



**USAID**  
FROM THE AMERICAN PEOPLE

**IWMI** International Water  
Management Institute



# Synthesis of MENAdrought Development of Drought Mitigation, Preparedness and Response Management Plans

## Final Report

Guy Jobbins, Makram Belhaj Fraj,  
Stephen Fragaszy, Ali Ghanim, Emad Al-Karablieh,  
Mona Fakh, Mohamed Yessef, Abdellatif Khatabi,  
Michael Hayes, Cody Knutson, Theresa Jedd, Mark Svoboda,  
Sandra Ruckstuhl and Rachael McDonnell



Farmer working on dried farmland (photo: Pierre Restoul / IWMI)

# Synthesis of MENAdrought Development of Drought Mitigation, Preparedness and Response Management Plans

## Final Report

**Submitted to:** USAID Bureau for the Middle East

**Prepared by:** International Water Management Institute (IWMI)

**Authors:** Guy Jobbins (Astande Ltd), Makram Belhaj Fraj (Consultant, International Water Management Institute [IWMI], and ACQUATEC Solutions, Dubai Technology Entrepreneur Campus, Dubai, United Arab Emirates), Stephen Fragaszy (Consultant, IWMI), Ali Ghanim (Drought Management Unit, Ministry of Water and Irrigation, Jordan), Emad Al-Karablieh (Department of Agricultural Economics and Agribusiness, The University of Jordan, Amman, Jordan), Mona Fakhri (Water Resources, General Directorate of Hydraulic and Electrical Resources, Ministry of Energy and Water, Lebanon), Mohamed Yessif (Institut Hassan II of Agronomy and Veterinary Medicine, Rabat, Morocco), Abdellatif Khatabi (Ecole National Forestier d'ingenieurs – Sale, Morocco), Michael Hayes (School of Natural Resources, University of Nebraska–Lincoln, Lincoln, Nebraska, USA), Cody Knutson (School of Natural Resources, University of Nebraska–Lincoln, Lincoln, Nebraska, USA), Theresa Jedd (Technical University of Munich, Germany), Mark Svoboda (National Drought Mitigation Center, University of Nebraska–Lincoln, Lincoln, Nebraska, USA), Sandra Ruckstuhl (IWMI) and Rachael McDonnell (IWMI)

Jobbins, G.; Belhaj Fraj, M.; Fragaszy, S.; Ghanim, A.; Al-Karablieh, E.; Fakhri, M.; Yessif, M.; Khatabi, A.; Hayes, M.; Knutson, C.; Jedd, T.; Svoboda, M.; Ruckstuhl, S.; McDonnell, R. 2022. *Synthesis of MENAdrought development of drought mitigation, preparedness and response management plans: final report*. Project report prepared by the International Water Management Institute (IWMI) for the Bureau for the Middle East of the United States Agency for International Development (USAID). Washington, DC, USA: USAID; Colombo, Sri Lanka: International Water Management Institute (IWMI). 95p. doi: <https://doi.org/10.5337/2023.208>

**Designer:** Mario Bahar, Gracewinds Advertising



**ACKNOWLEDGMENTS:** The authors would like to acknowledge the numerous government officials from Jordan, Lebanon and Morocco for their contributions to this project, and Lucy Lawrenson for her editorial support on this publication.

**DISCLAIMER:** This document was made possible through the support of the Office of Technical Support, Bureau for the Middle East, U.S. Agency for International Development, under the terms of Award No. 7200-ME-18-10-00001. The opinions expressed in this publication are those of the authors and do not necessarily reflect the views of the U.S. Agency for International Development or the United States Government.

# Executive Summary

## Purpose

This report summarizes MENAdrought engagements with government agencies in Jordan, Lebanon and Morocco to support drought risk management. It describes the development process for, and the content of, Drought Action Plans (DAPs) that national and local government agencies have developed with MENAdrought support.

The MENAdrought project applied the Integrated Drought Management Programme's (IDMP's) 3 Pillars approach (WMO and GWP 2014).<sup>1</sup> The 3 Pillars approach aims to help societies implement drought risk reduction approaches while also improving crisis response management, and thereby realizes the Sendai Framework objectives (UNDRR 2015). This Pillar 3 report should be read in conjunction with the MENAdrought Pillar 1 (Bergaoui et al. 2022) and Pillar 2 reports (Fragaszy et al. 2022a, 2022b) which summarize the drought early warning systems developed, and the impact and vulnerability assessment undertaken, in support of the development of the DAPs.

## Introduction

*Conceptual Overview of Drought Management.* Conceptually, governmental drought management incorporates law, policies and their implementation, as well as governance. Drought management is rarely prescribed in detail through law; rather, it is typically enacted through policy (what governments do in practice) and governance (the ways in which governments and civil society organizations implement policies). Furthermore, drought management is rarely codified in an integrated, or even official, policy document; it is most often the result of past practice, customary interventions and/or 'layering' over multiple policy documents and plans across jurisdictional scales.

As a result, drought management approaches are often oriented toward crisis response rather than proactive risk management through preparedness and response planning or pre-impact programs for mitigation and long-term adaptation to climate change. However, governments are increasingly shifting away from reactive interventions including through high-level policy dialogue (e.g., the Sendai Framework). A nascent body of evidence points to improved welfare outcomes and economic efficiency through risk management in comparison to postimpact interventions.

*Drought Management and Objectives in the Project Countries.* Initial assessments indicated that stakeholders focus primarily on drought impacts in relation to water resources availability, municipal water supply, forests and other ecosystems, and irrigated and rainfed agricultural systems, including pastoralism. The governments of the project countries have undertaken a range of preparedness and mitigation actions broadly oriented toward food and water security, but they also still undertake a range of drought crisis response actions. Both sets of actions reflect the political economy of the project countries. Agriculture is of outsized importance for their labor markets, rural populations and overall economic production through direct and indirect contributions to GDP via agricultural value chains, although this has decreased somewhat since the 1970s as these economies have diversified.

In all these countries, the implicit policy objectives of preexisting drought management actions include maintenance of

1. national food and water security;
2. livestock herd sizes and output of high-value and staple crops;
3. productive capacity of rangelands;
4. the credit position of landholders involved in the formal financial sector (by definition, larger landholders given the low financial sector participation rates in these countries); and
5. generally optimizing intersectoral water allocation based on economic output.

<sup>1</sup> Pillar 1 relates to drought monitoring and early warning systems; Pillar 2 relates to drought impact and vulnerability assessments; and Pillar 3 relates to drought management planning.

*Public and Private Sector Stakeholders' Stated Needs to Improve Drought Management.* Considered broadly, common stakeholder needs across these countries reflect factors that are logical starting points to assess and analyze drought management systems (Jedd et al. 2020): policy settings; financial systems; governance and institutional coordination mechanisms; drought management plans and institutional capacities to deliver them; extension services and crop planning; and water management regimes.

Overall, multiple stakeholders focused on the need for technically robust drought definitions and associated indicators and confirmation/declaration mechanisms. Likewise, they sought improved coordination and information sharing mechanisms, and drought responses that reflect monitoring of drought conditions. These suggestions indicate the stakeholders' desire to improve the transparency of decision-making and intervention processes, the equity of their outcomes and generally to embody norms associated with risk reduction. The Moroccan government's publication of drought maps is indicative of action in this direction.

## **MENAdrought Approach to Supporting Agencies in Drought Risk Reduction Planning**

At the High-Level Meeting on National Drought Policy convened by the World Meteorological Organization (WMO) in 2013, MENA (Middle East and North Africa) governments requested technical support to improve drought monitoring and management. The MENAdrought project resulted from this request. It was structured as a demand-led applied research and technical support project with the objective of supporting the governments of the project countries to build self-reliance in managing drought impacts on water and food security and so limit the social and economic losses resulting from these events.

*Principles of Engagement.* The MENAdrought team took a 'working with the grain' approach to engagement with the national agencies (boundary partners) of these countries according to the following principles:

- Advise and guide the agencies to achieve their objective of moving to a risk management policy and governance framework;
- Support boundary partners in reforming the policy, governance and working norms necessary to achieve the objective of shifting to a risk management framework; and
- Encourage and facilitate adoption of norms that we consider necessary to achieve the objective of moving to a risk management framework.

*DAP Development Process.* We applied these principles during engagements with national agencies to develop the DAPs through typical policy analysis approaches. Agency officials first identified and prioritized the core drought impacts to address through public policy interventions. Second, they assessed the root causes of those problems and identified potential interventions to address them. Subsequently, they evaluated those interventions in a structured manner.

This included a review of their own legal and policy frameworks to examine the alignment between potential preparedness, mitigation and drought response interventions and their own mandates and strategies as well as national adaptation plans, preexisting proposals to Treasury and international donors, etc. It also included scoring interventions against the following criteria: anticipated efficacy, equity, pragmatism and practicality.

In summary, we supported the agencies to consider what was most important for them to address first and how to do so with the available resources, policy context and constraints they face.

*Status of DAPs.* At the time of writing in early 2023, none of the DAPs developed had been approved formally by any agency's executive leadership or political body, though they had been approved by the relevant interagency Drought Technical Committees that drafted and will implement them. Therefore, they should be considered as draft policy or "guidance" for relevant agencies.

Lengthy formalization processes are not uncommon in natural hazard policy development. Often, such plans are not formalized until the hazard hits again and the agencies must respond. Therefore, this status does not devalue the content of the DAPs; it simply indicates that the DAPs do not bind the agencies or governments to any specific commitments. Nonetheless, many aspects of the DAPs are already being implemented.

## Common Structure and Content of DAPs

At a general level, the DAPs share a common structure in that they all include:

1. Priority impacts that are the focus of the given DAP;
2. Preparedness and mitigation actions associated with those priority impacts;
3. A governance framework that links the drought monitoring and policy implementation functions to hierarchies of decision-making;
4. Drought definitions, including:
  - a. Tiered Drought Classes that are based on expected return periods;
  - b. Triggers that reflect severity, longevity and extent of drought, and tie drought early warning system outputs to Response Levels;
  - c. Response levels that reflect the resource intensity and robustness of government responses;
5. Drought management response actions that escalate according to response levels; and
6. Impact monitoring as well as policy effectiveness monitoring, evaluation and learning.

*Common Governance Aspects.* Governance structures in the Jordanian and Lebanese DAPs are somewhat similar to one another but differ from the Souss-Massa (Morocco) DAP outline, given the latter's regional character. In summary, from the most operational and technical level to executive management, the Jordanian and Lebanese DAPs both include at least:

1. A drought monitoring group that operates the drought early warning system and provides associated analysis and advice, with members including a subset of the agencies involved in the Drought Technical Committee (DTC);
2. An interagency DTC that has a range of operational and policy planning and implementation roles, as well as support for higher management committees;
3. A senior management committee responsible for decision-making on actions that require reallocation of existing baseline funds, with members still to be confirmed but intended to be from the same agencies involved in the DTC; and
4. An executive management committee responsible for decision-making on actions that require requests for new money from Treasury or donors (e.g., World Food Programme).

*Common Policy Content of DAPs.* The DAPs share common thematic content. For example, preparedness and mitigation actions include policy and institutional developments; improving underlying data and information sharing systems; monitoring and analysis; and investments in infrastructure resilience.

Likewise, in all the DAPs, drought definitions are the core component in drought management planning escalation. Each plan includes four Drought Classes:

- Normal (no drought);
- Moderate (5-10 year return period);
- Severe (10-20 year return period); and
- Exceptional (50-year return period).

These classes are linked to 'triggers' that reflect enhanced Composite Drought Indicator (eCDI) values produced by the drought early warning system. These triggers support decision-making on response actions, which escalate according to the Drought Class, and in all DAPs include the following general types of measures:

- Information collection and provision;
- Supporting voluntary/nonregulatory efforts amongst various publics;

- Training (including extension services) and process improvement or optimization;
- Undertaking and/or facilitating resource reallocation;
- Market mechanisms;
- Regulatory interventions and compliance, monitoring and enforcement of regulations; and
- Direct goods and services delivery to people and/or businesses.

In addition to information from the early warning system and the eCDI, which reflect biophysical drought conditions and risks, the national DAPs for Jordan and Lebanon include impact monitoring components, and the Souss-Massa DAP includes their development as a preparedness action. This impact monitoring (drought impact reporting that builds on the initial local validation network) reflects the social, economic and environmental consequences of drought and therefore supports response decision-making and long-term validation and improvement of the early warning system. To minimize resource requirements and institutional burden, the Jordanian and Lebanese impact indicators come from data that are already collected routinely, or otherwise readily accessible.

