over 7 million of Syrians[22] were internally displaced. The population in Idleb has doubled, and Aleppo, Deir ez Zor, Homs and Hama experienced depopulation. Since December 2024, over 1.9 million internally displaced returned to their areas of origin,[23] with Aleppo, Homs, Idleb and Rural Damascus governorates experiencing the highest population movement.[24]

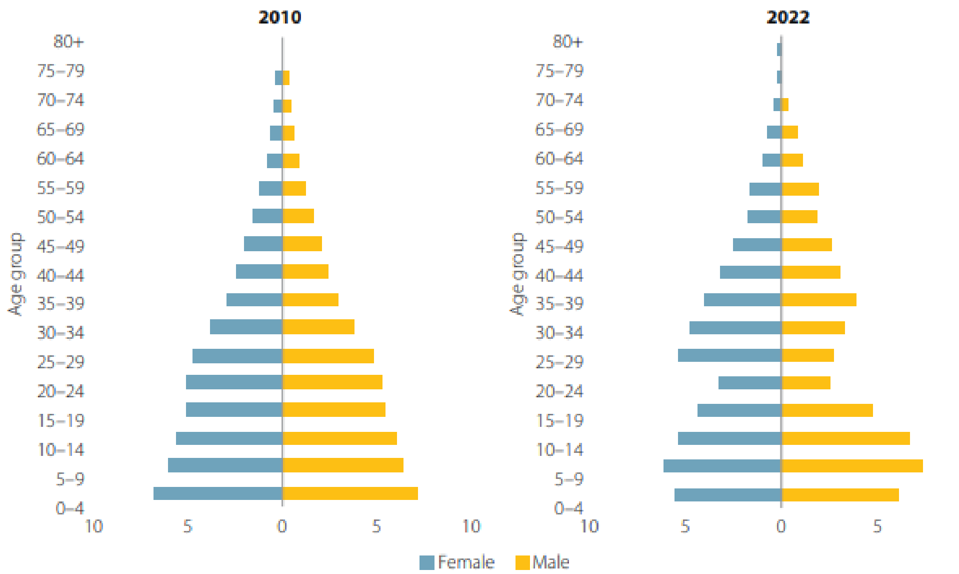


Figure 4: Population pyramid 2010 and 2022[25]

The conflict in Syria has shaped the demographic structure with visibly fewer men between the ages of 20 and 40.[26] The estimated population, however, remains young with approximately a quarter of the population under the age of 15 and average life expectancy 72 years. Fertility has declined over the past decade spurred likely by the progressive deterioration of living conditions and maternal mortality,[27] however remains above replacement level.[28] Due to the years of conflict, almost 30 percent of the population have been left with permanent disabilities requiring ongoing support.[29] According to the latest World Bank data, 97 percent of men and 92 percent of women aged 15 and above are literate, indicating high overall literacy but a continued gender gap.[30]

Syria remains mostly urban, with accelerated urbanization in the 1970s, reaching 53.3 percent in 2007 and estimated 57 percent of the population living in urban areas in 2025.[31] The two largest cities in the country remain Damascus and Aleppo, hosting a combined estimated population of

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[22] United Nations High Commissioner for Refugees, (2025), Syria governorate IDPs and IDP returnee overview for October 2025. Available here.
[23] United Nations High Commissioner for Refugees, (2025), A million Syrians have returned home by September 2025. Available here.
[24] United Nations High Commissioner for Refugees, (2025), Syria governorates of return overview for October 2025. Available here.
[25] World Bank, (2022), The Welfare of Syrian Households after a Decade of Conflict. Available here.
[26] Ibid.
[27] Ibid.
[28] World Bank, (2023), Syrian Arab Republic Social Indicators. Available here.
[29] United Nations Development Program, (2025), The Impact of the Conflict in Syria: A Devastated Economy, Pervasive Poverty and a Challenging Road Ahead to Social and Economic Recovery. Available here.
[30] World Bank Gender Data Portal, (2021), Syrian Arab Republic – Adult literacy rate, female 15+. 91.8% in 2021. Available here
[31] United Nations World Population Prospects, (2025), Population Syrian Arab Republic. Available here.

over 4.6 million. Low rainfall and reoccurring drought have further pushed large numbers of inhabitants to the outskirts of Syrian cities in search for work due to the crop failure and consequent abandonment of agricultural livelihoods. It is estimated the 2006- 2009 drought led to movement of at least 1.5 million agricultural workers and family farmers from rural areas to the cities and camps.[32] In terms of population density, it differs greatly from one governorate to another. Prior to the conflict, Damascus governorate, hosting the capital city, was the most densely populated governorate, while Deir ez Zor governorate, encompassing vast desert areas in the southeastern part of the country was the least populated.[33]

## 2.4. Economic profile

Before 2011, Syria was classified as a lower middle-income country making steady progress toward achieving the millennium development goals, with significant improvements in human development indicators. Fourteen years of conflict have had a profound impact on Syria's economy, resulting in a cumulative gross domestic product (GDP) contraction of over 50 percent since 2010.[34] With the current gross national income (GNI) per capita estimated at only 830 USD in 2025, Syria slid below the international threshold for low - income countries. Syria has not been classified under one of the usual economy groups in the International Monetary Fund's database since 2011 due to 'uncertain political circumstances'.[35] In 2023, Syria ranked 135 out of 137 countries in the economic complexity index with low diversity of exports focused on raw materials with imports three times higher than exports indicating significant trade deficit and reliance on foreign goods.[36]

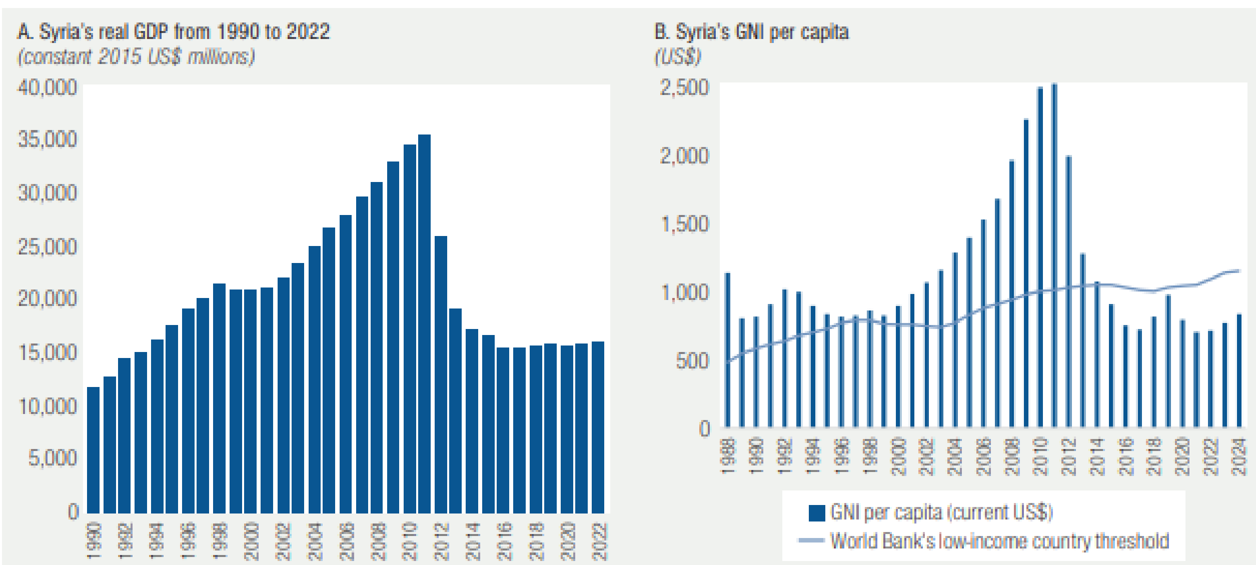


Figure 5: GDP and GNI per capita between 1990 and 2024[37]

In the past decade, Syria's socioeconomic conditions continued to deteriorate, shaped by a combination of overlapping shocks. These include the protracted conflict, international sanctions, recurring droughts, prioritization of military expenditure and the deepening economic crises in neighbouring Lebanon and Türkiye. The depreciation of the Syrian pound (SP) has fuelled high inflation

[32] Gleick, P.,H., (2014), Water, Drought, Climate Change, and Conflict in Syria. Available here.
[33] Syrian Arab Republic Presidency of the Council of Ministries State Planning Commission, (2005), Second National Report on MDGs in Syrian Arab Republic. Available here.
[34] World Bank, (2025), Syria Macro- Fiscal Assessment. Available here.
[35] International Monetary Fund, (2025), World Economic Outlook. Available here.
[36] Observatory of Economic Complexity, (2023), Syria. Available here.
[37] World Bank, (2025), Syria Macro- Fiscal Assessment. Available here.

averaging 54.5 percent between 2011 and 2024,[38] which significantly eroded real incomes and contributed to rising levels of poverty across the country. As such, extreme poverty now affects roughly one in four Syrians, who are unable to meet their basic needs, while around 67 percent of the population live below the lower middle-income poverty line.[39] Over 75 percent of Syrians therefore depend on some form of humanitarian aid, compared with only five percent in the first year of the conflict[40] while an estimated 37 percent of Syrian households receive remittances from abroad.[41]

Due the territorial fragmentation, growth of the informal economy and weakened collection capacity the tax revenues of the central government in 2024 represented only 10 percent of pre-conflict levels with non-tax revenues from public entities and service fees decreasing dramatically.[42] This limits the ability of the government to invest in social programs and reconstruction efforts. Half of the country's infrastructure has been destroyed or rendered dysfunctional,[43] including roads, bridges, water networks, electric networks, bakeries, mills and storage facilities, housing stock and education and health facilities. With the central bank reporting debt of 128 percent of GDP,[44] Syrian financial system faces challenges to recovery which limit the ability of the government to invest in sustained reconstruction and investments without external support.

Early policy adjustments by the new government have already created potential openings for future private investment and fiscal revitalisation. Authorities have signalled an increased focus on private-sector development and investment-friendly reforms as a core pillar of economic recovery, including efforts to restore investor confidence and simplify the business environment to attract foreign and domestic capital. Senior officials have emphasised the need to support the private sector and rebuild institutional trust as part of broader economic reforms to complement reconstruction priorities.[45] The efforts were followed by high-level investment engagements reflecting interest from regional economies in supporting Syria's reconstruction and economic cooperation.[46] Simultaneously, announcements from key international actors regarding the easing or removal of longstanding sanctions, including by the United States[47] and follow-on actions by international financial institutions,[48,49] signal willingness to gradually reintegrate Syria into formal trade systems. Such changes could facilitate better access to global financial markets and formal trade channels, supporting fiscal stability and enabling a more conducive environment for private investment and reconstruction financing.

## 2.5. Financial and banking sector

While Syria's banking sector in 2025 remains heavily conditioned by past conflict and sanctions, the period marks the beginning of potential structural realignment and reintegration with regional and international financial systems. The financial system is dominated by six state owned banks with an estimated fifteen private banks licenced for conventional and Islamic banking services.[50]

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38 Ibid.
39 World Bank, (2022), The Welfare of Syrian Households after a Decade of Conflict. Available here.
40 United Nations Development Program, (2025), The Impact of the Conflict in Syria: A Devastated Economy, Pervasive Poverty and a Challenging Road Ahead to Social and Economic Recovery. Available here.
41 World Bank, (2022), The Welfare of Syrian Households after a Decade of Conflict. Available here.
42 World Bank, (2025), Syria Macro- Fiscal Assessment. Available here.
43 United Nations Development Program, (2025), The Impact of the Conflict in Syria: A Devastated Economy, Pervasive Poverty and a Challenging Road Ahead to Social and Economic Recovery. Available here.
44 World Bank, (2022), The Welfare of Syrian Households after a Decade of Conflict. Available here.
45 Reuters, (2025), Syria's finance minister says foreign investors welcome after US sanctions move. Available here.
46 Gulf News, (2025), Saudi Arabia signs $5 billion investment deals with Syria to aid reconstruction. Available here.
47 United States Department of State, (2025), Termination of Syria sanctions. Available here.
48 World Bank, (2025), World Bank group confirms support to Syria's recovery. Available here.
49 International Monetary Fund, (2025), Syria- IMF staff visit to Damascus. Available here.
50 World Bank, (2025), Syria Macro- Fiscal Assessment. Available here.

In 2025, the banking sector showed signs of tentative reintegration: for example, in June the central bank announced Syria's first direct international bank transfer via the SWIFT messaging network since the war, a symbolic step toward reconnecting with global finance.[51] At the same time, sanctions relief by Western and regional actors, such as the European Union's suspension of certain restrictive measures in February 2025, including for financial and banking-related transactions, created a window for reform and reconstruction efforts.[52] Major structural challenges however remain: banks suffered from low liquidity, weak deposit-withdrawal trust, a high share of non-performing loans and outdated infrastructure, including underdeveloped electronic payment systems and heavy reliance on cash.[53] Syria remains on the Financial Action Task Force's grey list which remains an obstacle in facilitating foreign investments. However, the Ministry of Finance has developed a national strategy for 2026 to implement reforms needed for full banking compliance.[54] At the same time, the Central Bank announced a new regulatory and supervisory framework to strengthen banking relationship and align with international standards as well as to modernize digital payment infrastructures.

Agricultural and rural finance in Syria continue to evolve in 2025 within the broader context of economic recovery and banking sector reform. The Agricultural Cooperative Bank, a state-owned institution mandated to support farmers and rural development remains an important institutional channel for agricultural finance. In late 2025, Ministry of Agriculture (MoA) advanced implementation of an interest – free loan programme providing support to priority crop producers aligned with national food security objectives.[55]

## 2.6. Livelihoods, poverty and food security

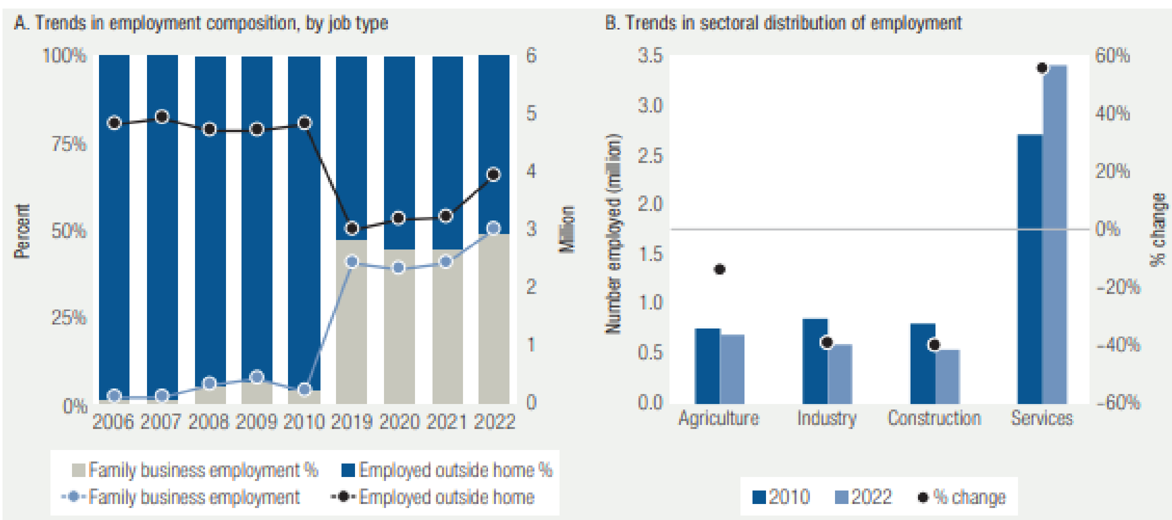


Figure 6: Employment composition and sectoral distribution[56]

Unemployment across Syria remains high, reaching an estimated 24 percent in 2024,[57] with the economy and labour market deeply reshaped by over a decade of conflict. Unemployment rates

[51] Reuters, (2025), Syria made first direct international bank transfer via SWIFT since war. Available here.
[52] Council of the EU, (2025), Syria: EU suspends restrictive measures on key economic sectors. Available here.
[53] World Bank, (2025), Syria Macro- Fiscal Assessment. Available here.
[54] The National, (2025), We will be out of the grey list very soon, says Syrian Finance Minister. Available here.
[55] Acted, (2025), Stakeholder consultations - Agricultural Cooperative Bank; Ministry of Agriculture.
[56] World Bank, (2025), Syria Macro- Fiscal Assessment. Available here.
[57] United Nations Development Program, (2025), The Impact of the Conflict in Syria: A Devastated Economy, Pervasive Poverty and a Challenging Road Ahead to Social and Economic Recovery. Available here.

among youth aged 15–24 rose from 20.4 percent in 2010 to estimated 45.9 percent in 2021 (42 percent for men and 59.7 percent for women), while more than 60 percent of persons with disabilities are estimated to be out of work.[58] Public sector employment, once a mainstay for women, has seen wages eroded and purchasing power decline despite repeated state-led pay increases. The private sector, largely composed of micro-, small-, and medium-sized enterprises, provides over half of all jobs but faces severe constraints. Industrial employment has sharply declined due to destruction, looting, and capital flight, while the oil sector has collapsed.[59]

The International Labour Organization (ILO) estimates that labour-force participation fell from approximately 51–54 percent in 1990 to estimated 38.7 percent in 2024, reflecting long-term economic deterioration and conflict-related disruptions.[60,61] However, women's labour force participation has increased in some areas likely due to conflict-related demographic changes that may have driven women to compensate for absent male members. World Bank estimates women labour market participation rising from 13 percent in 2010 to 31 percent in 2022,[62] while ILO models estimate more modest increase to 13.3 percent.[63] At the same time, Syria's employment landscape has shifted dramatically toward informal and service-based work, with family businesses and the services sector absorbing much of the workforce, especially women, 86 percent of whom worked in services by 2022.[64] This puts women in a precarious position due to lack of legal and social protection, income insecurity and increasing their vulnerability to exploitation.

**Agriculture** has long been a key pillar of Syria's economy, contributing around 22 percent of GDP and nearly 25 percent of total employment in the 2000s. In rural areas, its role was even more critical, with 80 percent of rural residents relying on agricultural income by 2010.[65] However, agricultural value added declined by nearly two-thirds between 2011 and 2023, and productivity per worker fell significantly due to climate shocks, water scarcity, energy shortages, displacement of farmers, landmines, and the destruction of irrigation infrastructure. The irrigation systems damage is estimated to over USD 3.2 billion with over 60 percent of irrigated-farmers losing water access.[66]

The production of wheat halved compared to pre-conflict levels, in 2015, Syria shifted from a net exporter to a net importer of wheat.[67] Farmers now face high costs for formerly subsidized inputs, rising fuel prices, limited access to markets, and shortages of storage and processing facilities, leading to significant food losses.[68]

In 2024 and 2025, drought conditions affected over 75 percent of cultivated crops and livestock grazing areas, while erratic rainfall contributed to 90 percent failure of rain-fed crops.[69] These cli-

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[58] United Nations, (2025), Syria common country analysis: 2024 update. Available here.
[59] United Nations, (2025), Syria common country analysis: 2024 update. Available here.
[60] CEIC Data, (2023), Syria Labour Force Participation Rate (1990–2023) – Yearly %. Available: here
[61] Statistical, Economic and Social Research and Training Centre for Islamic Countries, (2024), OIC Member States in Figures: Syria. Available here
[62] World Bank, (2022), The Welfare of Syrian Households after a Decade of Conflict. Available here.
[63] International Labour Organization, (2025), Syria: Employment and environment factsheet v5. Available here
[64] World Bank, (2025), Syria Macro- Fiscal Assessment. Available here.
[65] Ibid.
[66] Food and Agriculture Organization of the United Nations, (2023), Irrigation is a top priority for agriculture. Available here.
[67] International Bank for Reconstruction and Development, World Bank, (2024), Syria Economic Monitor: Conflict, Crisis, and the Collapse of Household Welfare. Available here.
[68] United Nations, (2025), Syria common country analysis: 2024 update. Available here.
[69] Zawahri, N., (2024), Adapting to Climate Change in Conflict-Affected Syria. Available here.

mate shocks exacerbate existing conflict induced food insecurity: an estimated 14.56 million Syrians are affected, of whom 5.4 million are at risk of hunger.[70] As a result, malnutrition and stunting affect 25–28 percent of children, putting the country's future human capital at risk.[71]

The combination of repeated crop failures, economic crisis, inflation, and the impact of the war in Ukraine on global grain prices has driven a surge in food costs. Between 2020 and 2022, food prices increased by 800 percent, the steepest rise since 2013. High food prices and poor economic conditions have led the Food and Agriculture Organization of the United Nations (FAO) to classify Syria as a hunger "hot spot" and a location of continued concern.[72]

Despite these challenges, agriculture remains a vital livelihood for millions. For much of the rural population, it serves as a secondary source of income and a fall-back mechanism, forming a cornerstone for future economic recovery and the reintegration of millions of IDPs and returning refugees.

## 2.7. Land tenure

Before the 2011 conflict, roughly 62 percent of land was publicly owned and 38 percent privately held, though much of it remained unregistered or informally occupied.[73]

Rapid population growth and rural-to-urban migration (including climate induced migration) during the 1990s and 2000s led to the expansion of informal settlements, particularly around major cities such as Damascus, Aleppo, and Homs. Many low-income, displaced, and minority communities settled on unregistered or state-owned land, often without secure tenure or legal recognition. These pre-existing governance and documentation gaps created a fragile foundation for land management and made large segments of the population vulnerable to eviction, expropriation, and exclusion from formal land systems even before the crisis.[74]

Decades of unregistered land, damaged registries, and widespread informal transactions have weakened governance over land and resource management. The protracted conflict has displaced more than seven million people internally and caused extensive damage to housing, infrastructure, and land records, leaving many without legal proof of ownership or occupancy. The loss of property documentation, coupled with demographic shifts and limited institutional capacity, has increased disputes over ownership, access, and use of land. These challenges intersect with issues of gender and minority inclusion, as women and historically marginalized groups have faced structural barriers to formal ownership and inheritance, especially in the past.[75] The return of IDPs and refugees to their areas of origin will likely result in a high number of disputing claims over housing, land and property.

Access to land is further hindered by lasting and widespread risk of explosive ordnance contamination. A country-wide survey has yet to determine the full scale of contamination but estimates indicate that over 65 percent of Syrians are at risk, especially in former frontline areas.[76]

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[70] United Nations Office for the Coordination of Humanitarian Affairs, (2025), Syria Humanitarian Response Plan. Available here.
[71] Zawahri, N., (2024), Adapting to Climate Change in Conflict-Affected Syria. Available here.
[72] Food and Agricultural Organization for the United Nations, World Food Programme, (2024), Hunger Hotspots FAO–WFP early warnings on acute food insecurity. Available here.
[73] United Nations Human Settlements Programme, (2022), Land governance, natural resources and climate change in the Arab region. Available here.
[74] Norwegian Refugee Council, (2016), Housing, Land and Property in the Syrian Arab Republic. Available here.
[75] Ibid.
[76] United Nations Mine Action, (2025), Syria. Available here.

# 3. Water profile of Syria

## 3.1. Total rainfall and water availability

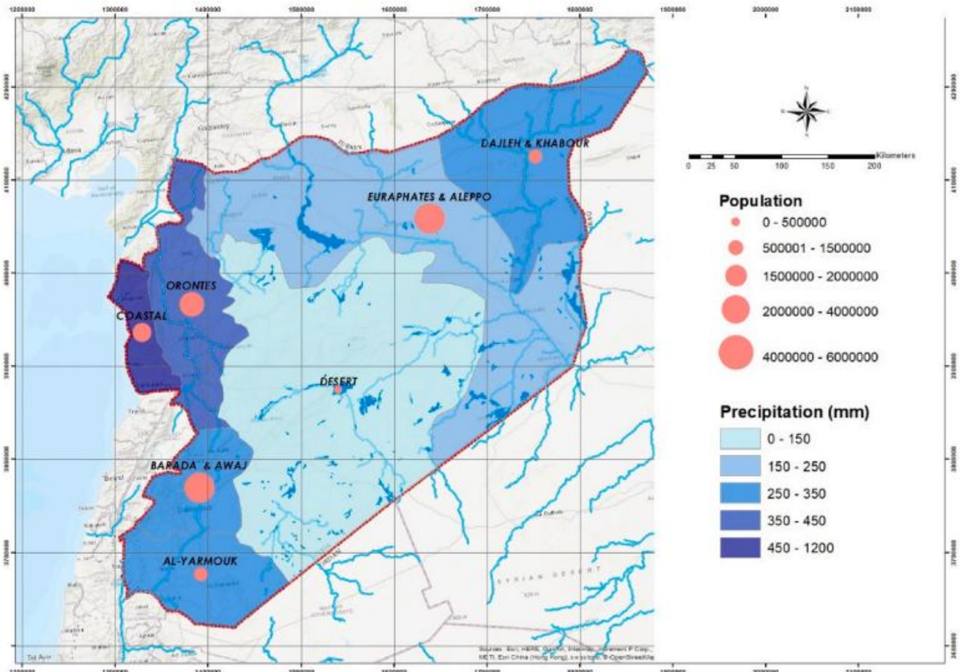


Figure 7: Hydrographic basins of Syria[77]

There is limited or outdated research on the overall water resources in Syria and the reported available estimates vary depending on period and method of calculation. The most recent estimates show Syria has access to about 16.8 billion cubic meters ($m^3$) per year of renewable water resources,[78] of which 67 percent is surface water and estimated 33 percent is groundwater.[79] The country remains in a severe water deficit of an estimated three billion $m^3$/year.[80,81] The water deficit is not constant: drought years, conflict years, changes in use, groundwater drawdown can change the balance each year. The decreasing availability of water is notably reflected in annual per capita water availability, which declined from 1,791 $m^3$ in 1995 to 882 $m^3$ in 2005[82] and is

[77] Baba, A., Karem, R., Yazdani, H., (2021), Groundwater resources and quality in Syria. Available here.
[78] The annual renewable water resources are the sum of the net surface water flow, the net groundwater flow, and the reclaimed water.
[79] Ertug E., Cagri K., van der Zwet J., Dobrescu I., (2024), Water Footprint Assessment of the Middle East. Available here.
[80] Syrian Arab Republic, Ministry of state for Environment Affairs, (2010), Initial national communication of the Syrian Arab Republic: Submitted to the United Nations Framework Convention on Climate Change. Available here.
[81] Mourad, K., A., Berndtsson, R., (2011), Syrian water resources between the present and the future. Air, Soil and Water Research. Available here.
[82] De Chatel, F., Holst-Warhaft, G., Steenhouis, T., (2014), Water scarcity, security and democracy: A Mediterranean Mosaic. Available here.

projected to decline down to 500 $m^3$ by 2050, approaching absolute water scarcity.[83] It is estimated climate change is expected to reduce Syrian water resources by approximately 1,300 million $m^3$ by 2050.[84] Consequently, the country is classified as severely water poor.[85]

Water resources in Syria are distributed among seven water basins or drainage areas: Barada and Awaj, Al-Yarmouk, Orontes, Al-Khabour, Euphrates, Desert and Coastal basin. Most of these basins are shared with other countries. Rain is the main water resource in Syria, affecting the availability of all other water resources. The water stress is therefore closely linked with precipitation and population density.

Precipitation is distributed unevenly across the country based on the five precipitation zones or agro-ecological zones.

- Zone I cover some 2.7 million hectares and have an average annual rainfall of 450–1,200 mm.
- Zone II covers about 2.5 million hectares and has an average annual rainfall of 350–450 mm.
- Zone III covers about 1.3 million hectares and has an average annual rainfall of approximately 250–350 mm.
- Zone IV has a total area of around 1.8 million hectares and an average annual rainfall of 150–250 mm.
- Zone V has approximately 8.3 million hectares and an average annual rainfall of less than 150 mm.

Humid zones are primarily located along Syria's Mediterranean coast in the west, while the eastern, northern, and southern regions consist mainly of arid and semi-arid areas. The coastal mountains block rain clouds from moving inland, causing rainfall to drop from about 900 mm on the coast to around 60 mm in eastern Syria. In a normal year, roughly fifty-five percent of the country receives less than 200 mm of rain and accounts for only twenty-seven percent of total annual rainfall, mainly in the steppe and rangelands of zone V. In dry years this area can expand to sixty-four percent, while in wet years it may shrink to about forty percent.[86]

As most precipitation occurs during the winter months (December to March), there is a pronounced seasonal variation in water resource availability. Longitudinal studies show declining trends in rainfall across country, indicating increasing water shortages and a growing risk of drought.[87] Because most rainfall in Syria occurs in winter and spring, with very little in autumn and almost none in summer, climate change is expected to further intensify the country's water scarcity.

## 3.2. Surface and ground water profiles

The seven water basins in Syria: Barada and Awaj, Al-Yarmouk, Orontes, Al-Khabour, Euphrates, Desert and Coastal basin contain Syria's 21 river systems.[88] Many of these rivers have become seasonal streams due to declining precipitation and over-extraction. Permanent rivers are mostly

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[83] Rida, F., Aw-Hassan, A., Bruggeman, A., (2004), The impact of food and agricultural policies on groundwater use in Syria. Available here.
[84] Mourad, K., A., Berndtsson, R., (2012), Water status in the Syrian water basins. Available here.
[85] Isayed A., Menendez-Aguado J.,M., Jemmali, H., Mahmoud N., (2024), Water Poverty Index over the Past Two Decades: A Comprehensive Review and Future Prospects—The Middle East as a Case Study. Available here.
[86] Jumaa, A., Al-Tibi, G., Nji, M., Pala. M., (1999), Review paper on optimizing soil water use in Syria. Available here.
[87] Zelenakova, M., Abd-Elhamid, H.,F., Krajinikova, K., Smetankova, J., Purcz, P., Alkhalaf, I., (2022), Spatial and Temporal Variability of Rainfall Trends in Response to Climate Change—A Case Study: Syria. Available here.
[88] Mourad, K., A., Berndtsson, R., (2011), Syrian water resources between the present and the future. Air, Soil and Water Research. Available here.

found in the north and west, whilst the south and east have only intermittent streams.[89] The basins also contain several lakes created as reservoirs through an estimated 140 dams.[90] Jabbul saline lake in Aleppo governorate is the only natural lake in the country.

The Euphrates (Al-Furat) river, originating in Türkiye, is the country's most significant watercourse and hosts Syria's largest reservoir, Lake Al-Assad and several hydroelectric dams: Tabqa and Tishreen dams. These dams supply Raqqa and Aleppo governorates with electricity. The Euphrates river is responsible for approximately 85 percent of surface water available in Syria.[91] All five of Syria's major rivers including the Tigris, Euphrates, Orontes, Nahr al-Kabir al-Janoubi, and Yarmouk are shared with neighbouring countries and are subject to various transboundary water arrangements. Most of these agreements are non-binding protocols or memoranda of understanding, rather than fully ratified international treaties, and they have limited enforcement or monitoring mechanisms.[92] Reduced river flows due to large-scale upstream infrastructure developments, including and particularly the building of dams, and climate change, particularly decreased snowmelt and precipitation and increased evaporation, has already led to a decrease in the volume of water reaching Syria.[93] For example, the Euphrates flow into Syria was agreed at around 500 cubic meters per second ($m^3/s$), yet in recent years it has dropped to 200 $m^3/s$ or less, representing a reduction of over 50 percent.[94] The projections show that climate change might reduce the inflow from the Euphrates, Tigris and Orontes by 695 million, 132 million and 34 million $m^3$ respectively by 2050.[95] Considering that over half of Syria's annual renewable water resources originate from cross-border flow, with the majority of it from the Euphrates, any changes to the river inflows have major impact on the water scarcity in Syria.[96] A caveat being that data collection and hydrological monitoring have been severely disrupted by the conflict, leaving limited reliable records of Syria's actual water allocations or inflows.

**Groundwater** is available in most of the country's geological formations. Folding and faulting of the geological layers has resulted in the mingling of the sub aquifer systems. Approximately 75 percent of Syria's territory is composed of sedimentary rock formations, predominantly carbonaceous units, clastic materials, and evaporites, whose geological ages range from the Triassic to the Neogene. The remaining part is mainly covered with volcanic rocks such as basalt flows from the upper Jurassic and Lower Cretaceous. Additionally, ophiolite rocks with associated volcanic-sedimentary rocks can be found in the north and northwest regions of Syria.[97]

The Regional Deep Cretaceous Aquifer (RDCA) serves as Syria's primary groundwater resource, and existing data reveal the presence of three different groundwater types within it:

1. Renewable groundwater[98] found in the RDCA outcropping area in western Syria along the coastal and Anti-Lebanon mountains.
2. Semi-renewable groundwater, found in the unconfined section of the RDCA and parallel to the renewable zone.

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[89] Kaggle, (no date), Syria river and lake shapefiles. Available here.
[90] Mourad, K., A., Alshihabi, O., (2015), Assessment of future Syrian water resources supply and demand by the WEAP model. Available here.
[91] Baba, A., Karem, R., Yazdani, H., (2021), Groundwater resources and quality in Syria. Available here.
[92] Mourad, K., A., Berndtsson, R., (2011), Syrian water resources between the present and the future. Air, Soil and Water Research. Available here.
[93] Met Office, (2025), Climate risk report for the Middle East and North Africa (MENA) region, Available here.
[94] Zawahri, N., (2024), Adapting to Climate Change in Conflict-Affected Syria. Available here.
[95] Mourad, K., A., Alshihabi, O., (2015), Assessment of future Syrian water resources supply and demand by the WEAP model. Available here.
[96] Met Office, (2025), Climate risk report for the Middle East and North Africa (MENA) region, Available here.
[97] Baba, A., Karem, R., Yazdani, H., (2021), Groundwater resources and quality in Syria. Available here.
[98] The term renewable groundwater resource refers to long-term average groundwater recharge.

3. Non-renewable groundwater found in most of the Syrian interior, where the RDCA becomes confined.[99]

This last type is of most concern, since uncontrolled withdrawal of non-renewable water in the semi-arid and arid regions of Syria results in irreversible decline in groundwater levels.

In addition to the RDCA Syria has several other important aquifers that are transboundary in nature, including Anti-Lebanon aquifer shared with Lebanon, Basalt aquifer shared with Jordan, Negene aquifer shared with Turkiye and Iraq, Upper Jezira, and the Jezira tertiary limestone aquifer system.[100]

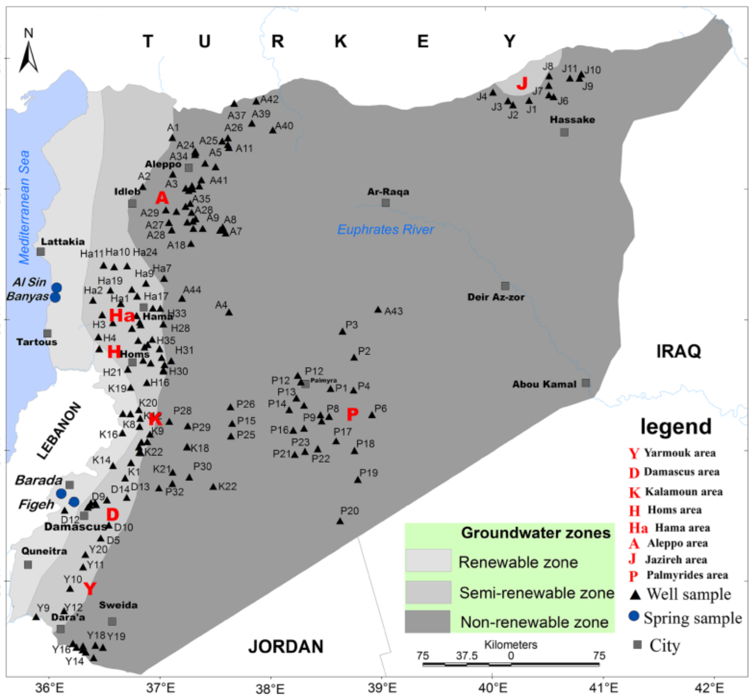


Figure 8: Distribution of geographic zones of renewable, semi-renewable and non-renewable groundwater from the Regional Deep Cretaceous Aquifer in Syria[101]

The Anti-Lebanon aquifer is a major, transboundary groundwater system shared by Syria and Lebanon, with recharge coming from high precipitation in the mountainous regions. Groundwater is stored in fractured and karstic carbonate rocks, particularly from the Jurassic and Cretaceous periods, and flows out through major springs that contribute to rivers like the Barada, Awaj, and Orontes. Total actual groundwater inflow is estimated at 1.33km3/year, of which 1.2km$^3$ is from Türkiye and 0.13km$^3$ is from Lebanon. Groundwater outflow to Israel and Jordan is estimated at 0.25km$^3$/year and 0.09km$^3$/year respectively. The aquifer feeds important springs such as the Ein al-Fijeh which provides almost two thirds of drinking-water supply of water to Damascus.[102]

[99] Al-Charideh, A., Kattaa, B., (2015), Isotope hydrology of deep groundwater in Syria: renewable and non-renewable groundwater and paleoclimate impact. Available here

[100] International Groundwater Resource Assessment Center, (2021), Transboundary aquifer world map. Available here.

[101] Al-Charideh, A., Kattaa, B., (2015), Isotope hydrology of deep groundwater in Syria: renewable and non-renewable groundwater and paleoclimate impact. Available here

[102] Koeniger, P., Toll, M., (2016), Stable isotopes of precipitation and spring waters reveal an altitude effect in the Anti-Lebanon Mountains Syria. Available here.

The shared Basalt aquifer between Syria and Jordan is an important source of groundwater for the region, and its intensive use has led to management challenges, including conflicting water policies between Syria and Jordan, particularly concerning the Yarmouk river basin.

In the Neogene aquifer system, the groundwater flow across the political borders of Türkiye and Iraq is generally directed towards river courses and salt flats. Groundwater in aquifer is generally brackish (4,000-≥20,000 mg/L Total Dissolved Solids (TDS), with relatively more freshwater in the upper layers (in the Rabia'a Plain, salinity varies from less than 1,000 to 4,000 mg/L TDS in most wells.[103]

Many aquifers are overexploited, declining and non-renewable. Both historical and contemporary data reveal that the withdrawal of groundwater significantly surpasses the natural replenishment rate in nearly all regions.[104] Groundwater recharge estimates using Surface Water Accounting Model (SWAcMOD) suggests that 28.5 percent of the rainfall recharges the groundwater system, 11.5 percent enters surface water bodies and 60.3 percent is lost via actual evapotranspiration. The area correlated with areas of high irrigation showing how agriculture activities are contributing to a decrease in groundwater levels. However, a lack of routine aquifer testing and monitoring across the country has resulted in a significant lack of essential information about groundwater resources.