Lastly, the national DAPs for Jordan and Lebanon share similar broadly-described policy effectiveness, evaluation and learning components. This is not built into the Souss-Massa DAP beyond prescribed reporting.

## Achievements, Challenges and the Next Steps

In relation to Pillar 3, MENAdrought accomplished several objectives:


- Established reliable and operational systems for drought monitoring that are run and trusted by national government officials. These meet the stakeholders' need for robust scientific evidence on which to base drought management decision-making;
- Developed a comprehensive understanding of drought impacts and sources of vulnerability, including hazard maps, and worked with government officials to understand the root causes of these sources of vulnerability in a policy development context;
- Supported national and local government agencies to begin integrated drought management planning, a first in the MENA region. This includes development of DAPs that have been approved by mid-level management across multiple ministries (Jordan and Lebanon) and senior managers in Souss-Massa, Morocco;
- Supported interagency and multidisciplinary teams of young engineers and managers in building their own technical capacities and working together effectively on drought monitoring and management themes; and
- Supported governmental transparency and broader participation in policy processes through establishment of mechanisms for local feedback to central government via drought impact reporting networks and some publication of drought monitoring outputs. This sets the basis for possible permanent local feedback networks and/or public information sharing.

Broadly, the challenges the MENAdrought team faced in supporting the national agencies can be boiled down to adapting to the respective national context; the logistics and public service responses to and impacts from the Covid-19 pandemic and the war in Ukraine and their effects on project boundary partners; and to conditions typical of working at the science-policy interface.

The national agencies faced a range of challenges in developing the DAPs. These were associated with:

1. the science-policy interface—using information from sophisticated technical tools—which has important uncertainties and ambiguities for policymaking, which itself contains its own uncertainties and ambiguities;
2. consideration and trade-offs between improving resilience and adaptation; and
3. the political economy of natural resource governance.

Overall, we consider that we have contributed to nascent institutional (largely governmental) and human capability and capacity to undertake drought risk management in the ways in which we were invited to do so by national and local government agencies. We supported government officials in writing DAPs that will help them improve drought



risk management if resourced to do so. We consider that, with longer-term commitment (donor-funded and/or considerable investment from the relevant local agencies), they will be able to take the next, longer strides.

We consider also that the most immediate and impactful opportunities to support them require longer-term assistance to embed drought risk management planning across institutions and sectors. This would help realize an implicit objective in the DAPs: to create integrated strategies across actors. Likewise, we consider that enabling public participation through support for regional impact reporting networks would set the conditions necessary for the coalitions that, in other countries and contexts, have been critical for embedding risk management approaches.

# ملخص تنفيذي

## الهدف

يلخص هذا التقرير التعاقبات التي تربط منطقة الشرق الأوسط وشمال أفريقيا للجفاف (MENAdrought) مع الوكالات الحكومية في كل من الأردن ولبنان والمغرب لدعم عمليات إدارة مخاطر الجفاف. وهو يصف كلا من محتوى وعملية تطوير خطط العمل الخاصة بالجفاف (DAPS) التي طورتها الوكالات الحكومية الوطنية والمحلية بدعم من منطقة الشرق الأوسط وشمال أفريقيا للجفاف (MENAdrought).

وقد طُبِق مشروع منطقة الشرق الأوسط وشمال أفريقيا للجفاف نهج الركائز الثلاث (٣) الذي يتبعه البرنامج المتكامل لإدارة الجفاف- (IDMP) (المنظمة العالمية للأرصاد الجوية WMO و الشراكة العالمية للمياه GWP ٢٠١٤)٢. ويهدف نهج الركائز الثلاث إلى مساعدة المجتمعات على تنفيذ مناهج الحد من مخاطر الجفاف مع تحسين إدارة الاستجابة للآزمات، وبالتالي تحقيق أهداف إطار سينداي (UNDRR ٢٠١٥). وينبغي قراءة تقرير الركيزة ٣ هذا بالاقتران مع تقارير الركيزة ١ (Bergaoui et al. ٢٠٢٢) و الركيزة ٢ (Fragaszy et al. ٢٠٢٢a, ٢٠٢٢b) الخاص بمنطقة الشرق الأوسط وشمال أفريقيا للجفاف (MENAdrought) التي تلخص أنظمة الإنذار المبكر بالجفاف التي تم تطويرها، و بعمليات تقييم الأثر وقابلية التأثر التي اجريت ، لدعم تطوير خطط العمل الخاصة بالجفاف (DAPS).

## مقدمة

نظرة عامة مفاهيمية لإدارة الجفاف. من الناحية النظرية، تتضمن الإدارة الحكومية للجفاف القوانين والسياسات وتنفيذها، بالإضافة إلى الحوكمة. و نادراً ما يتم وصف إدارة الجفاف بالتفصيل من خلال القانون؛ بل يتم تفعيلها عادة من خلال السياسة (ما تفعله الحكومات في الممارسة العملية) والحكم (الطرق التي تنفذ بها الحكومات ومنظمات المجتمع المدني السياسات). علاوة على ذلك، نادراً ما يتم تدوين إدارة الجفاف في وثيقة سياسات متكاملة أو حتى رسمية؛ وغالباً ما يكون ذلك نتيجة للممارسات السابقة والتدخلات العرفية و/أو "الطبقات" ("layering") على وثائق سياسات متعددة وخطط عبر نطاقات قضائية.

ونتيجة لذلك، فإن نهج إدارة الجفاف غالباً ما تكون موجهة نحو الاستجابة للآزمات بدلاً من الإدارة الاستباقية للمخاطر من خلال التخطيط للتأهب والاستجابة أو برامج ما قبل التأثير للتخفيف والتكيف طويل الأجل مع تغير المناخ. ومع ذلك، فإن الحكومات تتعدّد بشكل متزايد عن التدخلات التفاعلية، بما في ذلك من خلال حوار السياسات الرفيع المستوى (على سبيل المثال، إطار سينداي). وتشير مجموعة من الأدلة الناشئة إلى تحسين نتائج الرعاية الاجتماعية والكفاءة الاقتصادية من خلال إدارة المخاطر مقارنة بالتدخلات ما بعد الأثر (بعد حدوث التأثير).

إدارة الجفاف وأهدافه في دول المشروع. وأشارت التقييمات الأولية إلى أن أصحاب المصلحة يركزون في المقام الأول على آثار الجفاف فيما يتعلق بتوافر الموارد المائية، وإمدادات المياه البلدية، والغابات وغيرها من النظم الإيكولوجية، والنظم الزراعية المروية والبيعية، بما في ذلك الرعي. وقد اتخذت حكومات بلدان المشروع مجموعة من إجراءات الاستعداد والتخفيف الموجهة على نطاق واسع نحو الأمن الغذائي والمائي، لكنها لا تزال تتخذ أيضاً مجموعة من إجراءات الاستجابة لأزمة الجفاف. وتعكس كلا المجموعتين من الإجراءات الاقتصاد السياسي لبلدان المشروع. وللزراعة أهمية كبيرة بالنسبة لأسواق العمل وسكان الريف والإنتاج الاقتصادي العام من خلال المساهمات المباشرة وغير المباشرة في الناتج المحلي الإجمالي عبر سلاسل القيمة الزراعية، على الرغم من أن هذا قد سجل انخفاضاً إلى حد ما منذ السبعينيات مع تنوع هذه الاقتصادات.

وفي كل هذه الدول، تشمل الأهداف السياسية الضمنية لإجراءات إدارة الجفاف القائمة مسبقاً الحفاظ على

١. الأمن الغذائي والمائي الوطني؛

٢. حجم قطعان الماشية و إنتاج المحاصيل العالية القيمة والمحاصيل الأساسية؛

٣. القدرة الإنتاجية للمراعي.

٤. الوضع الائتماني لأصحاب الأراضي المشاركين في القطاع المالي الرسمي (بحكم التعريف، أصحاب الأراضي الأكبر حجماً نظراً لانخفاض معدلات مشاركة القطاع المالي في هذه البلدان)؛ و

٥. تحسين تخصيص المياه بين القطاعات بشكل عام على أساس الناتج الاقتصادي.

ومن بين بلدان المشروع الثلاثة، لا ينفذ حالياً سوى المغرب تدابير منهجية وواسعة النطاق للحد من المخاطر المالية (التأمين ضد المخاطر) أو دعم سبل العيش (استبدال الدخل) التي تستهدف الضعف المالي الأساسي لصغار الملاك وتهدف إلى تحسين المرونة المالية للمجتمعات الريفية.

الاحتياجات المعلنة لأصحاب المصلحة في القطاعين العام والخاص لتحسين إدارة الجفاف. وتعكس الاحتياجات المشتركة لأصحاب المصلحة على نطاق واسع في جميع هذه البلدان عوامل تشكل منطلقاً منطقياً لتقييم وتحليل نظم إدارة الجفاف (Jedd et al. ٢٠٢٠): وضع السياسات؛ والنظم المالية؛ وآليات الحوكمة والتنسيق المؤسسي؛ وخطط إدارة الجفاف والقدرات المؤسسية اللازمة لتنفيذها؛ وخدمات الإرشاد وتخطيط المحاصيل؛ ونظم إدارة المياه.

وبشكل عام، ركز العديد من أصحاب المصلحة على الحاجة إلى تعريفات قوية للجفاف من الناحية الفنية والمؤشرات ذات الصلة وآليات التأكيد/الإعلان. وبالمثل، سعوا إلى تحسين آليات التنسيق وتبادل المعلومات، والاستجابات للجفاف التي تعكس رصد ظروف الجفاف. وتشير هذه الاقتراحات إلى رغبة

٢ وتعلق الركيزة ١ برصد الجفاف ونظم الإنذار المبكر؛ والركيزة ٢ بتقييمات آثار الجفاف وقابلية التأثر به؛ أما الركيزة ٣ فتتعلق بالتخطيط لإدارة الجفاف.



أصحاب المصلحة في تحسين شفافية عمليات صنع القرار والتدخل، والعدالة في نتائجها، وتجسيد المعايير المرتبطة بالحد من المخاطر بشكل عام. ويعد نشر الحكومة المغربية لخرائط الجفاف مؤشرا على العمل في هذا الاتجاه.

## نهج منطقة الشرق الأوسط وشمال أفريقيا للجفاف الداعمة للوكالات في التخطيط للحد من مخاطر الجفاف

وفي الاجتماع الرفيع المستوى بشأن السياسة الوطنية للجفاف الذي عقدته المنظمة العالمية للأرصاد الجوية في عام ٢٠١٣، طلبت حكومات منطقة الشرق الأوسط وشمال أفريقيا الدعم الفني لتحسين مراقبة الجفاف وإدارته. وقد تم إنشاء مشروع منطقة الشرق الأوسط وشمال أفريقيا للجفاف (MENAdrought) بناءً على هذا الطلب. وقد تم تنظيمه كمسؤول للبحث التطبيقي والدعم الفني قائم على الطلب بهدف دعم حكومات بلدان المشروع لبناء الاعتماد على الذات في إدارة آثار الجفاف على الأمن المائي والغذائي وبالتالي الحد من الخسائر الاجتماعية والاقتصادية الناجمة عن هذه الأحداث.

مبادئ الارتباط. اتبع فريق منطقة الشرق الأوسط وشمال أفريقيا للجفاف نهج "العمل مع الحبوب" في التعامل مع الوكالات الوطنية (boundary partners) (الشركاء الوسطاء) لهذه البلدان وفقاً للمبادئ التالية:

- تقديم المشورة والتوجيه للوكالات لتحقيق هدفها المتمثل في الانتقال إلى سياسة إدارة المخاطر وإطار الحوكمة.
- دعم الشركاء الوسطاء في إصلاح السياسة والحوكمة ومعايير العمل اللازمة لتحقيق هدف التحول إلى إطار إدارة المخاطر. و
- تشجيع وتسهيل اعتماد المعايير التي تعتبرها ضرورية لتحقيق هدف الانتقال إلى إطار إدارة المخاطر.

عملية تطوير خطط العمل الخاصة بالجفاف (DAPs). لقد طبقنا هذه المبادئ خلال تعاملتنا مع الوكالات الوطنية لتطوير خطط العمل الخاصة بالجفاف (DAPs) من خلال مناهج تحليل السياسات النموذجية. قام مسؤولو الوكالة أولاً بتحديد وترتيب أولويات تأثيرات الجفاف الأساسية التي يجب معالجتها من خلال تدخلات السياسة العامة. ثانياً، قاموا بتقييم الأسباب الجذرية لتلك المشاكل وحددوا التدخلات المحتملة لمعالجتها. وبعد ذلك، قاموا بتقييم تلك التدخلات بطريقة منظمة.