The availability of water sources also varies per water basin. Assuming minimal reclamation of water in the past 14 years due to the conflict related destruction of the relevant infrastructure, the biggest dependency on groundwater is in Barada and Awaj, and Al-Khabour water basins with 93 percent of the available annual renewable water resources in the basins coming from the groundwater and only 7 percent from surface water.

Similar situation is in the Desert/Badia and Al-Yarmouk water basins with 88 percent of the available annual renewable water resources coming from the groundwater and 12 percent from the surface water sources. While more balanced, in Orontes water basin 57 percent of the available annual renewable water resources come from the groundwater and 43 percent from the surface water. Greater availability of surface water is in the Coastal and Euphrates basins with 60 and 92 percent of the available annual renewable water resources coming from the surface water sources respectively.[105]

## 3.3. Water demand and state of infrastructure

Syria has no official legislation defining water use priorities, but there is a widely accepted consensus that drinking water takes top priority, followed by agriculture and industry.[106] Updated, comprehensive data on national water demand have not been collected in the past 14 years.

Based on historic estimates, approximately 87 percent of all water in Syria is used for irrigation, domestic use accounts for about nine percent and industry four percent.[107] Water demand varies across basins, with agriculture dominating in Al-Khabour (96%) and Euphrates (80%), while domestic use is significant in small, densely populated basins such as Barada and Awaj (38%), highlighting the social vulnerability to water scarcity.

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103 United Nations Economic and Social Commission for Western Asia, Bundesanstalt für Geowissenschaften und Rohstoffe, (2013), Inventory of Shared Water Resources in Western Asia. Available here.
104 Ertug E., Cagri K., van der Zwet J., Dobrescu I., (2024), Water Footprint Assessment of the Middle East. Available here.
105 Mourad, K., A., Berndtsson, R., (2012), Water status in the Syrian water basins. Available here.
106 Food and Agriculture Organization of the United Nations, (2008), Country Profile – Syria. Available here.
107 Baba, A., Karem, R., Yazdani, H., (2021), Groundwater resources and quality in Syria. Available here.

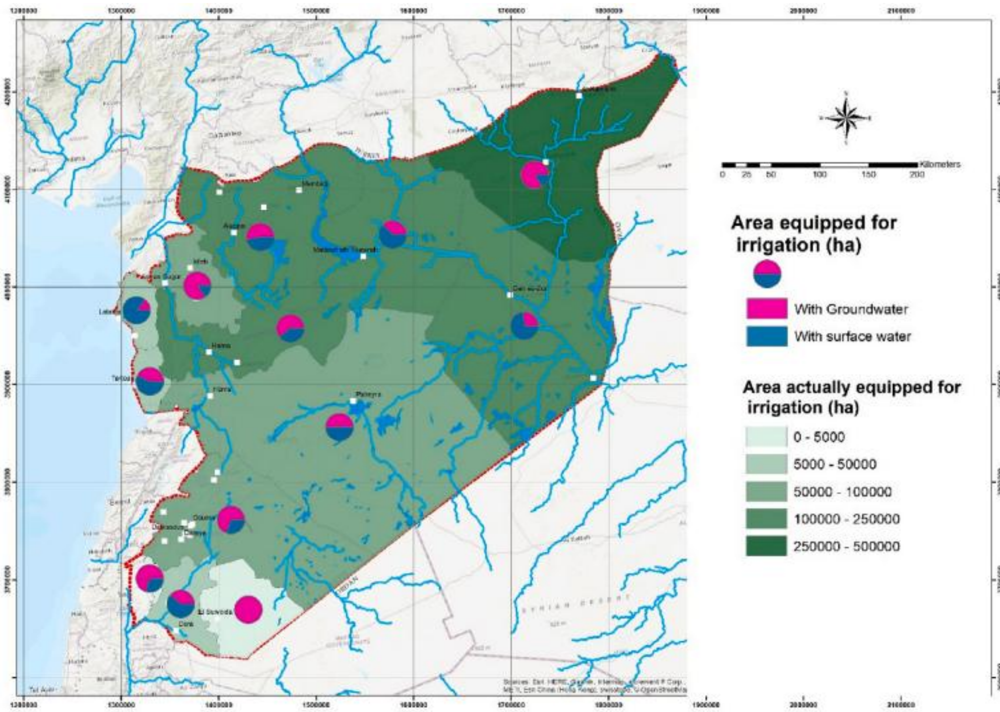


Figure 9: Area equipped for irrigation and its source[108]

Groundwater use, particularly for irrigation, increased dramatically in Syria from the mid-1980s to the late 1990s due to fuel subsidies, which shifted a large portion of agricultural fields from rainfed to irrigated cultivation. Conflict and weak regulatory enforcement have led to a proliferation of unlicensed wells; currently, over two-thirds of wells are estimated to be illegal, dug without oversight or planning.[109] The destruction of irrigation canals during the conflict has further driven farmers to over-exploit groundwater, even in areas with available surface water.

Reliance on groundwater for irrigation is estimated at 60 percent,[110] but adoption of modern, climate-smart irrigation methods remains limited. Regional studies reported that only 16 - 35 percent[111,112] of farmers use irrigation techniques (e.g sprinkles and drip irrigation) that could reduce water consumption by half and increase efficiency up to 90 percent.[113] As a result, groundwater-based agriculture contributes significantly to water stress in Syria's predominantly semi-arid regions.

[108] Baba, A., Karem, R., Yazdani, H., (2021), Groundwater resources and quality in Syria. Available here.
[109] Rida, F., Aw-Hassan, A., Bruggeman, A., (2004), The impact of food and agricultural policies on groundwater use in Syria. Available here.
[110] Alper, B., Ruwad, K., Hamidreza, Y., (2021), Groundwater resources and quality in Syria. Available here.
[111] REACH, (2025), Socio-Economic Water Survey (SEWS): Tel Tamer, Al-Hasakeh. Available here.
[112] iMMAP, (2022), Wheat value chain analysis. Available here.
[113] Lakhiar, I.,A., Yan, H., Zhang, CH., Wang, G., He, B., Hao, B., Han,Y., Wang, B., Bao, R., Syed, T., N., Chaunhdary, J.,N., Rakinbuzzaman, Md., (2024), A review of precition irrigation water saving technology under changing climate for enhancing water use efficiency, crop yield and environmental footprint. Available here.

Prior to the conflict, access to potable water in Syria was generally high, with approximately 98 percent of urban residents and 92 percent of rural residents having reliable access to safe water.[114] Significant regional disparities existed, with Damascus enjoying much higher access than for example northeastern governorates. Urban and rural populations also exhibited notable differences in water usage and sanitation infrastructure. Per capita daily water consumption averaged 125 litres in urban areas versus less than 80 litres in rural areas, and urban sewerage network coverage reached 89 percent compared with 69 percent in rural areas. Only 71 percent of urban residents and seven percent of rural residents had access to wastewater treatment facilities.[115] Despite these high coverage rates, non-revenue water was estimated at 33 percent, indicating inefficiencies in supply and management.[116]

Since 2011, the water infrastructure in Syria has experienced extensive damage due to the conflict, decreased efficiencies due to lack of preventive maintenance, spare parts, equipment, and qualified managing and operating staff, including diminished social capital linked with management of national water sources. [117] Approximately half of all pumping stations, one-third of water towers, two-thirds of water treatment plants, and one-sixth of wells were destroyed or rendered inoperative.[118] Disruptions to electricity supply and distribution networks have further limited water service provision. At the same time, adoption of household level water recycling and rainwater harvesting across Syria remains low despite its potential to mitigate acute water scarcity. Consequently, roughly half of Syria's population is water insecure,[119] relying increasingly on trucked water from humanitarian organizations or private vendors, often without proper water quality testing or treatment.[120] These combined factors have resulted in widespread scarcity, contamination, and associated public health risks.

Projected water deficits emphasize the growing challenge of water security and the need for targeted climate adaptation measures. Based on historic demand, population growth, and post-conflict infrastructure limitations, as well as taking into consideration climate change impact on water supply, six out of seven basins are expected to face significant deficits by 2030 and 2050, if no measures are implemented. The Coastal basin is the only one projected to be more balanced and retain some minimal surplus.[121]

These projections emphasize the critical need for basin-specific water management strategies balancing improvement of water systems that could reduce domestic water losses, improved irrigation efficiency, and investment in resilient infrastructure to mitigate growing water stress and support sustainable development under changing climatic conditions.

## 3.4. Water quality

Water quality across Syria has come under increasing pressure due to a combination of climatic stressors, conflict-related infrastructure damage, and longstanding over-exploitation of water resources. Low precipitation levels and rising temperatures have intensified evaporation rates, leading to a decline in both water quantity and quality as salinity and mineral concentrations increase.

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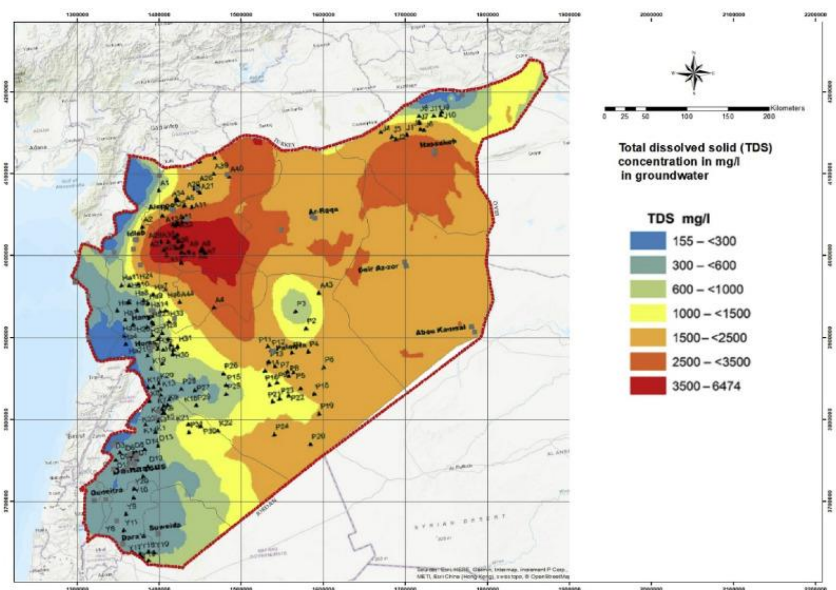
[114] International Committee of the Red Cross, (2021), Syria water crisis: Up to 40 % less drinking water after 10 years of conflict. Available here.
[115] Fanack Water, (2019), Water infrastructure of Syria. Available here.
[116] Daher, J., (2022), Water scarcity, mismanagement and pollution in Syria. Available here.
[117] Met Office, (2025), Climate risk report for the Middle East and North Africa (MENA) region, Available here.
[118] United Nation's Industrial Development Organization, (2024), Environmental and Social Management Plan for the pilot project for revitalizing Syrian agro-food sector. Available here.
[119] Zawahri, N., (2024), Adapting to Climate Change in Conflict-Affected Syria. Available here.
[120] REACH, (2023), Current situation of the water crisis in northeast Syra and its humanitarian impacts. Available here.
[121] Mourad, K., A., Berndtsson, R., (2012), Water status in the Syrian water basins. Available here

This is specifically dominant in the eastern region of Syria due to the is relatively low precipitation, and high evaporation, which facilitates the natural presence of these salts. In some regions, the situation is further aggravated by unsustainable water infrastructure design and excessive pumping, which draw saline water from deeper aquifers into upper freshwater layers, leading to progressive salinization.[122]

According to the Intergovernmental Panel on Climate Change (IPCC), there is some evidence of medium confidence that climate change can affect water quality. For example, rivers may experience higher eutrophication and increased occurrences of algal blooms at higher temperatures. In addition, droughts reduce the dilution capacity of rivers and lower groundwater levels which can concentrate contaminants and increase the risk of water source contamination.[123,124]

Approximately 17 percent of Syria's groundwater resources are of good quality with substantial renewable supplies, while 40 percent are good quality but originate from non-renewable or semi-renewable aquifers. The remaining 43 percent of groundwater contains high concentrations of sulfate ($SO_4^{2-}$) and/or sodium chloride ($NaCl$), reflecting widespread salinity issues.[125] Groundwater types vary across regions: Damascus aquifers are dominated by $NaCl$ and $MgSO_4$ types; Ar-Raqqa and Deir-ez-Zor by $MgSO_4$ and $CaSO_4$; and Aleppo City by $NaCl$ type waters, indicating elevated mineralization. In contrast, Latakia, and Tartous generally maintain better-quality groundwater due to higher rainfall and lower abstraction pressures.[126] Additionally, total dissolved solids, which is a measure of the dissolved content of all inorganic and organic substances including salts, minerals and metals, and a useful indicator of water quality, is high in groundwater across the country, particularly towards the east and northwest, including towards eastern areas of the Barada and Awaj basin.




122 Acted, Ground Water Relief, (2021), Desk Review – Al Khabour water basin.
123 Caretta, M., A., Mukherji, A., Arfanuzzaman, M., Betts, R., A., Gelfan, A., Hirabayashi, Y., Lissner, T., K., Liu, J., Lopez, E., Morgan, R., Mwanga, S., Supratid, S., (2022), Water In: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Available here.
124 United States Environmental Protection Agency, (2025), Climate Adaptation and Source Water Impacts. Available here.
125 Baba, A., Karem, R., Yazdani, H., (2021), Groundwater resources and quality in Syria. Available here.
126 Ibid.

Figure 10: TDS concentrations in groundwater across Syria[127]

Anthropogenic pollution compounds these challenges. Agricultural practices such as the use of untreated sewage for irrigation and excessive application of fertilizers and pesticides have resulted in elevated nitrate concentrations in soils and aquifers, while agricultural runoff contributes significantly to surface water pollution. Before 2011, 26 wastewater treatment plants were in operation with a total capacity of 821,000 $m^3$ per day. There were four main centralised wastewater treatment plants in the major cities of Damascus, Hama, Homs and Aleppo, and 22 smaller decentralised unit across the country. Plants in Damascus and Aleppo cities were however rendered inoperative since 2012 due to direct conflict related activity.

Overall, the number of people served by the treatment plants decreased from 13.5 percent in 2010 to three percent a decade later.[128] At the national level at least 70 percent of sewage is now discharged untreated with no less than half of the sewerage systems are out of order. This widespread system failure has contributed to elevated organic and microbial pollution in all major rivers, including the Barada and Euphrates.[129]

In addition to conventional pollutants, several sites were reportedly affected by chemical agents during the conflict. Some of these are in areas with highly permeable geological formations, increasing the risk of long-term groundwater contamination from residual chemicals.[130] Climate projections indicate that ongoing reductions in rainfall and increasing temperature extremes will exacerbate groundwater salinization and pollutant concentrations, while continued aquifer depletion will limit natural dilution and recharge. These combined pressures represent a significant barrier to the achievement of climate-resilient water management and public health protection.

Addressing these challenges requires an integrated, climate-resilient approach to water resource management. Strengthening water quality monitoring networks, rehabilitating facilities, promoting sustainable groundwater abstraction, and supporting nature-based solutions to adapt to climate-induced water stress and protect vulnerable communities from future water quality degradation.

## 3.5. Water governance

At the national level, the newly established Ministry of Energy (MoE)[131] provides overall oversight of the water sector through two complementary public entities: the General Commission for Water Resources (GCWR) and the Public Corporation for Drinking Water and Sanitation. Both institutions report directly to the MoE and work in close coordination to ensure integrated and sustainable water resource management and service delivery.

GCWR is responsible for the management, development, allocation, and protection of Syria's surface and groundwater resources at the basin and national levels. Its mandate covers all major river basins of the Syrian Arab Republic, including the Barada and Awaj. GCWR's core functions include strategic water resources planning, development of national water policies, legislation, and technical standards, licensing and regulation of water abstraction, and hydrological and hydrogeological monitoring. GCWR also leads basin-level investment planning and supervises the monitoring of water resources and water infrastructure across all basins. Through specialized directorates, such as the Integrated Water Resources Management Directorate and the Water

[127] Ibid.
[128] Daher, J., (2022), Water scarcity, mismanagement and pollution in Syria. Available here.
[129] United Nation's Industrial Development Organization, (2024), Environmental and Social Management Plan for the pilot project for revitalizing Syrian agro-food sector. Available here.
[130] Baba, A., Karem, R., Yazdani, H., (2021), Groundwater resources and quality in Syria. Available here.
[131] Presidential Decree No. 155 of 2025 created Ministry of Energy that merges Ministry of Oil and Mineral Resources, Ministry of Electricity, and Ministry of Water Resources.

Resources Information Centre, GCWR supports policy formulation and operates national databases, geographic information systems (GIS), and monitoring networks. These functions underpin climate-informed planning and sustainable water resources management under conditions of increasing climatic variability. In addition, GCWR is responsible for the operation, maintenance, and development of water projects and infrastructure under its ownership, as well as the study and design of irrigation and water infrastructure projects and the establishment of engineering standards for their implementation and operation. Capacity building and technical training of water sector staff also form part of GCWR's mandate.

GCWR operates through 13 governorate-level directorates,[132] which coordinate closely with governors' offices and are responsible for groundwater regulation, licensing, and oversight of water resource use at the local level. These directorates also supervise and coordinate with service providers to ensure that abstraction and service delivery are aligned with basin-level management objectives and national water policies.

In parallel, the Public Corporation for Drinking Water and Sanitation, hosted by the Ministry of Energy, is responsible for the operation, maintenance, and customer-facing management of drinking water supply and wastewater services. The Public Corporation oversees the operation and maintenance of water supply and sewage networks, manages service delivery to consumers, and is responsible for tariff collection and customer services to support the financial sustainability of operations. Its functions are implemented through governorate-level branches that manage assets and services within their respective service areas. At the district and municipal levels, local operation and maintenance units ensure the continuity of water services and provide direct support to consumers.

While GCWR focuses on water resource management, regulation, planning, and monitoring, the Public Corporation concentrates on service provision, infrastructure operation and maintenance, and tariff administration. The two entities cooperate closely to ensure coherence between water resource availability, abstraction controls, infrastructure performance, and service delivery. This institutional arrangement ensures that national water resource management objectives are effectively translated into reliable and sustainable drinking water and sanitation services at the local level.

The Ministry of Local Administration and Environment (MoLAE) serves as the national authority for environmental protection and sustainable development. The Ministry is responsible for setting and enforcing environmental standards, including those related to water quality, and for coordinating national and international efforts in the field of environmental protection. The Ministry hosts a national environmental database and acts as the National Designated Authority (NDA) to the Green Climate Fund, ensuring that national climate and environmental priorities are reflected in international cooperation and financing initiatives. The international climate commitments and the development of national policies are through the newly established Climate Change Directorate.

In addition to setting and enforcing environmental standards, including for water quality, MoLAE oversees a newly unified system[133] of General Directorates of Local Administration and Environment established in each governorate. These Directorates consolidate previously separate administrative and environmental functions, covering transport, sanitation, technical services, urban planning, and waste management, under a single structure. Each Directorate reports administratively to the governor and technically to MoLAE, ensuring coherent implementation of national

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[132] The Damascus and Rural Damascus Water Resources Directorate oversees water related initiatives in both Damascus and Rural Damascus governorates.

[133] Established by the decision of the General Secretariat of the Presidency of the Republic No. 1626/Q on October 1, 2025

policies at the local level. The General Director, appointed by the Minister and serving as Deputy Governor for Local Administration and Environment Affairs, supervises all local environmental, service, and development functions, ensuring that climate and environmental considerations are integrated into local planning and investment decisions.

At the district and municipal levels, District Directorates and local administrative units operationalize MoLAE's policies by implementing projects and services directly in communities. Their responsibilities include managing waste and sanitation services, supporting local adaptation initiatives, overseeing land use and urban planning, and promoting sustainable development projects. This tiered system enhances administrative decentralization and enables locally informed responses to environmental and climate-related challenges. Through this structure, MoLAE plays a central role in aligning national climate and environmental objectives with local implementation, contributing to climate-resilient infrastructure, pollution control, and sustainable water and waste management systems.

The Ministry of Agriculture (MoA) plays an important role in managing irrigation demand through promotion of efficient water use in the agricultural sector. MoA is responsible for crop planning, the introduction of modern irrigation techniques, and the dissemination of water-saving practices through its extension services overseen through the Agricultural Extension and Rural Development Department. This supports the rational use of available water resources and helps to align agricultural production systems with the realities of changing climatic and hydrological conditions. The Agricultural Extension and Rural Development Department oversees governorate level Agricultural Extension and Rural Development directorates which are further divided into sub-directorates based on administrative boundaries which oversee community level extension units delivering direct services to farmers. The units identify current problems and needs of farmers, develop relevant programs, conduct pilots and demonstrations to improve farmers skills, maintain community channels to deliver extension services, as well as monitor and follow up on economic impact of the services.

At the local level, water governance is supported through a combination of public institutions and community-based structures, particularly in areas where collective water use is important. While these structures have primarily focused on irrigation, they also provide an entry point for broader community participation in integrated water resources management. Reflecting the current focus, Water User Associations (WUAs) are established on an ad hoc basis and operate within the existing legal and institutional framework governing irrigation and agricultural water management. They are typically formed through ministerial approvals and approved by-laws and function under the technical oversight of MoA and GCWR, in coordination with local authorities. There is no standalone legislation governing WUAs.

Community-level farmer associations, alongside other specialized agricultural associations (e.g. livestock breeders or beekeepers), report to district-level farmer associations, which in turn report to governorate-level farmer unions. These are represented nationally through the General Farmers' Union, registered with the Ministry of Social Affairs and Labour and mandated to represent farmers' interests at the national level.

In areas where they fully function, WUAs play an important role in the day-to-day management of shared water infrastructure, particularly irrigation networks and collective groundwater abstractions. Their functions commonly include organizing water distribution among members, supporting routine operation and maintenance, collecting user contributions, and facilitating coordination with public institutions. In some locations, WUAs also serve as platforms for resolving water-related disputes and promoting efficient water use at the community level. Although participation of women, youth, and vulnerable groups has traditionally been limited, there is increasing recognition of the importance of inclusive approaches to strengthen local ownership, accountability, and sustainability of water management interventions.

Strengthening local water governance structures, including WUAs and farmer associations, provides an opportunity to enhance coordination between water supply, groundwater management, and agricultural demand, particularly under conditions of increasing climate variability. When supported by clear mandates, technical capacity building, and access to data and financing, local governance mechanisms can complement public institutions by translating national strategies into effective, locally informed water management practices.

While Syria has a well-defined institutional structure for water and environmental management, a number of practical challenges limit the efficiency and resilience of the system. Coordination among national and local institutions can be further strengthened to enhance integrated water resources management and climate adaptation. Data collection and hydrogeological monitoring networks require modernization to provide timely and accurate information for planning and decision-making. In some regions, technical and financial capacities of water utilities and local institutions remain limited, affecting the implementation of water efficiency and adaptation measures. Continued investment in institutional capacity building, modernization of monitoring systems, and cross-sectoral coordination will help strengthen the enabling environment for climate-resilient and sustainable water governance in line with national development and adaptation priorities.

## 3.6 National legal framework

As a result of the prolonged conflict, some national strategies related to climate change mitigation and adaptation, as well as water resource management, are currently under review, in need of updating or yet to be fully developed. The new administration is committed to strengthening and modernizing these strategies and regulatory frameworks. In the meantime, the following relevant frameworks continue to provide guidance:

**National legislation:**

Water is defined by Syrian law as a public good that is not treated according to market forces. The foundational law on water resources in Syria is **Water Legislation Law No. 31** from 2005 and related amendments and executive instructions. It regulates the use and protection of water resources, including for domestic, agricultural and industrial purposes and related licencing. It does not include incentives to encourage water users to register their wells. However, unlicensed wells are subject to fines and criminal penalties, and ultimately illegal wells can be backfilled or destroyed. The recent amendments strengthened enforcement and penalties for illegal well drilling. However, the implementation of these measures remains weak due to the recent conflict and ongoing fragmentation of the country. The law requires the installation of meters to measure quantities of water extracted from wells. However, while there are some monitoring of meters' validity and the safety of their operations, it is not performed in a regular or periodic manner. Tempering of meter readings is subject to fines, criminal penalties and revocation of licenses. Additionally, the law covers registration and participation in WUAs, which have various functions including developing programs and settling disputes.

Relatedly, **Legislative decree No. 29 from 2012 on agricultural land reclamation** set the responsibility of the supervising ministry for minimum and maximum water quotas for reclaimed irrigated lands. These are typically those developed or upgraded through public irrigation schemes and therefore subject to state regulation of water allocation. This includes monitoring of distribution and use.

Both Law No.31 and decree No. 29 are currently being revised and consolidated into a single legislature given that the oversight over all water resources, including for irrigation is now allocated to the GCWR hosted seated at the MoE. The project will leverage this institutional reform to support integrated water-land planning, ensuring that reclaimed land, agricultural water use, and community-based interventions are aligned with water availability, efficiency, and long-term water security strategies.

**Resolution No. 629 of 2007** establishes basin management committees in every governorate responsible for addressing environmental degradation, water pollution and water deficit problems in coordination with the local authorities to rationalize the use of water and water consumption in irrigation. While formal provisions are in place, the committees are currently not functioning. Should their functionality be renewed, the project will collaborate closely with these committees, providing data, technical inputs, and decision-support tools to enhance water allocation, monitoring, and dispute resolution at the basin level.

The **Environmental protection law, law No.12,** came into force in 2012. This law, consisting of 26 articles across five chapters, establishes the fundamental rules for environmental protection, pollution prevention, and sustainable development, including related water resources. It further defines the Ministry of Environment's responsibilities (*note: currently Ministry of Local Administration and Environment*) in implementing these provisions. It assigned the Ministry a wide range of duties, including setting national environmental policy and strategies, preparing legislation, monitoring environmental conditions, conducting research, regulating industries with environmental impacts, managing hazardous substances and waste, overseeing environmental assessments, and promoting biodiversity, environmental awareness, and civil society engagement. Additionally, it authorized environmental inspectors with enforcement powers, specified penalties for environmental violations such as improper waste disposal or handling hazardous materials, provides tax incentives for environmentally beneficial activities, and exempts certain environmental awareness efforts from advertising fees. The project supports the law by incorporating evidence-based environmental monitoring, minimizing infrastructure impacts, reducing leakage, and preventing pollution.

Although the project is a Category C project and does not require a full Environmental Impact Assessment under **Ministerial Decree No. 225 of 2008**, environmental safeguards are integrated through infrastructure rehabilitation, safe greywater reuse, and community awareness programs.

Project activities under Components 1 and 2 will ensure compliance with **Approved Standards No. 45 of 2007** related to key parameters and limits for drinking water quality while Components 2 and 3 will ensure compliance with **Approved Standard No. 2752 of 2008** concerned with the use of treated water in irrigating crops, **Approved Standard No. 3474 of 2009** related to disposal of treated water in watershed. While not directly linked to the proposed activities, the project will also take note and ensure awareness of **Approved Standard No. 2580 of 2008** concerned with release of treated industrial water in the general sewage network **and Approved Standard No. 2665 of 2002** related to safe use of permitted waste resulting from wastewater treatment plants.

In addition, while all project activities under Component 3 will work exclusively with and through public nurseries and extension services, all domestic propagation, demonstrations, nursery activities, and distribution of plant material will comply with national plant health requirements. This includes **Law No. 26 of 2007 on Plant Quarantine** and **Executive Instructions** embedded in **Decision No. 23/T of 2008** to ensure that locally propagated seeds and plants meet quarantine and phytosanitary standards. The project will not involve import of seeds and plant parts to Syria.

All nursery-related activities will be implemented in line with the procedural and technical framework governing plant production and propagation established under **Ministerial Decisions No.**

**31/T of 2013,** and the relevant amendments updating the technical standards and quality control requirements applicable to public nurseries and seed multiplication activities, including **Decision No. 33/T of 2021, No. 42 of 2021, No. 43/T of 2021,** and **No. 65/T of 2021.**

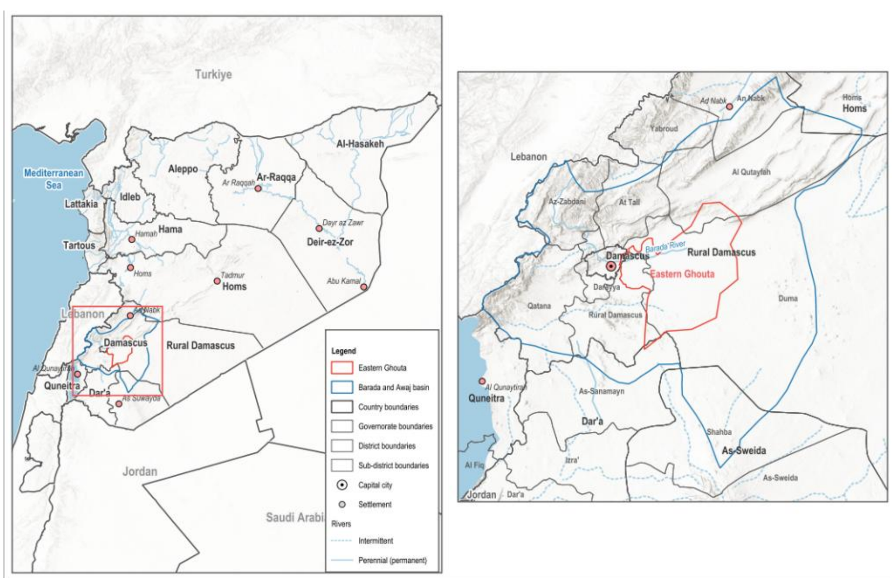
In addition, through the direct involvement of the MoA in activity design, implementation, and technical backstopping, the project will operate in accordance with **Legislative Decree No. 11 of 2007** and **Decision No. 183/T** of **2006,** which define MoA's mandate and institutional authority over public nursery operations and agricultural interventions. This approach ensures that all locally propagated plant material and demonstration plots are managed in accordance with Syrian law, preventing pest spread, maintaining seed quality, and supporting sustainable, climate-resilient agriculture.

By embedding these legal and regulatory requirements, the project strengthens institutional capacities, promotes climate adapted water infrastructure and agriculture, and contributes to sustainable, long-term water security and environmental protection. This supports long-term water security and environmental protection, directly contributing to GCF's paradigm-shifting climate adaptation objectives.

# 4. Project area profile

## 4.1. Overview of project target areas

The proposed project is located within the Barada and Awaj water basin. This basin was selected from the seven hydrological basins[134] in the country because it supplies nearly all the freshwater for the Damascus metropolitan area and supports agricultural production in surrounding peri-urban and rural communities. It is considered water-poor and highly stressed, with water availability estimated at less than five percent of Syria's total renewable water resources, while hosting approximately 21 percent of the country's population (5.7 million).[135] Its semi-arid climate, depleted groundwater, and high dependence on a few springs make it far less resilient to rising temperatures and declining precipitation than Syria's larger, more diversified basins. No




[134] Barada and Awaj, Al-Yarmouk, Orontes, Al-Khabour, Euphrates, Desert and Coastal basin.
[135] Mourad, K.,A., (2012), Marginal and Virtual Water for Sustainable Water Resources Management in Syria. Available here.

other basin is as strategically important for such a large number of people, whilst being so extremely vulnerable to the impact of climate change.

Figure 11: Project target area

The surface of the basin is estimated at approximately 8,596 km$^2$, extending across the western part of Rural Damascus governorate and slightly into the neighbouring governorates of Homs, As-Sweida and Dar'a. The hydrological characteristics of the basin are shaped by a combination of climatic variability, topography, geomorphology, geological formations, and ecological conditions. The basin includes the Barada and Awaj rivers, the Ein al-Fijeh spring system, and associated groundwater aquifers that historically sustained the Ghouta oasis surrounding the capital. Drainage networks are relatively dense along the surrounding mountain slopes, particularly in the Anti-Lebanon range, but progressively diminish and largely disappear across the flat lowlands in the southern and south-eastern parts of the basin, known as Ghouta. The project applies a two-fold focus, combining information collection, monitoring and ex-ante assessment of climate impacts on the Barada and Awaj basin, with targeted concrete adaptation techniques in Eastern Ghouta to respond to the key climate hazards identified through the basin-wide studies.

Eastern Ghouta is located to the east and southeast of Damascus and comprises a combination of urban, peri-urban, and rural municipalities, the majority of which fall within Douma district of Rural Damascus governorate. The rural areas of Eastern Ghouta contain a significant share of agricultural land, covering approximately 18,000 hectares. Historically, the area served as a key agricultural hinterland for Damascus, supplying food, livelihoods, and ecosystem services to the capital.[136]

The area has experienced significant population displacement and infrastructure deterioration as a result of prolonged conflict. Damage to drinking water networks, sewage systems, and agricultural irrigation canals has undermined service delivery and agricultural productivity. Farmers face low average incomes and heightened economic vulnerability, driven by war-related destruction, drought, and limited access to resources. Groundwater use is largely unregulated and individually managed, leading to over-extraction, declining water tables, and rising production costs.[137] While district-specific return figures are not available, Rural Damascus governorate continues to host the largest proportion of internally displaced persons in Syria (33 percent of all IDPs), and an estimated 141,393 IDPs have returned to the governorate since December 2024, including to Douma District.[138]

From a social and institutional perspective, Eastern Ghouta is ethnolinguistically homogeneous, with a population that is predominantly Arab and Arabic-speaking.[139] The absence of significant linguistic or ethnic minorities reduces barriers to communication and facilitates inclusive stakeholder engagement across the project area. Social organisation is largely community- and municipality-based, with strong local ties to land and water resources. The area also has a relatively high number of female-headed households due to the impacts of prolonged conflict, highlighting the importance of gender-sensitive approaches and equitable participation in project activities. These characteristics support the effective implementation of participatory, locally led climate adaptation interventions.

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136 Sawaan, M., (2018), History of Urban Planning and Development in the Middle East as a Context of Syrian Post-war Re-construction. Available here.
137 Acted, (2025), Stakeholder consultations – Ministry of Local Administration and Environment.
138 International Organization for Migration, (2025), Syrian Arab Republic — Population Mobility and Baseline Assessment — Round 10, Available here.
139 Acted, (2025), Stakeholder consultations – Eastern Ghouta.

Water supply in Eastern Ghouta has historically relied on a combination of surface water from the Barada river and groundwater abstraction from shallow and intermediate aquifers. Over time, population growth, urban expansion, and changes in land use have altered the hydrological balance of the area, placing increasing pressure on groundwater resources and reducing the resilience of water supply systems.[140]

The Barada river originates in the Anti-Lebanon mountain range and flows through the Damascus plain toward the eastern parts of the basin, historically culminating in Lake Otaiba in Douma district. Within Eastern Ghouta, the river gradient is low and flows are highly sensitive to upstream abstraction and seasonal precipitation.[141] In recent years, surface water availability has declined significantly due to reduced rainfall and increased demand. During dry seasons, reliance on groundwater for both domestic and agricultural use has intensified. In 2025, the river flow did not reach Eastern Ghouta at all, further accelerating groundwater depletion and increasing vulnerability to drought.[142]

Agriculture remains the primary consumer of water in Eastern Ghouta and continues to play a central role in the local economy. Although urban expansion has reduced the overall area of cultivated land, farming remains a key livelihood for a large share of households, particularly in the eastern and southeastern municipalities. The area belongs to the agro-ecological zone 4 with estimated annual precipitation of up to 250 mm. Agricultural production is characterised by small and medium-sized farms, intensive water use with largely traditional practices, and a strong dependence on groundwater irrigation. Farming systems are predominantly irrigated and include a mix of open-field cultivation and limited greenhouse production. Agriculture provides direct employment to farmers and seasonal labourers and supports related activities such as input supply, transport, food processing, and local markets.[143]

Eastern Ghouta has traditionally been known for high-value horticultural production, supplying Damascus with fresh produce. Key crops include winter vegetables (leafy greens, onions, garlic), fruit trees (apple, peach, apricot, fig), and field crops (wheat and barley for fodder). In recent years, greenhouse vegetable production, particularly tomatoes and cucumbers, has expanded in response to market demand and land constraints. While this has increased productivity on smaller plots, it has also intensified pressure on groundwater resources, especially during the dry season.[144,145]

Agricultural activities generally follow a Mediterranean planting calendar, with adjustments based on irrigation availability and local conditions. Winter cereals are typically sown in autumn (September–November) and harvested in late spring to early summer (May–June), with recent seasons experiencing delayed planting and reduced yields due to insufficient rainfall. Winter vegetables are planted in late autumn and grow through the cooler months, while fruit trees enter vegetative growth and flowering in spring (March–April), requiring careful water management.[146] Irrigation demand peaks between May and September, when rainfall is minimal and temperatures

[140] Arraf, F., (2019), Causes of Decreasing Water Balances in the Barada Awaj (Damascus) Drainage Basin until the Uprising in Syria. Available here.
[141] Ibid.
[142] AP News, (2025), Syria's driest winter in nearly 7 decades triggers a severe water crisis in Damascus. Available here.
[143] Acted, (2025), Stakeholder consultations – Eastern Ghouta.
[144] Acted, (2025), Stakeholder consultations – Eastern Ghouta.
[145] Food and Agriculture Organization of the United Nations, (2025), Climate – resilient farmer field schools revive agriculture in Eastern Ghouta. Available here.
[146] European Commission, (2025), Anomaly hotspots of agricultural production in Syria. Available here.

are highest, leading to intensified groundwater abstraction and competition between agricultural and domestic water uses.

Climate change projections for Syria consistently indicate rising temperatures, increased evapotranspiration, and more frequent and prolonged droughts, with particularly severe implications for central and southern regions (*see Section 5 for more details*). In the Barada and Awaj basin, these trends are expected to reduce groundwater recharge, increase irrigation demand, and exacerbate competition among domestic, agricultural, and environmental water uses. The basin's heavy reliance on groundwater makes it especially sensitive to these projected changes.