وشمل ذلك مراجعة الأطر القانونية والسياسية الخاصة بهم لفحص التوافق بين التدخلات المحتملة للتأهب والتخفيف والاستجابة للجفاف وبين الصلاحيات واستراتيجيات الخاصة بهم، بالإضافة إلى خطط التكيف الوطنية، والمقترحات الموجودة مسبقاً المقدمة إلى الخزانة (Treasury) والجهات المانحة الدولية، وما إلى ذلك. كما شمل ذلك مراجعة تسجيل التدخلات وفقاً للمعايير التالية: الفعالية المتوقعة والإنصاف والواقعية (البرامغامية) والتطبيق العملي.

وباختصار، لقد دعمنا الوكالات للنظر في الأمور الأكثر أهمية التي يتعين عليها معالجتها أولاً وكيفية القيام بذلك باستخدام الموارد المتاحة وسياق السياسات والقيود التي تواجهها.

وضعية خطط العمل الخاصة بالجفاف (DAPs). و حتى لحضة اعداد هذا التقرير في أوائل عام ٢٠٢٣، لم تتم الموافقة رسمياً على أي من خطط العمل الخاصة بالجفاف (DAPs) التي تم تطويرها من قبل القيادة التنفيذية أو الهيئة السياسية لأي وكالة، على الرغم من أنه قد تمت الموافقة عليها من قبل اللجان الفنية المشتركة بين الوكالات ذات الصلة بالجفاف والتي قامت بصياغة هذه الخطط وتنفيذها. ولذلك، ينبغي اعتبارها بمثابة مسودة سياسة أو "إرشادات" للوكالات ذات الصلة.

إن عمليات إضفاء الطابع الرسمي المطولة ليست نادرة الحدوث في عمليات تطوير سياسات المخاطر الطبيعية. ففي كثير من الأحيان، لا يتم إضفاء الطابع الرسمي على هذه الخطط حتى يضرّب الخطر مرة أخرى وعندها يجب على الوكالات الاستجابة. ولذلك، فإن هذا الوضع لا يقلل من قيمة محتوى خطط العمل الخاصة بالجفاف (DAPs)؛ إنه يشير ببساطة إلى أن خطط العمل الخاصة بالجفاف لا تلزم الوكالات أو الحكومات بأية التزامات محددة. ومع ذلك، فإن العديد من جوانب خطط العمل الخاصة بالجفاف يجري تنفيذها بالفعل.

## البنية المشتركة و محتوى خطط العمل الخاصة بالجفاف (DAPs)

أعلى المستوى العام، تشترك خطط العمل الخاصة بالجفاف (DAPs) في بنية مشتركة حيث تشمل جميعها ما يلي:

١. التأثيرات ذات الأولوية التي تمثل محور خطط العمل الخاصة بالجفاف (DAPs) المعنية؛
٢. إجراءات الاستعداد والتخفيف المرتبطة بتلك التأثيرات ذات الأولوية؛
٣. إطار إداري يربط بين وظائف مراقبة الجفاف وتنفيذ السياسات والتسلسل الهرمي لصنع القرار؛
٤. تعريفات الجفاف ومنها:
  - أ. فئات الجفاف المتدرجة التي تعتمد على فترات العودة المتوقعة؛
  - ب. المحفزات التي تعكس شدة الجفاف وديمومته ومداه، وترتبط مخرجات نظام الإنذار المبكر بالجفاف بمستويات الاستجابة؛
  - ج. مستويات الاستجابة التي تعكس كثافة الموارد وقوة الاستجابات الحكومية؛
  ٥. إجراءات الاستجابة لإدارة الجفاف التي تتصاعد وفقاً لمستويات الاستجابة؛ و
  ٦. رصد الأثر وكذلك رصد فعالية السياسات وتقييمها ودراساتها.

جوانب الحوكمة المشتركة. تتشابه هياكل الحوكمة في خطط العمل الخاصة بالجفاف (DAPs) الأردنية واللبنانية إلى حد ما ولكنها تختلف عن الخطوط العريضة لخطة العمل الخاصة بالجفاف (DAP) في سوس ماسة (المغرب)، نظراً للطابع الإقليمي للأخيرة. باختصار، من المستوى التشغيلي والتقني إلى الإدارة التنفيذية، تشمل كلا خطتي العمل الخاصة بالجفاف (DAPs) الأردنية واللبنانية على الأقل:

١. فريق لرصد الجفاف يدير نظام الإنذار المبكر بالجفاف ويقدم التحليلات والمشورة ذات الصلة، مع أعضاء بما في ذلك مجموعة فرعية من الوكالات المشاركة في اللجنة الفنية للجفاف (DTC)؛

٢. لجنة فنية للجفاف مشتركة بين الوكالات تضطلع بمجموعة من الأدوار التشغيلية وتخطيط السياسات وتنفيذها، بالإضافة إلى دعم لجان الإدارة العليا؛

٣. لجنة الإدارة العليا المسؤولة عن اتخاذ القرار بشأن الإجراءات التي تتطلب إعادة تخصيص التمويلات الأساسية الحالية، مع أعضاء لم يتم تأكيد تعيينهم بعد ولكن من المقرر أن يكونوا من نفس الوكالات المشاركة في اللجنة الفنية للجفاف (DTC)؛ و

٤. لجنة إدارية تنفيذية مسؤولة عن اتخاذ القرارات بشأن الإجراءات التي تتطلب طلبات للحصول على أموال جديدة من الخزانة (Treasury) أو الجهات المانحة (مثل برنامج الأغذية العالمي).

محتوى السياسة المشتركة لخطط العمل الخاصة بالجفاف (DAPs). تشترك خطط العمل الخاصة بالجفاف (DAPs) في محتوى موضوعي مشترك. على سبيل المثال، تشمل إجراءات الاستعداد والتخفيف تطورات السياسات والمؤسسات؛ وتحسين أنظمة تبادل البيانات والمعلومات الأساسية؛ والرصد والتحليل؛ والاستثمارات في تعزيز مرونة البنية التحتية.

وبالمثل، في جميع خطط العمل الخاصة بالجفاف (DAPs)، تعد تعريفات الجفاف العنصر الأساسي في تصاعد عمليات التخطيط لإدارة الجفاف. تتضمن كل خطة أربع فئات للجفاف:

• عادي (لا يوجد جفاف)؛

• معتدلة (فترة العودة من ٥ إلى ١٠ سنوات)؛

• شديدة (فترة العودة من ١٠ إلى ٢٠ سنة)؛ و

• استثنائي (فترة العودة - ٥٠ سنة).

ترتبط هذه الفئات بـ "المحفزات" التي تعكس قيم مؤشر الجفاف المركب المحدث (eCIDI) التي أنتجها نظام الإنذار المبكر بالجفاف. تدعم هذه المحفزات اتخاذ القرار بشأن إجراءات الاستجابة، والتي تتصاعد وفقاً لفئة الجفاف، وتتضمن جميع خطط العمل الخاصة بالجفاف (DAPs) الأنواع العامة التالية من التدابير:

• جمع المعلومات وتوفيرها.

• دعم الجهود التطوعية/غير التنظيمية بين فئات الجماهير المختلفة.

• التدريب (بما في ذلك الخدمات الإرشادية) وتحسين العملية أو تعزيز الاستفادة منها.

• القيام بأعادة و/أو تسهيل إعادة تخصيص الموارد.

• آليات السوق.

• التدخلات التنظيمية والامتثال والرصد وإنفاذ اللوائح. و

• توصيل السلع والخدمات مباشرة إلى الأشخاص و/أو الشركات.

بالإضافة إلى المعلومات الواردة من نظام الإنذار المبكر ومؤشر الجفاف المركب المحدث (eCIDI)، والتي تعكس ظروف الجفاف البيوفيزيائية ومخاطره، تتضمن خطط العمل الخاصة بالجفاف (DAPs) الوطنية لكل من الأردن ولبنان مكونات لرصد الأثر (Impact monitoring)، وتتضمن خطة العمل الخاصة بالجفاف لسوس ماسة تطويرها كإجراء استعادي. ويعكس رصد الأثر هذا (الإبلاغ عن تأثيرات الجفاف الذي يعتمد على شبكة التحقق المحلية الأولية) العواقب الاجتماعية والاقتصادية والبيئية للجفاف، وبالتالي يدعم اتخاذ قرارات الاستجابة والتحقق من صحة نظام الإنذار المبكر وتحسينه على المدى الطويل. ولتقليل متطلبات الموارد والعبء المؤسسي، تأتي مؤشرات الأثر الأردنية واللبنانية من البيانات التي يتم جمعها بشكل روتيني بالفعل، أو التي يمكن الوصول إليها بسهولة.

وأخيراً، تشترك خطط العمل الخاصة بالجفاف (DAPs) الوطنية للأردن ولبنان في مكونات مماثلة موصوفة على نطاق واسع لفعالية السياسات والتقييم والدراسة. وهذا ليس مدمجاً في خطة العمل الخاصة بالجفاف (DAP) لسوس ماسة بخلاف التقارير الموصوفة.

## الإنجازات والتحديات والخطوات التالية

فيما يتعلق بالركيزة الثالثة، حققت منطقة الشرق الأوسط وشمال أفريقيا للجفاف (MENAdrought) عدة أهداف:

• إنشاء نظم موثوقة وتشغيلية لرصد الجفاف يديرها ويثق بها المسؤولون الحكوميون الوطنيون. حيث يلبي هذا حاجة أصحاب المصلحة إلى أدلة علمية قوية يمكن أن يركز عليها اتخاذ القرارات المتعلقة بإدارة الجفاف؛

- استحداث فهم شامل لآثار الجفاف ومصادر الضعف، بما في ذلك خرائط المخاطر، والعمل مع المسؤولين الحكوميين لفهم الأسباب الجذرية لمصادر الضعف هذه في سياق وضع السياسات.
- دعم الوكالات الحكومية الوطنية والمحلية لبدء التخطيط المتكامل لإدارة الجفاف، وهو الأول من نوعه في منطقة الشرق الأوسط وشمال أفريقيا. ويشمل ذلك تطوير خطط العمل الخاصة بالجفاف (DAPs) التي تمت الموافقة عليها من قبل الإدارة المتوسطة عبر وزارات متعددة (الأردن ولبنان) وكبار المديرين في سوس ماسة، المغرب؛
- دعم الفرق المشتركة بين الوكالات والمتعددة التخصصات من المهندسين والمديرين الشباب في بناء قدراتهم الفنية الخاصة والعمل معًا بفعالية في موضوعات رصد وإدارة الجفاف؛ و
- دعم الشفافية الحكومية والمشاركة الأوسع في عمليات وضع السياسات من خلال إنشاء آليات لتقديم ردود الفعل المحلية إلى الحكومة المركزية عبر شبكات الإبلاغ عن تأثير الجفاف ونشر بعض مخرجات (نواتج) رصد الجفاف. وهذا يضع الأساس لشبكات التعليقات المحلية الدائمة المحتملة و/أو تبادل المعلومات العامة.

بشكل عام، ان التحديات التي واجهها فريق منطقة الشرق الأوسط وشمال أفريقيا للجفاف (MENAdrought) في دعم الوكالات الوطنية يمكن اختصارها في التالي: التكيف مع السياق الوطني المعني؛ و استجابات الخدمات اللوجستية والعامة لوباء كوفيد - ١٩ وآثاره؛ والحرب في أوكرانيا وتأثيراتها على الشركاء الوسطاء للمشروع؛ و الظروف النموذجية للعمل في مجال واجهة التفاعل بين العلوم والسياسات.

واجهت الوكالات الوطنية مجموعة من التحديات في تطوير خطط العمل الخاصة بالجفاف (DAPs) وارتبطت هذه التحديات بما يلي:

١. واجهة التفاعل بين العلوم والسياسات - باستخدام المعلومات المستمدة من أدوات تقنية متطورة - التي تنطوي على أوجه شكوك وغموض مهمة بالنسبة لصنع السياسات، والتي تتضمن في حد ذاتها أوجه عدم اليقين والغموض الخاصة بها؛
٢. والنظر في تحسين المرونة والتكيف والموازنة بينهما؛<sup>١</sup>
٣. الاقتصاد السياسي لإدارة الموارد الطبيعية.