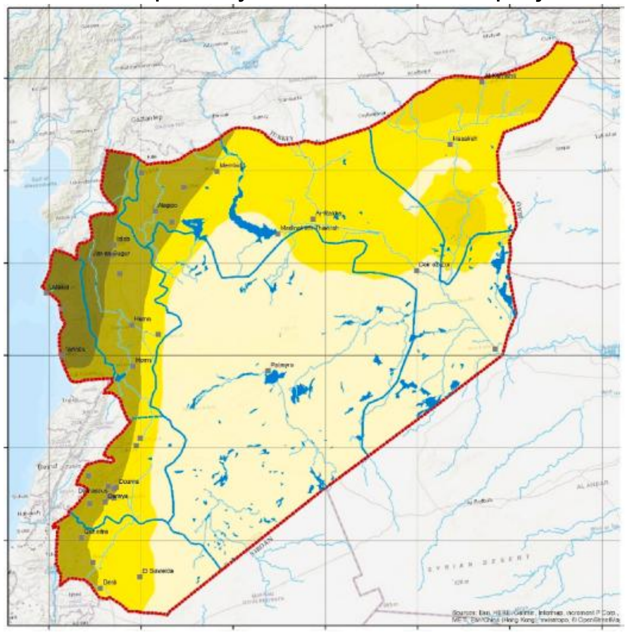


Figure 12: Agro-ecological zones in Syria[147]

Based on national assessments and consultations led by the MoLAE, Eastern Ghouta has been identified as a priority area for climate adaptation due to the convergence of climate exposure, water scarcity, population pressure, and livelihood dependence on water resources. During the project inception phase, and in close coordination with MoLAE and relevant governorate and local authorities, the project will finalise the selection of target municipalities and communities within Eastern Ghouta. This selection will be guided by agreed technical and vulnerability-based criteria, including levels of groundwater stress, reliance on shared drinking water infrastructure, agricultural water demand, and opportunities to strengthen community-level water governance and service delivery. This phased and government-led approach ensures that project interventions are strategically targeted, technically sound, and aligned with evolving local priorities, while maintaining flexibility to respond to updated data and stakeholder consultations.

The project's basin-based approach enables interventions in Eastern Ghouta to contribute to wider water security objectives for the Barada and Awaj basin. By combining improved groundwater monitoring, climate-informed planning, resilient water infrastructure, and demand management in agriculture, the project will generate evidence and operational models that can inform future investments across the basin. The location therefore provides both an urgent adaptation context and a practical platform for demonstrating scalable, locally led climate-resilient water management approaches aligned with national priorities.

[147] European University Institute, (2022), Water Scarcity, Mismanagement and Pollution in Syria. Available here.

# 5. Climate change context

## 5.1. Climate analysis

Syria is among the most water stressed countries in the world[148] and the vast majority of cropland in Syria is under high water stress.[149] Under the Representative Concentration Pathway (RCP) 8.5 business as usual climate change scenario, water stress, measured as the ratio of water withdrawals to water supply, is projected to increase by 2-2.8 times or more by 2040 in parts of Syria, including across the Barada and Awaj basin. Furthermore, climate change, infrastructure damage and inadequate management policies have resulted in increased water pollution.[150]
Future climate change projections point towards a continuation of these trends in the Barada and Awaj basin, and across Syria as a whole. The below table provides a summary of projected changes in average conditions, as well as selected indicators of extreme climate conditions as projected under the Shared Socioeconomic Pathways (SSP) [151] 2-4.5 and SSP5-8.5 climate change scenarios by 2040-59. SSP2-4.5 is the middle-ground scenario, in which social, economic and technological trends do not markedly shift from the present, whilst SSP5-8.5 is based on a scenario driven by increasing investment in fossil-fuel based development and is considered the worst-case scenario.[152]

Table 1:Summary of projected changes in average and extreme climate conditions in the project focus areas by 2040-2059 compared to 1995-2014 under middle-ground (SSP2-4.5) and worst-case (SSP5-8.5) climate change scenarios[153]

| | **Indicator** | **SSP2-4.5** | **SSP5-8.5** |
|---|---|---|---|
| **Average conditions** | Mean annual surface temperature anomaly | Focus areas: +1.7°C<br>Syria: +1.8°C | Focus areas: +2.3°C<br>Syria: +2.4°C |
| | Mean annual precipitation anomaly | Focus areas: -4.1%<br>Syria: -4.1% | Focus areas: -4.9%<br>Syria: -3.9% |
| **Extreme conditions** | Anomaly in number of hot days (>40°C) | Focus areas: +11<br>Syria: +21 | Focus areas: +21<br>Syria: + 30 |
| | Anomaly in max number of consecutive dry days | Focus areas: +3<br>Syria: +4 | Focus areas: +5<br>Syria: +4 |

## 5.2. The current climate in Syria

According to the Koppen climate zone classification, the east and southeast of Syria is predominantly arid desert (*BWh* and *BWk).*[154] In this region, known as the Syrian Desert, annual average rainfall is around 20-370 mm/year.[155] Arid steppe (*BSh*) dominates to the north of the country,

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148 Pax for Peace, (2025), Priorities for Addressing Syria's Water Security Challenges in Early Recovery. Available here.
149 World Resources Institute, (2025), Resource Watch – Water. Available here.
150 Pax for Peace, (2025), Policy Recommendations: Seven Priorities for Addressing Syria's Water Security Challenges in Early Recovery. Available here.
151 The SSPs provide estimates of future greenhouse gas emissions based on narratives of how global society, demographics and economics might change over the next century. More information here.
152 Carbon Brief, (2018), Explainer: How 'Shared Socioeconomic Pathways' explore future climate change. Available here.
153 World Bank Climate Change Knowledge Portal, (2025), Syrian Arab Republic. Available here.
154 Beck, H.,E., McVicar, T.,R., Vergopolan, N., Berg, A., Lutsko, N.,J., Dufour, A., Zeng, Z., Jiang, X., van Dijk, A.,I.,J.,M., Miralles, D.,G, (2023), High-resolution (1 km) Köppen-Geiger maps for 1901–2099 based on constrained CMIP6 projections. Available here.
155 Climate Centre, (2024), Syria Climate fact sheet. Available here.

whilst colder temperatures are found in the Anti-Lebanon mountains and the mountain belts north of Damascus. West of Damascus and along a narrow strip of fertile land bordering the Mediterranean coast to the northwest, the climate is temperate with average annual rainfall reaching 1,365 mm/year in some areas. Climate data indicates declining trends in precipitation and increasing temperatures across Syria, particularly since the early 1990s.[156]

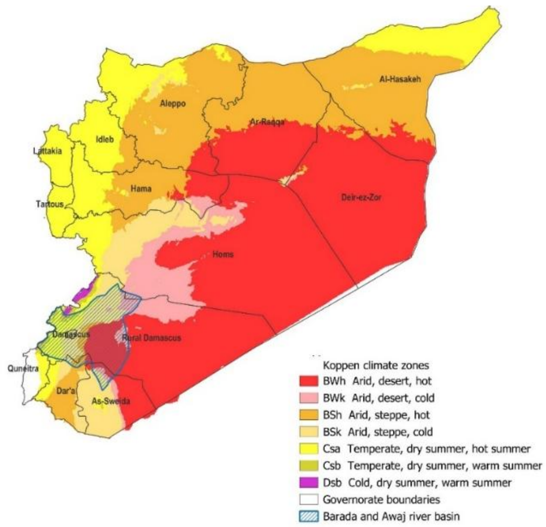
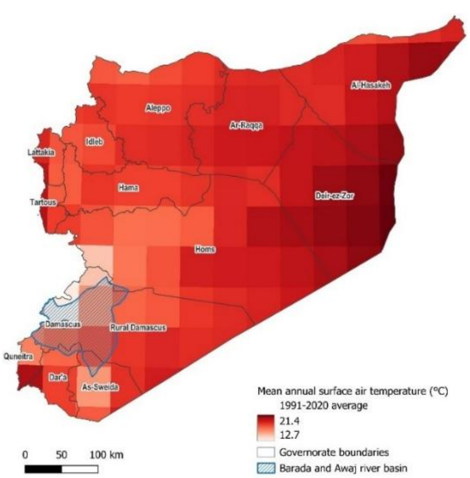
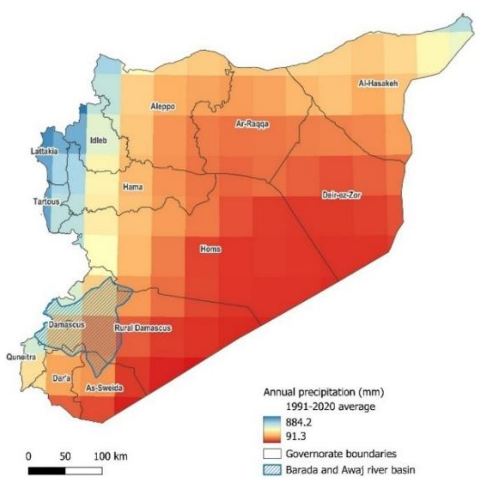



Figure 13: Climate zones in Syria according to the Koppen climate zone classification. The location of the Barada and Awaj basin is also shown[157]

The maps below indicate the annual average precipitation and temperature across Syria based on data from 1991 to 2020. Temperatures generally increase towards the east and northeast in Precipitation meanwhile is highest along the coastal and mountainous areas in the west, with the arid steppe and desert zones. Least rainfall is occurring in the east and southeast desert zones.




[156] World Bank Climate Change Knowledge Portal, (2025), Syrian Arab Republic. Available here.
[157] Beck, H.,E., McVicar, T.,R., Vergopolan, N., Berg, A., Lutsko, N.,J., Dufour, A., Zeng, Z., Jiang, X., van Dijk, A.,I.,J.,M., Miralles, D.,G, (2023), High-resolution (1 km) Köppen-Geiger maps for 1901–2099 based on constrained CMIP6 projections. Available here.

Figure 14: Annual average (a) temperature and (b) precipitation across Syria (1991-2020)[158]

### 5.2.1 Drivers of climate variability in Syria

Rainfall predominantly falls during the winter months in Syria due to westerly winds carrying moist air from the Mediterranean Sea. This results in orographic rainfall in the mountainous western areas of the country. Rainfall is thus lower in the eastern plateaus due to the rainfall shadow effect. During the summer, prevailing winds are easterly and continental, leading to hot and dry conditions in Syria.

Long-term climate oscillations such as the North Atlantic Oscillation (NAO) and the El Nino Southern Oscillation (ENSO) influence regional rainfall and temperature patterns in the Middle East.[159] The NAO is related to sea surface pressure differences between the sub-tropical (Azores) high pressure zone and the subpolar low-pressure zone. The NAO shows strong seasonal and inter-annual variability and has significant impacts on moisture and heat transport, leading to far-reaching variability in precipitation and temperature.[160] In Syria, a positive NAO tends to bring drier conditions, whilst a negative NAO can increase winter rainfall in Syria.

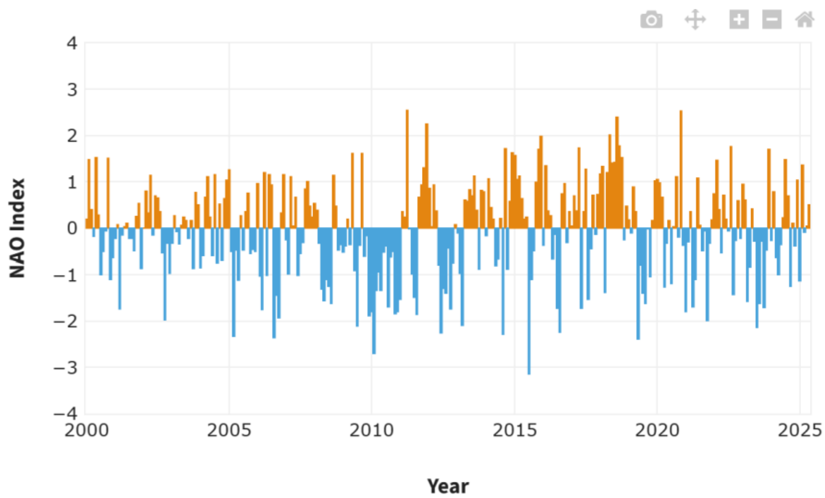



Figure 15: NAO index (2000-2025)[161]

Due to climate change, sea surface temperatures (SSTs) in the Mediterranean Sea have been anomalously high over the past 15 years, with the Eastern Mediterranean seeing the warmest SSTs observed since 1982 in 2024.[162] However, despite this leading to higher moisture availability, rainfall has in fact decreased in the region over the long term with major droughts occurring frequently in recent years. This can be partly attributed to positive NAO phases strengthening the subtropical high-pressure belt which causes sinking air, suppressing cloud formation and rainfall.

[158] World Bank Climate Change Knowledge Portal, (2025), Syrian Arab Republic. Available here.
[159] Donat, M., G., Peterson, T., C., Brunet, M., King, M., Almazroui, Kolli, R., K., Boucherf, D., Al-Mulla, A.,Y, Nour, A.,Y., Attia Aly, A., Ali Nada, T.,A., Semawi, M.,M., Al Dashti, H.,A., Salhab T.,G., El Fadli, K.,I, Muftah, M.,K., Eida, S.,D., Badi, W., Driouech, F., El Rhaz, K., Abubaker, M. ,J., Y., Ghulam, A.,S., Erayah, A.,S., Mansour, M.,B., Jemie, W.,O., Al Dhanhani, S., Al Shekaili, M.,N., (2014), Changes in extreme temperature and precipitation in the Arab region: Long-term trends and variability related to ENSO and NAO. Available here.
[160] National Centres for Environmental Information, (2025), North Atlantic Oscillation (NAO). Available here.
[161] Climate.gov, (2009), Climate Variability: North Atlantic Oscillation. Available here.
[162] Copernicus, (2024), European Ocean. Available here.

Climate change further intensifies natural oscillations such as the NAO, resulting in more intense droughts in recent years.

### 5.2.2 Climate of the Barada and Awaj river basin

The Barada and Awaj basin extends across several climate zones (Figure 16).[163] The mountainous west has a temperate climate (*Csa* and *Csb* climate zones). The central part is arid steppe, with a cold climate (*BSk*) in mountainous areas and a hot climate (*BSh*) in the lowlands. Finally, the eastern part of the basin is predominantly hot arid desert (*BWh*) with small areas characterised by a colder climate (*BWk*).

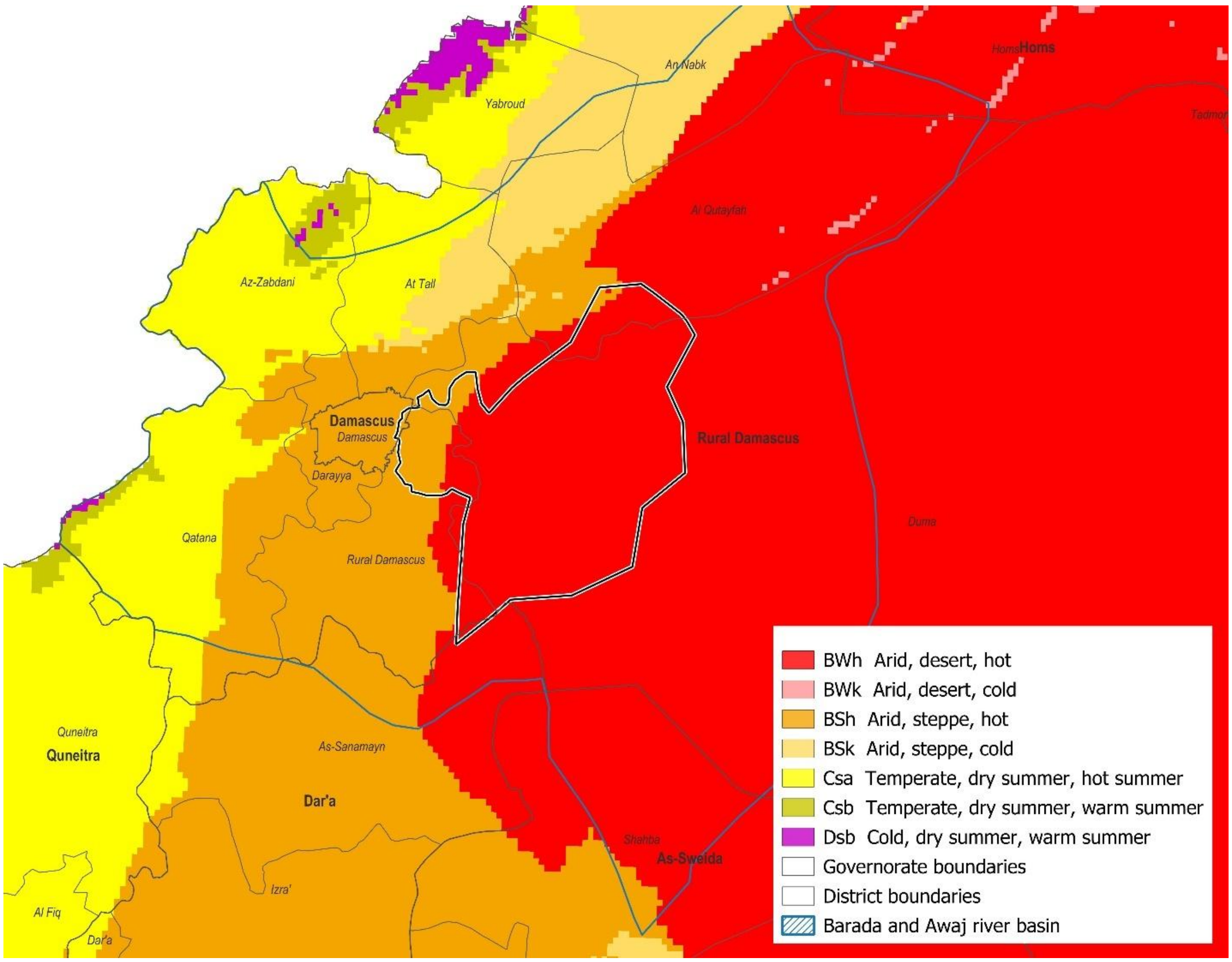



Figure 16: Koppen Climate zones in the Barada and Awaj basin[164]

Eastern Ghouta, the focus areas for this project, is located in the centre of the basin, directly east of Damascus. Parts of Eastern Ghouta is within the hot arid steppe zone (*BSh*), with a small area in the cold arid steppe (*BSk*) to the west, however, majority of Eastern Ghouta is within the hot

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[163] Beck, H.,E., McVicar, T.,R., Vergopolan, N., Berg, A., Lutsko, N.,J., Dufour, A., Zeng, Z., Jiang, X., van Dijk, A.,I.,J.,M., Miralles, D.,G, (2023), High-resolution (1 km) Köppen-Geiger maps for 1901–2099 based on constrained CMIP6 projections. Available here.
[164] Ibid.

arid desert zone (*BWh*). The project focus will include the steppe zone (*BSh*) and partially the desert areas (*BWh*).

The annual average temperature across Barada and Awaj basin between 1991 and 2020 was 17.6°C, slightly lower than the national average of 18.8°C, whilst annual average precipitation was 249.3mm/year, below the national average of 294.8 mm/year.[165] However, note that both temperature and precipitation vary significantly across the basin, with wetter and colder conditions generally found towards the west, and drier and hotter conditions in the east.

Figure 17 below shows the average monthly precipitation and temperatures in the Barada and Awaj basin. Generally, the region experiences a hot dry summer, with the hottest months being July and August, and cool to cold winters. Most rainfall occurs in the winter months, peaking in January. Snow also falls during the winter months in the mountainous regions to the west of the basin.

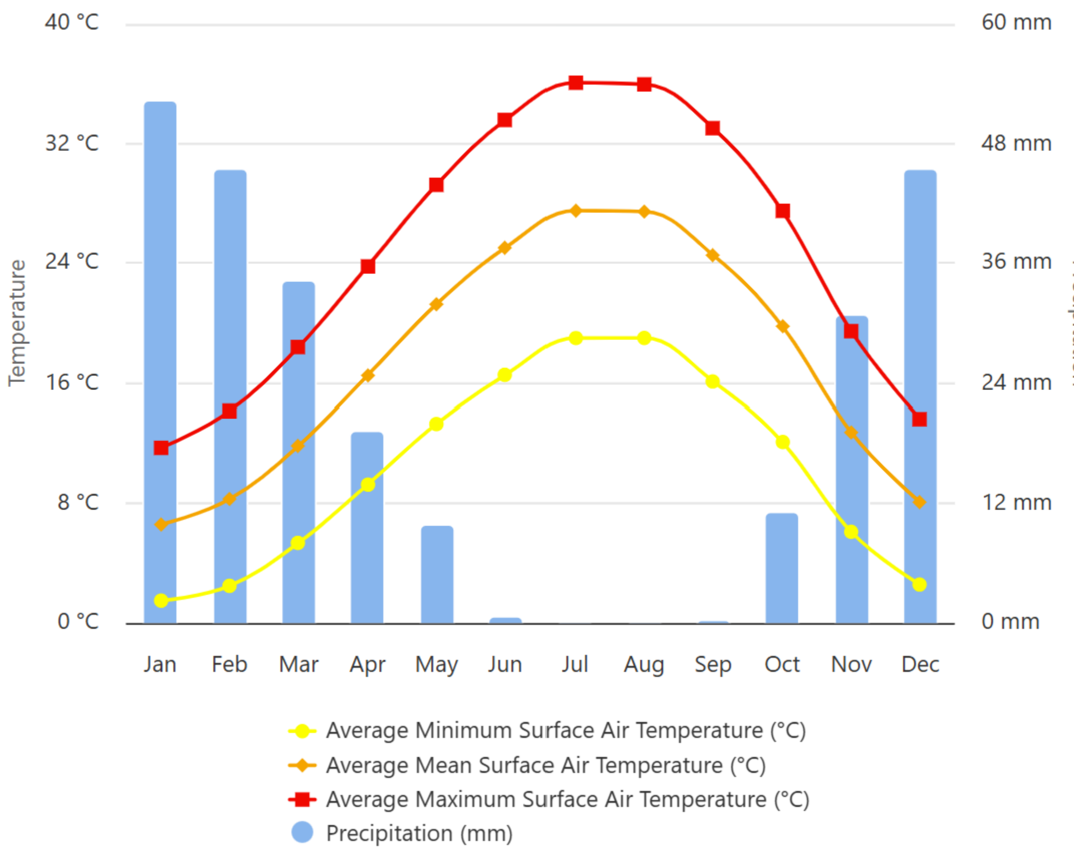


Figure 17: Average precipitation and temperature in Barada and Awaj basin (1991-2020)[166]

Aligning with national trends, temperatures in the basin have been steadily increasing since the early 1990s, reaching 18.4°C in 2024 and 2010 being the hottest year since 1900 (at 19.2°C).[167] At the same time, precipitation has shown a decreasing trend, with rainfall in 2024 being below

[165] World Bank Climate Change Knowledge Portal, (2025), Syrian Arab Republic. Available here.
[166] Ibid.
[167] Ibid.

average (245 mm) and the lowest rainfall since 1900 being observed in 2017 (123 mm).[168] Temperature shows an increasing trend, particularly since the early 1990s, whilst precipitation trends have been irregular but generally appears to be decreasing.


Figure 18: Historic trends in (a) temperature and (b) precipitation in Barada and Awaj basin, Syria (1901-2024)[169]

## 5.2.3 Climate related hazards in Barada and Awaj basin

According to Think Hazard, the main hazards in Barada and Awaj basin are water scarcity and wildfires, as well as landslides towards the mountainous west of the governorate. River floods and extreme heat present a medium hazard, whilst there is also a moderate earthquake hazard.[170] Currently drought and water scarcity are major concerns. Other environmental issues include soil erosion, sandstorm and dust storms (SdS) and desertification.[171]

*Drought*: water sources in this part of Syria are very dependent on climatic factors and observed changes in precipitation and temperature patterns in recent decades are contributing to depletion of these resources. Most streams within the Barada and Awaj basin are fed by baseflow, i.e.

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168 World Bank Climate Change Knowledge Portal, (2025), Syrian Arab Republic. Available here.
169 Ibid.
170 Think Hazard, (n.d.), Syrian Arab Republic. Available here.
171 United Nations Development Programme - Climate Change Adaption, (2025), Syrian Arab Republic. Available here.

groundwater that feeds streams primarily from seasonal springs. Additionally, rainfall creates streams in seasonal wadis, with further water coming from runoff and snowmelt.[172]

Many sources indicate significant drops in groundwater levels and recharge rates across Syria.[173,174] Droughts and seasonal trends have further adverse impacts. For example, groundwater hit a low point between Al-Zabadani and Damascus in the Barada and Awaj basin between 1989 and 1992.[175] In 2024-25, baseflow collapsed to its lowest point in over a decade, with a national average drop of 80 percent compared to the 2010-23 average.[176]

Over the past century, Syria has experienced at least seven major droughts, during which precipitation levels in the main rainy season (winter) fell to roughly one-third of the normal average. Earlier droughts typically lasted for a single season, but the three most recent events, those of 2006–2011**,**[177] 2020- ongoing, have persisted across multiple seasons. The increasing frequency of these droughts has severely limited the natural replenishment of aquifers and reservoirs. Additionally, the repeated droughts triggered widespread crop failures, the collapse of agricultural livelihoods, and large-scale migration from rural areas to urban centres.

In the late 1990s, a severe drought resulted in rainfall more than 50 percent below average, damaging wheat and barley crops in the country. Several rivers were also reported to have dried up affecting irrigated crops, whilst livestock were also reportedly adversely affected by the drought conditions.[178]

Between 2006-10, Syria and the wider region was hit by a significant drought. At the time it was the worst drought in the instrumental record, leading to widespread agricultural losses, livestock deaths and widespread migration of farming families to urban areas. Studies suggest that the drought was very unlikely to have occurred without the long-term drying trend associated with anthropogenic climate change that has been observed in Syria.[179]

From 2020 to present, there have been a series of extremely dry seasons across Syria, leading to very low water levels in rivers and reservoirs, dried springs and reduced groundwater availability, affecting irrigation and domestic water availability. The 2025 winter was reportedly the driest in 70 years in the Damascus area.[180] International Federation of Red Cross (IFRC) reported that as of April 2025, an estimated 1.2 million people were affected by the drying of the Barada river and springs, coupled with the near total collapse of irrigation systems resulting from conflict damage. Agricultural as well as household water availability was reported to be inadequate.[181] About

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172 Arraf, F., (2019), Causes of Decreasing Water Balances in the Barada Awaj (Damascus) Drainage Basin until the Uprising in Syria. Available here.
173 Mery Corps Crisis Analysis – Syria, (2025), Situation Report - Parched Foundations: Syria's Slide into Protracted Drought. Available here.
174 Syrian Future Movement, (2025), Syria's Water Crisis Between Climate Change and Dysfunctional Management. Available here.
175 Arraf, F., (2019), Causes of Decreasing Water Balances in the Barada Awaj (Damascus) Drainage Basin until the Uprising in Syria. Available here.
176 Mery Corps Crisis Analysis – Syria, (2025), Situation Report - Parched Foundations: Syria's Slide into Protracted Drought. Available here.
177 Gleick, P.,H., (2014), Water, Drought, Climate Change, and Conflict in Syria. Available here.
178 Food and Agricultural Organization of the United Nations, (1999), Special Report: drought causes extensive crop damage in the near east raising concerns for food supply difficulties in some parts. Available here.
179 Kelley, C.,P, Mohtadi, S., Cane, M.,A, Kushnir, Y., (2015), Climate change in the Fertile Crescent and implications of the recent Syrian drought. Available here.
180 Euronews, (2025), Lowest winter rainfall in Syria for almost 70 years triggers water crisis in Damascus. Available here.
181 International Federation of Red Cross Go, (2025), Syria Droughts 2025. Available here.

30 percent of the agricultural land in Rural Damascus was reportedly out of service as of June 2025 due to the depletion of wells, increasing food insecurity.[182]

A report from World Weather Attribution states that extreme drought across Syria observed since 2020 was significantly worsened due to rising temperatures resulting from anthropogenic climate change.[183]

*Heatwaves:* due to high temperatures, low humidity and high evapotranspiration across the region, heatwaves remain a significant hazard. Heatwaves can further reduce soil moisture and magnify the effects of droughts, further stressing crops and livestock.

High temperatures during critical crop growing periods such as flowering and grain filling can cause significant losses in staple crops. This includes up to 27 percent losses in wheat yields per 2°C temperature increase and 10-15 percent losses of barley under heat stress. In addition, plants are weakened under heat stress, making them more susceptible to pests and diseases.[184] Furthermore, heatwaves also lead to higher demand for irrigation, putting more pressure on groundwater and surface reserves.

*Sand and dust storms:* sand and dust storms (SdS events damage crops, causing damage due to abrasive particles, reducing soil fertility due to loss of topsoil, as well as causing contamination of water sources and leading to health issues for livestock.

Syria is regularly affected by SdS, including around the project area.[185] In 2015 for example, a sandstorm hit Damascus and the surrounding area. The event struck unseasonally in September and led to deaths and hundreds of asphyxia cases, whilst also causing damage to agriculture and the environment.[186]

It has been suggested that the likelihood of the 2015 event was exacerbated due to recurrent droughts and an increase in hot and dry days.[187] However, some sources indicate that decline of agriculture in northern Syria, leading to reduction in vegetation cover, as well as soil damage due to military activity were driving factors.[188] This highlights how climate change, and conflict interplay to increase the likelihood and severity of climate and environmental hazards.

*Desertification* is a type of land degradation occurring in arid and sub-arid areas involving the gradual loss of soil productivity and the thinning of vegetation cover in transitional zones.[189] It is a major environmental issue in Syria and data from United Nations Convention to Combat Desertification (UNCCD) indicates that 4.43 million hectares, equivalent to 23.79 percent of Syria's total land area was degraded as of 2019.[190] Much of the land in Barada and Awaj basin is degraded (Figure 19).

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182 Syrian Future Movement, (2025), Syria's Water Crisis Between Climate Change and Dysfunctional Management. Available here.

183 World Weather Attribution, (2023), Human-induced climate change compounded by socio-economic water stressors increased severity of drought in Syria, Iraq and Iran. Available here.

184 Hobi, S., Taha, A., (2025), The Compounded Impact of Climate Change and Armed Conflict on the Agri food Sector in Northwest Syria. Available here.

185 Food and Agricultural Organization of the United Nations, (2025), FAO mitigates sandstorms impact on agricultural production in Syria. Available here.

186 Syrian Arab News Agency, (2015), Environment Ministry: Plans for avoiding dust storms in the future. Available here.

187 Ibid.

188 The Washington Post, (2015), Syria's war helped create an epic dust storm, scientists say. Available here.

189 United Nations Convention to Combat Desertification, (n.d.), UNCCD frequently asked questions (FAQ). Available here

190 United Nations Convention to Combat Desertification, (2019), Syrian Arab Republic. Available here.

In Syria, desertification is driven by a combination of factors including weak land and resource management and increasing droughts due to climate change. Whilst the steppe has been grazed sustainably by nomadic pastoralists for centuries, who set aside protected non-grazing areas to allow for ecological restoration, the modern Syrian state focussed on maximising agricultural output and set up an open access system, which led to overgrazing.[191] Degraded vegetation is not able to regenerate naturally due to overgrazing, which destroys seedlings in the spring, leading to desertification and soil erosion.[192] Soil erosion meanwhile is increased as topsoil is no longer protected by vegetation cover. In general, desertification processes are leading to a reduction in productive lands and ecosystems, putting more pressure on agricultural livelihoods.[193]

Dust and sandstorms are already an environmental hazard in Syria. However, these phenomena have increased in number due to the degradation of vegetation cover by overgrazing, desertification, soil degradation and salinization, poor agricultural practices and climate change. These events also cause respiratory health problems, reduce air quality, reduce visibility, and can damage crops. [194]

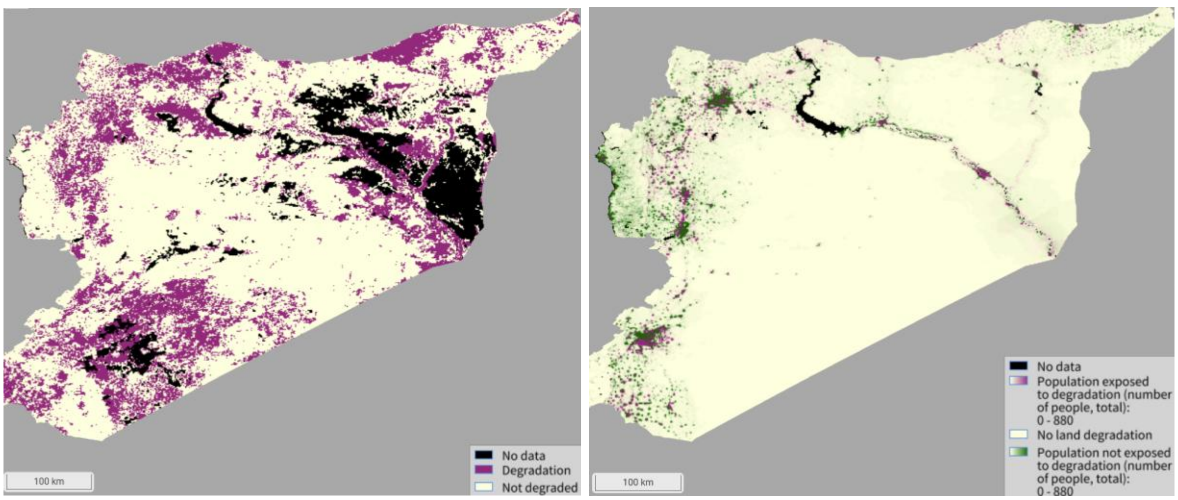


Figure 19: (a) land degradation in Syria as of 2019, and (b) population exposed to land degradation[195]

## 5.3 Future climate projections

Climate change projections predominantly indicate that recent climatic trends will continue in the same direction, with further increases in temperature and drops in precipitation. Looking at projected changes in the Köppen-Geiger zones (Figure 20), there is a clear expansion of the hot arid desert zone (*BWh*) which is projected to migrate towards the west, engulfing large areas of cold arid desert (*BWk*) and cold arid steppe (*BSk*) under both SSP2-4.5 and SSP5-8.5 scenarios by 2041-70.[196] These trends reflect desertification processes across Syria.

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191 Serra, G., (2015), Over-grazing and desertification in the Syrian steppe are the root causes of war. Available here.
192 Hypotheses, (2024), Degradation of the vegetation in Northern Syria: past and present. Available here.
193 United Nations Human Settlements Programme N Habitat, (2022), Pursuit of environmental sustainability and climate resilience through urban recovery in Syria. Available here.
194 Ibid.
195 UN Convention to Combat Desertification, (2019), Syrian Arab Republic. Available here.
196 Beck, H.,E., McVicar, T.,R., Vergopolan, N., Berg, A., Lutsko, N.,J., Dufour, A., Zeng, Z., Jiang, X., van Dijk, A.,I.,J.,M., Miralles, D.,G, (2023), High-resolution (1 km) Köppen-Geiger maps for 1901–2099 based on constrained CMIP6 projections. Available here.

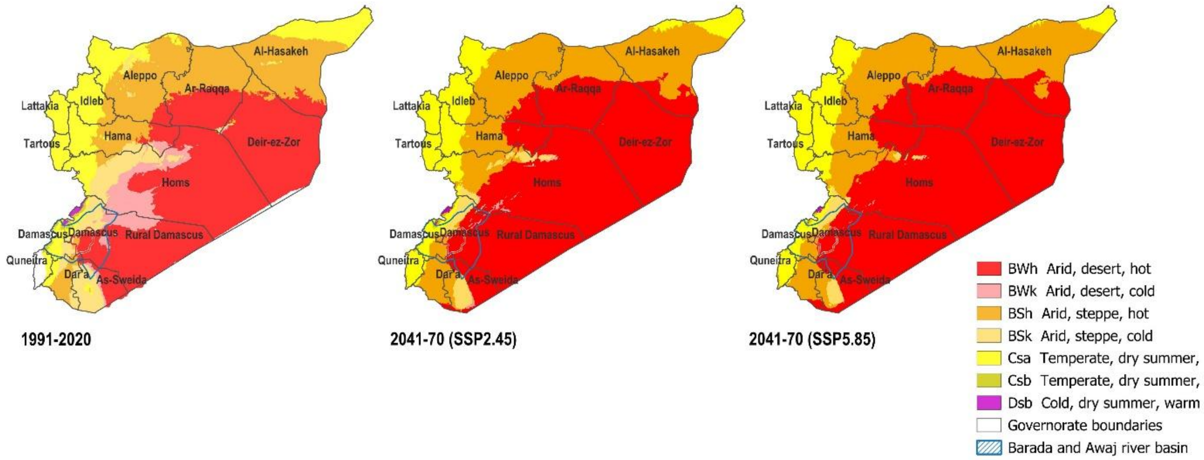


Figure 20: Projected shifts in Koppen climate zones between 1991-2020 and 2041-70 under SSP2-4.5 and SSP5-8.5 climate change scenarios[197]

***Temperature**:* Under both the middle ground (SSP2-4.5) and high emission (SSP5-8.5) climate change scenarios, average temperatures are projected to increase across Rural Damascus governorate, aligning with national trends. Figure 21 below indicates spatial trends in projected temperature changes across Syria. By 2040-59, temperature increases are relatively uniform across the country under the SSP2-4.5 scenario, falling in the +1.5-2°C range and averaging at +1.7°C in the project focus areas. Under the SSP5-8.5 scenario on the other hand, temperature increases range from +2-3°C and are projected to be highest mostly towards the east of the country. In the project focus areas, temperatures are projected to increase by 2.3°C.