وبشكل عام، فإننا نعتبر أننا ساهمنا في تعزيز القدرات والإمكانات المؤسسية (الحكومية إلى حد كبير) والبشرية الناشئة للاضطلاع بإدارة مخاطر الجفاف بالطرق التي دعنا الوكالات الحكومية الوطنية والمحلية للقيام بها. لقد دعمنا المسؤولين الحكوميين في صياغة خطط العمل الخاصة بالجفاف (DAPs) التي ستساعدهم على تحسين إدارة مخاطر الجفاف إذا توفرت الموارد اللازمة للقيام بذلك. ونرى أنه من خلال الالتزام طويل الأمد (تمويل من الجهات المانحة و/أو استثمار كبير من الوكالات المحلية ذات الصلة)، سنتمكن من اتخاذ الخطوات التالية الأطول.

ونعتبر أيضًا أن الفرص الأكثر إلحاحًا وتأثيرًا لدعمهم تتطلب مساعدة طويلة الأجل لتضمين تخطيط إدارة مخاطر الجفاف عبر المؤسسات والقطاعات. وهذا من شأنه أن يساعد على تحقيق هدف ضمني في خطط العمل الخاصة بالجفاف (DAPs): وضع استراتيجيات متكاملة بين الجهات الفاعلة. وبالمثل، فإننا نرى أن تمكين المشاركة العامة من خلال دعم شبكات الإبلاغ عن الآثار الإقليمية من شأنه أن يهيئ الظروف اللازمة للتحالفات التي كانت، في بلدان وسياقات أخرى، حاسمة في ترسيخ مناهج إدارة المخاطر.

# Résumé exécutif

## Objectif du rapport

Ce rapport résume les engagements de *MENAdrought* avec les agences gouvernementales en Jordanie, au Liban et au Maroc pour soutenir la gestion des risques de sécheresse. Il décrit le processus d'élaboration et le contenu des Plans d'action contre la sécheresse (*DAPs*) que les agences gouvernementales nationales et locales ont mis au point avec le soutien de *MENAdrought*.

Le projet *MENAdrought* a appliqué l'approche des 3 piliers du Programme intégré de gestion de la sécheresse (IDMP) (WMO (Organisation météorologique mondiale OMM) et GWP (Partenariat Mondial de l'Eau) 2014).<sup>3</sup> L'approche des 3 piliers vise à aider les sociétés à mettre en œuvre des approches de réduction des risques de sécheresse tout en améliorant la gestion de la réponse aux crises, et à réaliser ainsi les objectifs du Cadre de Sendai (UNDRR 2015). Ce rapport sur le Pilier 3 doit être lu conjointement avec les rapports sur le Pilier 1 (Bergaoui et al. 2022) et le Pilier 2 (Fragaszy et al. 2022a, 2022b) de *MENAdrought* qui résument les systèmes d'alerte précoce à la sécheresse développés, et l'évaluation de l'impact et de la vulnérabilité entreprise, à l'appui du développement des *DAPs*.

## Introduction

*Aperçu conceptuel de la gestion de la sécheresse.* D'un point de vue conceptuel, la gestion gouvernementale de la sécheresse englobe le droit, les politiques et leur mise en œuvre, ainsi que la gouvernance. La gestion de la sécheresse est rarement prescrite en détail par la loi ; elle est plutôt promulguée par la politique (ce que les gouvernements font en pratique) et la gouvernance (la façon dont les gouvernements et les organisations de la société civile mettent en œuvre les politiques). En outre, la gestion de la sécheresse est rarement codifiée dans un document politique intégré, voire officiel ; elle est le plus souvent le résultat de pratiques antérieures, d'interventions coutumières et/ou de la "superposition" de plusieurs documents politiques et plans à l'échelle des juridictions.

En conséquence, les approches de gestion de la sécheresse sont souvent orientées vers la réponse aux crises plutôt que vers la gestion proactive des risques par le biais de la préparation et de la planification de la réponse ou de programmes de pré-impact pour l'atténuation et l'adaptation à long terme au changement climatique. Toutefois, les gouvernements s'éloignent de plus en plus des interventions réactives, notamment par le biais d'un dialogue politique de haut niveau (par exemple, le Cadre de Sendai). Un nouveau corpus de preuves indique que la gestion des risques améliore le bien-être et l'efficacité économique par rapport aux interventions postérieures à l'impact du changement climatique.

*Gestion de la sécheresse et objectifs dans les pays du projet.* Les évaluations initiales ont indiqué que les parties prenantes se concentrent principalement sur les impacts de la sécheresse en relation avec la disponibilité des ressources en eau, l'approvisionnement en eau des municipalités, les forêts et autres écosystèmes, et les systèmes agricoles irrigués et pluviaux, y compris le pastoralisme. Les gouvernements des pays du projet ont entrepris une série d'actions de préparation et d'atténuation largement orientées vers la sécurité alimentaire et la sécurité de l'eau, mais ils entreprennent également une série d'actions de réponse à la crise de la sécheresse. Ces deux types d'actions reflètent l'économie politique des pays du projet. L'agriculture est d'une importance capitale pour leurs marchés du travail, leurs populations rurales et leur production économique globale par le biais de contributions directes et indirectes au PIB via les chaînes de valeur agricoles, même si cette importance a quelque peu diminué depuis les années 1970, à mesure que ces économies se sont diversifiées.

Dans tous ces pays, les objectifs politiques implicites des actions préexistantes de gestion de la sécheresse comprennent le maintien de

1. la sécurité alimentaire et hydrique nationale
2. la taille des troupeaux de bétail et la production de cultures de base et à haute valeur ajoutée ;
3. la capacité de production des terres de parcours

<sup>3</sup> Le Pilier 1 concerne la surveillance de la sécheresse et les systèmes d'alerte précoce; le Pilier 2 concerne l'évaluation de l'impact de la sécheresse et de la vulnérabilité; et le Pilier 3 concerne la planification de la gestion de la sécheresse.

4. la position de crédit des propriétaires terriens impliqués dans le secteur financier formel (par définition, les plus grands propriétaires terriens étant donné les faibles taux de participation au secteur financier dans ces pays) ; et
5. l'optimisation générale de l'allocation intersectorielle de l'eau sur la base de la production économique.

Parmi les trois pays concernés par le projet, seul le Maroc met actuellement en œuvre des mesures systématiques et à grande échelle de réduction des risques financiers (assurance contre les risques) ou de soutien aux moyens de subsistance (remplacement des revenus) qui ciblent la vulnérabilité financière sous-jacente des petits exploitants et visent à améliorer la résilience financière des communautés rurales.

*Besoins déclarés des parties prenantes des secteurs public et privé pour améliorer la gestion de la sécheresse.*

Considérés de manière générale, les besoins communs des parties prenantes dans ces pays reflètent des facteurs qui constituent des points de départ logiques pour évaluer et analyser les systèmes de gestion de la sécheresse (Jedd et al. 2020) : cadres politiques ; systèmes financiers ; mécanismes de gouvernance et de coordination institutionnelle ; plans de gestion de la sécheresse et capacités institutionnelles à les mettre en œuvre ; services de vulgarisation et planification des cultures ; et régimes de gestion de l'eau.

Dans l'ensemble, de nombreuses parties prenantes ont mis l'accent sur la nécessité de disposer de définitions de la sécheresse techniquement solides et d'indicateurs associés, ainsi que de mécanismes de confirmation/déclaration. De même, elles ont souhaité une amélioration des mécanismes de coordination et de partage de l'information, ainsi que des réponses à la sécheresse qui reflètent le suivi des conditions de sécheresse. Ces suggestions indiquent que les parties prenantes souhaitent améliorer la transparence des processus de prise de décision et d'intervention, l'équité de leurs résultats et, d'une manière générale, incarner les normes associées à la réduction des risques. La publication par le gouvernement marocain de cartes de la sécheresse est un exemple d'action dans ce sens.

## **Approche de MENAdrought pour soutenir les agences dans la planification de la réduction des risques de sécheresse**

Lors de la réunion de haut niveau sur les politiques nationales de lutte contre la sécheresse organisée par l'Organisation météorologique mondiale (OMM) en 2013, les gouvernements de la région MENA (Moyen-Orient et Afrique du Nord) ont demandé un soutien technique pour améliorer la surveillance et la gestion de la sécheresse. Le projet MENAdrought est issu de cette demande. Il a été structuré comme un projet de recherche appliquée et de soutien technique axé sur la demande, avec pour objectif d'aider les gouvernements des pays concernés à renforcer leur autonomie dans la gestion des effets de la sécheresse sur la sécurité de l'eau et de l'alimentation et à limiter ainsi les pertes sociales et économiques résultant de ces événements.

*Principes d'engagement.* L'équipe MENAdrought a adopté une approche de "travail avec le grain" pour s'engager avec les agences nationales (partenaires limitrophes) de ces pays selon les principes suivants:

- Conseiller et guider les agences pour qu'elles atteignent leur objectif de passer à une politique de gestion des risques et à un cadre de gouvernance ;
- Soutenir les partenaires limitrophes dans la réforme des politiques, de la gouvernance et des normes de travail nécessaires pour atteindre l'objectif de passage à un cadre de gestion des risques ; et
- Encourager et faciliter l'adoption des normes que nous jugeons nécessaires pour atteindre l'objectif du passage à un cadre de gestion des risques.

*Processus d'élaboration des DAP.* Nous avons appliqué ces principes lors de nos engagements avec les agences nationales pour développer les DAP par le biais d'approches typiques d'analyse politique. Les représentants des agences ont d'abord identifié et hiérarchisé les principaux impacts de la sécheresse à traiter par le biais d'interventions de politique publique. Ensuite, ils ont évalué les causes profondes de ces problèmes et identifié des interventions potentielles pour y remédier. Enfin, ils ont évalué ces interventions de manière structurée.

Ils ont notamment passé en revue leurs propres cadres juridiques et politiques afin d'examiner l'adéquation entre les interventions potentielles de préparation, d'atténuation et de lutte contre la sécheresse et leurs propres mandats et stratégies, ainsi que les plans d'adaptation nationaux, les propositions préexistantes au Trésor et aux bailleurs de fonds internationaux, etc. Il s'agissait également d'évaluer les interventions en fonction des critères suivants : efficacité anticipée, équité, pragmatisme et praticité.

En résumé, nous avons aidé les agences à déterminer ce qu'il était le plus important pour elles de traiter en premier et comment le faire avec les ressources disponibles, le contexte politique et les contraintes auxquelles elles sont confrontées.

*Statut des DAP.* Au moment de la rédaction de ce document, début 2023, aucun des DAP élaborés n'avait été officiellement approuvé par la direction exécutive ou l'organe politique d'une agence, bien qu'ils aient été approuvés par les Comités Techniques de la Sécheresse (*Drought Technical Committee DTC*) interinstitutions concernés qui les ont rédigés et qui les mettront en œuvre. Ils doivent donc être considérés comme des projets de politique ou des "orientations" pour les agences concernées.

Les longs processus de formalisation ne sont pas rares dans l'élaboration des politiques relatives aux risques naturels. Souvent, ces plans ne sont pas formalisés jusqu'à ce que l'aléa frappe à nouveau et que les agences doivent réagir. Ce statut ne dévalorise donc pas le contenu des plans d'action nationaux ; il indique simplement que les plans d'action nationaux ne lient pas les agences ou les gouvernements à des engagements spécifiques. Néanmoins, de nombreux aspects des PAH sont déjà mis en œuvre.

## Structure et contenu communs des DAP

D'une manière générale, les DAP (Plans d'action contre la sécheresse) ont une structure commune en ce sens qu'ils comprennent tous les éléments suivants

1. Les impacts prioritaires qui font l'objet du DAP en question ;
2. Les mesures de préparation et d'atténuation associées à ces impacts prioritaires ;
3. Un cadre de gouvernance qui relie les fonctions de suivi de la sécheresse et de mise en œuvre des politiques aux hiérarchies de prise de décision ;
4. Définitions de la sécheresse, y compris :
  - a. Les classes de sécheresse à plusieurs niveaux qui sont basées sur les périodes de retour prévues ;
  - b. Les déclencheurs qui reflètent la gravité, la longévité et l'étendue de la sécheresse, et qui relient les résultats du système d'alerte précoce à des niveaux de réponse ;
  - c. Des niveaux de réponse qui reflètent l'intensité des ressources et la robustesse des réponses des pouvoirs publics ;
5. Des mesures de gestion de la sécheresse qui s'intensifient en fonction des niveaux d'intervention ; et
6. Le suivi de l'impact ainsi que le suivi, l'évaluation et l'apprentissage de l'efficacité des politiques.