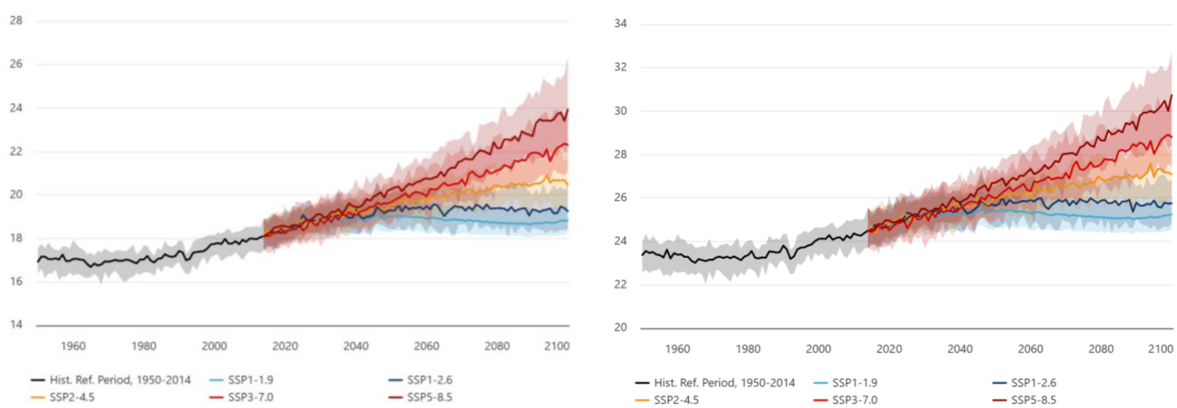


Figure 21: Historic and projected changes in average (a) mean and (b) maximum surface air temperature in Rural Damascus governorate under different climate change scenarios in reference to 1995-2014[198]

By 2080-99 meanwhile, temperature increases are projected to range from around +2.4 to 3.3°C under the SSP2-4.5 scenario, with the greatest increases in Al-Hasakeh in the far northeast and slightly lower increases in western areas including the Barada and Awaj basin. In project focus

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[197] Beck, H.,E., McVicar, T.,R., Vergopolan, N., Berg, A., Lutsko, N.,J., Dufour, A., Zeng, Z., Jiang, X., van Dijk, A.,I.,J.,M., Miralles, D.,G, (2023), High-resolution (1 km) Köppen-Geiger maps for 1901–2099 based on constrained CMIP6 projections. Available here.

[198] World Bank Climate Change Knowledge Portal, (2025), Syrian Arab Republic. Available here.

areas, temperatures are projected to increase by +2.7°C. Under the SSP5-8.5 scenario, temperature increases are projected to range from around 4.5-6.5°C, averaging at +5°C in project focus areas. Under this scenario, temperature increases will be slightly lower along the coastal and western areas of the country.

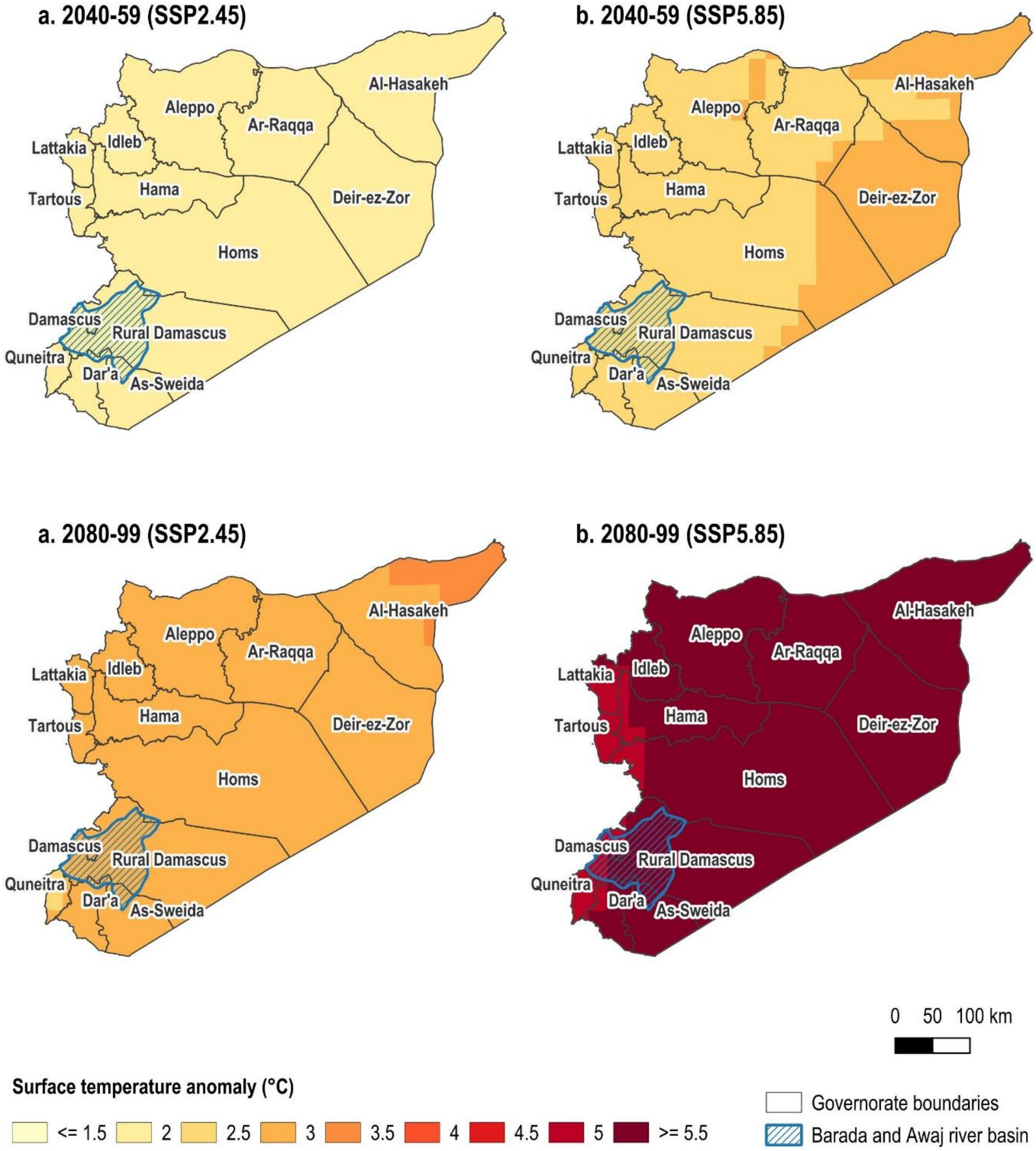


Figure 22: Projected mean temperature anomalies in 2040-59 compared to 1995-2014 under (a) SSP2-4.5 and (b) SSP5-8.5 climate change scenarios, and in 2080-99 under (c) SSP2-4.5 and (b) SSP5-8.5 scenarios[199]

[199] World Bank Climate Change Knowledge Portal, (2025), Syrian Arab Republic. Available here.

Figure 23 below shows projected month-by-month trends in mean surface air temperature anomalies up to 2100 in reference to the 1995-2014 average under the SSP2-4.5 and SSP5-8.5 climate change scenarios in Rural Damascus governorate. The chart shows that temperature changes will not be uniform, with the greatest increases being observed between July and September under SSP2-4.5 and between June and November under SSP5-8.5. This includes projected increases of 6.9°C in August by 2091-2100. Such extreme seasonal temperatures will contribute to more severe heatwaves and droughts due to enhanced evapotranspiration and soil moisture loss.

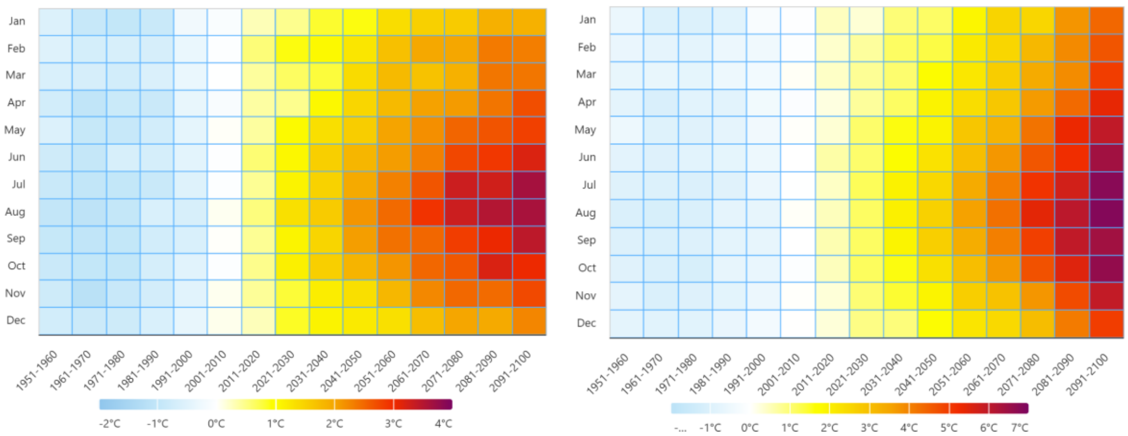


Figure 23: Month-by month projections in average mean surface air temperature in Rural Damascus under SSP2-4.5 and SSP5-8.5 scenarios in reference to 1995-2014[200]

***Precipitation:*** Annual average precipitation is projected to continue to decrease across the majority of the country (Figure 24).

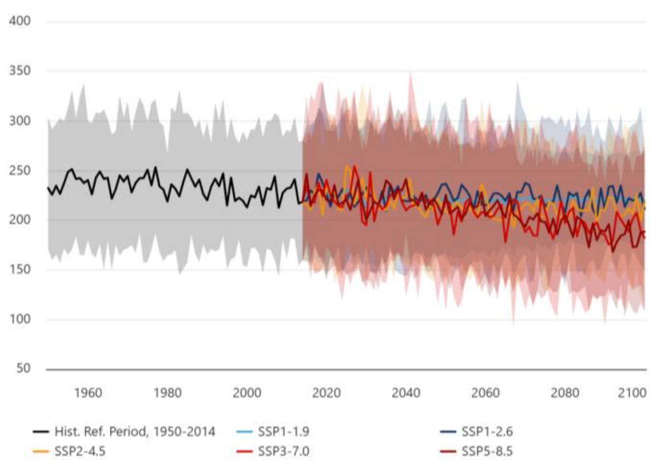


Figure 24: Historic and projected changes in average mean precipitation in Rural Damascus governorate under different climate change scenarios in reference to 1995-2014[201]

Figure 25 below indicates the projected percentage precipitation change under different timeframes and climate change scenarios. The spatial trends indicate that in general, the greatest percentage drops will be found in the north and west of the country. These are also the parts of

[200] World Bank Climate Change Knowledge Portal, (2025), Syrian Arab Republic. Available here.
[201] Ibid.

the country with the highest annual average precipitation at present. Whilst the east is projected to see more stable trends in precipitation in the short term, drops in precipitation are also expected by 2080-99.

Under the SSP2-4.5 climate change scenario, this could mean a drop of -4.1% in project focus areas by 2040-59 or -6.5% by 2080-99. The more extreme SSP5-8.5 scenario on the other hand could lead to a drop of -4.9% in project focus areas, above the national average of -3.9% by 2040-59, and a much more significant drop of -11.8% by the end of the century (2080-99).

Drops in precipitation like this are likely to lead to reduced surface and groundwater availability in the long term as well as enhanced drought conditions and soil moisture loss in the short term. These trends will be exacerbated by the projected increases in temperature.

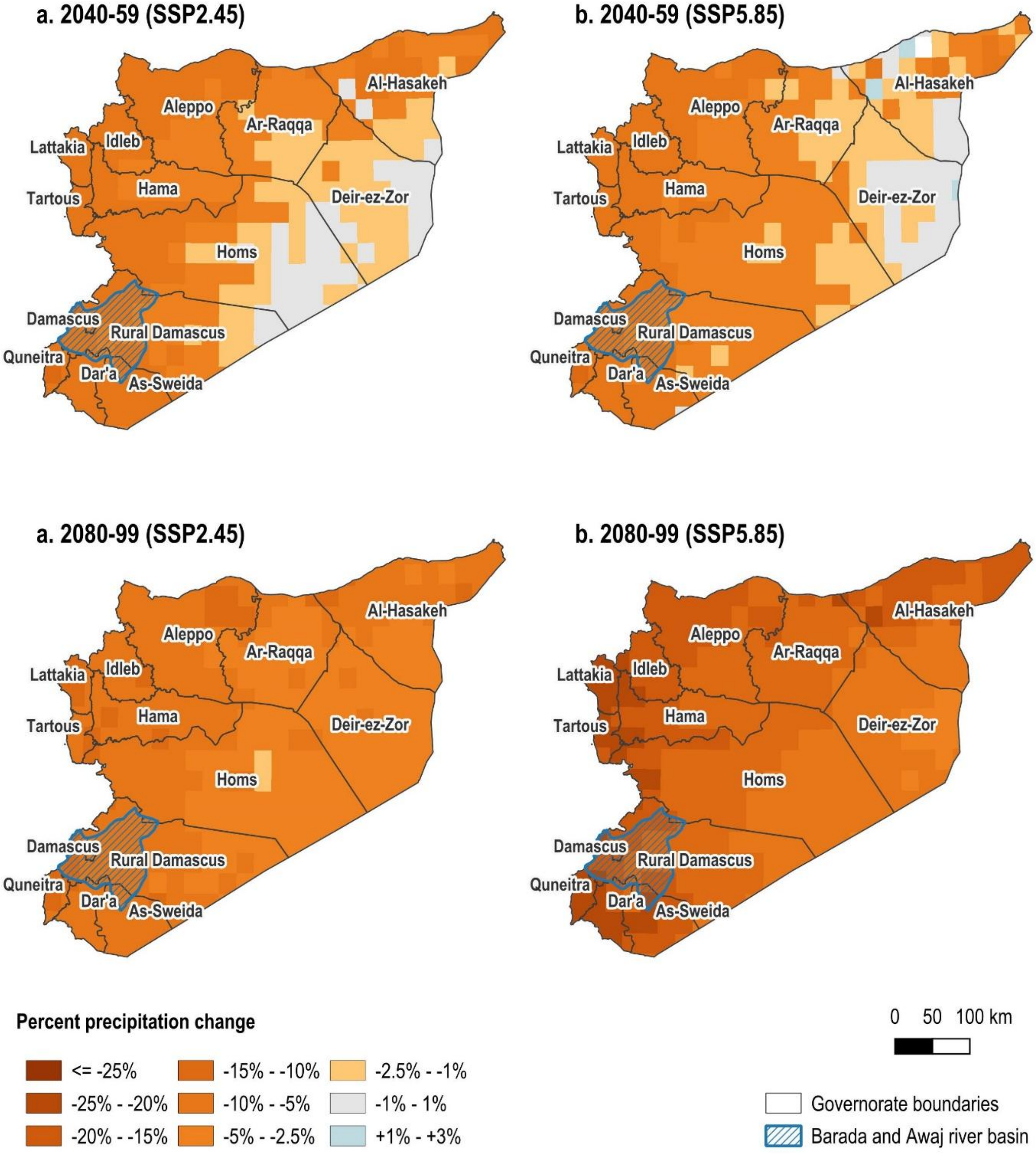

Figure 25: Projected percentage change in average precipitation in 2040-59 compared to 1995-2014 under (a) SSP2-4.5 and (b) SSP5-8.5 climate change scenarios, and in 2080-99 under (c) SSP2-4.5 and (b) SSP5-8.5 scenarios[202]

Figure 26 below demonstrates that changes in precipitation will not be unform throughout the year. December will see the greatest drying trends under SSP2-4.5 (-3 mm), whilst December to May will see the largest drying trends under SSP5-8.5 (up to -5.6 mm in January, which is the peak of the rainy season). Note that some months are also projected to become wetter, particularly in the drier summer months under SSP2-4.5, where May and October will see minor increases in rainfall (+0.5 and +0.8mm respectively).

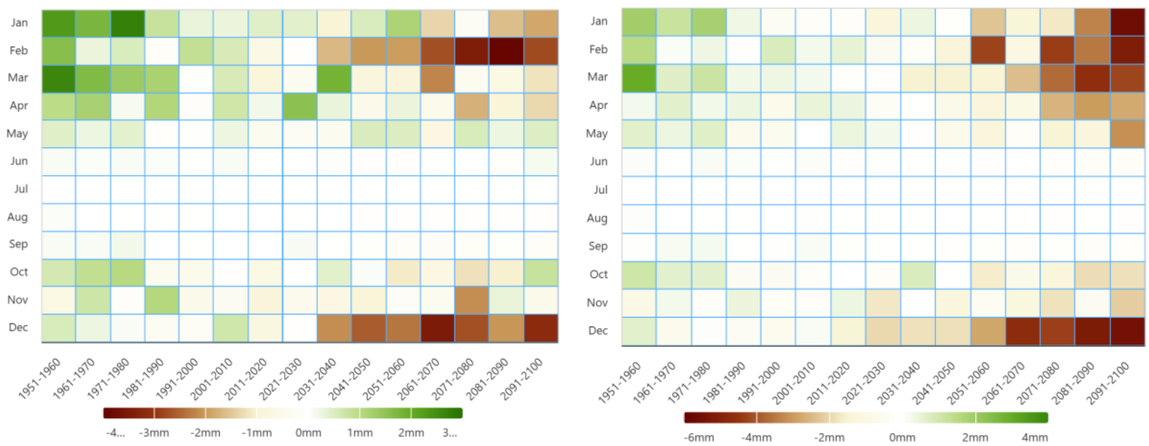


Figure 26: Month-by month projections in average precipitation in Rural Damascus under SSP2-4.5 and SSP5-8.5 scenarios in reference to 1995-2014[203]

## 5.4 Project changes in extreme events

Whilst current mean maximum temperatures in the project focus areas peak at around 38°C in July, models suggest an increase in the number of days where the maximum temperature exceeds 40°C by 11 and 21 days per year respectively under the SSP2-4.5 and SSP5-8.5 scenarios by 2040-59 and by 27 and 75 days under the same scenarios respectively by 2080-99 (Figure 27).

Furthermore, increases in the number of days where the maximum temperature exceeds 45°C are expected across Syria (Figure 28). In the project focus areas, there is projected to be a modest increase of up to 1 day under both scenarios. However, under SSP5-8.5, there could be an increase of up to 8 days in parts of the basin by 2080-99.

[202] World Bank Climate Change Knowledge Portal, (2025), Syrian Arab Republic. Available here.
[203] Ibid.

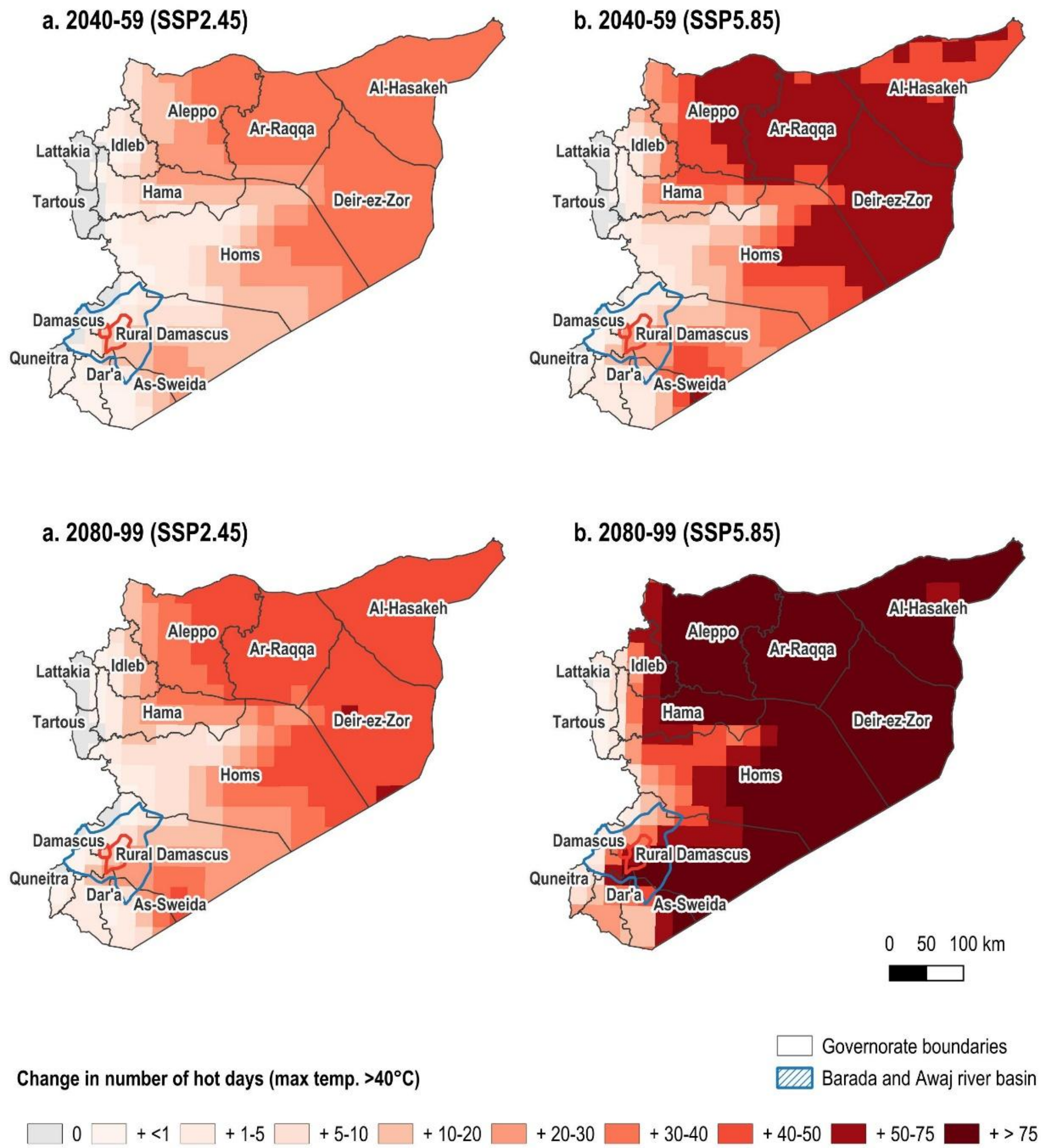


Figure 27: Projected changes in the number of hot days where the maximum temperature exceeds 40°C in 2040-59 based on (a) SSP2-4.5 and (b) SSP5-8.5 and in 2080-99 based on (c) SSP2-4.5 and (d) SSP5-8.5 climate change scenarios, in reference to 1995-2014 average[204]

[204] World Bank Climate Change Knowledge Portal, (2025), Syrian Arab Republic. Available here.

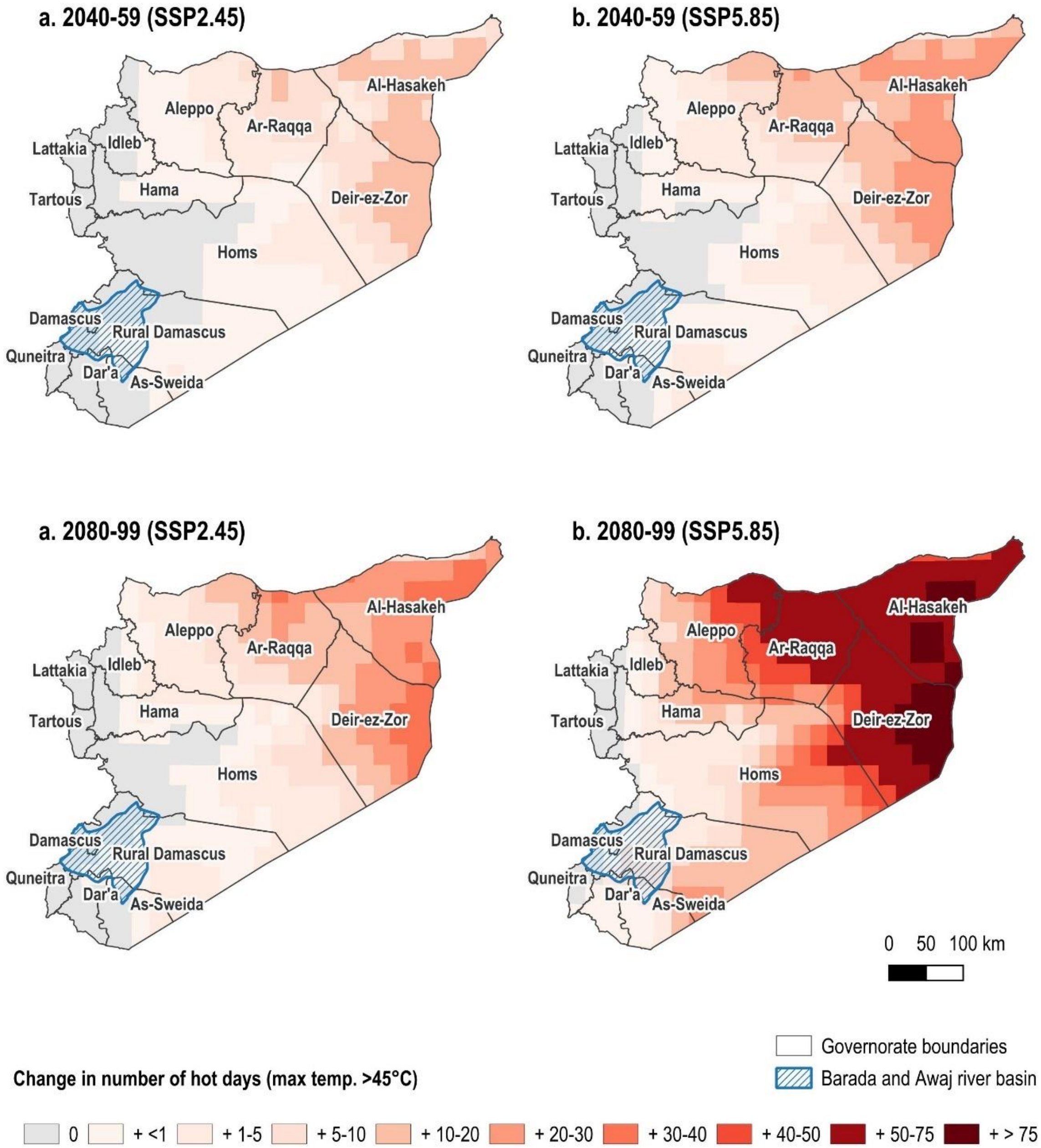


Figure 28: Projected changes in the number of hot days where the maximum temperature exceeds 45°C in 2040-59 based on (a) SSP2-4.5 and (b) SSP5-8.5 and in 2080-99 based on (c) SSP2-4.5 and (d) SSP5-8.5 climate change scenarios, in reference to 1995-2014 average[205]

Models also suggest an increase in the number of consecutive dry days, calculated as the maximum number of days in a row where precipitation is below 1mm in a given year.[206] Specifically, it is projected that by 2040-59 there could be an increase of +2.5 days under the SSP2-4.5 climate change scenario and by +5.4 days under the SSP5-8.5 scenario across project areas. By 2080-

[205] World Bank Climate Change Knowledge Portal, (2025), Syrian Arab Republic. Available here.
[206] Climate Adapt, (n.d.), Consecutive dry days. Available here.

99, this is projected to be +5.5 or +14.3 under the same scenarios respectively. This would increase water stress and adversely impact recharge rates of surface and groundwater sources, with knock on effects on water access and agriculture.

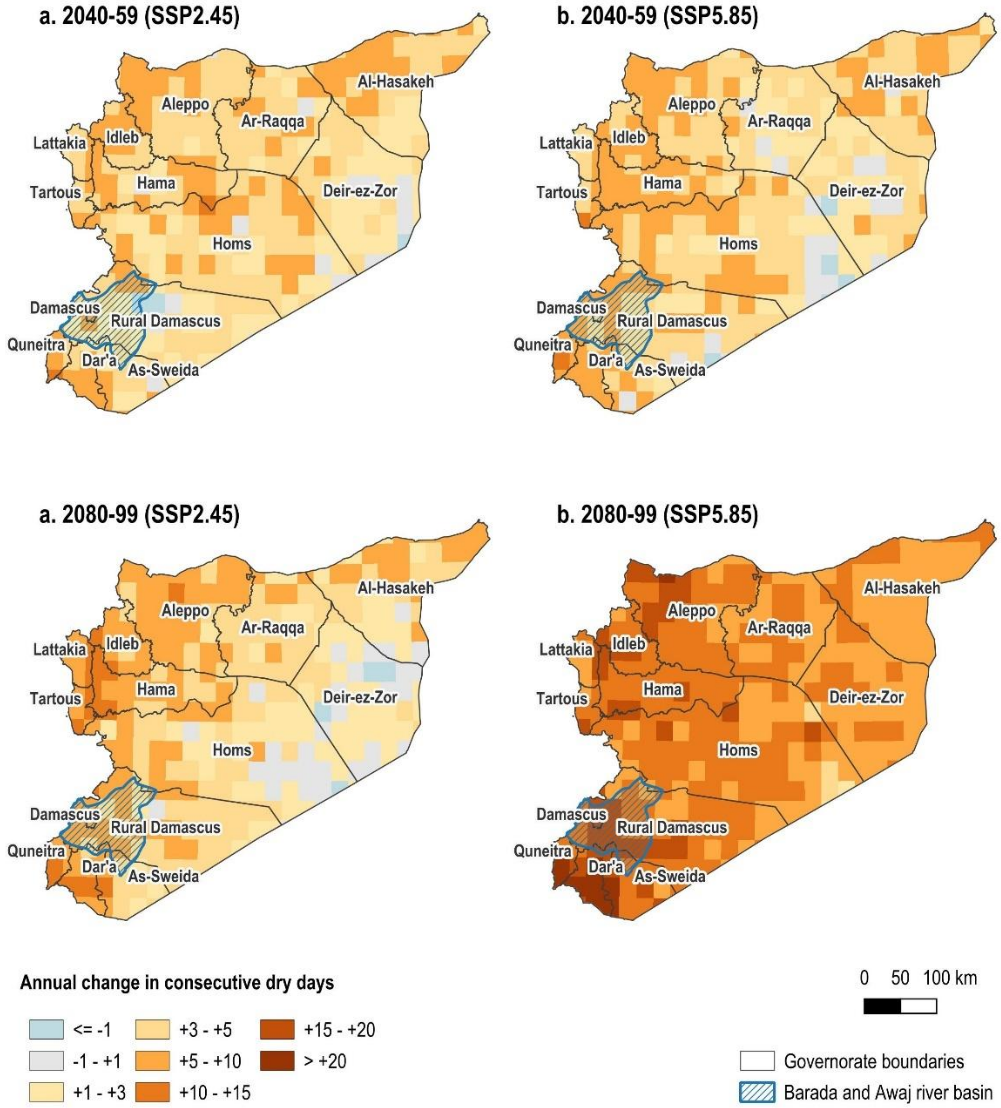


Figure 29: annual change in consecutive dry days, i.e. the maximum number of days in a row with precipitation less than 1mm in a year[207]

In a region already experiencing water depletion and overexploitation of water resources, these projected climate trends will likely lead to further adverse impacts on water access. In particular, lower rainfall will lead to less surface and groundwater recharge, whilst hotter temperatures will lead to higher evapotranspiration. Paired with increased population pressures and expanding irrigation, this is likely to result in significant increases in water scarcity in future.[208]

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[207] World Bank Climate Change Knowledge Portal, (2025), Syrian Arab Republic. Available here.
[208] Arraf, F., (2019), Causes of Decreasing Water Balances in the Barada Awaj (Damascus) Drainage Basin until the Uprising in Syria. Available here.

The extreme temperatures projected with the increase in number of hot days will increase evapotranspiration from soil, vegetation and waterbodies, intensifying droughts and increasing wildfire risk due to drier conditions. Given that the number of consecutive dry days is also projected to increase, surface and groundwater recharge is likely to be reduced. This will affect both domestic water availability, which is primarily sourced from springs, wells, rivers and reservoirs, and supplies used for agriculture, given that irrigation is largely dependent on groundwater resources. Crops will also be affected by increased heat stress which can lead to damage, whilst livestock illness and mortality may also increase.[209] Table 2 outlines some of the major impacts of climate change on agriculture. These factors will adversely affect food security and likely lead to increased market prices.

Table 2: Impacts of climate change on agriculture[210]

| Agriculture type | Climate risks | Impacts |
|---|---|---|
| Planting and crop production | • Erratic seasons<br>• Variability in rainfall volume<br>• Unstable temperatures and humidity<br>• Increased frequency of disasters | • Disturbed plant growth<br>• Difficulty estimating agricultural costs and profits |
| Livestock | • Changes in temperature and humidity<br>• Variability in water quantity and quality | • Increased stress levels among livestock<br>• Low reproductive rates<br>• New or re-emerging infectious disease outbreaks |
| Aquaculture and fishery | • Changes in water quantity and quality<br>• Increased acidity<br>• Higher water temperatures | • Mortalities in aquatic species<br>• Low reproduction rates<br>• Extinction risk for certain aquatic species |

Increased temperatures can also lead to increased pests and diseases, further impacting crops. As temperature is the most important factor affecting insect population dynamics, it is expected that warming may trigger an expansion in their geographic range, increase overwintering survival, increase number of generations, increase risk of invasive insect species and insect-transmitted plant diseases, as well as changes in their interaction with host plants and natural enemies.[211] Furthermore, human health would also be directly affected due to higher temperatures which can increase mortality and illness.

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[209] Federation of American Scientists, (2025), Impacts of Extreme Heat on Agriculture. Available here.
[210] United Nations Development Programme, (2025), How does climate change impact agriculture?. Available here.
[211] Skendžić, S, Zovko, M, Živković, I.,P., Lešić, V., Lemić, D., (2021), The Impact of Climate Change on Agricultural Insect Pests. Available here.

# 6. Vulnerability assessment

Climate hazards affecting Eastern Ghouta and Syria more broadly include rising average temperatures, declining and increasingly variable precipitation, intensification of multi-year drought cycles, and elevated evapotranspiration rates.[212,213,214,215,216] Collectively, these hazards are driving sustained reductions in surface water availability as evidenced through declining stream flows, shrinking springs, and diminished groundwater recharge resulting in progressive lowering of ground water levels across key basins of Syria, including the Barada and Awaj basin.[217,218,219] Despite the existing discrepancies and contradictions in the estimate of the water balance in the Barada and Awaj basin, all the research and reports show that the basin suffers from water depletion.[220]

## 6.1 Vulnerability of municipal water for drinking and domestic use

Municipal drinking and domestic water systems in the Barada and Awaj basin are highly **sensitive** to climate variability and change due to their strong dependence on winter precipitation, snowmelt-driven recharge, and spring- and groundwater-fed supplies. The greater Damascus metropolitan area and surrounding Rural Damascus governorate, including Eastern Ghouta, rely predominantly on groundwater and major karst springs such as Ein al-Fijeh, making household water security highly sensitive to drought, rising temperatures, and altered hydrological regimes. Due to the demands of Syria's largest city, Damascus, downstream peri-urban areas such as Eastern Ghouta are particularly sensitive.

Climate-induced reductions in precipitation and increased interannual variability directly reduce both quick flow and baseflow, stressing springs and wells that supply municipal systems.[221] Reductions in snowfall frequency and magnitude, combined with earlier snowmelt timing, further reduce delayed recharge of groundwater systems and weaken late-spring and early-summer baseflow contributions to rivers and springs.[222,223] This diminishes the natural buffering capacity of the basin during dry months, increasing the likelihood of intermittent supply and spring failure. During the exceptionally dry 2025 winter, the driest reported in approximately 70 years in the

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[212] Newman, N., (2024), Forgotten Paradise: Damascus Water Engineering and Management from Antiquity to the End of the Umayyad Period. Available here.
[213] United Nations Environment Programme, (2023), Middle East Climate Stress Atlas: Hydrological Impacts of Warming in Arid Basins. Available here.
[214] United Nations Development Programme, (2021), Syria Water Resource Management and Adaptation Strategy. Available here.
[215] Arraf, F., (2019), Causes of Decreasing Water Balances in the Barada Awaj (Damascus) Drainage Basin until the Uprising in Syria. Available here.
[216] Food and Agriculture Organization of the United Nations, (2018), AQUASTAT Country Profiles: Syrian Arab Republic Water Resources. Available here.
[217] United Nations Economic and Social Commission for Western Asia, (2023), Regional Climate Outlook for the Arab Region 2023–2024: Water Security, Drought and Adaptation Needs. Available here.
[218] Intergovernmental Panel on Climate Change, (2022), Impacts, Adaptation and Vulnerability Working Group II Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Available here.
[219] Mourad, K.,A., Berndtsson, R., (2012), Water Status in the Syrian Water Basins. Available here.
[220] Homsi, R., Shiru, M.,S., Shahid, S., Ismail, T., Harun, S.,B., Al-Ansari, N., Chau, K.,W., Yaseen, Z.,M., (2020), Precipitation projection using aCMIP5 GCM ensemble model: A regional investigation of Syria. Available here.
[221] Kelley, C.,P, Mohtadi, S., Cane, M.,A, Kushnir, Y., (2015), Climate change in the Fertile Crescent and implications of the recent Syrian drought. Available here.
[222] Alsilibe, F., Bene, K. Bilal, G., Alghafli, K., Shi, X., (2023), Accuracy Assessment and Validation of Multi-Source CHIRPS Precipitation Estimates for Water Resource Management in the Barada Basin, Syria. Available here.
[223] United Nations Children's Fund, (2023), Water, Sanitation and Hygiene (WASH) in Syria — Sector Brief. Available here.

Damascus area,[224] near-cessation of flow at the Ein al-Fijeh spring caused acute drinking water service interruptions for millions of people. This resulted in emergency reliance on private tankers and wells in Damascus and its countryside.[225] The Barada River, which historically received approximately 200 million m³ annually from the spring, [226,227] experienced a dramatic reduction in flow. By the time it reached Eastern Ghouta, flows were minimal, leaving communities without surface water and further limiting groundwater recharge of drinking water wells. These supply-side impacts are compounded by rising temperatures, which significantly increase drinking and domestic water demand during heatwaves, further intensifying water stress at the household and utility levels.