*Aspects communs de la gouvernance.* Les structures de gouvernance des DAP jordaniens et libanais sont quelque peu similaires l'une à l'autre, mais diffèrent des grandes lignes du DAP de Souss-Massa (Maroc), étant donné le caractère régional de ce dernier. En résumé, depuis le niveau le plus opérationnel et technique jusqu'à la direction générale, les DAP jordaniens et libanais comprennent au moins les éléments suivants

1. Un groupe de suivi de la sécheresse qui gère le système d'alerte précoce de la sécheresse et fournit des analyses et des conseils associés, avec des membres comprenant un sous-ensemble des agences impliquées dans le Comité Technique de la Sécheresse (*DTC*) ;
2. Un *DTC* interinstitutions qui joue un rôle dans la planification et la mise en œuvre des opérations et des politiques, et qui soutient les comités de gestion supérieurs ;
3. Un comité de gestion de haut niveau chargé de prendre des décisions sur les actions qui nécessitent une réaffectation des fonds de base existants, dont les membres doivent encore être confirmés, mais qui devraient provenir des mêmes agences que celles impliquées dans le *DTC* (Comité Technique de la Sécheresse) ; et
4. Un comité de gestion exécutif chargé de prendre des décisions sur les actions qui nécessitent des demandes d'argent frais (*new money*) auprès du Trésor ou des donateurs (par exemple, le Programme alimentaire mondial « *PAM* »).

*Contenu politique commun des DAP.* Les DAP ont un contenu thématique commun. Par exemple, les actions de préparation et d'atténuation comprennent des développements politiques et institutionnels, l'amélioration des données sous-jacentes et des systèmes de partage d'informations, le suivi et l'analyse, ainsi que des investissements dans la résilience des infrastructures.

De même, dans tous les plans d'action nationaux, les définitions de la sécheresse constituent l'élément central de l'escalade de la planification de la gestion de la sécheresse. Chaque plan comprend quatre classes de sécheresse :

- Normale (pas de sécheresse) ;
- Modérée (période de retour de 5 à 10 ans) ;
- Grave (période de retour de 10 à 20 ans) ; et
- Exceptionnelle (période de retour de 50 ans).

Ces classes sont liées à des "déclencheurs" qui reflètent les valeurs de l'Indice composite de sécheresse amélioré (eCDI) produites par le système d'alerte précoce en cas de sécheresse. Ces déclencheurs facilitent la prise de décision concernant les mesures d'intervention, qui augmentent en fonction de la classe de sécheresse et qui, dans tous les programmes d'action contre la sécheresse, comprennent les types généraux de mesures suivants :

- Collecte et fourniture d'informations ;
- Soutien aux efforts volontaires/non réglementaires parmi les différents publics ;
- Formation (y compris les services de vulgarisation) et amélioration ou optimisation des processus ;
- Entreprendre et/ou faciliter la réaffectation des ressources ;
- Mécanismes de marché ;
- Interventions réglementaires et respect, suivi et application des réglementations ; et
- Fourniture directe de biens et de services aux personnes et/ou aux entreprises.

Outre les informations provenant du système d'alerte précoce et de l'eCDI, qui reflètent les conditions biophysiques de la sécheresse et les risques, les plans d'action nationaux pour la Jordanie et le Liban comprennent des éléments de suivi de l'impact, et le plan d'action pour le Souss-Massa prévoit leur développement en tant qu'action de préparation. Ce suivi de l'impact (rapport sur l'impact de la sécheresse qui s'appuie sur le réseau de validation local initial) reflète les conséquences sociales, économiques et environnementales de la sécheresse et soutient donc la prise de décision en matière de réponse ainsi que la validation et l'amélioration à long terme du système d'alerte précoce. Pour minimiser les besoins en ressources et la charge institutionnelle, les indicateurs d'impact jordaniens et libanais proviennent de données déjà collectées régulièrement ou facilement accessibles.

Enfin, les plans d'action nationaux pour la Jordanie et le Liban ont en commun des composantes d'efficacité, d'évaluation et d'apprentissage des politiques décrites de manière générale. Ces éléments ne sont pas intégrés dans le DAP de Souss-Massa au-delà des rapports prescrits.

## Réalisations, défis et prochaines étapes

En ce qui concerne le pilier 3, le programme *MENAdrought* a atteint plusieurs objectifs :

- Mise en place de systèmes fiables et opérationnels de suivi de la sécheresse, gérés par les responsables des gouvernements nationaux et auxquels ces derniers font confiance. Ces systèmes répondent au besoin des parties prenantes de disposer de preuves scientifiques solides sur lesquelles fonder la prise de décision en matière de gestion de la sécheresse ;
- Une compréhension globale des impacts de la sécheresse et des sources de vulnérabilité, y compris des cartes des risques, et une collaboration avec les responsables gouvernementaux pour comprendre les causes profondes de ces sources de vulnérabilité dans un contexte d'élaboration de politiques ;
- Soutenir les agences gouvernementales nationales et locales pour commencer à planifier la gestion intégrée de la sécheresse, une première dans la région MENA. Cela inclut le développement de DAP qui ont été approuvés par les cadres moyens de plusieurs ministères (Jordanie et Liban) et les cadres supérieurs de Souss-Massa, au Maroc ;
- Soutien à des équipes interagences et multidisciplinaires de jeunes ingénieurs et gestionnaires pour renforcer leurs propres capacités techniques et travailler ensemble efficacement sur des thèmes de surveillance et de gestion de la sécheresse ; et

- Soutien à la transparence gouvernementale et à une participation plus large aux processus politiques par la mise en place de mécanismes de retour d'information au niveau local vers le gouvernement central via des réseaux de notification de l'impact de la sécheresse et une certaine publication des résultats de la surveillance de la sécheresse. Cela jette les bases d'éventuels réseaux locaux permanents de retour d'information et/ou de partage d'informations publiques.

D'une manière générale, les défis auxquels l'équipe *MENAdrought* a dû faire face pour soutenir les agences nationales peuvent se résumer à l'adaptation au contexte national respectif, à la logistique et aux réponses des services publics à la pandémie de Covid-19 et à la guerre en Ukraine, ainsi qu'à leurs effets sur les partenaires limitrophes du projet, et aux conditions typiques du travail à l'interface entre la science et la politique.

Les agences nationales ont été confrontées à une série de défis lors de l'élaboration des DAP. Ces défis étaient liés

1. à l'interface science-politique - l'utilisation d'informations provenant d'outils techniques sophistiqués - qui comporte des incertitudes et des ambiguïtés importantes pour la prise de décision politique, qui contient elle-même ses propres incertitudes et ambiguïtés ;
2. aux considérations et compromis entre l'amélioration de la résilience et l'adaptation ; et
3. à l'économie politique de la gouvernance des ressources naturelles.

Dans l'ensemble, nous considérons que nous avons contribué à renforcer les capacités institutionnelles (essentiellement gouvernementales) et humaines naissantes pour entreprendre la gestion des risques de sécheresse de la manière dont nous avons été invités à le faire par les agences gouvernementales nationales et locales. Nous avons soutenu les responsables gouvernementaux dans la rédaction des plans d'action nationaux qui les aideront à améliorer la gestion des risques de sécheresse s'ils disposent des ressources nécessaires. Nous estimons qu'avec un engagement à plus long terme (financé par des donateurs et/ou des investissements considérables de la part des agences locales concernées), ils seront en mesure de réaliser les prochaines étapes, plus longues.

Nous considérons également que les opportunités les plus immédiates et les plus efficaces pour les soutenir nécessitent une assistance à plus long terme pour intégrer la planification de la gestion des risques de sécheresse dans les institutions et les secteurs. Cela permettrait de réaliser un objectif implicite des DAP : créer des stratégies intégrées entre les acteurs. De même, nous estimons que le fait de permettre la participation du public en soutenant les réseaux régionaux de rapports de l'impact créerait les conditions nécessaires aux coalitions qui, dans d'autres pays et contextes, ont été essentielles à l'intégration des approches de gestion des risques.



# Contents

Executive Summary .....	3
ملخص تنفيذي .....	8
Résumé exécutif .....	12
<b>1. Introduction .....</b>	<b>23</b>
1.1 Conceptual Overview of Drought Law, Policy and Governance .....	24
1.1.1 Drought Legislation .....	24
1.1.2 Drought Policies .....	25
1.1.3 Drought Governance.....	25
1.2 Approaches to Drought Management and IDMP's Three Pillars .....	26
1.2.1 IDMP's Three Pillars of Drought Management.....	26
1.3 Drought Management Actions and Implicit Objectives .....	27
1.3.1 Private Sector Interventions.....	27
1.3.2 Public Sector Interventions .....	28
1.3.3 Implicit Policy Intent of Public Sector Interventions .....	29
1.4 Public and Private Sector Stakeholders' Stated Needs to Improve Drought Management (as of 2017).....	29
1.5 Section Summary.....	31
<b>2. MENAdrought Approach: Supporting Agencies to Implement Pillar 3 .....</b>	<b>32</b>
2.1 Principles of Engagement .....	32
2.1.1 Pillar 3 Working Goals in the Light of the Principles of Engagement .....	33
2.2 The DAP Development Process .....	33
2.2.1 DAP Development as a Negotiation Process .....	34
2.3 Status of DAPs in the Project Countries .....	35
2.4 Section Summary .....	35
<b>3. MENAdrought Pillar 3 in Jordan .....</b>	<b>36</b>
3.1 Summary of Drought-related Legal, Policy and Governance Arrangements.....	36
3.1.1 Drought-related Law .....	36
3.1.2 Water Sector Policy for Drought Management and National Risk Reduction Strategy .....	37
3.1.3 Governance Prescribed by the Water Sector Policy for Drought Management .....	37

3.2 Working with Boundary Partners in Jordan.....	38
3.2.1 DAP Development Timeline.....	38
3.3 Drought Governance Structure, Composition and Function in the Jordanian DAP .....	38
3.3.1 Role of the DTC and DMU .....	39
3.3.2 NDMC and NCSCM within the DAP Operational Framework .....	40
3.3.3 Status of Operational Governance .....	40
3.4 Summary of the Jordanian DAP.....	41
3.4.1 Priority Impacts and Preparedness and Mitigation Actions.....	41
3.4.2 Drought Definitions .....	41
3.4.3 Drought Impact Monitoring .....	42
3.4.4. Drought Management Response Actions.....	42
3.4.5 Policy Monitoring, Evaluation and Learning .....	43
3.5 How the Principles of Engagement/Negotiation Shaped the State of the DAP .....	44
<b>4. MENAdrought Pillar 3 in Lebanon .....</b>	<b>44</b>
4.1 Summary of Drought-related Legal, Policy and Governance Arrangements .....	44
4.1.1 Water Sector Policy Relevant to Drought .....	45
4.2 Working with Boundary Partners .....	46
4.3 Drought Governance Structure, Composition and Function in the Lebanese DAP .....	46
4.3.1 Status of Operational Governance .....	47
4.4 Summary of the Lebanese DAP .....	48
4.4.1 Priority Impacts and Preparedness and Mitigation Actions.....	48
4.4.2 Drought Definitions .....	48
4.4.3 Drought Impact Monitoring.....	49
4.4.4 Drought Management Response Actions.....	49
4.4.5 Policy Monitoring, Evaluation and Learning .....	50
4.5 How the Principles of Engagement/Negotiation Shaped the State of the DAP .....	50
<b>5. MENAdrought Pillar 3 in Morocco .....</b>	<b>50</b>
5.1 Summary of Drought-related Legal, Policy and Governance Arrangements .....	51
5.1.1 Water Law and Drought Management Governance .....	51
5.1.2 Role of ABHs and the National Water Utility .....	52
5.1.3 Rangelands Law and Drought Management .....	52
5.1.4 Decentralization and Drought Policy and Governance in Morocco .....	52
5.2 Working with Boundary Partners at the Central and Local Government Levels .....	53
5.2.1 Supporting National Efforts .....	53
5.2.2 Establishing a Working Relationship with ABH Souss-Massa and the Activities Chronology .....	53