Municipal water quality is also highly sensitive to climate stressors. Reduced flows and falling groundwater tables increase contamination risks through negative pressure and intrusion in damaged networks, while low-flow conditions amplify pollutant concentrations in rivers and aquifers. Water quality analyses in the Barada and Awaj basin indicate increased contamination under drought conditions, raising treatment requirements and operational costs to meet permissible drinking water standards.[228] Rising temperatures exacerbate these risks by accelerating microbial growth in storage reservoirs[229] and distribution networks and reducing chlorine stability,[230] leading to faster decay of disinfectant residuals and heightened public health risks, including diarrheal disease.

**Exposure** to climate hazards affecting drinking and domestic water supply is heterogeneous across the basin and shaped by interactions between climatic stressors and non-climatic drivers, including rapid urban expansion around Damascus, groundwater over-abstraction, aging infrastructure, and post-conflict institutional constraints.[231] Urban growth has increased impervious surfaces, reduced infiltration, and intensified demand for water upstream, further limiting the volume and reliability of flows reaching downstream and peri-urban areas.

High-elevation recharge zones are primarily exposed to temperature-driven reductions in snow accumulation and shortened snowmelt periods, which reduce groundwater storage that historically sustained downstream gravity-fed systems.[232] Mid-basin communities dependent on springs and shallow aquifers face heightened exposure to prolonged droughts, declining recharge, and intermittent spring drying.[233]

Eastern Ghouta exhibits one of the highest exposure profiles due to its peri-urban location, high population density, and dependence on residual flows and shallow groundwater after upstream

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[224] Euronews, (2025), Lowest winter rainfall in Syria for almost 70 years triggers water crisis in Damascus. Available here.
[225] International Federation of Red Cross, (2025), Syria Droughts 2025. Available here.
[226] Smiatek, G., (2013), Hydrological Climate Change Impact Analysis for the Figeh Spring near Damascus, Syria Journal of Hydrometeorology. Available here.
[227] Kunstmann, H., (2013), Hydrological Climate Change Impact Analysis for the Figeh Spring near Damascus. Available here.
[228] Asmael, N., Villanueva, J., D., Peyraube, N., Baalousha, M., Huneau, F., Dupuy, A., Le Coustumer, P., (2021), Integrative approach for groundwater pollution risk assessment coupling hydrogeological, physicochemical and socioeconomic conditions in southwest of the Damascus Basin. Available here.
[229] Stauber, C., Miller, C., Cantrell, B., Kro, K., (2014), Evaluation of the compartment bag test for the detection of Escherichia coli in water. Available here.
[230] World Health Organization, (2017), Guidelines for Drinking Water Quality, 4th edition. Available here.
[231] United Nations Development Programme, (2023), Climate Change Risk Assessment for the Water Sector in Syria. Available here.
[232] Intergovernmental Panel on Climate Change, (2022), Impacts, Adaptation and Vulnerability Working Group II Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Available here.
[233] International Committee of the Red Cross, (2021), When Rainfall Fails: Climate Variability and Water Stress in Conflict-Affected Syria. Available here.

abstraction for the metropolitan core. During drought periods, climate-induced reductions in water availability are compounded by reallocation toward Damascus, affecting peri-urban drinking water supply. [237] As a result, households increasingly rely on private wells or water trucking, exposing them to higher costs, limited water quality oversight, and elevated public health risks.[234]

Land-use change, soil sealing, and infrastructure damage further reduce local infiltration and groundwater replenishment, while shallow and poorly protected wells are highly sensitive to declining water tables, salinization, and contamination. These impacts disproportionately affect low-income households with limited capacity to secure alternative water sources.

**Adaptive capacity** for drinking and domestic water supply in the Barada and Awaj basin, particularly in Eastern Ghouta, remains low and uneven. Chronic groundwater depletion, declining well yields, and localized salinization reduce water availability while increasing pumping depths and energy costs. Deepening groundwater levels significantly increase the cost of water supply, making access increasingly unaffordable for low-income households. Household coping strategies, such as water trucking, private storage, or deeper pumping, provide only short-term relief and are financially inaccessible for many families. Eastern Ghouta's historical role as an agricultural belt further constrains adaptive capacity. Competition between irrigation and drinking water has intensified as surface flows and groundwater levels decline.

Institutional adaptive capacity has been weakened by prolonged conflict, damage to water and infrastructure, limited operational resources, and limited data collection, monitoring and regulatory enforcement. Demographic pressures, including displacement and returns, further strain overstretched systems.[235] Overall, adaptive capacity remains low, particularly in peri-urban and downstream areas, underscoring the urgent need for climate-resilient investments that improve supply reliability, protect water quality, and address structural inequities in access to drinking and domestic water.

## 6.2 Vulnerability of agricultural production systems in the basin

Agricultural systems in the Barada and Awaj basin are highly **sensitive** to climate variability, particularly fluctuations in rainfall and temperature that directly affect crop productivity, pest pressure, and water availability. Majority of the agriculture can be found in Eastern Ghouta and is highly reliant on groundwater irrigation. [236] One study found that wheat is particularly sensitive to heat stress during key developmental stages, including germination, flowering, and grain filling. Temperatures exceeding optimal thresholds (particularly above 30-32°C) significantly reduce kernel number and weight, spikelet fertility, and ultimately yield.[237] Another study found that under heat stress in arid/desert conditions, average grain-yield declined by approximately 53.8 percent.[238] Crops such as wheat and barley can also be highly sensitive to irrigation deficits. One study found that wheat yield declined by 7 percent at 80 percent water supply, 23 percent at 60 percent water supply and by almost 50 percent at 40 percent of water supply in semi-arid regions.[239] Similar studies have also shown yield declines and plant mortality in other key crops such as fruits and

[234] United Nations Children's Fund, (2023), Urban Water Fragility and Intermittent Supply in Syria. Available here.
[235] Selby, J., Dahi, O., S., Fröhlich, C., Hulme, M., (2017), Climate change and the Syrian civil war revisited. Available here.
[236] Syrian Future Movement, (2025), Syria's Water Crisis Between Climate Change and Dysfunctional Management. Available here.
[237] Singh, H., (2024), Impact of high temperature on wheat (Triticum aestivum) crop – review. Available here.
[238] Ghazy, A., I., Al Ateeq, T., K., Ibrahim, E., I., Abdel-Haleem, H., Attia, K., A., Azab, O., Al-Doss, A. ,A., (2025), Selection of heat stress tolerant wheat genotypes for desert environments. Available here.
[239] Shoukat H., B., Ishaque, W., Ahmad, S., Ali, S., El-Sheikh, M., A., (2025), Optimizing wheat productivity and water productivity through deficit irrigation strategies in semi-arid environments. Available here

vegetables.[240,241] Agriculture in the Barada and Awaj basin is highly sensitive to drought and heat-waves, and projected increases in temperature alongside declining precipitation are likely to cause significant yield reductions in key crops such as wheat, barley, and vegetables that are central to national food security. Agriculture in the basin is also highly sensitive to sand and dust storms, which strip fertile topsoil, damage crops through abrasion, reduce photosynthesis, and increase irrigation needs, further stressing already scarce water resources. One study found that SdS caused yield declines of 1.5-24 percent for grains such as wheat and barley, depending on severity and exposure.[242] Another study found that additional dust-storm days were associated with a 5-9 percent reduction in vegetable yields and a 9.2 percent reduction in fruit yields in agricultural settings, as dust deposition inhibits photosynthesis and leaf function.[243]

**Exposure** of farmers and agricultural systems in the Barada and Awaj basin is high due to significant variability in rainfall and temperature. Western mountainous areas experience moderate exposure because orographic rainfall provides some buffering against dry spells, whereas central and eastern arid zones including Eastern Ghouta face high exposure to prolonged dry periods, reduced rainfall, and increasing frequency of extreme heat events, with days exceeding 40°C becoming more common. Rainfed areas and locations with shallow groundwater are particularly vulnerable, as deficits in precipitation and high evapotranspiration directly reduce soil moisture availability, affecting agricultural outputs. Overall, the basin exhibits heterogeneous exposure: eastern and central districts (key areas targeted by this project) are highly exposed to climate variability, while western elevated regions show relatively lower exposure.

**Adaptive capacity** of agricultural communities in the Barada and Awaj basin is constrained by limited improvements in human, physical, and economic assets over recent decades. Human capital remains low, with minimal increases in climate-resilient agronomic knowledge and skill levels among farmers and extension services, reflected in persistent reliance on traditional irrigation and limited uptake of efficient technologies.[244] This lack of adaptive capacity is evidenced in declining productivity of the agricultural sector in the country - national data shows up to 60 percent drop in domestic wheat production in recent severe drought periods compared to historical averages.[245] Total assets, including access to reliable water, irrigation equipment, and financial reserves, are also uneven: peri-urban irrigators retain somewhat better infrastructure, while rural and eastern zones face deteriorating well yields and rising costs due to deeper pumping and fuel scarcity, reducing their ability to invest in adaptation.[246] Low institutional capacity, and lack of reliable data to ensure climate-risk informed planning also hinder adaptation among farming communities in the basin. These trends suggest that most farmers' adaptive capacity is currently weak or declining in response to increased climate variability, underscoring the need for investments in the area.

[240] HortScience, (2025), Heat stress in hydroponic tomato cultivation significantly reduces yield (approx. 37%–98%) under high temperatures. Available here.
[241] ScienceDirect, (2023), Drought and water deficit conditions reduce tomato and eggplant yield by 16%–94% depending on irrigation level. Available here,
[242] Ahmadzai, H., Malhotra, A., Tutundjian, S., (2023), Assessing the impact of sand and dust storm on agriculture: Empirical evidence from Mongolia. Available here.
[243] Ibid.
[244] Acted, (2025), Stakeholder consultation – Eastern Ghouta.
[245] Syrian Future Movement, (2025), Syria's Water Crisis Between Climate Change and Dysfunctional Management. Available here.
[246] Acted, (2025), Stakeholder consultation – Eastern Ghouta.

## 6.3 Impact of climate change on resource use conflicts

Climate change poses a significant risk of exacerbating resource-use conflicts in Eastern Ghouta, primarily through its effects on water and land availability. Increasingly scarce water resources, combined with pre-existing governance and allocation challenges, could heighten tensions at household and inter-sectoral levels. Climate-induced reductions in precipitation, declining groundwater tables, drying springs have reduced both agricultural and municipal water supply, undermining agricultural production and household well-being. Damaged infrastructure and deteriorating water quality have increased operational costs of water utilities, and accelerated land degradation. These pressures force farmers to abandon land or engage in unsustainable water abstraction practices, which can intensify disputes over well access, irrigation schedules, and land use. Resource pressures are particularly acute in peri-urban areas, where the expansion of Damascus increases demand for limited water, often prioritizing urban supply over rural and peri-urban communities, deepening inequalities in access.

The consequences of these stressors include crop failures, declining pasture quality, livestock losses, atypical animal movements, increased competition for irrigation systems, and heightened risk of plant and livestock diseases and pest outbreaks. Reduced access to drinking and domestic water also increases health risks, particularly through exposure to unsafe water and intermittent supply, while exacerbating the burden on women responsible for water collection and management. These dynamics contribute to rising food and nutrition insecurity and place further pressure on already vulnerable households. Youth, particularly in rural and peri-urban communities, experience shrinking livelihood opportunities as agriculture becomes less viable under climate stress. This contributes to unemployment, negative coping strategies, and heightened social tension, increasing the risk of localized conflict and instability.[247]

Climate-driven resource scarcity interacts with return movements and weakened local institutions. Higher population density intensifies demand for overstretched water and land resources, while limited platforms for community involvement and dialogue limit peaceful management of resources and disputes. Although climate change alone does not directly cause conflict, it amplifies competition over agricultural, domestic, and drinking water resources, deepens socio-economic vulnerabilities, and erodes social cohesion, particularly affecting women and youth. These dynamics underscore the importance of targeted adaptation measures to strengthen equitable resource allocation, enhance community resilience, and reduce the risk of climate-exacerbated disputes.

[247] Acted, (2025), Stakeholder consultation – Eastern Ghouta.

## 6.4 Summary of key climate vulnerabilities and adaptation measures

Table 3: Vulnerabilities and adaptation for municipal water for drinking and domestic water supply

| Indicator | Projected trend | Impact | Adaptation |
|---|---|---|---|
| Temperature increase | +1.7°C (SSP2-4.5)<br>+2.3°C (SSP5 - 8.5) | - Increased evapotranspiration → reduced groundwater recharge.<br><br>- Higher heat stress → increased household water demand.<br><br>- Reduced reliability of municipal supply. | - Enhance aquifer recharge through revegetation of public lands and recharge infrastructure (wells, infiltration trenches).<br><br>- Install groundwater and surface water monitoring sensors for adaptive water management.<br><br>- Promote household and institutional water efficiency (e.g., low-flow fixtures, rainwater harvesting).<br><br>- Improve catchment management to maintain natural infiltration and groundwater replenishment. |
| Mean maximum temperature anomaly (days >40°C) | 11 days (SSP2-4.5)<br>21 days (SSP5-8.5) | - Prolonged extreme heat increases peak water demand.<br><br>- Stresses pumping systems and infrastructure.<br><br>- Increased risk of water quality deterioration during low-flow conditions due to contaminant concentration. | - Climate-proof water supply systems (install flow meters, develop efficient boreholes).<br><br>- Raise awareness on sustainable water use.<br><br>- Promote household and institutional water efficiency (low-flow fixtures, demand management).<br><br>- Integrate temperature projections into water management and planning.<br><br>- Support national and district-level water quality laboratories for monitoring and early warning. |
| Average annual precipitation | -4.1% (SSP2-4.5)<br>-4.9% (SSP5-8.5) | - Reduced aquifer recharge and spring flows that historically supported Eastern Ghouta.<br><br>- Exacerbates over-abstraction of groundwater → declining water tables and increased salinity. | - Support natural infiltration and revegetation of public lands to enhance recharge.<br><br>- Climate-informed groundwater abstraction using well-field investigations and regulated abstraction schedules.<br><br>- Establish a groundwater monitoring network and strengthen centralized data management. |

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|---|---|---|---|
| | | - Increased dependence on unsafe or costly water sources. | - Community-level climate-resilient water planning using land use, water availability, quality, and demand mapping.<br><br>- Develop groundwater flow model for the basin and sub-basins to simulate combined impacts of demand and climate change.<br><br>- Support greywater reuse at household and institutional levels.<br><br>- Review regulatory frameworks (drilling licenses, permits, cost recovery systems) to control groundwater extraction. |
| No of consecutive dry days (<1mm precipitation) | +2.5 (SSP2-4.5) +5.4 days (SSP5-8.5) | - Longer dry spells intensify multi-year drought impacts, leading to more frequent supply interruptions and reduced water availability.<br><br>- Extended dry periods increase contamination risks due to reduced flow, thermal effects on pathogen growth, and decreased chlorine effectiveness. | - Increased awareness campaigns on water conservation at household and institutional levels.<br><br>- Climate-proofing of boreholes to increase pumping efficiency and reduce non-revenue water.<br><br>- Drought-resilient water safety planning for well fields and all drinking water supply wells.<br><br>- Support national and district laboratories to strengthen water quality monitoring capacity. |

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|---|---|---|---|
| Month-by-month trend in precipitation / temperature anomaly | Precipitation: December - largest drying trends under SSP2-4.5 (-3 mm)<br><br>December to May largest drying trends under SSP5-8.5 (up to -5.6mm in January).<br><br>Temperature: Greatest increase in temperature between July and September under SSP2-4.5<br>June and November under SSP5-8.5 | - Reduced winter precipitation (Dec–May) lowers seasonal groundwater recharge, reducing water availability during summer peak demand.<br><br>- Seasonal temperature increases raise evapotranspiration and household water demand.<br><br>- Greater reliance on intermittent or tanker-supplied water, which is costly and may have poor quality. | - Reduce non-revenue water through leakage detection, network rehabilitation, and maintenance in high-loss zones.<br><br>- Strengthen governance at grassroots and district levels to manage water during scarcity periods.<br><br>- Integrate climate projections and climate risk mapping into water sector planning.<br><br>- Build capacity for NDA and local authorities to develop climate finance proposals.<br><br>- Establish multistakeholder forums to review water use trends and climate risks. |

Table 4: Vulnerabilities and adaptation for agricultural production systems

| Indicator | Projected trend | Impact | Adaptation |
|---|---|---|---|
| Temperature increase | +1.7°C (SSP2-4.5)<br>+2.3°C (SSP5 - 8.5) | - Increased evapotranspiration → reduced soil moisture, reduced crop water availability.<br><br>- Changes in crop suitability.<br><br>- Soil salinity accumulation and stress on crops. | - Reduce evapotranspiration and improve soil moisture retention via cover crops, mulching, crop residue retention.<br><br>- Shift to climate-resilient crops (olives, figs, grapes, suitable vegetables).<br><br>- Adopt conservation agriculture practices (minimum tillage, intercropping, organic fertilizers) to improve soil structure, water retention, and reduce salinity.<br><br>- Enhance groundwater recharge through infiltration structures to support irrigation. |

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|---|---|---|---|
| Mean maximum temperature anomaly (days >40°C) | 11 days (SSP2-4.5)<br>21 days (SSP5-8.5) | - Reduced baseflow due to increased evapotranspiration → groundwater stress.<br><br>- Increased heat stress on crops, shortening growing windows, reducing flower set, decreasing yields.<br><br>- Increased sunburn-related plant diseases and insect outbreaks.<br><br>- Poor plant growth and stunting.<br><br>- Loss of fodder crops for livestock. | **Water management and Irrigation:**<br>- Micro-catchment water harvesting (contour bunds, negarim basins, meskat systems).<br><br>- Improve irrigation efficiency and schedule irrigation during cooler hours.<br><br>- Calculate crop-specific water requirements at all growth stages.<br><br>**Crop adaptation:**<br>- Use heat-tolerant crop varieties (wheat, barley, vegetables).<br><br>- Implement optimal planting schedules.<br><br>- Apply palliative techniques for crops (Kaolin clay, net shading).<br><br>**Livestock adaptation:**<br>- Increase access to water points and shade.<br><br>- Promote heat-tolerant livestock and fodder species.<br><br>- Adjust herd management to land carrying capacity. |
| Average annual precipitation | -4.1% (SSP 2-4.5)<br>-4.9% (SSP5-8.5) | - Increased water stress → droughts.<br><br>- Reduced vegetation cover → soil and wind erosion.<br><br>- Reduced water availability for crops and rangelands → higher feed costs.<br><br>- Reduced crop yields and agricultural productivity. | **Water harvesting and efficiency:**<br>- Micro-catchment water harvesting (contour bunds, negarim basins, meskat systems).<br><br>- Drip irrigation to deliver water directly to roots.<br><br>- Scheduled irrigation during cooler hours (morning/evening) to reduce evaporation.<br><br>- Greywater reuse for irrigation.<br><br>- Water box devices for seedlings to reduce evaporation.<br><br>**Soil and crop management:**<br>- Mulching and cover crops to retain soil moisture. |

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| | | | - Conservation agriculture (zero/minimum tillage, crop residue retention, stubble mulch).<br><br>- Planting windbreaks to reduce erosion.<br><br>- Use of organic fertilizers and compost to improve soil water retention.<br><br>- Protected agriculture (greenhouses, shade nets) and hydroponics/aquaponics for water-efficient crop production. |
| No of consecutive dry days (<1mm precipitation) | +2.5 (SSP2-4.5) +5.4 days (SSP5-8.5) | - Increased water stress, reduced soil moisture and recharge.<br><br>- Reduced crop productivity due to prolonged dry spells.<br><br>- Changes to crop suitability and growth cycles.<br><br>- Stress on fruit trees, vegetables, and other sensitive crops. | **Water harvesting and efficiency:**<br>- Micro-catchment water harvesting (contour bunds, negarim basins, meskat systems).<br><br>- Improved water use efficiency (drip irrigation, irrigation scheduling).<br><br>- Greywater reuse for irrigation.<br><br>**Soil crop management:**<br>- Conservation agriculture (zero/minimum tillage, mulching, crop residue retention, stubble mulch).<br><br>- Use of organic fertilizers and compost to improve water retention and soil health.<br><br>- Palliative techniques to reduce water stress on crops (e.g., reducing number of fruits per tree, summer pruning).) |

| | | | |
|---|---|---|---|
| Month-by-month trend in precipitation / temperature anomaly | <u>Precipitation</u>: December - largest drying trends under SSP2-4.5 (-3mm)<br><br>December to May largest drying trends under SSP5-8.5 (up to -5.6mm in January).<br><br><u>Temperature</u>: Greatest increase in temperature between July and September under SSP2-4.5<br>June and November under SSP5-8.5 | - Reduced winter rainfall affects sowing and maturation of wheat and barley.<br><br>- Reduced rainfall during Dec–May lowers citrus fruit size and quality, affecting harvest Jan–April.<br><br>- Elevated temperatures during Jul–Sep increase mortality and reduce yields of fruits and vegetables (okra, onion, garlic, apples, grapes, apricots).<br><br>- Wheat and barley harvests delayed; increased incidence of crop fires | - Adjust planting calendar to better match expected precipitation and temperature patterns.<br><br>- Increase availability of seeds for short-cycle crops to ensure harvest within favourable climatic windows.<br><br>- Promote drought- and heat-tolerant crop varieties.<br><br>- Use crop management techniques to reduce heat stress and water demand (mulching, shading, pruning).<br><br>- Fire prevention and monitoring strategies during harvest periods. |

# 7. Project design

## 7.1. Project theory of change

The project has been designed to address the key climate vulnerabilities of municipal water for drinking and domestic water supply as well as agricultural production systems in Barada and Awaj water basin outlined in the sections above. The theory of change for this proposed project is as follows:

**IF** vulnerable, water-scarce communities in Syria are empowered to lead locally driven climate adaptation using climate and groundwater data, inclusive governance, and sustainable water and agricultural practices,

**AND** are supported by resilient infrastructure and institutions,

**THEN** water security will improve, sustain agricultural productivity and reduce climate vulnerability,

**BECAUSE** locally led, data-informed decisions enable efficient, equitable, and anticipatory water and agricultural management.

## 7.2. Key barriers and assumptions

The climate related risks outlined above further exacerbate existing vulnerabilities.

**Barrier 1: Gaps in national capacity for water management and planning informed by climate data**
While important efforts exist, national water institutions currently have limited access to fully integrated, real-time water and climate information systems. Groundwater monitoring coverage and digital data management platforms remain uneven across the country. Thus, routine use of groundwater modelling is still developing, which limits the ability to fully embed climate-informed, anticipatory water management into day-to-day operations.

**Barrier 2: Fragmented climate-water governance following years of conflict**
Institutional coordination mechanisms for climate-resilient water management are being re-organised following years of disruption. Coordination across water, agriculture, environment, and local service delivery institutions can be further strengthened. At the local level, water governance structures could be an important foundation for participatory water management, yet gaps remain in capacity and accountability.

**Barrier 3: Limited national capacities to access and leverage climate finance**
National institutions are increasingly engaging with international climate finance mechanisms. However, there remains the space for support on specific support related to proposal development, climate analysis, and environment and social safeguards. Expanding these capacities would enable access to climate finance and support long-term investment planning aligned with national adaptation priorities.

**Barrier 4: Limited financial and technical capacity of local public authorities to restore climate-resilient water services**
Local public authorities continue to operate in a context of significant fiscal and capacity constraints following prolonged conflict and economic disruption. This means limited ability to repair

or reconstruct damaged infrastructure. Beyond practical rehabs, gaps remain in technical diagnostics, climate-informed operational planning, non-revenue water reduction, and the establishment of sustainable operation and maintenance (O&M) and cost-recovery systems.

**Barrier 5: Limited technical and financial capacity at the household level to adopt water efficiency practices**
Although water-efficient technologies are increasingly recognised as important adaptation measures, upfront costs can constrain uptake, even where technologies are low-cost and appropriate. There is an opportunity to further improve household-level awareness and practical skills related to efficient water use, and safe water re-use. Many households have had limited access to information of water-saving technologies. Targeted outreach, user training, and technical support would help increase adoption rates, improve proper operation and maintenance, and maximise water-saving impacts over time.

**Barrier 6: Limited technical and financial capacity of farmers and extension services to adopt, sustain and support expansion of climate smart practices**
Agricultural extension services and smallholder farmers continue to adapt to evolving climate and water challenges. However, additional technical and financial support is needed to expand the adoption and sustained use of climate-smart agricultural practices. Strengthening extension services, and access to inputs and financing would help improve agricultural water efficiency.

In addition to above barriers, there are several key assumptions informing the project design:

**Assumption 1: Core water governance institutions remain functional and issue decisions**
Project activities depend on these institutions (GCWR, WRIC, DRD-WRD, and MoLAE) to operate and exercise their formal water management mandates. At the same time, the project's institutional anchoring extends beyond any single ministry, and draws substantially on sub-national structures whose continuity is independent of national government composition. Where shifts in institutional roles occur, this operational backbone alongside national counterparts, as well as adaptive management provisions allow implementation arrangements to be resilient or adjusted.

**Assumption 2: Climate shocks do not bypass formal data-based decision-making procedures**
Acute climate events, while anticipated, remain within a range that allows water management institutions to respond through the established, data-based procedures rather than ad hoc emergency measures. The project recognises that institutional capacity for data-based decision-making is currently constrained – strengthening this capacity to manage climate variability is a core project objective rather than a pre-existing condition.

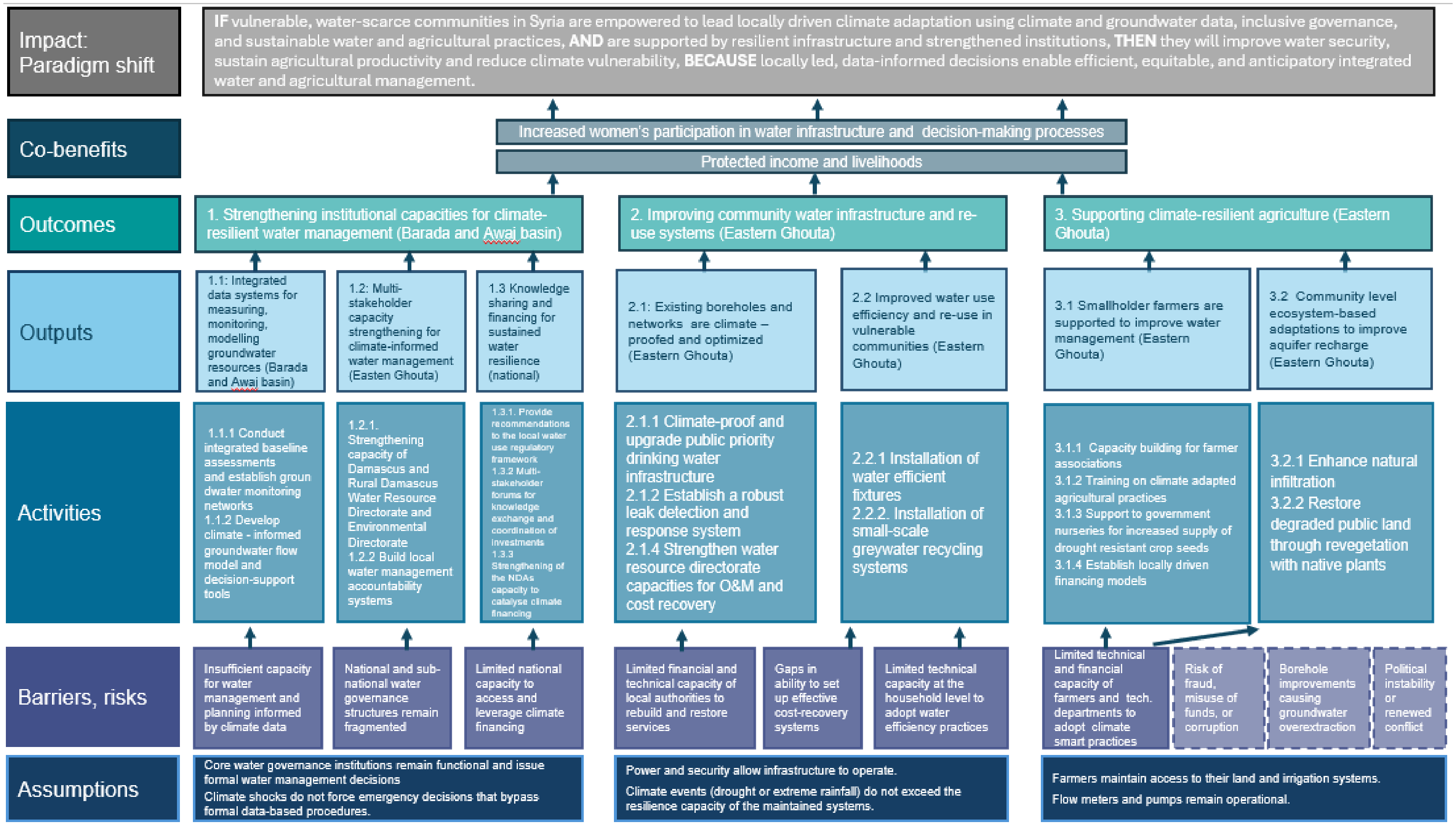
**Assumption 3: Power and security conditions allow infrastructure to operate**
Monitoring infrastructure and data transmission systems require sufficient stability in power supply and security conditions to function reliably. The project assumes that conditions remain within a range that permits routine operation and maintenance of physical systems throughout the project.

**Assumption 4: Climate events do not exceed the resilience capacity of maintained systems**
Drought episodes and extreme rainfall events occur within a range that rehabilitated infrastructure and restored ecosystems can absorb and continue to function effectively. The project's system designs are calibrated to projected climate variability in the Barada and Awaj basin, though events of exceptional severity could temporarily reduce system performance.

**Assumption 5: Farmers maintain access to their land and irrigation systems**
The project area selected in part for its relative stability and ethnolinguistically homogeneous demographic profile, which reduces the likelihood of conflict-driven displacement or land access disruption within the project area. Implementation presence in the project area will provide continuous visibility on conditions, enabling timely adaptation of activity delivery where needed.

**Assumption 6: Flow meters and pumps remain operational**
The accurate measurement and regulation of groundwater abstraction depend on flow meters and pumping infrastructure remaining functional throughout the project period. The establishment of O&M protocols and community-level technical capacity under the project support WUAs and local water management structures are equipped to carry out routine maintenance and minor repairs independently.

## 7.3. Theory of change diagram



## 7.4. Project components

### 7.4.1 Component 1: Strengthening institutional capacities for climate-resilient water management (Barada and Awaj basin)

This component will enable the building of systems at basin level to generate real-time data on water availability, demand and use. This data will both feed into short-term planning (including serving as an early warning system for local authorities at the basin level) as well as for conducting climate-risk informed planning through the development of a ground water model. This model can then be used by basin and national level stakeholders for long-term planning of water use and replenishment at the basin. Moreover, to ensure the systems built remain operational and accountable to users, community-based mechanisms such as WUAs and local community structure (e.g CSO or municipality associated volunteer board) will be supported to set up community-based accountability systems and linked to local governance mechanisms for meaningful engagement around operation and maintenance of key technologies and infrastructure related to groundwater management. A full stakeholder mapping will be conducted at project inception, including women-led CSOs and WLOs, ensuring women's priorities shape governance decisions at the community level and feed into basin-level planning processes. Participatory and technical assessment carried out at project inception and throughout implementation will be continuously leveraged by community structured identified under Component 1 to inform implementation. Finally, to ensure multiplier effects, and to secure additional capital for the replication/scaling up of the technologies, approaches and infrastructures piloted in this project, knowledge sharing networks and national conferences will be organized among public, private and non-governmental stakeholders. Multi-stakeholder climate forums and strengthened NDA capacity will support national policy uptake, learning and long-term climate finance, embedding evidence driven decision-making.

Table 5: Indicative list of adaptation techniques

| Adaptation Typology | Technology | Adaptation benefit | Climate hazard Addressed |
|---|---|---|---|
| Integrated water resources management | Installation of groundwater and surface water monitoring sensors | Helps in understanding ground and surface water levels and trends and the data will be incorporated into water planning<br><br>Helps in understanding groundwater quality in relation to water levels | Declining surface and groundwater availability |
| | Installation of climate data monitoring equipment (weather stations) | Helps in understanding the impact of climate change on surface and groundwater availability | Impact of increased temperature and low rainfall on water resources availability |
| | Geophysics equipment | Identifies resilient aquifers, prevents over-abstraction, supports sustainable groundwater use | Drought, groundwater depletion, salinization |
| | Groundwater modelling | Forecasting groundwater changes over time, during climate shocks to support water planning | Water scarcity, declining ground water recharge and groundwater availability |

| | | | |
|---|---|---|---|
| | GIS workstations | Water resources mapping and understating land use and landcover changes in relation to water resources availability | Loss of vegetated land and desertification due to prolonged droughts |
| | Integrated Water Resources Management | Strengthens coordinated planning and management of surface water and groundwater under increasing climate variability, improving system-wide resilience | Climate-induced water scarcity and competing water demand |
| Water quality adaptation | Supporting water quality analysis laboratories | Improves drinking water safety during low-flow periods and supply interruptions | Low water flows; increasing concentration of pollutants during drought and high saline levels associated with decreases water tables |
| Institutional | Strengthening national, governorate level and community-based water governance structures | Strengthens water management, technical capacity, equitable water allocation and conflict prevention | Resource competition intensified by climate stress |
| | GIS workstations | Decision support through climate risk mapping, climate-informed planning, targeting vulnerable areas | Drought, heat stress, floods, land degradation |
| | Multi-stakeholder forums mechanisms | Enhances knowledge sharing on climate adaptation, water use trends and financing in the basin.<br><br>Reduces risk of climate-related water conflicts through transparent, equitable management | Increasing frequency and severity of droughts<br><br>Climate-driven resource competition and conflict risk |
| | Reviewed regulatory frameworks on water efficiency | Supports development and enforcement of updated legal frameworks on water use efficiency including regulating drilling at local level | Decreased groundwater levels due to unregulated drilling and over abstraction of groundwater |

Table 6: Description of activities under Component 1

| Output 1.1 Integrated data systems for measuring, monitoring, and modelling groundwater resources (Barada and Awaj basin) | |
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| Activity 1.1.1 Conduct integrated baseline assessments and establish groundwater monitoring networks | |
| This activity will strengthen national institutional capacities to generate, analyse, and use groundwater and climate data for climate-risk informed water allocation, drought preparedness, and sustainable abstraction. This will be done through supporting real-time data collection and assessments. All interventions under this activity will be carried out with the support of a technical consultant, while ownership, operation, and long-term maintenance will rest with relevant government entities.<br><br>Technical equipment alongside hands on training on installation, operation and maintenance (O&M) plans will be provided to at least 130 relevant government staff from the Ministry of Local Administration and Environment (MoLAE), the Ministry of Energy (MoE), specifically General Commission for Water Resources (GCWR), Water Resource Information Centre (WRIC) and Rural Damascus Water Resources Directorate (DRD-WRD), and Ministry of Agriculture (MoA), ensuring effective knowledge transfer and sustainability.<br><br>The data generated under this Activity will be cascaded down to lower administrative levels under Output 1.2 and Components 2 and 3 to build capacities and inform planning of local authorities and prioritize project activities and investments. Further it will be utilized to build groundwater flow model under activity 1.1.2 below which can be used for future planning and climate-risk informed water management. | |
| Sub-Activity 1.1.1.1 | **Collection of real-time data on water availability/water demand:** In partnership with the MoE (GCWR), a **hydrological desk study** will be undertaken covering the Barada and Awej basin. The desk study will integrate existing field data, satellite-based climate information, and existing assessments produced by government entities, academic institutions, and water, sanitation and hygiene (WASH) partners in the basin. Critical gaps in existing data will also be identified. Based on this, a report will be produced, cross-checked with farmers and community representatives and validated through consultations with technical departments and MoLAE to ensure alignment with environmental and climate action priorities.<br><br>In addition, high-resolution **land use maps** using satellite imagery, remote sensing, field verification, and GIS analysis will be generated by the project in coordination with the MoE (WRIC, DRD-WRD) as well as MoA (Directorate of Lands) and MoLAE (Environmental Research Department). The mapping will assess land degradation, recharge areas, ecosystem health, and drivers of change. In addition to informing the groundwater flow model under Activity 1.1.2, it will also inform the ecosystem-based approaches (EbA) under Component 3 below.<br><br>A national team composed of MoLAE and MoE (GCWR) will undertake **non-invasive geophysical surveys, including Electrical Resistivity Tomography (ERT) and downhole geophysics**, in priority locations. This will improve understanding of subsurface hydrogeological conditions, provide information on geological boundaries of the aqui- |

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| | fers, their depth, recharge pathways, fracture zones, and geological constraints, supporting climate-resilient water supply planning and investment decisions. No drilling or construction activities will be undertaken.<br><br>In cooperation with MoLAE and the Directorate of Environment in Damascus, MoE's GCWR and MoA, a basin wide **socio-economic survey** at household level, mapping water usage across the basin for domestic and agricultural consumption will be conducted. Concurrently, a **water quality mapping** and **mapping of licensed and unlicensed boreholes** across the basin will be undertaken. This exercise will enable the government to better understand water accessibility and demand, usage patterns. It will also flag hotspots with deteriorating water quality for water safety planning.<br><br>In addition, and **pumping tests** will be implemented in strategic locations across the basin in partnership with MoLAE, MoE (GCWR) and MoA**.** The tests will provide critical information on yield, aquifer transmissivity, and well performance under climate stress. Some of these tests will take place in Eastern Ghouta, project areas targeted under Component 2 and 3. They will not only inform the groundwater flow model under Activity 1.1.2 below, but also directly inform activity design under Components 2 and 3. |
| Sub-Activity 1.1.1.2 | Based on the priority locations identified through the study and assessments above, a **groundwater and hydro-climatic monitoring network** will be established in partnership with the MoE (GCWR). Monitoring locations will be confirmed jointly with MoLAE to ensure alignment with environmental protection and climate adaptation priorities. This monitoring network will be set up in pre-existing, government-owned boreholes and monitoring points. This will allow them to track groundwater levels and climate-sensitive water quality parameters. The analysis of the data will be done by the Water Resource Information Centre (WRIC), embedded within GCWR and MoLAE (Environmental Observatory). The time-series data generated over the first 2-3 years of the project will help develop accurate predictive model under activity 1.1.2 below. Further, this data will support in governorate and district level planning under Sub-Activity 1.2.1.1 and Sub-Activity 1.2.1.2. |
| Activity 1.1.2 Develop climate-informed groundwater flow model and decision-support tools | |
| Using all of the data collected under Activity 1.1.1 during the first 2-3 years of the project, this activity will develop climate-informed groundwater flow models to support sustainable abstraction, recharge enhancement, drought management, and long-term climate adaptation planning. The model will simulate aquifer behaviour, predict water availability under different climate and demand scenarios, and provide a tool for evidence-based decision-making. All interventions under this activity will be carried out with the support of a technical consultant and closely coordinated with MoLAE and MoE (GCWR). Ownership, operation, and long-term maintenance will rest with relevant government entities.<br><br>To ensure practical use, at least 45 key national stakeholders, will be trained not only to maintain and interpret the model but also how to integrate it into local and national water management planning, including: guiding wellfield development, informing pumping schedules, prioritizing recharge interventions, and supporting emergency drought response. A structured | |