5.3 Drought Governance Structure, Composition and Function in the Souss-Massa DAP .....	54
5.3.1 Office of the Wali, Drought Management Committees and the ABH .....	54
5.3.2 ABH Souss-Massa and DAP Structure.....	55
5.4 Summary of the Souss-Massa DAP .....	56
5.4.1 Priority Impact and its Relation to Preparedness and Mitigation Actions .....	56
5.4.2 Preparedness and Mitigation Actions .....	56
5.4.3 Drought Definitions .....	57
5.4.4 Drought Impact Monitoring and Drought Management Response Actions .....	57
5.4.5 Policy Monitoring, Evaluation and Learning .....	58
5.5 How the Principles of Engagement/Negotiation Shaped the State of the DAP .....	58
<b>6. Achievements, Challenges and Next Steps .....</b>	<b>59</b>
6.1 Achievements .....	59
6.1.1 Formalizing Drought Risk Management in the MENA Region .....	59
6.2 Challenges National Agencies Faced in Developing DAPs .....	60
6.2.1 The Science-Policy Interface: Boundaries and Authority .....	60
6.2.2 Consideration of and Trade-offs between Resilience and Adaptation.....	61
6.2.3 Political Economy of Natural Resource Governance .....	61
6.3 Challenges We Faced Supporting National Agencies.....	62
6.3.1 Challenges Typical of Working at the Science-Policy Interface with Boundary Partners .....	62
6.3.2 Adapting to National Institutional Contexts .....	63
6.3.3 Logistical Challenges .....	63
6.3.4 Public Service Responses to and Impacts from Covid-19 .....	63
6.4 The Next Steps to Embed Drought Risk Management Approaches .....	64
6.4.1 Embedding Drought Risk Management Planning Across Institutions and Sectors .....	64
6.4.2 Enabling Public Participation through Support of Regional Validation Networks .....	64
6.5 Section Summary .....	64
<b>References .....</b>	<b>66</b>
<b>Annex A. Additional Detail from Section 1 .....</b>	<b>72</b>
A1. Summary Description of Relevant Reports and Policies on Drought Management in MENA.....	72
<b>Annex B. Additional Detail on Stakeholders' Stated Needs .....</b>	<b>74</b>
B1. Full Description of Stakeholder-described Drought Management Needs in Jordan .....	74
B1.1 Pair Drought Announcement with Financial Relief Programs .....	74
B1.2 Coordinate Groundwater Management.....	75

B1.3 Clarity on Relation between Monitoring and Management .....	75
B1.4 Link Drought Management with Other Issue Areas .....	75
B1.5 Intersectoral Allocation and Understanding of Demands .....	76
B1.6 Agricultural Water Demand Management .....	76
B1.7 Understand Drought Impacts Across Sectors .....	76
B1.8 Enhanced Public-Private Engagement .....	76
<b>B2. Full Description of Stakeholder-described Drought Management Needs in Lebanon .....</b>	<b>77</b>
B2.1 Enact a National Water Management Policy and Connect It with Drought .....	77
B2.2 Enhance Outreach and Education for Civil Society, Work Directly with Farmers to Issue Crop Planting Guidance and to Understand Market Needs .....	77
B2.3 Use Efficient Irrigation Methods, New Technologies for Water Supply and Maintain Yield Productivity .....	78
<b>B3. Full Description of Stakeholder-described Drought Management Needs in Morocco .....</b>	<b>78</b>
B3.1 Clear and Predetermined Institutional Roles and Coordination Mechanisms .....	79
B3.2 Tiered Intervention and Ease of Declaration .....	79
B3.3 Assessing Groundwater Levels through Monitoring and Research on Use and Recharge .....	79
B3.4 Addressing Uneven ABH Capacity .....	79
B3.5 Connecting with Other Long-term Projects .....	80
B3.6 Understanding Changing Irrigation Needs .....	80
B3.7 Soil Conservation .....	80
<b>B4. Stakeholder Needs Across Countries Related to Drought Definitions and Declaration .....</b>	<b>80</b>
B4.1 Drought Definitions and Declaration Processes .....	80
B4.2 Transparency and Timeliness in Declaration Processes .....	81
B4.3 Tiered Drought Declarations .....	81
B4.4 Drought Declaration Trigger Mechanisms .....	81
B4.5 Technical Definitions of Drought .....	81
<b>B5. Stakeholder Needs Across Countries Related to Drought Management Plans and Governmental Guidance .....</b>	<b>82</b>
B5.1 Drought Management Plans and Institutional Capacity to Deliver Them .....	82
B5.2 Planting and Crop Guidance .....	82
B5.3 Locally Tailored Management Guidelines and Directives .....	82
<b>B6. Stakeholder Needs Across Countries Related to Water Management .....</b>	<b>83</b>
B6.1 Groundwater Management .....	83
B6.2 Surface Water Infrastructure and Management Systems .....	83
<b>B7. Stakeholder Needs Across Countries Related to Financial Programs and Insurance .....</b>	<b>83</b>
<b>B8. Stakeholder Needs Across Countries Related to Multilevel Governance Coordination .....</b>	<b>85</b>
<b>Annex C. Additional Detail from Section 2 .....</b>	<b>86</b>
<b>Annex D. Additional Detail from Section 3 .....</b>	<b>87</b>
<b>D1. Drought-relevant Policy in Jordan .....</b>	<b>87</b>
D1.1 Drought Within the Jordan National Natural Disaster Risk Reduction Strategy .....	87
D1.2 Additional Detail on Water Sector Policy for Drought Management .....	88
<b>D2. Priority Drought Impacts from the Jordanian DAP .....</b>	<b>88</b>

<b>Annex E. Additional Detail from Section 4 .....</b>	<b>90</b>
<b>E1. Drought-relevant Policy in Lebanon.....</b>	<b>90</b>
<b>E1.1 Summary of Drought Management Challenges in Lebanon as of 2019 .....</b>	<b>90</b>
<b>E1.2 Drought-relevant Water and Agriculture Sector Policy Developments from 2000 to 2018.....</b>	<b>90</b>
<b>E2. Priority Drought Impacts Identified by the Lebanese DAP.....</b>	<b>91</b>
<b>E3. Overview of Preparedness Actions in the Lebanese DAP.....</b>	<b>92</b>
<b>Annex F. Additional Detail from Section 5 .....</b>	<b>93</b>
<b>F1. Drought-relevant Policy in Morocco .....</b>	<b>93</b>
<b>F1.1 Summary of Drought-relevant Policy Arrangements in Morocco .....</b>	<b>93</b>
<b>F1.2 Government-wide Hazard Risk Management Policy .....</b>	<b>93</b>

## List of Tables

Table 1. Types of drought policy intervention .....	26
Table 2. Governmental drought management interventions in the project countries .....	28
Table 3. Implicit policy intent of drought management interventions in project countries .....	29
Table 4. Stated drought management needs by frequency of thematic mentions in needs assessment engagements in Jordan .....	30
Table 5. Stated drought management needs by frequency of mention in needs assessment engagements in Lebanon .....	30
Table 6. Drought definitions in the Jordanian DAP .....	42
Table 7. The drought mitigation component of Lebanon’s Integrated Hydrological Information System (IHIS) .....	45
Table 8. The drought mitigation component of Lebanon’s Integrated Hydrological Information System (IHIS) .....	48
Table 9. Drought definitions in the Moroccan DAP .....	57
Table C1. Evaluation of options to address the root causes of ‘declining quality of water services’ in Jordan .....	86
Table D1. Natural disaster risk ranking for Jordan .....	87

## List of Figures

Figure 1. The DAP development process as a series of interactions and negotiations .....	35
Figure 2. The drought governance structure in the Jordanian DAP .....	39
Figure 3. Drought governance structure in the Lebanese DAP .....	47
Figure 4. Drought governance structure in Souss-Massa .....	55
Figure B1. Gaps in Jordan’s agricultural finance sector and potential linkages to eCDI .....	74
Figure B2. Stakeholder-identified gaps related to financial risks .....	84
Figure C1. Problem tree for ‘reduced domestic water availability’ in Lebanon .....	86
Figure D1. Heat wave hazard distribution in Jordan .....	87
Figure F1. Synthesis diagram of the Moroccan national DRM Strategy 2020-2030 .....	94

# List of Acronyms

ABH	Agence de Bassin Hydraulique (Morocco)
ASI	Agricultural Stress Index
CAM	Crédit Agricole du Maroc
CHIRPS	Climate Hazards Group InfraRed Precipitation with Station data
CNCT	Centre National de la Cartographie et la Télédétection (Tunisia)
CNN	Convolutional Neural Network
CNRS	National Council for Scientific Research (Lebanon)
CRTS	Centre Royal de Télédétection Spatiale (Morocco)
DAP	Drought Action Plan
DGCA	Directorate General of Civil Aviation (Lebanon)
DGE	Direction Générale de l'Eau (Morocco)
DGF	Direction Générale des Forêts (Tunisia)
DGRE	Direction Générale des Ressources en Eau (Tunisia)
DMN	Direction de la Météorologie Nationale (Morocco)
DSCI	Drought Severity and Coverage Index
DSS	Directorate of Strategy and Statistics (Morocco)
eCDI	enhanced Composite Drought Indicator
ECMWF	European Centre for Medium-Range Weather Forecasts
ENSO	El Niño/Southern Oscillation
eVIIRS	EROS Visible Infrared Imaging Radiometer Suite
FCDO	Foreign, Commonwealth & Development Office
IMERG	Integrated Multi-satellite Retrievals for GPM
INRA	Institut National de la Recherche Agronomique (Morocco)
INM	Institut National de la Météorologie (Tunisia)
IWMI	International Water Management Institute
JMD	Jordanian Meteorological Department
JVA	Jordan Valley Authority
LARI	Lebanese Agricultural Research Institute
LIS	Land Information System
LRA	Litani River Authority
LST	Land Surface Temperature
MAMDA	Mutuelle Agricole Marocaine D'Assurance
MENA	Middle East and North Africa
MO	Mediterranean Oscillation
MoA	Ministry of Agriculture (Morocco)
MoEW	Ministry of Energy and Water (Lebanon)
MWI	Ministry of Water and Irrigation (Jordan)
NAO	North Atlantic Oscillation
NCARE	National Center for Agriculture Research and Extension (Jordan)
NDVI	Normalized Difference Vegetation Index
NMME	North American Multi-Model Ensemble
SMA	Soil Moisture Anomaly
SPEI	Standardized Precipitation and Evapotranspiration Index
SPI	Standardized Precipitation Index
SSI	Standardized Streamflow Index
USAID	United States Agency for International Development
WMO	World Meteorological Organization

# 1. Introduction

The Middle East and North Africa (MENA) region is a global hotspot of water insecurity with water shortages constraining economic growth, exacerbating social and economic inequalities, and water withdrawals exceeding sustainable supplies (World Bank 2017a). As outlined in MENAdrought's Pillar 2 reports (Fragaszy et al. 2022a, 2022b), this water insecurity heightens vulnerability to droughts, which can significantly affect the project countries' national budgets and trade balances, and contribute to health and livelihoods impacts, rural outmigration and political disruption. Drought preparedness and management are therefore important for socioeconomic and political economy considerations beyond natural resource management.

Officials in the national agencies<sup>4</sup> in Jordan, Lebanon and Morocco would prefer to manage drought risk rather than respond to drought crises (Jedd et al. 2020). The MENAdrought project worked within the IDMP's 3 Pillars approach (WMO and GWP 2014) to support these agencies in that objective of shifting away from a predominantly reactive and relatively ad hoc management of droughts and their impacts.

MENAdrought is a demand-led<sup>5</sup> applied research and technical advisory project that involves a wide range of international expertise including external staff and consultants (i.e., the authors not affiliated with government ministries or agencies in the project countries). It is a development aid project funded by USAID's Bureau for the Middle East with the objective of supporting the governments of the project countries in building self-reliance in managing drought impacts on water and food security and so limiting the social and economic losses resulting from such events.<sup>6</sup>

In Jordan and Lebanon, the MENAdrought project worked primarily with central government agencies in connection with all 3 Pillars. In Morocco, we worked with central government agencies primarily in relation to drought monitoring and early warning systems (Pillar 1) as well as impact and vulnerability assessments (Pillar 2) and worked with a local government agency, L'Agence du Bassin Hydraulique (watershed basin agency, hereafter ABH) of Souss-Massa, on drought impact and vulnerability assessments as well as drought preparedness, mitigation and management components (Pillar 3).

The Pillar 3 components of the project were undertaken in approximately the following order:

**Step 1 (2015-2016):** Drought management needs assessment and legal, policy and institutional review (partially reported by Fragaszy et al. [2020] and Jedd et al. [2020]).

**Step 2 (2017-2018):** Definition of needed institutional functions and establishment of institutional working groups and structures.

**Step 3 (2019-2022):** Support uptake of research for policy application:

- a. Produce drought monitoring information (using systems produced through Pillar 1);
- b. Consider key issues to address through Drought Action Plans (using information from Pillars 1 and 2); and
- c. Iterative drafting of DAPs.

**Step 4 (2022):** Seek approval of the DAPs through higher management committees.

In the rest of this section, we provide a basic and general conceptual overview of drought law, policy, governance and management, as well as the 3 Pillars approach. We then describe results from Step 1, including a synthesis of major drought management actions undertaken by each country and their implicit policy objectives, as well as the stakeholders' stated needs (as of 2017) for improved drought risk management in each country.

Following this context, Section 2 includes a description of our principles of engagement for Pillar 3 activities, emphasizing that we were 'working with the grain' (Levy 2014) in regard to the policy and governance structures

<sup>4</sup> We use the term 'agency' generally to mean any organization directly overseen by the government, for example, a ministry or specific directorate of a ministry, or other state-controlled entity such as a research center or water and sewerage utility. We use the term 'institution' more broadly to mean an agency or other organization that is either affiliated with the government (such as universities) or that interacts closely with the government (such as a farmers' union, professional society or chamber of commerce).

<sup>5</sup> The Pillar 1 report describes the 2013 High-Level Meeting from which the MENAdrought project emerged. Subsequently, individual countries reiterated this need at a conference convened by FAO in Cairo in 2015.

<sup>6</sup> <https://menadrought.iwmi.org/>

present in the project countries and their general modes of working. The section also includes a description of our approaches to DAP development.

Sections 3-5 provide descriptions of the following aspects in relation to each project country:

- The drought-relevant legal, policy and governance context;
- How we applied the principles of engagement and worked with the national partners;
- Current state of the DAP and associated policy and governance structures; and
- The status and summary of content in the DAP.

This includes a description of the function and placement of new working groups developed through the project within existing policy and governance structures<sup>5</sup> (Steps 2 and 3), how they went about their work to develop DAPs (Step 3), and how that affected the resultant DAPs.

Section 6 provides conclusions about the status of the DAPs and our suggestions for future work to support improved drought risk reduction in the project countries. At the time of writing, all of the DAPs had been approved by the relevant DTC, which was the project objective. However, none of the DAPs has been formally adopted as government or agency policy, and no agency has allocated a specific additional budget to implement preparedness and mitigation actions although some of the actions did fall under preexisting programs of work.

## 1.1 Conceptual Overview of Drought Law, Policy and Governance

As described in MENAdrought's Pillar 2 reports, drought affects multiple socioenvironmental systems through various pathways. As such, no single actor could have the requisite knowledge, resources and mandate or ability to mitigate and respond to all the possible impacts (Kooiman 2003). In practice, for governments, this means that multiple entities should be involved in the anticipation of and response to drought.

Drought preparedness and management occur through a range of mechanisms. To achieve conceptual clarity, they must be explicitly defined. These mechanisms include legislation (*law and regulations*)<sup>7</sup>, public policy (*what governments do*)<sup>8</sup> and private sector interventions. The MENAdrought project focused on public policy, including how it shapes *governance*, which we define here as the processes by which the state implements policy, and the modes of interaction in practice amongst state actors and between state and non-state actors.

We provide below a brief and general overview of some of these concepts (partially adapted from McDonnell et al. 2019) and terminology that we refer to throughout this report. Annex A provides a range of examples from the project countries.

### 1.1.1 Drought Legislation

In law, drought is most commonly incorporated in legislation that broadly relates to water, agriculture or disaster response. Drought-related laws generally establish the legal basis for policy and governance related to drought monitoring and management rather than specifying actions themselves (Wilhite et al. 2014).

For example, in the United States, federal law establishes the national drought monitoring system, and the 2008 and 2014 Farm Bills authorize emergency drought relief payments through policy mechanisms (e.g., the Livestock Forage Disaster Program run by the US Department of Agriculture). Likewise, Spain's law delegates drought policy planning to river basin organizations, which are likewise established by law (Urquijo-Reguera et al. 2022).

As these examples show, there are specific ways to address drought through legal mechanisms, but the specificity of law makes it unable to address the entire breadth of impacts associated with drought. At times, the lack of legislation

<sup>7</sup> Inclusive of bylaws, orders, implementation decrees and other items published in the official gazettes in the project countries.

<sup>8</sup> We use the term 'policy' as defined by Lowi (2003): "Policy is the informal side of government, the real statement of what government actually does." Further, we use the term 'operational policy' to refer to concrete actions the government will or should take and the policy framework within which they occur.



specifically about drought can either leave politicians and government officials legally unable to act in specific ways, or otherwise put them in a legally ambiguous (and therefore risky) position when determining or enacting policies and governance regimes.

### 1.1.2 Drought Policies

Drought policies flow from enabling or mandating legislation and typically establish the principles, actions, governance and operating guidelines for responses to drought. Again, there are few examples of explicit and overarching national drought policies. On the other hand, many states have explicit but narrowly scoped drought-related provisions, which are often included in more general water policies.

Of course, the reach of drought is broad, and whether or not governmental entities have explicitly developed plans for managing drought impacts, the effects of drought do spur action. Therefore, in many countries, there are a plethora of implicit 'drought policies' that have been developed in a relatively ad hoc fashion by myriad governmental entities, including national ministries and local government; state-owned enterprises and water utilities; and other agencies (WMO and GWP 2014). Also, explicit policies related to other themes—such as agricultural, industrial or energy production, climate change and multi-hazard risk management—often interact with drought.

This can contribute to powerful tension among various policy objectives, as well as intersectoral and institutional contestation over resources and intended outcomes. Actors have different interests in relation to drought and different modes of power to act in those interests. Moreover, institutions can view drought-related scarcity in terms of zero-sum games. These characteristics increase the difficulty of negotiating trade-offs and developing cooperative responses for drought management.

Both of these issues—implicit drought policies and explicit policies that have conflictual or mutually exclusive elements when drought enters the picture—can be considered the effects of 'layering' of policies and associated governance. New policy and governance arrangements attempt to negotiate these challenges through the development of *integrated strategies* (Howlett and Rayner 2007). These strategies "represent efforts at integrated policy design and implementation revolving around the construction of policy mixes expected to optimize governments' goals... and are specifically intended to address the perceived shortcomings of previous, more *ad hoc*, policy regimes".

These integrated strategies, by necessity, reflect the policies of individual ministries and other government agencies.

### 1.1.3 Drought Governance

Drought policies, particularly those formulated as integrated strategies, typically describe governance regimes: interagency and public-private sector collaboration mechanisms for drought management. The highly contentious and political nature of drought management, as well as its cross-sector and environmental reach, makes it a complex undertaking. Coordination is typically one of the most salient challenges and barriers to effective drought management.

American, Australian (Wilhite et al. 2005) and Brazilian (Martins et al. 2015; de Nys et al. 2017) examples of drought policy development and coordination highlight the importance of internal coalitions within government and also among private sector groups to push national governments into action and ensure implementation, continuity and longevity of the resultant policies. By its very nature, drought risk management coordination—whether long-term or crisis mitigation—requires wide stakeholder involvement in policy processes, which is challenging in the best of cases.

Indeed, national disaster management agencies or commissions in many countries (e.g., the Federal Emergency Management Agency in the United States or the National Disaster Risk Management Commission in Ethiopia) primarily focus on disaster response and provide support to line agencies that have the main remit for preparedness and mitigation.

## 1.2 Approaches to Drought Management and IDMP's Three Pillars

Whether explicit or implicit, drought management policy objectives at the general level often center on facilitating management of water and reallocating it during drought events, sustaining impacted farmers and populations and supporting early recovery. As shown in the Pillar 2 reports and also emphasized here, there are three primary drought policy pathways and linked policy intents: postimpact intervention, preimpact programs for mitigation and development of preparedness plans and policies (Table 1).

The most significant postimpact interventions (for example, distribution of relief funds) typically require an authority to make a formal declaration of drought in a specific manner, as mandated by law. In contrast, development of preimpact programs for mitigation, and development of preparedness plans are almost always undertaken through policy, although they too are sometimes required by law.

**Table 1.** Types of drought policy intervention.

Policy type	Examples	Policy intent	Challenges
Post-impact interventions (response actions)	Water and feed provision for livestock; debt rescheduling/forgiveness for farmers; rural job-creation programs; water rationing; pricing regimes; insurance pay-outs; calamity funds.	Relief measures for those affected by drought; alleviation of long-term effects.	Implementation without reducing incentives for risk reduction measures can cause perverse incentives; timeliness of interventions.
Preimpact programs for mitigation (mitigation actions)	Drought early warning systems; surface water storage; irrigation efficiency and conservation; water demand management; pricing regimes.	Reduce vulnerability and impact.	Can lead to path dependency on unsustainable resource use (e.g., groundwater over-abstraction)
Development of preparedness plans and policies (preparedness actions)	Organizational frameworks; institutional arrangements; operational plans and triggering technical definitions of drought; standing drought committee.	Facilitate and expedite coordination, collaboration and action.	Requires strong institutional capacity and coordination to implement effectively; sometimes is only prioritized once drought is already a long-standing problem.

Sources: McDonnell et al. 2019; Wilhite et al. 2007.

The costs of these interventions can be classified into three categories: preparedness, mitigation and drought response. Overall, most of the funds go to the last of these with far less investment available for preparedness or mitigation actions (Gerber and Mirzabaev 2017).

The evidence-base increasingly highlights the benefits, and avoided costs, of shifting from a crisis management to risk reduction and management framework by focusing on development of preimpact mitigations and preparedness policies and plans (Gerber and Mirzabaev 2017). This resonates with the objective of the IDMP program: to support a shift to drought risk management frameworks, which in turn aligns with the Sendai Framework for Disaster Risk Reduction (UNDRR 2015).

The evidence presented in this report and in the Pillar 2 reports highlights the fact that the project countries, while certainly making progress in shifting toward risk management approaches, still have outside reliance on crisis management approaches. This likely results in suboptimal outcomes in terms of timeliness, efficacy and equity.

### 1.2.1 IDMP's Three Pillars of Drought Management

The IDMP<sup>9</sup> resulted from a WMO-convened High-Level Meeting on National Drought Policy in 2013, which involved drought experts from 93 countries. The program gives a structured approach to drought management planning and is based on 10-step plans and three 'pillars' (WMO and GWP 2014):

1. Drought monitoring and early warning systems;
2. Drought history of impacts and vulnerability assessments; and
3. Drought mitigation, preparedness and response.

**Pillar 1: Drought Monitoring and Early Warning Systems.** Drought monitoring consists of the collection of data and generation of information, often mapped, that illustrates the severity, extent and duration of drought conditions.

<sup>9</sup> [www.droughtmanagement.info/](http://www.droughtmanagement.info/)

Agencies often collect meteorological, hydrological, socioeconomic, environmental and agronomic data, or produce them using models, for this purpose. Our Pillar 1 report describes the MENAdrought project's development of enhanced Composite Drought Indicators (eCDIs) for this purpose; in this report, we discuss additional monitoring information that feeds into management planning.

*Pillar 2: Drought Impact and Vulnerability Assessments.* Vulnerability and impact assessments bring together quantitative and qualitative data on drought history, impacts and underlying causes of vulnerability across geographic regions, economic sectors, communities and the environment. Drought impacts, and their management, occur at all levels of society, from the household to the international arena when one considers commodity and food value chains. These types of assessments, including those conducted through the MENAdrought project and described in the Pillar 2 reports, highlight how vulnerability is a dynamic phenomenon in a state of continuous flux in terms of both biophysical and social processes (O'Brien et al. 2005). These assessments have informed policy development and planning in the project countries described in this report.

*Pillar 3: Drought Mitigation, Preparedness and Response.* The third pillar focuses on identifying and implementing actions to reduce the risk of and mitigate drought impacts. Drought preparedness planning is central to this. In the MENAdrought context, it includes, among other key elements, the development of integrated strategies to prioritize the impacts to target, identify actions and interventions that will reduce impacts, and set triggers to consider the initiation and cessation of response actions. Sections 3–5 focus on the development of these plans.

One of the primary objectives of this pillar is for policymakers to identify effective, feasible and equitable (pro-poor) intervention actions, and assign them to appropriate institutional actors with the relevant remit, mandate and resources.

For clarity on terminology, *preparedness actions* strengthen operational and institutional readiness to respond to drought events; *mitigation actions* are implemented before drought events to reduce the impacts of drought on people, the economy and the environment; and *response actions* are implemented during or immediately after drought events to alleviate impacts on people, the economy and the environment, and enable swifter recovery.

Beyond the IDMP program, international collaborative efforts aim to catalyze development of disaster risk management frameworks with the adoption of the Sendai Framework (2015). The core tenets of this are understanding disaster risk, strengthening governance to manage disaster risk, investing in disaster risk reduction for resilience, and enhancing disaster preparedness for effective response and 'building back better'. These objectives aim to guide national policies (integrated strategies) toward risk reduction frameworks and improve crisis management responses through a range of policy instruments.

## 1.3 Drought Management Actions and Implicit Objectives

In this subsection we describe a range of drought management interventions undertaken by the private and public sectors in the project countries during recent historical drought events. This summary comes from the needs assessment phase and draws heavily from Jedd et al. (2020).