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| knowledge transfer and operational protocol will be developed, linking model insights to concrete actions, monitoring, and adaptive management to ensure its sustained use beyond the project lifecycle. | |
| Sub-Activity 1.1.2.1 | **Development of a robust, climate-informed groundwater flow model:** In partnership with MoE (GCWR), the project will use the data from Activity 1.1.1 to establish a hydrology and geology baseline for the Barada and Awaj basin. Time-series data collected over the first 2-3 years of the project will allow for the development of an accurate predictive model. Using Leapfrog and SWAcMOD technologies, a conceptual ground water flow model will be developed. This will include details on aquifer boundaries, geological formations, recharge zones, faults/barriers, and interactions between surface water (Barada and Awaj rivers, springs) and groundwater. Climate change projections will also be simulated to understand long-term groundwater storage changes, spring reliability, and vulnerability hotspots. This model will be validated through observed data during the project lifetime and consultations with key stakeholders including MoLAE, MoE's DRD-WRD, academia and local experts. The model will be handed over to MoE's WRIC, with staff receiving training on model use, data updating, scenario interpretation and additional training on practical integration into water management planning noted above. |
| Sub-Activity 1.1.2.2 | **Cloud-based groundwater and climate data management systems for the Barada and Awaj basin:** MoE (WRIC) and MoLAE (Environmental Observatory) will be further supported by the project to build on and upgrade existing centralized hydrogeological database of the government. This database will continue to host the data collected under activity 1.1.1 above during project duration as well as after the project completion. Further, this database can be used to run analysis and update the groundwater flow model as relevant. Centralizing the data will ensure full interoperability with national environmental and water information systems and avoiding the creation of parallel databases.<br><br>A review of the existing system will be conducted to identify upgrades needed for improving data accessibility. Based on this review, data governance and access protocols will be established. Clear access for national institutions, governorate authorities and relevant local actors will be established to support transparency and accountability. Equipment (including IT equipment and access to PV systems for energy continuity), network connectivity and software support will be provided. Finally, training will be provided to relevant technical MoE's WRIC staff on data management and analysis. |
| Output 1.2: Multi-stakeholder capacity strengthening for climate-informed water management (Easten Ghouta) | |
| Activity 1.2.1 Strengthening capacity of Damascus and Rural Damascus Water Resource Directorate and Environmental Directorate | |
| Under this activity, the project will strengthen local government technical departments to enhance climate-risk informed water management within Eastern Ghouta region. This will be | |

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| achieved by cascading the national/basin level data collected in Output 1.1 to lower administrative levels through the MoE's DRD-WRD and MoLAE's Environmental Directorate (a governorate level authorities) using the available data for development of integrated local water management plans through the Douma district WRD (a district level authority within the same governorate). This allows the local planning to be informed by national data systems, thus strengthening evidence-based water planning and integrated governance. | |
| Sub-Activity 1.2.1.1 | **Capacity building for DRD- WRD and Environmental Directorate:** The technical and institutional capacity of the DRD-WRD and Environmental Directorate, and the relevant district Directorate branches will be strengthened to act as the critical bridge between national ministries and local communities. At least 30 staff members of DRD-WRD, Environmental Directorate and district branches will be provided with training on climate risk mapping, data collected under Activity 1.1.1 and 1.1.2 above and their practical utilization for integrated water resource planning and management. They will be also provided with equipment, digital tools, standardized procedures to cascade this data at district level and use it for drought preparedness and water allocation.<br><br>To further support the cascading of the data from the central database to the governorate and district level, and run governorate level scenarios, the DRD-WRD will be supported with **GIS-based dashboards.** The dashboard will allow the authorities to run simple scenarios such as seeing the effect of reduced pumping or enhanced recharge. Operational manuals and institutional guidelines for integrating the model into routine water resource planning. |
| Sub-Activity 1.2.1.2 | **Development of local water management plans:** The project will support the Douma district Water Resource Directorate (which is a district level branch of the DRD-WRD) and Environmental Directorate with the development of a local integrated water management plan to improve climate-resilient local policy and planning. These plans will be informed by the data collected under Output 1.1. above as well as operational plans for drinking water infrastructure (Output 2.1) and irrigation (Output 3.1). The plans will include different water scarcity scenarios alongside demand management options. These plans will be further informed through consultations with the WUAs – sitting within the DRD-WRD – strengthened in Activity 1.2.2 and the farmers associations in Activity 3.1.1. |
| Activity 1.2.2 Build local water management accountability systems | |
| This activity will strengthen accountability and participation in climate-resilient water management by establishing community-based mechanisms that enhance local participation, integrate community-level feedback, and foster local engagement. This will be implemented through Acted's Locally Led Action (LLA) Coordinator and through supporting both WUAs that are formal entities integrated with the existing regulatory systems in Syria (through having formal registrations) as well as complementary systems through a local civil society organisation (CSO) or similar community-rooted structure. Roles and responsibilities for community structure representation will be formalized under the project's Operations Manual. This activity will engage women (including women engaged through Women-Led Organizations), youth, returnees, | |

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| and other vulnerable groups who are often under-represented in formal water governance structures. Building on existing localisation and area-based approaches implemented in Syria, the activity will support structured community engagement processes to ensure that water management decisions are informed by community priorities, perceived equity of access, and service delivery performance. Participatory accountability tools will be co-developed and applied to enable communities to monitor and inform project intervention, identify grievances, and provide regular feedback to the Project Management Unit (PMU). Findings from these processes will be also systematically shared with WUAs and local authorities to inform adaptive management and improve the responsiveness of water planning and implementation. | |
| Sub-Activity 1.2.2.1 | **Establish/strengthen WUAs:** The project in coordination with local directorate of MoLAE and the DRD-WRD will conduct a stakeholder mapping to identify existing water governance structures such as WUAs (this will include mapping of WLOs). As mentioned under section 3.5 above, although WUAs exist in some parts of Syria, these are mainly focused on irrigation water and do not engage on networked water. To ensure holistic local engagement, the project may strengthen existing or establish additional structures depending on local needs, context etc., especially for enhancing accountability of networked water. The WUAs will include representatives from water utilities, local MoLAE directorate, farmer associations, and local water resource directorate and community representatives, whilst ensuring equitable and inclusive participation for women and women's leadership.<br><br>The stakeholder mapping will be conducted in the form of a workshop. During the workshop, institutional capacities of the existing WUAs, farmers associations etc. will be assessed. The coordination mechanisms that exist between these WUAs/farmers associations and national/local level government will also be examined to identify key opportunities and gaps for strengthening locally led climate action.<br><br>Following the workshop, capacity building of estimated 200 WUA members (including women) will be conducted. Their internal management and external coordination capacities will be built. This will include defining and harmonising local roles in water governance, building knowledge of local climate vulnerabilities, and ensuring synergy and institutionalisation with other structures/levels of water governance.<br><br>The WUAs will also be provided with knowledge/awareness of data collected under output 1.1 above to improve their understanding of water availability/demand and climate risk. Educational materials, such as booklets and brochures, will be distributed to promote awareness of responsible water use, whilst post-implementation visits will be conducted to assess behavioural change and ensure practical application of the concepts learned.<br><br>Finally, the WUAs will be supported to engage with the local water management plans under Sub-Activity 1.2.1.2 above. |
| Sub-Activity 1.2.2.2 | **Establish community-led feedback and monitoring mechanism:** A local community structure/entity (e.g. CSOs, community-elected municipality volunteer board) with demonstrated capabilities in community fa- |

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| | cilitation, social accountability, and inclusive engagement will be engaged (or created depending on existing structures) and receive training from the project to effectively co-facilitate annual community water resilience workshops. The local structure will have quarterly engagement with the project team, to ensure adaptive management. The workshops will bring together a broad range of water users, including domestic users, small-scale farmers, women and youth groups, returnees and representatives of WUAs, public utilities and technical departments. The workshops will be used as a forum to discuss water challenges, climate risks, and planned project interventions (including targeting criteria), and for sharing lessons learnt and strengthening linkages between community accountability mechanisms and formal water governance structures. At least one initial and four follow up workshops will be organized throughout the project. Women representatives, including those engaged with WLOs, are supported through this activity with technical skills and planning tools through the gender-sensitivity delivery approach applied under this Activity.<br><br>To further engage the community, a group of participants from the workshops will be selected to convene for quarterly meetings. These meetings will be facilitated by the local community structure, where community feedback will be reviewed to identify grievances and monitor the perceived impacts of water management interventions at the community level. This will include women representatives, including those engaged with WLOs. This mechanism will play a critical role in strengthening and sustaining local ownership by creating a direct linkage between the local community level and the project's governance. This includes sharing feedback to the PMU through LLA Coordinator to enable adaptive project management and translated to the TWG and PSC, where needed, to ensure community voice is embedded at every level of project governance. |
| Sub-Activity 1.2.2.3 | **Co-develop and apply participatory community monitoring tool:** Building on the priorities and indicators defined in a dedicated workshop, the community structure, with technical assistance from Acted, will support the group of participants (including women and WLO participants) to develop a community monitoring tool and to contribute to community-based data collection. The results will be consolidated and discussed during the annual workshops and provided to both WUAs, technical departments of local governments and PMU to support adaptive management. To complement this, the community structure itself will be supported through direct sub-grants to conduct periodic, structured qualitative feedback activities such as focus group discussions, participatory timelines, and storytelling methods, gathering deeper insights into community experiences, equity of access, and perceived impacts of project interventions. |
| Output 1.3: Knowledge sharing and financing for sustained water resilience (national) | |
| Activity 1.3.1. Participatory review and recommendations to the local water use regulatory framework | |

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| This activity will conduct a participatory review of existing water regulations, including greywater recycling, to identify gaps and recommend amendments. The review will be guided by climate data collected under Activity 1.1.1 and employ multi-stakeholder workshops to identify key gaps and produce practical, context-appropriate recommendations. The activity will be supported by a technical consultant in close coordination with MoALE. | |
| Sub-Activity 1.3.1.1 | **Conduct review of existing laws:** A review of existing national laws and how this applies to the local context in the Barada and Awaj basin will be conducted. This will be done through contextualizing data from output 1.1 above and holding consultations with key stakeholders including national and local government, water utilities, community structures, women groups (including WLOs), youth representatives, and technical experts. The review will include a specific focus on existing frameworks for greywater recycling and reuse, with attention to public health, environmental safety, and local implementation capacity. |
| Sub-Activity 1.3.1.2 | **Development of policy recommendations, guidance, and technical inputs:** Policy briefs and guidance notes will be produced to support uptake by local authorities and inform national discussions on climate-informed water regulation and regulatory reviews. Workshops will be done at the national level to support the review of the national policies on aligning them with climate data and national adaptation and mitigation priorities. In coordination with MoLAE, this will include technical guidance on greywater collection, treatment, storage, including definition of the required treatment levels according to intended uses and setting standards for regular maintenance. The guidance will further support the clarification of institutional roles and safe greywater management at the national and local levels. |
| Activity 1.3.2 Multi-stakeholder forums for knowledge exchange and coordination of investments | |
| This activity will establish knowledge networks and build a case for investment in grey-green technologies for improved water management in Syria. This will be done through building evidence base on technologies/approaches piloted during this project, developing a business case and convening multi-stakeholder forums to share best practices and knowledge, and secure opportunities for future investments. | |
| Sub-Activity 1.3.2.1 | **Development of business case:** Building on Outputs 1.1–1.2 and Components 2–3, this sub-activity will develop a bankable business case for priority climate-resilient water investments (e.g. green-grey infrastructure, groundwater recharge, water reuse, and efficiency measures). Participatory validation workshops will be conducted at national, basin, and local levels to ensure that business cases reflect community priorities, climate risks, and equity considerations. Stakeholders engaged will include MoLAE, MoE, MoA, Damascus and Countryside WRD, municipal water utilities, WUAs, farmer associations, women's and youth groups (including Women-Led Organizations), community structures, academia, and private sector actors. The resulting business cases will identify investment needs, climate ra- |

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| | tionale, economic and social benefits, and incentives for public and private financing, directly supporting pipeline development under Activity 1.3.2. |
| Sub-Activity 1.3.2.2 | **Multi-stakeholder national climate-water forum:** The project will support annual national-level climate–water dialogue events over the five-year implementation period, convened by MoLAE as a national entity for expert-led discussion on priority climate adaptation and climate finance issues in the water sector. At least five forums will be held. Each event will focus on a limited number of strategic themes selected based on emerging climate risks, national policy gaps, and lessons generated by the project. To ensure technical depth and relevance, preparatory technical workshops will be conducted ahead of the event as needed, including to synthesise project data, modelling results, and implementation lessons. The annual dialogues will generate policy briefs and finance-oriented recommendations aligned with Syria's NDC, NAP, and GCF investment criteria, directly informing the business cases under Sub-Activity 1.3.1.1 and the climate finance pipeline developed under Activity 1.3.2. |
| Activity 1.3.3 Strengthening of the NDAs capacity to catalyse climate financing | |
| This activity will enhance the capacity of MoLAE to access and manage climate finance through the development of a pipeline of concept notes and project proposals aligned with national adaptation and mitigation priorities. This includes training and institutional support for sustained engagement with the Green Climate Fund (GCF) and other climate finance mechanisms. | |
| Sub-Activity 1.3.3.1 | **Strengthened institutional capacities within MoLAE for climate financing:** Targeted training and institutional support will be provided to MoLAE and relevant line ministries to strengthen capacities in climate finance programming, project development, stakeholder coordination, and engagement with the GCF and other climate finance mechanisms. Training will emphasise GCF investment criteria, paradigm-shift articulation, gender and social inclusion, and blended finance approaches. Inter-ministerial workshops will be conducted to refine and prioritise national adaptation investment areas, drawing directly on data, business cases, and lessons from Activity 1.3.1. This will be embedded in institutional climate-finance tools, guidelines or standard operating procedures (SOPs). These processes will reinforce national ownership and ensure coherence between local adaptation needs and national strategies. |
| Sub-Activity 1.3.3.2 | **Development and pipelining of climate financing projects:** An experienced climate finance expert will support MoLAE to develop a pipeline of up to four climate finance projects on related programming (such as climate-resilient water management and agriculture). Proposals will target the GCF and complementary climate finance sources and will be developed in close coordination with sector ministries, water authorities, and local stakeholders. To ensure sustainability, the activity will establish standardised project formulation templates, guidance notes, and internal review processes, and support the formation of a Climate Project |

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| | Task Team within MoLAE. This will enable MoLAE to maintain and update the pipeline beyond the project duration, reducing reliance on ad hoc external support. |

### 7.4.2 Component 2: Improving community water infrastructure and re-use systems (Eastern Ghouta)

This component directly improves climate resilience and water security for vulnerable communities by climate-proofing existing boreholes and water networks that are critical water infrastructure and supporting demand management at household level. Strengthening O&M, and cost recovery systems supported by smart metering will sustain service delivery. Women-led CSOs and WLOs will be engaged in shaping cost-recovery structures and community reporting mechanisms, ensuring that infrastructure governance reflects women's priorities and avoids placing unintended burdens on female-headed households. Further, this component will support water efficient fixtures and promote grey-water recycling at household level to improve circularity in water use and curb demand. The interventions will be guided by data and governance systems established in Component 1 while real-time data will produce feeds directly into decision-support dashboards and local water management plans. Key beneficiaries include vulnerable households, water utility staff, and communities in Eastern Ghouta.

Table 7:Indicative list of adaptation techniques

| Adaptation Typology | Technology | Adaptation benefit | Climate hazard addressed |
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| Water efficiency and demand management | Installation of metering systems | A water demand management strategy that helps increase cost recovery for operations and maintenance | Water scarcity, declining surface and groundwater availability |
| | Household and institutional water efficient fixtures | Help adapt to climate change by reducing water demand | Water scarcity, declining surface and groundwater availability |
| | Household greywater treatment systems | Reduce freshwater demand through use of treated greywater for gardening | Water scarcity |
| | Installation of water flow meters and borehole development of drinking water boreholes | Supports monitoring of the water abstracted and improves borehole efficiency | Prolonged drought; declining rainfall; groundwater over-abstraction |

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| | Solar-powered groundwater pumping systems | Ensures reliable water supply to help vulnerable households cope with climate shocks | Prolonged drought, increased number of hot days |
| | Leak detection and repaired water network systems. | Reduces non- revenue water, increases effective supply without increasing abstraction | Water scarcity, declining surface and groundwater availability. |

Table 8: Description of activities under Component 2

| Output 2.1: Existing boreholes and networks are climate–proofed and optimised (Eastern Ghouta) | |
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| Activity 2.1.1 Climate-proof and upgrade public priority drinking water infrastructure | |
| This activity will support the Public Corporation for Drinking Water and Sanitation to climate-proof public drinking water infrastructure. This will improve reliability of service delivery despite declining groundwater levels, increased heat stress, and power supply disruptions. Integrating renewable energy sources will ensure reliable abstraction under climate extremes while improving operational reliability and sustainability. Prior to implementation, a sketch plan will be prepared for each priority project area. This activity will prioritise infrastructure serving vulnerable communities with large catchment areas, that are suffering from climate-related performance decline, or drought-period water supply issues. Standard quality assurance and efficiency testing will be conducted. | |
| Sub-Activity 2.1.1.1 | **Maintenance of public drinking water boreholes** will be conducted based on the findings of the pumping tests conducted under Activity 1.1.1 to improve operational efficiency and climate resilience while ensuring compliance with Syrian standard specifications. Adaptive technologies including corrosion-resistant casings, water flow meters, energy-efficient pumps, and renewable energy such as solarisation, will be installed on 28 boreholes to strengthen resilience against climate-induced stresses and reduce vulnerability to fuel supply disruptions. Boreholes will also undergo maintenance and flushing, implemented through a series of technically sequenced steps. This will include an assessment of the borehole's structural integrity and blockage, intensive cleaning and the dislodging of accumulated sediments, continuing until the extracted water is visibly clean and free of sand. Borehole flushing will help to prevent clogging, maintain aquifer connectivity, and reduce downtime, ensuring continuous access to safe water. Comprehensive water quality analyses will ensure compliance with drinking water standards, protecting aquifer integrity. |

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| Sub-Activity 2.1.1.2 | **Water supply network maintenance:** To reduce non-revenue water under increasing scarcity, targeted maintenance will be carried out on degraded sections of drinking water networks identified through technical assessments. Prioritised parts of the networks will be congested urban centres, old informal settlements, and high-pressure zones prone to bursts. Works will include pipe repairs, replacement of critical fittings, and installation of pressure regulation and ventilation components to improve network performance and reduce losses during climate-induced demand fluctuations. In conjunction, and where necessary, elevated water tanks will undergo maintenance to restore a critical component of the local water supply network. The intervention will encompass reinforced concrete patching, treatment of exposed steel, waterproofing, and replacing pipes and valves, followed by hydrostatic testing to verify performance. |
| Activity 2.1.2 Establish a robust leak detection and response system | |
| The project will support the Public Corporation for Drinking Water and Sanitation to establish a practical, scalable leak detection and response system designed to reduce wastage. By improving pressure management, network performance, and real-time visibility of losses, the system will increase effective water availability for households while reducing wastage, thereby strengthening resilience to drought and climate variability. | |
| Sub-Activity 2.1.2.1 | **Establish leak detection system:** A fit-for-context leak detection system will be established combining targeted technologies and strengthened operational procedures. This will include use of portable acoustic leak detection devices, smart bulk meters installed at key inlets and outlets, and integration of leak data into existing network management systems. Simple digital tools for data logging, visualisation, and prioritisation of repairs will be introduced, avoiding overly complex systems that cannot be sustained.<br><br>To ensure the sustainability of the leak detection system, 30 relevant staff will be trained on system O&M, including GIS analysis, remote sensing interpretation, hydraulic modelling, and digital data management. SOPs on leak detection, data validation and repair prioritisation will be developed for the government departments to institutionalise practices and ensure continuity beyond the project. |
| Sub-Activity 2.1.2.2 | **Establish community-based leak reporting mechanism:** To complement technical detection, a community-based leak reporting mechanism will be established to enable households and institutions to identify and report visible leaks at the user and neighbourhood level. This will include community consultation, including women representation, to inform the development of the system. The system will include a mobile and SMS-based reporting platform where users can report leaks using photos, location pins, or hotline messages. The customer reporting platform will be linked directly with the utility's GIS dashboard, enabling water department teams to consider customer-flagged leaks. Awareness campaigns |

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| | on the importance of community participation in leak detection at a network level and how to detect home leaks (e.g. checking toilet cisterns, monitoring meter movement, identifying pipe seepage) will be conducted by the project. Training sessions on reporting mechanisms will be held. These efforts will be bolstered through the community feedback and monitoring mechanism established under Activity 1.2.2, serving as an ongoing platform to promote use of the system and monitor usage. |
| Activity 2.1.3 Strengthen water resource directorate capacities for O&M and cost recovery | |
| This activity will strengthen the institutional capacity of the Public Corporation for Drinking Water and Sanitation, GCWR, and relevant utilities to sustainably operate, maintain, and finance climate-resilient water infrastructure, reducing long-term reliance on emergency or ad hoc funding. The focus will be on practical, transparent cost-recovery mechanisms that support routine O&M while remaining sensitive to affordability and vulnerability. Smart meter installation at in 20,000 households and institutions will further support cost-recovery and generate accurate data to support climate-informed water resource management. To ensure alignment and consistency with Syria's current national frameworks, the focus will remain on building the foundations, frameworks, and capacities for future cost-recovery mechanisms. | |
| Sub-Activity 2.1.3.1 | **Capacity building of technical departments to implement cost recovery activities:** Training will strengthen capacities in enforcing the developed operational plans and budgeting for O&M, linking revenue to service performance, and integrating cost-recovery considerations into water supply planning. A baseline assessment of current tariff structures, billing efficiency, and affordability will inform a financial model projecting long-term sustainability under different scenarios. Simple performance monitoring and public reporting tools will be strengthened to foster the piloting of cost-recovery mechanisms, enhancing transparency and accountability, and supporting trust between service providers and network subscribers. |
| Sub-Activity 2.1.3.2 | **Installation of water metering devices** will be conducted at both household and institutional levels to enable accurate monitoring of water use and support equitable and efficient resource management. At least 20,000 devices will be installed, supporting ongoing metering efforts of the Public Corporation in the area. A baseline assessment will identify priority installation zones based on consumption patterns, vulnerability, and network characteristics. The Public Corporation for Drinking Water and Sanitation staff will be trained in installation, reading, maintenance, and data analysis. Standard operating procedures for meter management will be developed. A mechanism for reporting meter faults will be established. |

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| Sub-Activity 2.1.3.3 | **Awareness on cost recovery initiatives:** Community awareness activities will be conducted to improve buy-in for cost-recovery mechanisms across Syria. The campaigns will explain the benefits of metering for improved services and climate resilience. A baseline survey will be conducted to understand community knowledge, attitudes, and perceptions on the tariff structure. Based on this, tailored messages will be developed to address concerns, promote transparency, and encourage responsible water use. Engagement approaches will be adapted to different population groups (including women) and may include community meetings, printed materials, SMS messaging, and local media, ensuring accessibility while reinforcing the link between cost recovery, service reliability, and climate resilience. At least 100,000 individuals are expected to be reached through the campaign. |
| Output 2.2 Improved water-use efficiency and re-use in vulnerable communities (Eastern Ghouta) | |
| Activity 2.2.1 Installation of water efficient fixtures | |
| This activity work with the Public Corporation for Drinking Water and Sanitation to enhance water-use efficiency and accountability in targeted vulnerable communities through the installation of water-efficient fixtures. These measures will reduce per-capita water consumption and promote conservation practices at household level. | |
| Sub-Activity 2.2.1.1 | **Installation of water-efficient fixtures** at the 19,500 selected households and 25 public institutions to promote conservation and reduce demand under conditions of increasing water scarcity. Households will be targeted based on socioeconomic vulnerability, with strong prioritization of female-headed households, and alignment with ongoing water infrastructure rehabilitation initiatives. The selection will be informed by participatory community consultations to assess local needs. Water conservation kits will include simple, low-maintenance devices designed to improve water pressure while reducing discharge rates at showers, taps, and cisterns, supporting sustained behavioural change without compromising basic water access. There will be a special focus in understanding gendered needs to ensure such fixtures do not cause additional burdens on women. |
| Activity 2.2.2 Installation of small-scale greywater recycling systems for household reuse | |
| The project will promote safe, decentralised greywater recycling and reuse to reduce pressures on freshwater demand and enhance households and public institutions' resilience to drought, drawing directly from the technical guidance developed under Activity 1.3.1 and in alignment with Syrian water quality standards. | |
| Sub-Activity 2.2.2.2 | **Installation of greywater recycling units:** Small greywater recycling units will be installed in 400 selected households and 25 public institutions to enable the safe reuse of wastewater from sinks, showers, and kitchens for non-potable purposes with an aim to change community perspective and trigger long-term behaviour change. Systems will be based on simple, low-cost technologies (e.g. collection tanks and basic filtration) designed for ease of operation and maintenance. Non-potable reuse will |

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| | target public green spaces, and livelihoods-enhancing activities at household level, namely home gardens and fodder for livestock. Garden kits (including seeds, basic gardening tools, organic fertiliser) will be provided to those households with a garden, whilst beneficiaries with livestock will receive hydroponic kits for fodder production. The system design will take into perspective the differentiated needs of men and women to ensure no additional burdens are placed on women's roles within the household. |
| Sub-Activity 2.2.2.3 | **Training for safe operation and maintenance:** All beneficiaries will receive training and ongoing support for both the recycling units and the relevant reuse practices (e.g. garden maintenance, irrigation techniques) to ensure safe and sustained use. The training will take into perspective women's specific roles in water management within the household and will target as much as feasible both women and men. Moreover, training materials will be adapted for low literacy conditions. Furthermore, regular water quality testing will ensure alignment with safe practices, technical guidance, and Syrian standards. |

### 7.4.3 Component 3: Supporting climate-resilient agriculture (Eastern Ghouta)

The third and final component aims to enhance the climate resilience of agricultural production and local ecosystems in Eastern Ghouta, by building on the basin-level data, water infrastructure improvements, and governance and community participatory monitoring mechanisms developed under Components 1 and 2. Local farmers, extension services and environmental workers will be supported to strengthen adoption of water-efficient and climate-smart practices, reducing pressure on shared groundwater resources, whilst sustainable financing options for the adoption of these practices helps create lasting impacts, reinforcing the paradigm shift. Women will be engaged throughout to ensure women's membership and participation in water management planning and that financing mechanisms are accessible to female farmers and women-headed households. Ecosystem-based adaptations to improve aquifer recharge likewise contribute to ensuring that agricultural communities, responsible for the vast majority of all water use in Syria, are supported with a multi-faceted approach to water security and long-term climate resilience.

Table 9: Indicative list of adaptation techniques

| Adaptation typology | Technology | Adaptation benefit | Climate hazard addressed |
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| Water management | Rainwater harvesting | Improved water retention, increased access to irrigation at farm and household level leading to increased production, productivity, and diversification | Increased average annual temperature, increased number of hot days, drought and extended dry periods |

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| | Micro catchments for water harvesting | Improved water retention, increased access to irrigation at farm and household level leading to increased production, productivity, and diversification | Increased average annual temperature, increased number of hot days, drought and extended dry periods |
| | Raised beds / wicking beds | Increased water use efficiency and maintaining soil moisture through dry periods | Increased average annual temperature, increased number of hot days, drought and extended dry periods |
| | Drip irrigation | Reduced water usage and loss for irrigation at farm level | Increased average annual temperature, increased number of hot days, drought and extended dry periods |
| | Micro-catchment earthworks with flood responsive hydrological designs | Mitigate flooding by increasing infiltration, evaporation, and storage. | Floods due to anomaly in average one day precipitation |
| | Natural flood Management Techniques | Tree planting, soil management techniques, rain gardens etc. | Floods due to anomaly in average one day precipitation |
| | Laser land-levelling | Reduced irrigation losses, efficient groundwater use<br><br>Reduce water consumption in irrigation and minimize water loss from flood irrigation<br><br>Prevent fertilizer wastage and groundwater pollution<br><br>Modernize traditional irrigation methods into improved systems. | Drought, high evapotranspiration |
| | Scheduled irrigation during cooler hours | Reduced evaporation losses, improved irrigation efficiency | Heat waves, high temperature |
| | Water-efficient drinking systems( Automatic waterers with sensors) | Reduces water wastage and improves water use efficiency | Drought, low rainfall, water scarcity |
| Input management | Use of resilient/improved seed varieties | Increased productivity of crops under various climate conditions, reduced losses | Increased average annual temperature, increased number of hot days, annual precipitation anomaly, |

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| | | | drought and extended dry periods |
| | Restoration/ Planting of adapted trees varieties | Increase productivity<br><br>Reduce water use<br><br>Improve the local environment by affecting the temperature and rainfall | Increased average annual temperature, increased number of hot days, annual precipitation anomaly, drought and extended dry periods |
| | Integrated Pest Management (IPM)` | Improved control of pests and diseases while reducing pesticide use and lowering risks to human health & environment. | Increased environmental stressors such as pathogens due to seasonal shifts/increasing temperatures leading. |
| | Use of bio stimulants/ bio pesticides / microbial additives | Stimulate natural plant growth and efficiency by enhancing nutrient uptake and stress tolerance and sustainable control of pests and diseases while reducing pesticide use, and lowering risks to human health & environment. | Increased environmental stressors such as pathogens due to seasonal shifts/increasing temperatures leading. |
| | Production of bioactive compost/ seven day compost | Increased soil fertility, improved productivity | Reduced soil fertility and land degradation |
| Soil conservation / Land management | Mulching | Reduced land degradation, reduced risk of erosion, increased soil fertility | Soil erosion, land degradation and precipitation anomaly |
| | Establishment of cover crops | Maintenance of soil fertility, reduction of erosion due to rainfall and wind, improved pest management | Soil erosion, land degradation and precipitation anomaly |
| | Nitrogen fixing plants | Increased soil fertility, improved productivity | Soil erosion, land degradation |
| | Planting wind breaks/ Shade trees | Provide shade, mitigating extreme weather impacts like soil erosion, storm surges, and wildfires | Soil erosion, land degradation, temperature anomalies. |
| | Fallowing | Increased soil fertility, reduction of land degradation and risk of erosion | Reduced soil fertility and land degradation |
| | Minimum tillage | Increased soil fertility, reduction of land degradation and risk of erosion | Soil erosion, land degradation |
| | Composting/ organic fertilizer | Improves soil structure and increases organic | Soil degradation and loss of fertility, soil moisture and |

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| | | matter content, increases beneficial organisms such as earthworms, enhances soil aeration and water retention, reduces the need for chemical fertilizers and maintains soil health | increased risk of drought, decreased soil water-holding capacity during dry periods |
| | Hydroponics & Aquaponics | Very high-water efficiency, reduced groundwater abstraction | Water scarcity, drought |
| | Crop rotation | Increased soil fertility | Soil erosion, land degradation |
| | Intercropping | Increased land productivity, diversification and improved soil fertility and moisture | Increased temperatures, drought and rainfall variability |
| | Adjusted planting calendar | Aligning crop growth with changing weather patterns, minimizing risks from extreme temperatures and water scarcity, and potentially increasing yields and water use efficiency. | Temperature anomaly and precipitation leading to inter-seasonal variability. |
| | Greenhouses, net shading | Reduced cross loss from extreme heat, reduced pests, improved soil moisture and water conservation | Increased temperatures, extreme heat, drought |
| | Alternative fodder (indigenous grasses and shrubs) | Locally adapted grasses with higher resilience to climate shocks, seeding early and providing, in extreme situations, grains for food. | Water scarcity and heat stress |
| Ecosystem-based adaptation | Supporting natural infiltration and revegetation of public land | Enhances natural aquifer recharge, reduces groundwater depletion, improves long-term water availability | Reduced recharge, ecosystem degradation under climate stress |

Table 10: Description of activities under Component 3

| Output 3.1 Smallholder farmers are supported to improve water management (Eastern Ghouta) |
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| Activity 3.1.1 Capacity-building for farmer associations |
| Trainings for 10 farmer associations (including female farmer membership) will compliment and build on the governance training provided to WUAs under Activity 1.2.2 to improve adaptive water governance and resource management at the farm level. The training will be |

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| closely coordinated with MoALE, MoA and MoE to ensure alignment across components and will be designed to ensure accessibility and suitability for vulnerable groups in terms of financial and digital literacy, including gender-inclusive measures. Detailed participatory and inclusive technical assessments during inception will further validate and refine technical assistance scope. | |
| Sub-Activity 3.1.1.1 | **Technical trainings on water management:** Tailored technical trainings will be provided on water demand/supply management and climate projection capacities to enhance data-informed agricultural planning. Indicative training topics may include: estimating crop water requirements; monitoring water use (through meters provided under Sub-Activity 3.1.1.2); irrigation scheduling and plan creation (based on irrigation well pumping tests conducted under Activity 1.1.1). |
| Sub-Activity 3.1.1.2 | **Provision of technical equipment to farmer associations:** Associations will be supported with essential tools such as soil moisture and salinity meters, along with water flow meters installed on pumping and irrigation systems, enabling accurate monitoring of the amount of water extracted from each well and providing essential water management data. This data will be incorporated and used to refine the local water management plans developed under Activity 1.2.1.3. |
| Sub-Activity 3.1.1.3 | **Development of O&M plans:** To ensure sustainability, the activity will facilitate the development of O&M plans for irrigation systems. The plans will clearly detail roles and responsibilities of the different actors within farmer associations for operation and maintenance of equipment provided, including on data ownership and information sharing, maintenance schedules, minimum performance standards and set up relationships with appropriate local authorities for any additional technical or institutional support that may be needed.<br><br>Inclusivity will be promoted by organising dedicated sessions for women farmers and supporting their inclusion in farmer associations coordination mechanisms. |
| Activity 3.1.2 Training on climate adapted agricultural practices | |
| Farmers (including female farmers), MoA's agricultural extension workers, and MoLAE's environmental workers will receive comprehensive training on a variety of climate adapted practices proven to bolster the climate resilience of agricultural production. Demonstration plots will be established to provide both theoretical and practical training on sustainable agricultural practices. In addition, agricultural extension and research centres will receive equipment and support alongside O&M training to ensure knowledge retention and transfer beyond the project span. All trainings will be designed to ensure accessibility and suitability for vulnerable groups in terms of financial and digital literacy and will include gender-inclusive measures. Detailed participatory and inclusive technical assessments during inception will further validate and refine technical assistance scope. | |
| Sub-Activity 3.1.2.1 | **Equipping and capacitation of agricultural extension and research centres:** To ensure the long-term functionality of the local agricultural extension centres, IT equipment, technical tools, and solar panels for the building electricity will also be provided. |

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| Sub-Activity 3.1.2.2 | **Establishment of demonstration plots:** Demonstration plots will be established through extension and research centres or champion farmers to facilitate hands-on training for climate-resilient agricultural practices. For each project area, suitable plots will be identified, and a list of key adaptation techniques will be prioritized from the list provided in Table 9: Indicative list of agricultural adaptation techniques above. The techniques selected will be based on agro-ecology of the project area, the key climate hazards and the types of crops grown in the area. Based on this list, the priority adaptions will be implemented in the demo plots. |
| Sub-Activity 3.1.2.3 | **Practical training within demonstration plots:** Following the establishment of demo plots, training curriculums will be developed. ToTs will be provided to 40 extension workers and environmental staff of MoLAE through expert trainers. With support from these workers, further trainings will be rolled out to farmers in the area. To ensure accessibility and suitability for vulnerable groups, including women and youth, these trainings will be simple and practical and will consider gender-inclusive measures. For example, female-only training groups and suitable training hours. Participants that successfully undergo the training programme will be prioritised to access grant/on-grant funding for climate-resilient practices under Activity 3.1.4 to scale up the adopted practices on their own land (provided other key selection criteria are also satisfied). |
| Activity 3.1.3 Support to government nurseries for increased supply of drought resistant crop seeds | |
| The project will support the General Organisation for Seed Multiplication (GOSM), and government nurseries in Rural Damascus governorate to increase local supply of drought resistant seeds. | |
| Sub-Activity 3.1.3.1 | **Provision of equipment to government nurseries and GOSM:** Laboratory equipment, essential production supplies, office furniture, and greenhouses related to national seed production will be provided. |
| Sub-Activity 3.1.3.2 | **Provision of training to the government nurseries and GOSM:** training will be provided for at least 50 staff and technicians covering topics such as improved and climate-adapted seed production practices, seed quality management, administrative and marketing skills, seed sample testing methods, and laboratory work. |
| Activity 3.1.4 Establish locally driven financing models | |
| The project will work on establishing locally driven financing models to support farmers in adopting climate-resilient water management, smart irrigation, water harvesting, and climate-adapted practices, including those covered under Activity 3.1.3. Two financing models for farmers and agribusinesses will be implemented: direct cash grants and a revolving on- granting mechanism, with the farmers' vulnerability and scale of operations being the main determining factor for which modality they will engage; grants for micro-farmers and on-granting for small- and medium-scale farmers. At least 2,060 farmers and agribusinesses are expected to access the financing support, benefitting over 12,360 individuals. | |
| Sub-Activity 3.1.4.1 | **Cost-sharing grants:** The project will support micro agribusinesses in the implementation of water harvesting techniques and modern irrigation |

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| | systems through the provision of cash grants and technical training. Priority will be given to those applicants that are able to contribute financially to the grant in the form of a cost-sharing model with strong encouragement of women participants. The mechanism is designed with deliberate flexibility to ensure accessibility for vulnerable households. Contribution levels are calibrated to individual capacity, with lower-liquidity households - including female-headed households, returnees, and those with significant care burdens - eligible for reduced contributions. Since investments are designed at micro-scale, the expected level of cost-sharing remains modest and proportionate. Acted programme teams review business plans on a case-by-case basis, allowing for adjustments where particularly vulnerable households face challenges.<br><br>Each micro business will be supported with business management trainings and mentored to develop a business plan, ensuring inclusion. The grants will be provided in instalments based on the agreed plans with detailed follow up by technical team to ensure compliance and inclusion and final instalments provided upon verification visits by field teams. |
| Sub-Activity 3.1.4.2 | **Establish revolving grant fund:** In partnership between Acted and a local, official financial institution, a revolving grant fund will be established providing no interest on-granting finance to farmers and agri-businesses to support the implementation of sustainable agricultural practices and strengthen livelihoods. The sub-grant agreement between Acted and the local financial institution and the RGF Operations Manual will clearly outline gender, inclusion, and PSEAH considerations are embedded in the partnership to ensure an inclusive approach to the mechanism's implementation. Acted will ensure participatory monitoring mechanisms established under the project (Activity 1.2.2) enable community feedback on relevant issues (such as targeting and mechanism implementation).<br><br>The fund will be carried out in two successive on-granting cycles. The first cycle will commence in Year 2 of the project, following the completion of capacity strengthening activities (Activities 3.1.2 and 3.1.3). The second cycle is launched after the recovery of on-grants from beneficiaries of the first cycle (approximately 18 months between cash distributions), allowing the same funds to be reinvested and re-disbursed to reach additional eligible enterprises. Both cycles will be completed by project end. The first cycle operates as a pilot, allowing meaningful lessons to be incorporated into refinements to operational procedures and support measures.<br><br>In accordance with the partnership agreement signed between the two parties, Acted – in coordination with MoLAE – will be responsible for the beneficiary selection process. Detailed technical assessments conducted at inception will inform any necessary adapted support measures to ensure inclusion and gender-sensitivity. Clear and accessible guidance will be provided to avoid discouraging less confident or less literate applications. After business plans are submitted (a requirement for the plan), applicants will received targeted support in developing the plans, thereby ensuring the projects are climate adapted, environmentally |

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| | sound, and financially feasible. This will likewise create a more supportive environment for vulnerable groups who might otherwise face barriers to application.<br><br>The financial institution will be responsible for disbursement of green on-granting and the management of repayment guarantees, in line with its internal policies and as outlined in the Operations Manual. Selection of the institution will include criteria related to experience in financial inclusion and demonstrated capacity to servie marginalized groups, including women and youth. Both Acted and the financial institution will jointly conduct monitoring and follow-up to ensure proper use of the on-granting funds, timely repayments, and the sustainability of the on-granting mechanism over the medium and long term. This will include oversight that inclusion considerations are adhered to and inadvertent exclusion is avoided, with challenges reviewed on a case-by-case bases.<br><br>At the end of the project, the revolving grant fund will be fully managed by the financial institution with oversight by MoA and MoLAE, which will continue administering the fund in line with the agreed eligibility criteria, on-granting conditions, and repayment mechanisms, ensuring the long-term sustainability of the scheme beyond the project duration. Details on the revolving on-granting functioning can be found in Annex 15. |
| Output 3.2 Community level ecosystem-based adaptations to improve aquifer recharge (Eastern Ghouta) | |
| Activity 3.2.1 Enhance natural infiltration | |
| Under this activity, the project will work closely with the MoE's GCWR, DRD-WRD to improve groundwater recharge, reducing vulnerability to drought and declining aquifers under climate change. | |
| Sub-Activity 3.2.1.1 | **Rehabilitation of infiltration assets:** First a mapping of existing recharge wells on public land will be conducted in partnership with local stakeholders. This mapping will be combined with land use data collected under Component 1 to identify hotspots and priority intervention areas where relevant. Following this, the project will support the maintenance and equipping of at least 50 existing recharge assets (e.g. wells) and establish infiltration trenches where feasible, with works including cleaning silt traps; maintaining erosion control structures; removing silt, grit, debris, and roots; and replacing gravel. These measures will support the natural infiltration of rainwater and surface runoff into underground aquifers, helping to increase groundwater availability and reduce stress on local water resources. |
| Sub-Activity 3.2.1.2 | **Development of O&M plans:** this will be done in coordination with MoE (GCWR and DRD-WRD), ensuring a collaborative approach to defining how the assets will be maintained post-project. These plans will outline clearly the roles and responsibilities of different actors responsible for the recharge wells and infiltration trenches, maintenance schedules, minimum performance standards, and where relevant a plan for financing the continued O&M of the assets. Community consultations facilitated under Outcome 1 (Activity 1.2.2) will enable consultations with diverse user |

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| | groups to ensure O&M reflect on-the-ground realities. Trainings will also be provided to local actors to ensure they understand clearly the O&M plans. |
| Activity 3.2.2 Restore degraded public land through revegetation with native plants | |
| Restoring vegetation cover and enhancing flora will be undertaken as a key step in mitigating soil erosion and desertification. The project will provide support to institutions and entities responsible for native forest/pasture seedling production and management, including under MoA (Badia Management and Development Authority, and the forestry directorate). Following this, revegetation campaigns to restore and rehabilitate flora and foliage in the targeted sites will be undertaken, supported by the establishment of an educational site to demonstrate and apply water conservation techniques for revegetation efforts. | |
| Sub-Activity 3.2.2.1 | **Support to MoA nurseries in Eastern Ghouta:** In collaboration with MoLAE (Directorate of Climate Change and Environmental Awareness and Directorate of Biodiversity and Land), a comprehensive support package of required inputs, equipment, and agricultural assets will be provided to the two main nurseries that produce pasture and forest plant seedlings in Eastern Ghouta. This may include growing medium, agricultural sand to improve drainage, basic hand and agricultural tools, mechanical equipment including tractors, irrigation systems, water salinity and pH measurement devices, and solar energy systems to ensure sustainable operation and reduce operating costs. A variety of pastoral seeds, locally adapted wild plants, and forest trees will likewise be included. |
| Sub-Activity 3.2.2.2 | **Revegetation campaigns:** Acted will work with MoLAE, MoA (BMDA and the Rural Damascus forestry directorate) in leading sustainable revegetation campaigns to restore estimated 300 hectares of degraded land. Sites will be selected in close coordination with both MoLAE and MoA, prioritising areas most vulnerable to desertification and soil erosion. Land use data collected under component 1 will be further used for prioritization of project sites where relevant. Climate-resilient native species provided from the supported nurseries under Sub-Activity 3.2.2.1. To ensure long-term success, local communities will be engaged in restoration activities, whilst MoA (BMDA) will oversee implementation and co-develop O&M protocols to establish clear watering, protection, and monitoring responsibilities. |
| Sub-Activity 3.2.2.3 | **Establish education site for sustainable land revegetation:** An educational site will be established to apply and demonstrate sustainable water use, water conservation, and low-input irrigation practices for land revegetation and reforestation using native plant species produced by supported nurseries adapted to local climate conditions. The site will function as a practical learning space showcasing locally appropriate species and techniques that support ecosystem restoration under climate stress.<br><br>The site will be used for hands-on training and knowledge exchange for up to 500 participants over the project period, including Ministry of Agriculture staff, university students, and local volunteers. This will be done through small group training sessions conducted in multiple cycles each |

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| | year. MoA (BMDA, local forestry directorate) and MoLAE, will be responsible for the site's sustained operation and upkeep post-project, as outlined in the O&M plan. |

## 7.5 Beneficiary selection

Overall, the project aims to reach approximately **198,620 direct beneficiaries** and an estimated **1,500,000 indirect beneficiaries**. Direct beneficiaries include national and basin-level institutions targeted under Component 1, as well as governorate, district, and community-level actors and households concentrated in Eastern Ghouta under Components 2 and 3. Indirect beneficiaries include the wider population of the Barada and Awaj basin who will benefit from improved water security, strengthened institutions, and enhanced climate resilience.

Acted will apply a two-step beneficiary selection and verification process to ensure transparent, inclusive, and impact-oriented targeting across all project activities. The approach is designed to prioritise vulnerability, support gender equality and youth inclusion, and mitigate risks of exclusion, elite capture, or conflict over land and water resources.

Step one -**Beneficiary selection:** For each activity a beneficiary selection memo will define clear eligibility and prioritisation criteria aligned with the activity's technical objectives. Eligibility criteria will ensure that participants have the appropriate roles, capacities, or service linkages to benefit from the activity. For example, Output 1.1 will be limited to staff and institutions with direct mandates in water resource management, planning, or data analysis. Selection of communities and households for water infrastructure rehabilitation, demand management measures, and reuse systems under Component 2 will prioritise areas facing the highest levels of climate-related water stress, service disruption, and dependency on shared water systems. For agricultural support under Component 3, eligibility will reflect the scale and nature of agricultural engagement to ensure technical relevance and effectiveness (for example, minimum agricultural engagement for climate-smart agriculture training or appropriate farm/business scale for access to grants or on-granting).

Across all activities, prioritisation criteria will favour vulnerable households and individuals, including female-headed households, households with persons with disabilities or chronic illness, high dependency ratios, reliance on primary production for income, low educational attainment, and economically vulnerable returnees and IDPs. Household surveys and community-level consultations, conducted in coordination with local governance structures, will inform identification of the vulnerable groups and the establishment of the project beneficiary database. Practical measures will also be taken to ensure vulnerable groups are not inadvertently excluded. For example, deploying female technical staff to support women during registration. Community monitoring and feedback mechanisms established under Activity 1.2.2 (including WUAs and CSOs) will play a central role in validating and refining targeting criteria. These mechanisms ensure representation of women, youth, persons with specific needs, elders, and other community groups, providing local insight to identify gaps, prevent unintended exclusion, and address early signs of social tension. Annual water resilience workshops, as well as community engagement team meetings (with participants drawn from the workshops) will be key formalized spaces for such consultation (Activity 1.2.2.2). For example, participants will validate criteria and identify whether proposed vulnerability indicators reflect actual conditions, and whether at-risk groups risk being inadvertently missed; they will also be able to monitor whether selection outcomes reflect agreed criteria in practice, flagging perceived exclusions or inequities to the PMU through the LLA Coordinator, ensuring targeting remains an ongoing accountability process, rather than a one-off exercise.

Furthermore, through the community monitoring tool (Activity 1.2.2.3), community0based data collection will generate localised evidence on vulnerability, water access, and household conditions to directly inform and refine prioritisation criteria, particularly for household-level activities under Output 2.2; and through WUAs (Activity 1.2.2.1), local knowledge about household climate-related water stress will inform infrastructure prioritisation under Component 2. For Component 3, farmer associations (including women farmers) engaged under Activity 3.1.1 will additionally be consulted to ensure criteria reflect local agricultural realities, and successful completion of training under Activity 3.1.1 will serve as a pathway criterion for access to financing support. This participatory validation strengthens transparency, and social cohesion.

Housing, Land and Property (HLP) considerations will be systematically integrated into project implementation, particularly for activities involving land or water access, to ensure a conflict-sensitive approach and prevent the creation or exacerbation of social tensions. For household- and community-level activities, Acted will apply a risk-based and context-appropriate HLP screening, focusing on the verification of legitimate land or water use and management rights, rather than formal ownership alone. Where relevant and feasible, verification surveys conducted on a sample of pre-selected households may include a review of available documentation (such as ownership records, rental or use agreements, or community attestations), without excluding households lacking formal papers. Established WUAs, CSO-led community mechanisms under Activity 1.2.2, and Acted's feedback and complaints mechanisms will serve as primary platforms for consultation, validation, and mediation of potential land or water-related disputes, ensuring inclusive, transparent, and conflict-sensitive implementation.

Step 2 - **Beneficiary verification:** Acted's MEAL team will conduct independent verification on a sample of household- and community-level direct beneficiaries identified under Components 2 and 3, providing a second layer of quality control to confirm eligibility and reduce inclusion errors and ensure a vulnerability-focused approach is applied. Verification will not apply to government institutions or public-sector staff participating in Component 1 or institutional capacity-building activities, where beneficiaries are selected based on official mandates and roles.

Table 11: Beneficiary targeting criteria for all project activities

| **Component 1: Strengthening institutional capacities for climate-resilient water management (Barada and Awaj basin)** | | |
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| **O1.1 Integrated data systems for measuring, monitoring, and modelling groundwater resources (Barada and Awaj basin)** | A1.1.1 Conduct integrated baseline assessments and establish groundwater monitoring networks | **Target beneficiaries:** GCWR, WRIC, DRD-WRD, MoE, MoA, MoLAE technical staff.<br><br>**Targeting criteria:** Staff will be selected based on their direct role in water resources management, data collection, and analysis, along with their technical expertise in hydrology, geology, modelling, and data management. Selection will ensure representation from relevant national and basin-level technical departments. Participation in model validation and training will be based on their institutional role in water resource planning and climate adaptation processes. |
| | A1.1.2 Develop climate-informed groundwater models and decision-support tools | |
| **O1.2 Multi-stakeholder capacity** | A1.2.1. Strengthening capacity of Damascus and | **Target beneficiaries:** DRD-WRD and Environmental directorate staff, district-level water and environment department staff. |

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| **strengthening for climate-informed water management (Easten Ghouta)** | Rural Damascus Water Resource Directorate and Environmental Directorate | **Targeting criteria:** DRD- WRD and district-level water department staff will be selected based on their direct responsibilities in local water management and planning. |
| | A1.2.2 Build local water management accountability systems | **Target beneficiaries:** WUAs, a local community structure (e.g CSO, municipality led volunteer board), community members including domestic users, farmers, women and youth groups, IDPs and returnees.<br><br>**Targeting criteria:** WUA members will include representatives from water utilities and water department, farmer associations, and community representatives, with equitable and meaningful participation of women, in line with project gender commitments. The community structure will be selected based on demonstrated experience in community facilitation, social accountability, and inclusive engagement. Community participants will be selected to ensure broad representation of water users and vulnerable groups in Eastern Ghouta, with a focus on those often under-represented in formal governance structures. |
| **O1.3 Knowledge sharing and financing for sustained water resilience (national)** | A1.3.1 Participatory review and recommendations to the local water use regulatory framework | **Target beneficiaries:** National ministries, local government, water utilities, community structures, women's groups, youth representatives, and technical experts.<br><br>**Targeting criteria:** Participants in multi-stakeholder workshops will be selected based on their role in or experience with local water regulation and management in Eastern Ghouta, ensuring diverse sectoral and social representation. |
| | A1.3.2 Multi-stakeholder forums for knowledge exchange and coordination of investments | **Target beneficiaries:** National institutions such as NDA (MoLAE), MoE, MoA<br><br>**Targeting criteria:** Participants in validation workshops and the national forum will be identified based on their institutional mandate, expertise, and role in national climate-water policy, investment, or community-level implementation. |
| | A1.3.3 Strengthening of the NDAs capacity to | **Target beneficiaries:** NDA and climate change department staff within MoLAE. |

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| | catalyse climate financing | **Targeting criteria:** Staff receiving training and support will be selected based on their direct involvement in climate finance programming, proposal development, and engagement with mechanisms like the GCF. |
| **Component 2: Improving community water infrastructure and re-use systems (Eastern Ghouta)** | | |
| **O2.1 Existing boreholes and networks are climate–proofed and optimised (Eastern Ghouta)** | A2.1.1 Climate-proof and upgrade priority public drinking water infrastructure. | **Target beneficiaries:** Vulnerable communities in Eastern Ghouta.<br><br>**Targeting criteria:** Infrastructure selection will prioritise systems serving highly vulnerable communities facing climate-related water stressors and those critical for water supply during droughts. |
| | A2.1.2 Establish a robust leak detection and response system. | **Target beneficiaries:** Public Corporation for Drinking Water and Sanitation staff, households and institutions in Eastern Ghouta.<br><br>**Targeting criteria:** Government staff will be selected from relevant departments for O&M training. Community participants in awareness campaigns and the reporting mechanism will be users of the water network in targeted areas. |
| | A2.1.3 Strengthen water resource directorate capacities for O&M and cost recovery. | **Target beneficiaries:** Public Corporation for Drinking Water and Sanitation, water utilities staff, and community members in Eastern Ghouta.<br><br>**Targeting criteria:** Technical department staff involved in finance and service delivery will be selected for capacity building. Community awareness activities will target the population served by the utilities, with messaging adapted to different groups. |
| **O2.2 Improved water use efficiency and re-use in vulnerable communities (Eastern Ghouta)** | A2.2.1 Installation of water efficient fixtures | **Target beneficiaries:** Vulnerable households and institutions in Eastern Ghouta.<br><br>**Targeting criteria:** Households will be selected based on socioeconomic vulnerability, with strong prioritisation of female-headed households, and alignment with ongoing water infrastructure rehabilitation. Selection will be informed by participatory community consultations and the community engagement team facilitated under Activity 1.2.2. Institutional metering will target priority zones based on consumption patterns and vulnerability. |

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| | A2.2.2 Installation of small-scale greywater recycling systems for household reuse | **Target beneficiaries:** Selected households and institutions in Eastern Ghouta.<br><br>**Targeting criteria:** Households will be selected based on vulnerability, their willingness to adopt reuse practices, whilst taking into account existing non-potable reuse avenues (i.e. home gardens, livestock). |
| **Component 3: 3. Supporting climate-resilient agriculture (Eastern Ghouta)** | | |
| **O3.1 Smallholder farmers are supported to improve water management (Eastern Ghouta)** | A3.1.1 Capacity-building for farmer associations | **Target beneficiaries:** Farmer associations and their members in Eastern Ghouta.<br><br>**Targeting criteria:** Associations and farmers engaged in agricultural water use will be targeted. Dedicated sessions will be organised for women farmers, and their inclusion in association coordination mechanisms will be prioritised. |
| | A3.1.2 Training on climate adapted agricultural practices | **Target beneficiaries:** Farmers, agricultural extension and agricultural research center workers of MoA, and environmental workers of MoLAE in Eastern Ghouta.<br><br>**Targeting criteria:** Participants will be selected based on their involvement in agriculture. Training-of-Trainers will target extension staff to ensure knowledge transfer. Participants successfully completing training may be prioritised for subsequent financing under Activity 3.1.4. |
| | A3.1.3 Support to government nurseries for increased supply of drought resistant seeds | **Target beneficiaries:** GOSM, public nurseries affiliated with MoA in Rural Damascus, their staff and technicians.<br><br>**Targeting criteria:** In-kind support will be directed to public institutions responsible for crop seed multiplication and distribution in the target areas, with training conducted staff in technical and production roles. |
| | A3.1.4 Establish locally driven financing models | **Target beneficiaries:** Micro, small-, and medium-scale farmers and agribusinesses in Eastern Ghouta.<br><br>**Targeting criteria:** As per the partnership agreement with the local financial institution, Acted will lead beneficiary selection for the on-granting. Beneficiaries will be selected based on scale of operations and vulnerability: grants for micro-farmers, on-granting for small- and medium-scale farmers. Priority will be given to farmers trained on climate-resilient practices under Activity 3.1.2, with strong encouragement |

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| | | for women participation. Applicants able to contribute financially will be prioritised for cost-sharing grants. |
| **O3.2 Community level ecosystem-based adaptations to improve aquifer recharge (Eastern Ghouta)** | A3.2.1 Enhance natural infiltration | **Target beneficiaries:** MoE (WRD and GCWR), MoLAE<br><br>**Targeting criteria:** Technical collaboration will involve staff responsible for land and water resource management in Eastern Ghouta |
| | A3.2.2 Restore degraded public land through revegetation with native plants | **Target beneficiaries:** MoA (BMDA, forest directorate), MoLAE; and local communities in Eastern Ghouta.<br><br>**Targeting criteria:** Support to nurseries will target the two main public seedling producers in Eastern Ghouta. Revegetation sites will be selected in coordination with MoA, prioritising areas most vulnerable to desertification. Local communities will be engaged in restoration activities through daily work opportunities. Location |

# 8. Responsiveness to GCF investment criteria

## 8.1. Project impacts

Syria is a water-scarce country, with communities in the Barada and Awaj basins particularly vulnerable to climate variability and prolonged drought. Years of conflict have weakened water infrastructure, institutional capacity, and governance, while limited access to finance constrains the implementation of climate-resilient water management. Adoption of climate adaptation measures is uneven, and existing water and agricultural practices often do not reflect the full risks posed by climate change. Women, youth, and vulnerable groups remain underrepresented in decision-making, reducing the inclusiveness and effectiveness of adaptation measures.

The project will support the Government of Syria and local authorities to strengthen institutional capacity for climate-informed water management. Basin-wide groundwater monitoring networks, integrated data platforms, and predictive groundwater models will provide actionable, real-time information to support evidence-based water allocation and demand management. Multi-stakeholder forums, capacity building of the NDA, and inclusive governance mechanisms will ensure that women, youth, and vulnerable groups meaningfully contribute to decision-making.

At the community level, the project will improve water infrastructure and service delivery, making them more resilient to climate shocks. Climate-proofed boreholes, optimized well-field operations, digital leak detection, and water-efficient fixtures will improve efficiency, reduce non-revenue water, and sustain reliable supply. Cost-recovery and strengthened O&M systems will ensure that infrastructure performance is maintained over the long term.

The project will support climate-smart agriculture and water demand management. By assessing irrigation practices, piloting efficient irrigation techniques, promoting drought-resistant crops, and supporting small-scale water harvesting and ecosystem-based recharge measures, the project will reduce agricultural water demand and increase soil moisture retention. Strengthened farmer associations, extension services, and local financing mechanisms will enable communities to adopt, maintain, and scale these measures.

Through knowledge generation and learning, the project will generate transferable lessons, tools and data systems for climate resilient, basin- scale water management. These will be consolidated and shared through MoLAE-led forums, creating a blueprint for replication across other water-scarce basins in Syria. By linking governance, infrastructure, and agriculture, the project will promote integrated, systemic, and sustainable climate-resilient water management, increasing water security, reducing climate vulnerability, and supporting resilient agricultural production for **198,620** people in the target area.

## 8.2 Paradigm shift potential

This project represents a paradigm shift in climate-resilient water management in the Barada and Awaj basin, with a focus on Eastern Ghouta. It moves away from fragmented, reactive interventions toward locally led, anticipatory, and scalable adaptation. By combining basin-wide groundwater monitoring, digital data systems, and participatory governance with optimized water infrastructure and climate-smart agricultural practices, the project introduces innovative, integrated approaches that have not previously been implemented at scale in Syria.

**Component 1:** Basin-wide groundwater monitoring networks, digital data systems and models will generate real-time information on climate impacts, predict aquifer dynamics and improve understanding of current water supply and demand in Barada and Awaj water basin. National and local level authorities will be trained to use this data for climate-informed planning. Inclusive water governance mechanisms and accountability channels will ensure meaningful participation of women, youth, and vulnerable groups in community water management decisions and planning. Multi-stakeholder climate forums and strengthened NDA capacity will support national policy uptake, learning and long-term climate finance, embedding evidence driven decision-making.

**Component 2:** operationalizes the capacities built under Component 1 by generating the field data needed for accurate monitoring, modelling, and management. Climate-proofed boreholes, surveys, and digital leak-detection will improve network performance, and keep abstraction within sustainable limits. Water-efficient fixtures, smart metering, and greywater reuse will further curb water demand in a sensitive manner to ensure affordability of drinking water for vulnerable populations. Strengthened O&M and cost-recovery strategies will sustain service delivery. Real-time data produced will feed directly into decision-support dashboards and local water management plans under Component 1.

**Component 3:** strengthens Components 1 and 2 by improving agricultural practices, curbing water demand and aligning farmer decisions. Assessments of agricultural abstraction, and improved irrigation efficiency will feed directly into the groundwater model and local demand-management scenarios. Building on water savings from Component 2, the demand management will be scaled up through efficient irrigation, climate-smart practices, drought-resistant crops, and small-scale water harvesting, supported by stronger farmer associations, extension services, and collaboration with local financial institutions. Ecosystem-based measures, such as infiltration trenches and re-vegetation, will boost water and soil management and support aquifer recharge. By integrating farmers into planning, Component 3 ensures agricultural needs and innovations are embedded in coordinated, climate-resilient water governance.

**Potential for scaling up and replicability**

The project's modular, basin-level design delivers scalable and replicable models for water governance (Component 1), climate proofed infrastructure (Component 2), and water demand management in agriculture (Component 3). Under Component 1, climate-informed, locally led water management approaches, rehabilitated monitoring systems, a predictive groundwater model, and standardized governance protocols create transferable frameworks that can be adopted by local authorities across the Barada and Awaj basin and in other water-scarce regions of Syria without major cost increases. Under Component 2 and 3, optimized infrastructure operations, cost-recovery mechanisms, and climate-smart agriculture interventions are packaged as reference solutions, complemented by extension services, documented lessons learned, business cases, and NDA-supported climate finance capacity. Partnerships with MoLAE and the GCWR ensure that data, planning tools, and governance mechanisms are institutionalized nationally, providing a pathway for replication through both government and donor-financed initiatives.

**Potential for knowledge sharing and learning**

The project integrates learning and knowledge exchange into all activities. MoLAE, GCWR, MoA and local service units will co-lead initiatives ranging from data collection and procurement to capacity building and groundwater model handover, ensuring institutional learning at all levels. Community water user associations and demonstration sites will serve as practical hubs for peer-to-peer learning on water-efficient practices, reuse systems, and climate-smart agriculture. Water governance accountability mechanism will create opportunities for greater community involvement, including participatory monitoring, and inclusive consultations of women, youth, and vulnerable groups in local decision-making processes. Consolidated lessons learned will be housed in a national knowledge repository and shared through MoLAE-led forums, fostering adaptive learning, policy feedback loops, and the systematic dissemination of evidence-based practices across governance levels.

**Contribution to the creation of an enabling environment**

By embedding climate data management, participatory governance and basin-level planning within MoLAE, GCWR, MoA and local entities, the project creates the institutional foundations for sustained climate-informed water governance. It will mainstream climate risk considerations into water planning processes and strengthen regulatory linkages between national and local actors. Through cost-recovery mechanisms, a revolving fund for irrigation, and training in climate finance access, the project will improve financial readiness for future adaptation investments.

**Contribution to the regulatory frameworks and policies**

The project will contribute to Syria’s regulatory framework by embedding climate-resilient water management practices within national and sub-national policies and operational guidelines. Through collaboration with MoLAE, GCWR, MoA and municipal authorities, it will support the integration of data-driven planning, inclusive governance structures, and ecosystem-based approaches into water resource regulations. Lessons from community-led models and pilot interventions will inform policy updates and sectoral guidelines, enabling evidence-based decision-making, standardization of best practices, and the replication of climate-smart water management approaches across other basins.

## 8.3 Sustainable development potential

The project establishes a holistic and sustainable framework for climate-resilient water management in the Barada and Awaj basins, with a focus on Eastern Ghouta. Institutional integration and formal governance mechanisms are central to ensuring that climate-informed water management continues beyond project completion. Groundwater monitoring systems and digital modelling tools will be handed over to GCWR with operation and maintenance plans and training to ensure timely updates and continuous trouble shooting. Combined with inclusive governance structures and accountability mechanisms embedded in local governance structures, this will enable routine, evidence-based decision-making at both national and local levels. Women, youth, and other vulnerable groups will be actively engaged through local water governance structures and accountability mechanisms strengthening social inclusion.

Infrastructure and operational sustainability will be achieved by strengthening government-led operation and maintenance (O&M) systems, rather than through stand-alone infrastructure upgrades. The project works directly with the Public Corporation for Drinking Water and Sanitation, to improve O&M through standardised maintenance procedures, staff training, and the introduction of practical tools for monitoring system performance. This includes flow meters and smart metering to support accurate consumption tracking and improved cost-recovery mechanisms. These institutional improvements are complemented by targeted infrastructure climate-proofing measures, such as solarisation of drinking water pumps and proactive leak detection, which reduce recurrent energy and repair costs, lower non-revenue water, and enable water utilities to operate systems more efficiently within existing budgets. Strengthened government capacity, reduced operational costs, improved revenue collection through metering supports the long-term functionality of water services and ensures sustained access to reliable and climate-resilient water supply for communities in Eastern Ghouta.

Community-level sustainability is strengthened through support to agricultural extension services, public nurseries, capacity-building of community water governance structures (WUAs) and farmer groups, and locally driven financing mechanisms such as cost-sharing grants and revolving funds. These measures ensure the continued adoption and scaling of climate-smart agricultural practices and ecosystem-based adaptation measures, supporting both water security and agricultural resilience over the long term.

Knowledge management and financing mechanisms will further support long-term sustainability., Business case development, and climate finance capacity-building create structural foundations for continued investment in climate-resilient water and agriculture interventions. Lessons learnt are documented and shared through multi-stakeholder forums under Activity 1.3.2, ensuring that best practices can be replicated and scaled across other water-scarce regions.

Overall, the project integrates institutional, infrastructural, and community interventions to embed climate resilience, promote sustainable resource use, and provide transferable models for replication in additional communities and basins, fostering long-term gender and economic co-benefits.

The project directly contributes to multiple SDGs by enhancing climate resilience, promoting sustainable water use, and strengthening local adaptive capacities:

**SDG 6 Clean Water and Sanitation:**
Strengthens equitable access to safe and reliable water through rehabilitation of boreholes, leak detection, greywater reuse, and efficient irrigation. Promotes integrated water resources management (IWRM) at basin and community levels.

**SDG 13 Climate Action:**
Builds adaptive capacity of vulnerable communities and institutions to climate-induced water stress through anticipatory planning, digital monitoring, and ecosystem-based adaptation.

**SDG 2 Zero Hunger:**
Improves smallholder farmers' resilience and productivity through water-efficient irrigation, micro-catchment restoration, and climate-smart agricultural practices.

**SDG 15 Life on Land:**
Employs nature-based solutions, enhancing soil moisture, reducing erosion, and protecting ecosystems that sustain local livelihoods.

**SDG 7 Affordable and Clean Energy:**
Integrates renewable energy (solarised pumping systems) into water supply, reducing emissions and operational costs.

**SDG 5 Gender Equality:**
Empowers women's participation in water user associations/farmer groups, communal decision-making on resources, and climate adaptation activities.

**SDG 17 Partnerships for the Goals:**
Fosters collaboration among national ministries, governorates, municipalities, communities, and development partners to scale climate-resilient water management.

## 8.3. Co-benefits

### 8.3.1. Gender co-benefits

Women and girls are often responsible for collecting, storing, and managing household water, as well as maintaining hygiene. These are tasks that have become increasingly difficult due to conflict-related infrastructure damage and climate-induced water stress. The project's emphasis on inclusive governance and participatory approaches will ensure that women are actively represented in the local water governance structures and local planning processes. Through tailored technical training on water monitoring, climate adaptation, and community-based decision-making, women will be empowered to move from beneficiaries to active leaders. This will be paired with dedicated mentorship and confidence building training, contributing to more equitable, effective, and sustainable water resource management at the local level.

Additionally, by improving the reliability of community water sources through small-scale borehole rehabilitation and leak reduction, as well as introduction of the greywater recycling and reuse systems the project will significantly reduce the time women spend managing water allowing women to dedicate time to other activities.

### 8.3.2. Economic co-benefits

Economic co-benefits arise from reduced water losses, sustained agricultural productivity in the face of climate change, and small-scale income opportunities. Leak detection, borehole maintenance, and optimized irrigation networks decrease non-revenue water and operational costs. Adoption of climate-smart irrigation, water reuse, and adaptation techniques tailored to the climate impacts in Eastern Ghouta will ensure sustained yields while reducing dependency on external inputs. Communal activities and infrastructure work generate temporary employment of local labour. The development of co-financing grants, revolving funds, and business cases for green-grey water infrastructure encourages sustainable investments, creating pathways for longer-term economic resilience in these communities.

# 9. Country ownership and stakeholder consultations

The project aligns with the priorities of national and local government institutions, and multiple government and non-governmental entities that were actively consulted in the design of the project. The project was designed through a process of co-creation with the Government of Syria. It closely aligns the priorities reflected in national policies and international commitments.

## 9.1 Alignment with policy and regulatory environment

### 9.1.1 Alignment with international climate treaties

Syria has ratified several international conventions, agreements, protocols and regulations relating to the management and protection of the environment, and the fight against climate change.

Table 12: Syria's application of relevant international climate treaties

| Convention | Status | Date of ratification | Date of entering into force |
|---|---|---|---|
| The United Nations Framework Convention on Climate Change (UNFCCC) | Ratified | 04/01/1996 | 03/04/1996 |
| Kyoto Protocol to the United Nations Framework Convention on Climate Change | Ratified | 27/01/2006 | 27/04/2006 |
| Paris Agreement on Climate Change | Ratified | 13/11/2017 | 13/12/2017 |
| United Nations Convention to Combat Desertification (UNCCD) | Ratified | 10/07/1997 | 09/10/1997 |
| The United Nations Convention on Biodiversity | Ratified | 04/01/1996 | 03/04/1996 |
| Cartagene Protocol to the United National Convention on Biodiversity | Accession | 01/04/2004 | 01/07/2004 |
| The Vienna Framework Convention for the Protection of the Ozone Layer | Accession | 12/12/1989 | 12/03/1990 |
| Ramsar Convention on Wetlands | Ratified | 05/03/1998 | 04/06/1998 |
| Barcelona convention | Accession | 26/12/1978 | 25/01/1979 |
| Convention for Protection of Marine Environment of the Mediterranean and Coastal Region | Accession | 10/10/2003 | 09/07/2004 |

Within the framework of the climate treaties, Syria developed a **strategy and action plan for adaptation to climate change in Syria**[248] in January 2010 enabling the preparation of Syria's

[248] Syrian Arab Republic, Ministry of state for Environment Affairs, (2010), Strategy and Action Plan for Adaptation to Climate Change in Syria. Available here.

**initial national communication to the UNFCCC**[249] in April 2010. The initial communication encompassed Syria's first national greenhouse gas (GHG) inventory, identified adaptation and mitigation measures for key sectors, identify national constraints limiting proposed implementation of activities related to UNFCCC. Increase of droughts and heat waves were identified as the main projected climate change hazards with a significant impact on water resource management, agriculture and land degradation.

Work on the **second National Communication** began in 2012 but was delayed due to the conflict. Similarly, implementation of the 2010 National Strategy and Action Plan for Adaptation has been limited.

In line with this strategy and action plan, Syria submitted their **first nationally determined contributions** (NDCs) under Paris Agreement on climate in November 2018. The NDCs do not include specific targets for GHG reduction but identify energy, forests, land and agriculture, transport, industry, and waste as key sectors for mitigation measures.

The key adaption priorities identified in the NDCs included efficient water resource management, biodiversity conservation, combatting land degradation and desertification, the formulation of integrated coastal zone management plans, and the establishment of early warning systems.

The project aligns with the key water resource priorities encompassing:

- the protection of water resources (and prevent contamination of surface and groundwater resources / wells);
- the reduction of water losses;
- the increase of water use efficiency, supporting water harvesting projects and using high efficiency irrigation methods;
- the promotion of use of non-traditional water resources (e.g. treated wastewater); and
- improved agricultural practices (e.g. drought tolerant crops, crops with lower water needs, capacitating rural extension services).[250]

Critically, the NDC's stipulate these priorities should be implemented through building capacity, expertise and competencies, raising about adapting to climate change, and establishing a participatory approach among residents of affected areas, and enhancing the role of local communities in the formulation and implementation of development programs.[251] This approach is at the core of the project.

Within the framework on UNCCD, in 2020, Syria also submitted the **National Report of Syrian Arab Republic on Land Degradation Neutrality, Land Degradation Neutrality - Target Setting Programme** with the strategic objectives to improve ecosystems, combat land degradation, promote sustainable land management, and crucially, mitigate drought effects. As part of the targeting, Syria committed to protect all water bodies and wetlands from degradation and rehabilitate damaged water infrastructure by 2025, as well as rehabilitate 50 percent of degraded water bodies and wetlands and improve water resource efficiency by 2030. As of today, all targets are yet to be met.

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[249] Syrian Arab Republic, Ministry of state for Environment Affairs, (2010), Initial national communication of the Syrian Arab Republic: Submitted to the United Nations Framework Convention on Climate Change. Available here.
[250] Syrian Arab Republic, (2018), Nationally Determined Contributions under Paris agreement on climate. Available here.
[251] Ibid.

The project is aligned with the water resource management priorities outlined in the NDCs, as well two voluntary targets within the UNCCD framework focused on protection and rehabilitation of water sources.

### 9.1.2 Alignment with national strategies and frameworks

As a result of the prolonged conflict, some national strategies related to climate change mitigation and adaptation, as well as water resource management, are currently under review, in need of updating or yet to be fully developed. The new administration is committed to strengthening and modernizing these strategies and regulatory frameworks. In the meantime, the following relevant frameworks continue to provide guidance:

**National strategies:**

The **national integrated water resource management (IWRM) strategy** was created in 2009 with support from United Nations Development Programme (UNDP) and Global Environment Facility (GEF). It focuses on enhancing Syria's capacity for sustainable water management while addressing challenges such as water scarcity, pollution and impacts of climate change. While this framework created an enabling environment, and the progress towards integrated water resource management was marked by the United Nation Environment Program (UNEP) as medium low,[117] decades of conflict slowed down resource allocation towards practical implementation of IWRM or feasibility of implementation at national scale. The strategy was further updated in 2024, however, based on the consultations with the relevant ministries, it will be further strengthened to allow for clear plan for forward.

The national development program – Syria Strategic Plan 2030,[118] developed in 2020 includes short - term and medium-term plans inclusive of the protection of the environment, which will be pursued by:

- achieving optimal use of water resources and maintaining their sustainability;
- developing the water and sanitation sector through the issue of developing regulations, laws, and regulating legislation, together with improving the efficiency of water resources investment, and reaching an integrated system;
- increasing the rate of organic products from agricultural products;
- reducing water losses in irrigation networks.

The national drought management strategy from 2009 covered the most immediate response to the emergency needs of the drought impacted population. However, it did not cover the impact of climate change or long-term adaption strategies to drought in water related sectors. It emphasized the need for an early warning mechanism. However, such mechanisms have not been put in place.

**National legislation:**

The project also embeds water and environmental legal and regulatory requirements detailed in *Section 3.6* to contribute to sustainable, long-term water security and environmental protection aligned with national legal frameworks.

## 9.2 Stakeholder consultations

The project was formulated in partnership with key Government of Syria ministries and governmental entities, including MoLAE in its capacity as the NDA, MoE, hosting GCWR, MoA and relevant directorates. The project has been designed through a participatory process that promotes country ownership and ensures strong alignment with national climate goals, reflecting priorities and national strategies outlined in *Section 9.1.* as well as GCF priorities.

To develop the concept note, a series of consultations were held with MoLAE, MoE, MoA, relevant directorates and other national stakeholders between June 2025 and November 2025 culminating in a one-day validation workshop held on November 27, 2025. During these meetings, Acted team was able to get feedback on proposed activities and locations, capitalize on lessons learnt, test assumptions, verify needs and priorities as well as alignment with national strategies. The meeting also assisted in identification of key challenges and areas for institutional strengthening. All were incorporated into the final version of the concept note and, ultimately, the funding proposal. As this project will be the first bi-lateral project for Syria, it was agreed in coordination with GCF that an application under SAP was the most appropriate fit.

Table 13: Summary of consultations at concept note stage

| Name of entity | Data and location |
|---|---|
| MoLAE; Climate change directorate | July 07, 2025; Damascus |
| MoLAE; NDA, International cooperation directorate | September 23, 2025; Damascus |
| MoLAE; NDA, International cooperation directorate | October 1, 2025; Damascus |
| MoE; Deputy Minister of Energy | October 13, 2025; Damascus |
| University of Damascus | October 13, 2025; Damascus |
| Public Corporation for Drinking Water and Sanitation | October 14, 2025; Damascus |
| MoE; General Commission of Water Resources | October 15, 2025; Damascus |
| MoLAE; Climate change directorate | November 02, 2025; Damascus |
| Agricultural Cooperative Bank | November 16, 2025; Damascus |
| MoE; General Commission of Water Resources | November 16, 2025; Damascus |
| MoA; International cooperation directorate, Directorate of Agricultural production support, Directorate of lands | November 24, 2025; Damascus |

Table 14: Summary of participants in the concept note validation workshop help on November 27, 2025, in Damascus

| No. | Name of entity | Job title | Name |
|---|---|---|---|
| 1. | Acted | Country Director | Ms. Marija Joffe |
| 2. | Acted | Area Coordinator | Mr. Mahmoud Alfreahat |
| 3. | Acted | Water and Environment Technical Coordinator | Dr. Tendai Kativhu |

| | | | |
|---|---|---|---|
| 4. | Acted | Country Finance Manager | Mr. Sebastien Roland |
| 5. | Directorate of Research and Environment, MoLAE | Director | Dr. Asa'ad Ulabi |
| 6. | Directorate of Research and Environment, MoLAE | Engineer within the Department of Environmental Impact Analysis | Eng. Hanan Safiah |
| 7. | Directorate of Environmental Safety, MoLAE | Director of Safety Department | Eng. Hakima Hawash |
| 8. | Directorate of Atmosphere and Environmental Awareness, MoLAE | Representative of Department of Climate Change | Dr. Shereen AlRaddawi |
| 9. | Directorate of Atmosphere and Environmental Awareness, MoLAE | Representative of Department of Environmental Awareness | Eng. Mohammad Yousef AlKurdi |
| 10. | Directorate of International Cooperation, MoLAE | Director of International Agreements | Ms. Rana Hameeda |
| 11. | Directorate of Environmental Safety, MoLAE | Engineer | Eng. Mayada AlHasan |
| 12. | Directorate of Biodiversity, Lands and Natural Reserves, MoLAE | Director of Biological Diversity | Eng. Bilal AlHayek |
| 13. | Directorate of International Cooperation, MoLAE | Meeting Rapporteur and Coordinator | Ms. Iman Bilal |
| 14. | Directorate of International Cooperation, MoLAE | National Coordinator for Green Climate Fund | Mr. Ahmad Bakkaieh |
| 15. | National Agricultural Policy Center, MoA | Director of Agricultural Policies Center | Mr. Ra'ed Hamza |
| 16. | General Directorate for Water, MoE | Deputy Director General for Water Infrastructure affairs | Mr. Hamdi EmadulDeen AlFattal |
| 17. | General Commission for Water Resources, MoE | Director of Water Resources Information Center | Ms. Su'ad Ibrahim Obeid |
| 18. | Damascus and Rural Damascus Water Resources Directorate, MoE | Director of Joint Services | Eng. AbdulRahman Al-Ghazawi |
| 19. | Damascus and Rural Damascus Water Resources Directorate, MoE | Deputy Director of Damascus and Rural Damascus Water Resources Directorate | Dr. Kassem Omar Saleh |

Figure 30: Photo from the concept note validation workshop

As part of the funding proposal development process a set of national, governorate level and local stakeholders' consultation were held to ensure that the proposed project is country-driven and fully responsive to local needs. Baseline data and information for the further development of the funding proposal were also gathered.

Table 15: Objectives of the stakeholder consultations

| Government | NGOs/UN | Farmers | Youth/women |
|---|---|---|---|
| Confirm the detailed activities and approach are consistent with government priorities.<br><br>Learn from their experience and identify potential risks. | Identify and confirm potential synergies and/or areas of duplication.<br><br>Learn from their experience and identify potential risks. | Understand impact of climate changes and existing successful adaptations and any indigenous solutions.<br><br>Confirm existing climate and environmental risks. | Develop a better understanding of the specific vulnerabilities of women and youth.<br><br>Understand the barriers that exist regarding influence on decision making, local water management, access to services for improved livelihoods. |

Throughout December 2025, two consultations were held with key governmental stakeholder in Rural Damascus governorate covering Douma district, which contains what is historically known as Eastern Ghouta. The purpose of these key informant interviews (KIIs) was to facilitate primary data collection, technical inputs, seek validation of the applicability and relevance of the proposed approaches and presence of other actors. SEAH-related risks were also discussed during consultations with government ministries to ensure alignment on prevention and response mechanisms. The consultations were held through KIIs and field visits with the representatives of the Public Corporation for Drinking Water in Damascus and Rural Damascus governorate, Agriculture Directorate for Rural Damascus as well as Douma Agricultural Sub-directorate, Haran Al'Awameed Agricultural Sub-directorate and Douma and Haran Al'Awameed Local Councils. At the national level, FP design workshops were held primarily with line ministries and public institutions, meaning women-led CSOs/WLOs, youth organizations and other civil society actors were not directly involved at that stage.

In addition, four focus group discussions were held with a diverse and inclusive group of community members, comprising farmers, youth, representatives of various local occupations, community leaders, and respected local notables. This broad representation ensured that multiple perspectives were captured, enriching the understanding of local needs, challenges, and opportunities for climate-resilient water management in the area.

Table 16: Community consultation gender disaggregation of the participants

| Sub -district | Number of men | Number of women | Total |
|---|---|---|---|
| Douma | 6 | 8 | 14 |
| Haran Al'Awameed | 5 | 6 | 11 |
| | 11 | 14 | **25** |

In each location a separated woman and men group discussion was carried out to ensure gender-sensitivity. While no specific vulnerable-group representative organizations were formally targeted during the consultations, individual participants from a range of vulnerable and marginalized groups were included. In Douma, female FGDs included young women, returnees, and a local council representative. In Harran Al-Awameed, female FGDs included older persons, IDPs, returnees, former detainees (who represented the majority of participants), and a representative of the Syrian Detainees Association. Male FGDs in Harran Al-Awameed included youth, older persons and a representative of the Charity & Benevolence Association, while male FGDs in Douma included youth and older persons.

Consultations with key government stakeholders and community members across Eastern Ghouta confirmed significant challenges in water resource management, agricultural productivity, and social protection that directly affect climate resilience. The area depends heavily on community-level boreholes without any centralized water stations, many of which became non-operational during years of conflict due to theft and damage. Water metering is absent, and water losses are high due to network leaks, theft, and lack of detection systems. Smart metring is however included in the development plans of the areas.

Drought affects groundwater levels and extraction costs. These challenges have increased household costs for water for domestic consumption and irrigation, as well as availability and affordability of fodder and food items. Women reported disproportionate increases in care and domestic work, including water collection, household rationing, and livestock care, while men often seek additional income through multiple jobs. While communities are adopting pragmatic coping strategies like greywater reuse and private house adaptations, these remain fragile due to perceived health risks, costs, and lack of access to credit. Adaptive capacity was found to be strongly linked to household economic status, with wealthier families able to purchase tanker water or hire labour. Poorer and vulnerable groups, including widows, female-headed households, displaced families, returnees, and smallholder farmers, face greater barriers to adaptation.

Participants highlighted that access to water is increasingly market-driven due to damaged public infrastructure, making topic of affordability more critical. Governance of water and irrigation continues to be predominantly men-led, with limited women's participation in decision-making and conflict resolution. Women participation at community level governance matters is highly dependent on education levels. The discussions also highlighted practical barriers to participation for women and returnees, such as social norms, timing, mobility constraints, and tenure insecurity.

These challenges and existing coping strategies underscore the need for integrated, locally led climate adaptation interventions in Eastern Ghouta. Rather than continuing unsustainable groundwater abstraction and reactive coping measures, stakeholders emphasized the importance of strengthening institutional and community capacities for climate-informed water management, improving the efficiency and sustainability of water infrastructure, promoting climate-resilient agricultural practices, and reinforcing inclusive governance mechanisms. Government counterparts confirmed that these priorities are aligned with national and governorate-level strategies for water resource management, agricultural resilience, and climate adaptation.

In addition to the primary consultations with government institutions and community representatives, the project design was further informed by exchanges with development partners and agencies active in the water and agriculture sectors in Rural Damascus. These discussions aimed to draw on existing experience, identify good practices, and ensure complementarity with ongoing and planned interventions, while avoiding duplication of efforts. In particular, technical discussions with FAO on November 20, 2025, provided insights from the implementation of climate adaptation and agricultural resilience activities in the governorate, including lessons related to farmer support, water use efficiency, and institutional coordination of the Adaptation Fund project. These inputs helped refine the project's approach to align with existing initiatives, while maintaining a clear focus on locally led, climate-resilient water management.

Stakeholder consultations directly informed the project's structure and prioritisation. Community feedback on high water costs and unreliable supply reinforced the focus on leakage reduction, metering, and renewable-powered pumping under Component 2. Concerns raised by women regarding time burdens and affordability informed the strengthening of the focus on household-level water efficiency measures and greywater reuse systems. Government stakeholders emphasised the lack of integrated groundwater data, leading to the prioritisation of a basin-wide monitoring and modelling system under Component 1 alongside targeted capacity strengthening for sustainability and replicability. Inputs from farmers and agricultural directorates highlighted the need to link water governance with agricultural demand management, shaping the design of Component 3 and its integration with the groundwater model.

The consultation process also informed the project's locally led adaptation approach. Community representatives, including farmers, women, and youth, highlighted the importance of having an increased role in water-related decision-making. As a result, the project embeds community participation through Water User Associations, participatory monitoring, sub-grants to local CSOs, and grievance and feedback mechanisms that will remain active throughout implementation. These mechanisms will enable continuous community input into water management decisions, infrastructure prioritisation, and adaptive responses to climate risks.

To maintain the country ownership of the project, further discussions with the with the NDA and relevant ministries were pursued throughout December and January 2026. The funding proposal was shared with the NDA for final validation on January 20, 2026 with a technical validation workshop held with MoLAE on January 25, 2026.

Given the focus on capacity building, small-scale rehabilitation of existing infrastructure, and nature-based solutions with minimal environmental risk, the project is classified as Category C in line with GCF environmental and social safeguards. Further specific considerations and adaptations regarding environmental considerations are detailed in Annex 12 with the Environmental and Social Action Plan, and regarding gender in Annex 4 with the Gender Assessment and Action Plan, including plans for further stakeholder consultations to address outstanding gaps at project inception.

## 9.3 Lessons learnt from previous projects

The proposed project will build on the readiness capacity

| Intervention | Lessons Learnt |
|---|---|
| **Output 1.1: Integrated data systems for measuring, monitoring, and modelling groundwater resources (Barada and Awaj basin)** | Acted has drawn on its ongoing groundwater measuring, monitoring, and modelling work in Hasakeh governorate in designing Output 1.1. Conducted in partnership with Groundwater Relief, a UK-based hydrogeological and groundwater technical consultancy, activities of the ongoing project consist of several components that will be directly replicated in the targeted basin, namely:<br><br>• Establish/expand groundwater monitoring coverage<br>• Installation and maintenance of water data and weather station loggers<br>• Conduct pumping tests and water quality analyses<br>• Develop wellfield analytical models<br>• Conduct geophysical assessments<br>• Train local water departments on the above components, in particular water quality testing and pumping tests<br><br>Four key lessons learnt drawn from the groundwater activities have been incorporated in project design and planning:<br><br>1. **Aquifer systems are highly heterogeneous, making borehole-specific performance assessments critical for sustainable management and accurate modelling:** Investigations revealed significant differences in yield and efficiency between individual boreholes, demonstrating that blanket assumptions about an aquifer's properties are insufficient, and that planning for resource utilisation must be informed by detailed, site-specific evaluations.<br>2. **Analytical modelling of abstraction scenarios is essential to predict long-term impacts and inform operational strategies:** Modelling of wellfields demonstrated that drawdown may not stabilise even after 20 years when cumulative abstractions are considered. It also indicated that adjusting pumping regimes (e.g. lower rates over longer periods) could mitigate drawdown or increase total yield.<br>3. **Building local technical capacity ensures the longevity of data collection and analysis beyond the project lifecycle:** Training provided to the local water department has enabled them to replicate boreholes surveys independently. Sustainable maintenance of the installed monitoring |

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| | network likewise relies on the ongoing involvement and ownership of local counterparts, reenforcing the importance of institutional capacity transfer.<br><br>Furthermore, and building on FAO/UNDP/UN-Habitat's work under the Adaptation Fund, the project will ensure monitoring data is operationalised by defining explicit triggers (e.g. groundwater decline thresholds) and linking them to concrete response actions for water authorities and users, thus fostering the link between data collection and direct decision-support. |
| **Output 1.2 Multi-stakeholder capacity strengthening for climate-informed water management (Easten Ghouta)** | Drawing from over years of area-based programming in Syria, the approach places community engagement, insights, and decision-making empowerment at the heart of its methodology. Having progressively developed and refined the approach over the years, Acted has closely drawn from well-document learnings to design this Output. Key lessons learnt include:<br><br>1. **The intentional engagement of a skilled local facilitator is critical for legitimacy and inclusive participation:** Community role in facilitating workshops and feedback mechanisms is essential for engaging underrepresented groups (women, youth, returnees) alongside formal structures (authorities, governance bodies) in a safe space, strengthening transparency and social cohesion whilst identifying and implementing concrete multi-sectoral interventions.<br>2. **Structured community workshops require careful design to ensure inclusivity and impact:** Workshop length, timing, and facilitation methods must be adapted to local preferences to ensure full and active participation, especially from women. Participation of authorities and decision makers is critical for inclusive process.<br>3. **Building on existing community structures and conflict-sensitive practices is fundamental for sustainability and mitigating social risk:** The activity is designed to empower local actors to drive climate action, whilst complimenting, not replacing or duplicating – existing formal governance structures, such as WUAs. This approach relies on understanding local social dynamics and ensuring the CSO-led mechanism is perceived as a legitimate, additional channel for all community segments, thereby avoiding the escalation of existing tensions over water resources.<br><br>Emphasis of the project is on institutional sustainability. Under Output 1.2, the project seeks to formalise the supervisory and technical role of relevant government entities (MoLAE, WRD) in activity oversight fostering long-term government ownership beyond the project duration. |
| **Output 2.1 Existing boreholes and networks are climate–proofed and optimised (Eastern Ghouta)** | WASH and critical water infrastructure play a core role in Acted's ABA programming, offering a wealth of experience related to borehole and network upgrades, along with the associated O&M training for key stakeholders. Key lessons learnt and best practices include:<br>1. **Integrating renewable energy solutions with infrastructure climate proofing has proven to improve the reliability and operational hours of water supply systems.**<br>2. **Sustainable infrastructure management requires the parallel strengthening of the institutional capacity of responsible technical departments.** Providing essential tools (e.g. water quality testing labs), |

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| | materials, and targeted O&M training and support to sustainable cost recovery empowers local water authorities to maintain systems independently, reinforcing the necessity of Activity 2.1.3. |
| **Output 2.2 Improved water use efficiency and re-use in vulnerable communities (Eastern Ghouta)** | Through both area programming and dedicated livelihoods projects, Acted's experience implementing household-level non-potable reuse of greywater has resulted in the following a key lesson learnt that have been taken into consideration for Output 2.2:<br>1. **Sustained adoption of new systems like home gardens and hydroponics requires continuous, post-installation technical support.** Low technology design, capacity building of the households on O&M and the local water departments strengthens the implementation success rate. |
| **Output 3.1 Smallholder farmers are supported to improve water management (Eastern Ghouta)** | Acted has drawn from its expansive agricultural programming across Syria to develop a refined, context-tailored, and implementation-informed approach. This programming includes support to farmers and agri-businesses through trainings on climate-resilient practices, cost sharing grants and revolving grant fund, implemented across Syria. Key lessons learnt relevant to Output 3.1 include:<br><br>1. **Maintaining flexibility in beneficiary targeting and programmatic scope based on findings from continuous community feedback mechanisms:** Several times throughout Acted's area programming, resources have been reallocated from one activity to another to ensure alignment with community-identified priorities at the feedback mechanisms that Output 1.2 seek to mirror. This practice ensures interventions remain relevant and impactful, whilst, core to GCF's LLA approach, places decision-making power at the most grassroots level feasible. This lesson supports the need for a participatory design of training curricula under Activity 3.1.1 and 3.1.2, and suggests maintaining operational flexibility to adapt training focus, demonstration plot crops, or even grant criteria (under 3.1.4) based on ongoing feedback from farmer associations and extension workers.<br>2. **Community-based water governance bodies require formal endorsement of local authorities to be effective, enforceable, and legitimate:** Community governance committees (like WUAs and farmer associations) require formal endorsement and capacity-building of relevant local authorities (e.g. Irrigation Directorates) to support and legitimise the committee's decisions. This directly informs Activity 3.1.1's aim to improve adaptive water governance, ensuring that the capacity-building for farmer associations is coordinated with, and recognised by, relevant official bodies. The local water management plans developed should likewise be formally acknowledged by authorities to ensure their use beyond the project lifecycle. Sustainability is thus linked to this official recognition and shared responsibility.<br>3. **Success in promoting climate-adapted practices is most likely when theoretical training is combined with immediate, practical application supported by resources:** Agricultural training under the area programming showed that innovative farming practices (e.g. hydroponic crops) were best adopted by making training mandatory prior to receiving financial support, along with requiring a business plan that outlines how the intended use of funds would be used to implement specific practices. |

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| | This validates the design of Activity 3.1.2 and supports the link to financing under Activity 3.1.4. |
| **Output 3.2 Community level ecosystem-based adaptations to improve aquifer recharge (Eastern Ghouta)** | Acted's global THRIVE programming, developed as an initiative to holistically address climate change and land degradation in rural ecosystems, offers a number of key lessons and best practices from across the 42 countries in which Acted operates. THRIVE works to restore the natural environment, protecting agro-pastural livelihoods while ensuring defence against natural disasters and climate change as key pillars of building resilient rural agricultural populations. Extensive implementation in Tajikistan and Lebanon has been drawn on for this Output, noting the following:<br>1. **The use of demonstration plots for reforestation to showcase benefits and boost replication by local resource users:** The practical, evidence-based demonstration of NBS on dedicated plots is a proven method for changing mindsets and encouraging the large-scale adoption of restoration techniques. This directly supports and validates the proposed approach in Sub-Activity 3.2.2.2 to conduct revegetation campaigns using climate-resilient native species, with the revegetation sites serving as visible proof for ecosystem restoration and aquifer recharge benefits within Eastern Ghouta.<br>This approach also builds on the ecosystem management demonstration plots established under FAO/UNDP/UN-Habitat's Adaptation Fund project. Under Output 3.2, eco-restoration pilots that explicitly measure both infiltration/water benefits and pollution reduction are thus incorporated. |

# 10. Implementation arrangements

## 10.1 Accredited and executing entity arrangements

Acted, an international NGO operating in 43 countries and reaching over 27 million people, will serve as the Accredited Entity (AE) for this project. As a "triple mandate" organisation - humanitarian, development, and environmental - Acted is committed to achieving a world of *Zero Exclusion, Zero Carbon, and Zero Poverty (3ZERO)*. Its work targets hard-to-reach communities, particularly in fragile and climate-vulnerable settings. Acted bridges humanitarian assistance with climate resilience, recognising that vulnerable populations are increasingly affected by both environmental crises and conflict. Partnerships are central to Acted's operating model, ensuring sustainability, accountability, and community ownership through collaboration with national authorities, local institutions, and civil society.

Under the overall fiduciary oversight of the Accredited Entity, the project will be implemented through two Executing Entities (EEs): The Government of the Syrian Arab Republic, acting through the Ministry of Local Administration and Environment (MoLAE) and Acted Syria. Clear roles, responsibilities, and coordination arrangements between the AE and EEs will be formalized through implementation agreements in line with GCF policies and procedures.

MoLAE will serve as a key EE, in accordance with its national mandate for environmental protection, climate change coordination, and sustainable local development. MoLAE ill execute activities related to institutional capacity building, knowledge management, and coordination with line ministries and public institutions, including MoA and MoE's General Commission for Water Resources. Implementation will be carried out through the Climate Change Directorate, ensuring alignment with national policies and effective integration of climate and environmental considerations into local planning and investment processes.

In its role as NDA to the GCF, MoLAE will also facilitate national-level coordination, support documentation and dissemination of lessons learnt, and strengthen institutional capacity for accessing and leveraging climate finance. This dual role will help ensure that project outcomes inform national policy processes and contribute to longer-term climate-resilient development pathways.

Acted Syria will also serve as an EE, drawing on its long-standing operational presence and technical experience in Syria. Acted has been active in the country since 2012 and operates through a coordination office in Damascus and field bases across multiple governorates, including Dar'a, Idleb, Aleppo, Raqqa, Hasakeh, and Deir ez Zor. Acted Syria implements multisectoral resilience programming in ten governorates, with an annual budget exceeding USD 65 million and direct assistance to over 1.49 million individuals in 2024.

Acted Syria's programming focuses on improved access to basic services, climate-resilient water management, sustainable livelihoods, particularly in agriculture, and strengthening local capacities. The organization has over a decade of experience implementing climate change adaptation activities in drought- and conflict-affected areas of Syria, including hydrogeological assessments and modelling to support sustainable groundwater and integrated water management. Acted Syria has a strong track record of collaboration with government institutions, UN agencies, donors, and civil society, ensuring coordinated, complementary, and policy-aligned interventions. Its technical expertise, robust monitoring and evaluation systems, and commitment to gender equality, social inclusion, and environmental safeguards position Acted Syria as a capable and reliable EE for the proposed GCF investment.

## 10.2 Project governance

The project will be implemented under Acted, serving as the Accredited Entity (AE) and grant holder, assuming full fiduciary responsibility in accordance with the Funded Activity Agreement (FAA) and the General Conditions of GCF. As AE, Acted will oversee:

1) Project appraisal, administrative, financial, technical management;
2) Fiduciary management to ensure the efficient and transparent use of GCF resources;
3) Monitoring and evaluation, including timely reporting;
4) Project closure, impact evaluation, and knowledge capture.

These functions will be coordinated by Acted's Headquarters in Paris, through a dedicated Project Task Force (PTF) including a Finance Manager, Lead Technical Advisor, and a Grant Manager, with contributions from other HQ technical specialists. In line with GCF Board Decision B.19/09, the PTF will remain separate from Acted Syria's Executing Entity (EE) functions to maintain objectivity and accountability.

To ensure transparency, national ownership, and multi-stakeholder coordination, the project will establish a high - level **Project Steering Committee (PSC)**, operational for the full project duration. PSC will provide strategic guidance and coordination, ensure national ownership and alignment with national climate and water priorities. Chaired by MoLAE, it will include representatives from key ministries: MoE, MoA, Emergency and Disaster Management, Finance, and others as relevant, as well as Acted Syria and the Project Director.

The PSC will meet annually, with a mandate including:

1) Provide guidance and direction aligned with national priorities
2) Address issues as raised by the Project Director
3) Review and validate annual work plans and budgets
4) Appraise the annual implementation period

A dedicated **Project Management Unit (PMU)** will also be established to ensure operational and programmatic oversight throughout the project lifecycle. The PMU will be chaired by the Project Director and consist of key sub-units (including finance, monitoring, evaluation, appraisal and learning (MEAL), partnerships) required for effective coordination, implementation, reporting, and deliverables. Convening at Damascus level at least quarterly, the PMU will support the preparation of materials for the PSC based on inputs received from the project implementation teams. Key PMU responsibilities will include:

1) Operational oversight and coordination
2) Supervision of project delivery across all components
3) Coordination of technical tools, reporting, and approaches across programs, finance, and MEAL of the EE and IPs
4) Problem-solving and revision of terms of work for partners if targets are not delivered

Further, day-to-day implementation and reporting to the PMU will be handled by the project staff within the project implementation teams of MoLAE, Acted and implementing partners.

A **Technical Working Group (TWG)** will be established to provide technical oversight and advisory support to the PMU. The TWG will review and advise on the technical delivery of the project, adaptative management, safeguards, and quality assurance, providing backstopping for implementation and progress. The TWG will be composed of designated technical focal points from the NDA, relevant line ministries, and the Executing Entities.

The TWG will meet on a quarterly basis, or on an ad hoc basis as required, and will be responsible for:

1) Reviewing technical designs, methodologies, and standards across all project components;
2) Providing technical recommendations to support adaptive management in response to climate risks, implementation challenges, or monitoring results;
3) Reviewing compliance with environmental and social safeguards, including gender and stakeholder engagement measures, in line with GCF requirements;
4) Ensuring alignment with national technical standards, policies, and climate strategies;
5) Validating key technical outputs prior to submission to the PMU and, where relevant, the PSC.

The TWG will have no fiduciary or procurement authority. Technical recommendations will be submitted to the PMU for operational decision-making and, where strategic endorsement is required, escalated to the PSC.

Further, the locally led, participatory approach embedded in the project design will empower community structures to meaningfully inform planning, implementation, and adaptive management of water and agricultural interventions. The project will institutionalise community voice and accountability through sub-grants to local civil society organisations to facilitate consultations, grievance mechanisms, and participatory monitoring, ensuring transparency and equitable water management. Thus, community feedback and monitoring data will be systematically channelled through the PMU to inform adaptive management decisions and, where necessary, strategic guidance by the PSC.

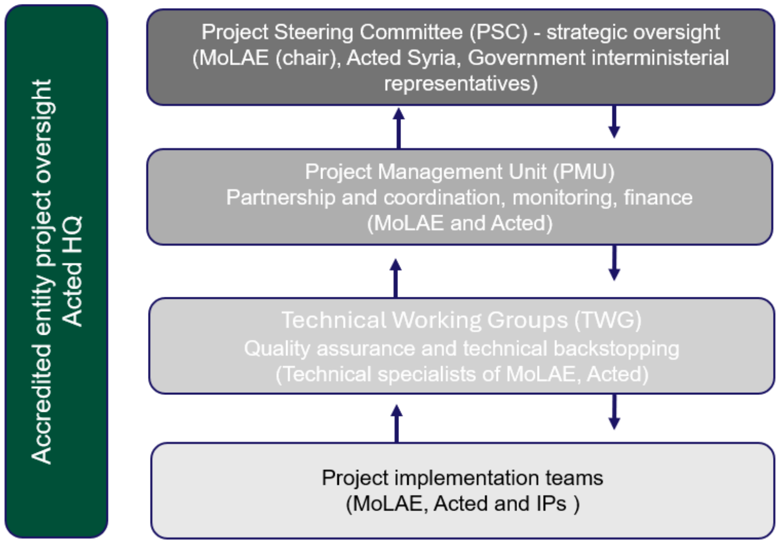


Figure 31: Project governance structure

## 10.3 Flow of funds

In line with the project execution arrangements outlined above, GCF funds received by Acted in its capacity as AE and will flow to the EEs - The Government of the Syrian Arab Republic, acting through MoLAE and Acted Syria. The flow of funds between Acted and Acted Syria will follow normal Acted financial procedures. The flow of funds between Acted (HQ) and MoLAE will follow the procedures and reporting requirements detailed in the MoU and project specific grant agreement. Where applicable, MoLAE and Acted Syria will establish other sub-granting agreements with third-party implementers (government partners, CSOs, local financial institution) approved by the PSC ensuring fiduciary integrity, transparency, and alignment with GCF financial management standards. Sub-grant beneficiaries will be responsible for full accountability of funds aligned with Acted and GCF requirements and reporting back to the executing entity on all results and achievements and ensuring full transparency of project utilization of funds. Any sub-granting by the EE will be fully aligned and follow the detailed scope of work for activities as outlined in the proposal and detailed in section 7 above.

This arrangement for the flow of funds will ensure that MoLAE is empowered to manage their funding and scope of work directly, while also helping to strengthen their experience and expertise in managing climate finance funds and develop a strong track record of managing funds.

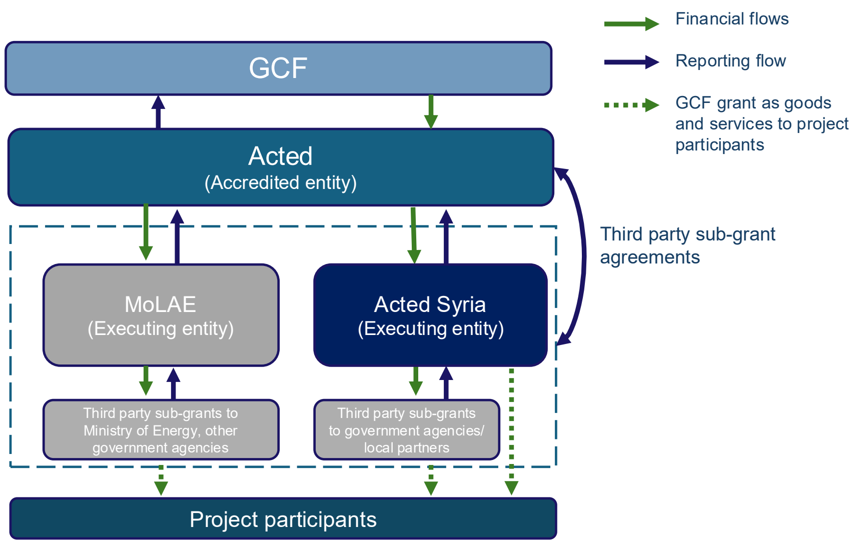


Figure 32: Flow of funds

# 11. Monitoring and evaluation

Acted, will oversee and implement the monitoring and evaluation (M&E) system in close collaboration with MoLAE and local stakeholders. The project will apply a tailored results-based and participatory M&E system structured around results-based monitoring and annual assessments carried out by Acted's Monitoring, Evaluation, Accountability and Learning (MEAL) Unit.

Results-based monitoring will follow the outcome and output indicators defined in the project's logical framework and a participatory approach will be applied to institutionalise feedback and adaptive decision-making within local governance and technical structures. Data collection will be conducted through varied means including household-level surveys, on-site monitoring, focus group discussions (FGDs), and key informant interviews (KIIs), and pre and post tests to assessed improved knowledge, with disaggregation by sex, age and status to ensure inclusivity. Additional participatory mechanisms will be incorporated throughout the project cycle to strengthen and ensure local ownership over monitoring, such as structured reflection sessions, participatory site inspection reports, seasonal participatory irrigation review meetings, and self-assessment governance scorecards. Monitoring data will be collected annually, analysed by the MEAL department, and used to inform periodic progress reports and adaptive management decisions.

Acted will collect the data from a stratified proportionate random sample with 95 percent confidence level and 5 percent to 10 percent margin of error, and the sample will be stratified per location withing the target areas of the governorate (all based on the beneficiary population). Informed consent will be gained from all respondents prior to collecting any information from them. For this, an informed consent paragraph will be included within all data collection tools to ensure all respondents are fully informed of the purpose and scope of the data collection activity and the conditions under which the information can be stored and used. All personal information will be stored securely including password protection of all electronic files. All enumerators and data collection staff will be trained on research ethics, informed consent, and data protection prior to the start of any data collection.

Acted will use a multi-layered results-based management approach that will ensure that progress and lessons are continually fed back into implementation to improve project management and implementation and to provide critical support for PMU decision-making.

**Project management**: Acted's MEAL Unit will ensure close collaboration and coordination with the PMU. The MEAL Unit will align the design of the Project Work Plan with the Project Management Framework (PMF) tool to plan monitoring of activities as soon as they are implemented or immediately after completion of the activity. The overall project tool will ensure that all required mitigation measures identified as part of the Environmental and Social Action Plan (Annex 12), and the Gender Action Plan (Annex 4) are integrated into the overall framework of monitoring project activities. This will allow for real-time monitoring of progress and the identification of any challenges or delays as they occur. This will allow Acted's country senior management team, the country MEAL manager, and project director and senior officer to assess progress and highlight blocking points early. Quality of implementation, progress, and challenges faced will be reported during monthly coordination meetings held at field level and escalated to appropriate channels.

**Monitoring, evaluation, accountability, and learning (MEAL):** Acted's in-country MEAL Unit – which is independent from the project teams and reports directly to the Country MEAL Manager - will provide a comprehensive and coordinated set of monitoring tools and approaches covering Acted's programming and activities. The MEAL Unit is dedicated to improving the relevance, quality and accountability of Acted's programs by ensuring that project monitoring and reporting are responsive to all assigned indicators. Acted also utilises the MEAL Unit as a functional learning instrument to extract and organise key findings and relevant information and experience from both MEAL data and outputs and Project Management teams. The Acted Country MEAL Manager will oversee all aspects of project monitoring, evaluation, accountability and learning to ensure coherence between the project activities and reporting on indicators and harmonization of tools and approaches across all project locations. The MEAL Unit will ensure that tools and methodological approaches are harmonised across monitoring activities in the geographical areas of intervention and ensure integration of participatory MEAL approaches. MEAL Unit team members will ensure that project data is collected, cross-checked, consolidated, analysed, reported on, and shared on an ongoing basis according to the PMF and work plans. Under the direction of the Country MEAL Manager, the MEAL Officers utilize monitoring tools directly or supervising trained enumerators to capture data and information on the technical aspects and results of interventions. MEAL Officers will conduct physical site visits for beneficiary registration and verification activities, and post-rehabilitation activities using a combination of direct observation, photo evidence, phone-based verification, beneficiary and staff interviews, narrative reporting tools, checklists, and Acted Feedback Mechanism (AFM) feedback. Project activities will be monitored continuously throughout implementation, in alignment with activity timelines, with particular attention to risks, achievements, beneficiary selection processes, inclusiveness, problem analysis, and the quality of implementation against stated objectives. Acted will leverage already developed MEAL tools and institutional expertise to effectively monitor and verify information. A comprehensive MEAL Framework will be developed for the action, based on the project logic model, to plan indicator measurement, consolidate data across all locations, and provide a structured basis for quality assurance, programme review, and reporting. Clearly defined information flows will ensure that data is standardised at national level and systematically fed back into implementation, strengthening programme flexibility, learning, and adaptive capacity.

Accountability focal points within the MEAL unit will oversee the collection, categorisation, and response to all community feedback and complaints received through Acted's formalised grievance redress mechanism (AFM).[252] All community feedback will be formally registered, categorised and addressed (see Annex 12 section 7). Feedback and complaints received through the AFM will be used to help Acted understand our programmes from the perspective of project participants and other key stakeholders, to identify any issues and take corrective measures as required, adjust activities to best meet community needs.

**Monitoring of gender integration and gender mainstreaming**: Gender-specific data will be captured and disaggregated for key project indicators during monitoring activities and the analysis of program data, providing insight into potential gender biases in the uptake or effect of the different programming modalities. Implementation of the Gender Action plan, including a dedicated Gender and PSEAH baseline assessment in Year 1, as outlined in Annex 4 will be done under the supervision of the Gender and Safeguarding Specialist.

**Data management and processing**: The MEAL Unit is also concerned with the management of information flows, data cleaning, and analysis. They will ensure that project data and information are collected and collated within standardised MEAL data management tools and platforms. Data and information will be consolidated at the national level. The MEAL Unit will ensure that project data, community feedback, and monitoring data continually feed back into project management decision-making, increasing the flexibility and adaptability of the programmatic approaches and interventions, and ensuring the relevance and quality of implementation in the field.

**Finance, logistics, administration and transparency (FLAT):** Acted's internal compliance departments will provide a final level of control, ensuring compliance with internal and external procedures and internal audit. In accordance with Acted's Standard Financial Procedures, an accounting system called SAGA will be used to track all expenditures and ensure frequent and robust monitoring of program and expenditures. With support from Acted's Country Finance Department, Compliance Officers will monitor logistics and other compliance processes through quality checks for contracts of a certain size, thus ensuring high quality and compliant materials are transparently sourced and used.

**Project and programmatic learning**: In order to continue the practice of improving programming from lessons learnt and to ensure a robust implementation of activities, Acted will conduct annual learning sessions with all the relevant stakeholders. Acted will also rely on established coordination structures to share information and will continue to facilitate a collaborative, flexible environment that promotes timely communication amongst relevant actors. Community feedback about project activities (notably, level 3 and level 4 feedback and complaints – see Annex 12 Section 7.2 for details) received through the AFM will be fed into the project's learning systems to ensure that follows a process of continuous improvement.

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