Notably, significant aspects of risk reduction fall under the aegis of the governments' long-term programs for water security (e.g., managed aquifer recharge and treated wastewater reuse), food security (crop adaptation) and anti-desertification (soil conservation or rainwater harvesting). We did not assess and review these components comprehensively during the needs assessment, but that type of review informed the development of DAPs during Steps 2 and 3 outlined above.

### 1.3.1 Private Sector Interventions

In the livestock sector, despite the general decline in nomadism due to sedentarization and land fragmentation, there is a major increase in these practices in times of drought, as well as temporary migration to cities. Farmers generally describe an increase in transhumance and reliance on groundwater, legal and illegal (unlicensed) water purchase and illegal water-pipe access. These observations match with previous reports of individual livestock holders enacting their own forms of drought relief measures including relocation, forming grazing arrangements with other communities (e.g., the traditional *Hima* system in the Arabian Peninsula), selling animals for food or cash, diversifying crops and livestock (including animal

species) and diversifying into non-agricultural occupations (Hazell et al. 2001; Taha et al. 2014). Our Pillar 2 reports provide greater depth of detail on drought management activities undertaken by farmers and communities.

### 1.3.2 Public Sector Interventions

The governments of Jordan, Lebanon and Morocco have undertaken a range of drought management interventions. Of course, their modes and depth of implementation vary significantly. As of late 2019 (before the Covid-19 pandemic, the economic crisis in Lebanon and the recent war in Ukraine), all countries had intervened during or after drought in the past two decades in the following ways:

- **Livestock sector:** expanded and accelerated vaccination programs;
- **Irrigated agriculture:** subsidies provided for agricultural inputs and irrigation equipment; state-funded irrigation infrastructure improvements; adjusted sectoral water allocation;
- **Rainfed agriculture:** subsidies provided for inputs (grains, cereals and fodder seeds, fertilizer, pesticide, fungicide treatment) and market/import planning;
- **Municipal water supply:** increased groundwater pumping; deepened/expanded public supply well network; utility focus on nonrevenue water and demand management; water allocation preference for utilities; and
- **Financial relief:** credit programs for farmers engaged in the formal and state-controlled agricultural finance sector; insurance cover by Mutuelle Agricole Marocaine D'assurances (MAMDA) in Morocco.

Table 2 provides more specific details and/or additional country-specific interventions taken up during or after drought.

**Table 2.** Governmental drought management interventions in the project countries.

Sector	Jordan	Lebanon	Morocco
Livestock	<ul style="list-style-type: none"> <li>• Increase in fodder/feed, and water subsidies and/or provision</li> <li>• Jordanian Ministry of Agriculture requested funding to increase extension staff</li> <li>• Stabilize purchase price of a limited volume of feed</li> <li>• Repair and expand shallow groundwater wells for livestock in Badia areas</li> </ul>	<ul style="list-style-type: none"> <li>• No other central government actions</li> </ul>	<ul style="list-style-type: none"> <li>• Fodder/feed subsidies</li> <li>• Direct fodder/feed provision (amount dictated by kg/animal owned and/or farmer's total holding)</li> <li>• Livestock water provision (trucking or digging wells)</li> <li>• Livestock sanitary check and vaccination campaigns</li> <li>• Manage livestock access to rangelands</li> <li>• Compensation for animal drought-related death</li> </ul>
Rainfed agriculture	<ul style="list-style-type: none"> <li>• Subsidize seeds for barley and wheat</li> </ul>	<ul style="list-style-type: none"> <li>• Subsidies for seeds and soil analysis (not limited to drought events)</li> </ul>	<ul style="list-style-type: none"> <li>• If fall drought: Subsidies, extension services and preferential loans to switch to spring crops</li> <li>• If winter/spring drought: Insurance payouts (wheat/barley, delimited areas). See financial interventions below</li> </ul>
Irrigated agriculture	<ul style="list-style-type: none"> <li>• Crop-season planning and preferential allocation in Jordan Valley</li> <li>• Subsidized reverse osmosis systems</li> <li>• Mandatory crop area reduction, without compensation</li> <li>• Increase treated wastewater reuse</li> </ul>	<ul style="list-style-type: none"> <li>• Extension services to expand irrigation efficiency measures</li> <li>• Subsidies for hill lakes (lacs collinaires)</li> <li>• Local government irrigation rationing</li> <li>• Export facilitation and shipping subsidies</li> </ul>	<ul style="list-style-type: none"> <li>• Preferential irrigation allocation (arboriculture, alfalfa/seed production, industrial crops) from strategic reserves for municipal use if water volume for the mining industry is secured</li> <li>• Augment groundwater pumping and dig new wells</li> <li>• Speed up new well/well-deepening licensing processes</li> </ul>
Municipal supply	<ul style="list-style-type: none"> <li>• Subsidize household cisterns and small-scale rainwater storage</li> <li>• Water trucking (increases during drought)</li> <li>• Utility rationing</li> <li>• Awareness/education campaigns</li> </ul>	<ul style="list-style-type: none"> <li>• Subsidize home storage infrastructure</li> <li>• Increase utility water trucking</li> <li>• Utility rationing</li> <li>• Increase line monitoring for illegal connections</li> </ul>	<ul style="list-style-type: none"> <li>• Basin plans and sector strategies govern municipal supply interventions (devolved governance) with preferential water allocation to municipalities</li> <li>• Awareness/education campaigns</li> <li>• Campaign to reduce non-revenue water</li> </ul>
Financial	<ul style="list-style-type: none"> <li>• Reschedule payments (Agricultural Credit Corporation)</li> </ul>	<ul style="list-style-type: none"> <li>• Credit rescheduling through Kefalat or other central bank mechanisms (large landholders only)</li> </ul>	<ul style="list-style-type: none"> <li>• Credit relief programs from state-owned banks (Credit Agricole du Maroc: Cereals Guarantee Program)</li> <li>• Job creation programs (focused on water/electricity/transport infrastructure)</li> <li>• Multi-risk climate insurance subsidized (drought for rainfed cereals and other crops in some areas)</li> </ul>

### 1.3.3 Implicit Policy Intent of Public Sector Interventions

From the interventions described above, we can infer generalities about the objectives of national governments' current drought crisis management efforts, as shown in Table 3. This estimation of policy intent is based on analysis of self-reported intervention actions and not on policy documents. As noted previously, the scope and scale of state-led interventions varies dramatically across the project countries as well as between themes within a country. It should be noted that the relative political economic importance, and therefore policy importance, and resourcing devoted to each objective listed here are not equal.

**Table 3.** *Implicit policy intent of drought management interventions in project countries.*

Primary drought management objectives	Morocco	Lebanon	Jordan
Safeguard municipal water supplies and provision	X	X	X
Surface water storage and distribution infrastructure improvement and/or repair, construction, subsidies	X	X	X
Groundwater abstraction and distribution infrastructure expansion	X	X	X
Demand management campaigns (municipal supply)	X	X	X
Irrigated agriculture water allocation shifts (by geography and/or by crop selection)	X	X	
Protect landholders' credit positions	X	X	X
Deflect hardship from pastoralists (herd preservation)	X		
Demand management campaigns (irrigated agriculture)		X	
Increase use of treated wastewater	X		
Rainfed farming income risk reduction (insurance)	X		
Rainfed farming recovery (direct support beyond normal subsidies)	X		
Water allocation reflects water and food security and agro-industry economic strategy objectives	X		
Rural income replacement programs	X		
Protect long-term viability of rangelands	X		

Considering these objectives in conjunction with identified drought impacts (see Pillar 2 reports), it is clear that the governments focus primarily on hydrological and agricultural drought impacts, with closely linked socioeconomic impacts addressed to some extent. However, wider socioeconomic challenges associated with drought, and agricultural market- and labor-pattern disruptions, etc. are not addressed directly in most cases.

Generally, ecological and environmental effects such as wetland or soil degradation are not included in short-term drought management efforts, with the exception of Morocco's recent adoption of rangelands management laws, which is described further in Section 5.

## 1.4 Public and Private Sector Stakeholders' Stated Needs to Improve Drought Management (as of 2017)

During the needs assessment interview process (see Fragaszy et al. 2020; Jedd et al. 2020), a wide range of stakeholders provided many suggestions to improve drought risk management and impact mitigation interventions. Tables 4 and 5 show the most frequently stated needs in Jordan and Lebanon, respectively; and those for Morocco are described below. Annex B has more detail on these themes specific to each country, as well as additional needs that were common across the three countries.

Overall, stakeholders focused on the need for technically robust drought definitions, operational indicators and declaration mechanisms; improved coordination and information sharing and feedback; management planning to reflect monitoring of drought conditions; and active and explicit arbitration of needs among various water users. These suggestions reflect a desire to improve drought risk management, the transparency of decision-making and intervention processes, and the equity of their outcomes. They also helped shape the development of DAPs.

The DAPs include 'pre-agreed' responses to drought. This does not remove the political aspects of drought management; rather, it shifts the primary consideration of trade-offs (political considerations) associated with drought

management to normal times rather than during a crisis. The aim is to enable officials to consider those trade-offs more fully and in the absence of competing demands. The interagency nature of the DAP development process is intended to help ensure that broad agreement on “technical” issues—such as drought management triggers—can align the politics of responses associated with those triggers. However, if there is poor alignment between technical and political matters, there is a risk that focus on technical matters will lead to technical rules being ignored or broken during drought crises because they do not respond to political requirements and constraints.

**Table 4.** Stated drought management needs by frequency of thematic mentions in needs assessment engagements in Jordan.

Need	Description	Frequency (out of 34)
Pair drought announcement with financial relief programs	Pair drought declaration/confirmation with financial relief programs; provide clear applications for drought monitoring information.	14
Coordinate groundwater management	Coordinate groundwater management across agencies, citizens and farmers; enforce regulations for new well-drilling operations and monitor existing wells.	11
Clarity on relation between monitoring and management	Combine monitoring and drought announcement with clearly defined management steps; reduce uncertainty regarding agency roles.	11
Link drought management with other issue areas	Link drought management with other issue areas (frost, water supply and scarcity, poverty, desertification, zoning regulations) and the climate domain.	8
Intersectoral allocation and understanding of demands	Consider the balance between water demands in municipal and agricultural supply; build capacity by enhancing crop mapping and municipal water demand.	8
Agricultural water demand management	Control agricultural water demand by using efficient, innovative, conservative and seasonally appropriate irrigation practices.	8
Understand drought impacts across sectors	Build on a comprehensive understanding of impacts in order to inform cross-sector management.	6
Enhanced public-private engagement	Coordination with farmer and nongovernmental organizations: use the capacities of farmers and local organizations for monitoring and enforcement.	4
Enhance surface water infrastructure	Improve surface water storage and distribution infrastructure.	4
Tailor drought management interventions	Develop specific interventions for geographic and climate zones.	4

Source: Fragaszy et al. 2020.

**Table 5.** Stated drought management needs by frequency of mention in needs assessment engagements in Lebanon.

Need	Description	Frequency (out of 35)
National drought plan	Enact a national water management policy and connect it with drought.	17
Enhanced outreach	Enhance outreach and education of civil society; work directly with farmers to issue crop planting guidance and to understand market needs.	16
Efficient irrigation	Use efficient irrigation methods; use new technologies for water supply and maintain productivity.	12
Agricultural insurance	Insurance and financial reform for agricultural operations.	7
Address social vulnerability	Address underlying vulnerabilities that plague water resources.	7
Municipal infrastructure	Focus on municipal supply, pumping capacity; eliminate leaks and theft.	7
Groundwater management	Understand groundwater recharge processes, build managed aquifer recharge (MAR) infrastructure, and manage drought through interventions in years when rain is plentiful.	7
Surface storage	Build surface water infrastructure that is capable of coping with additional demand as well as flooding.	7
Formalize management actions	Formalize ministerial and interagency cooperation.	6
Link with disaster relief programs	Connect with disaster programs and provide funding for drought relief programs.	5
Interagency cooperation	Instill a desire for cooperation and coordination of efforts among agencies.	4
Change household practices	Improve household efficiency and rainwater harvesting.	4
Water markets	Use private water markets to achieve conservation goals.	4
Law enforcement	Enforce water laws and regulations; comprehensively implement policies that are already in place.	3
Land restoration	Consider land restoration, including forest health.	2
Technical skills	Have an effective management leadership that possesses technical orientation and political skills.	2

Source: Fragaszy et al. 2020.

In Morocco, government officials noted a range of drought management needs that revolved around policy and governance constructs as well as technical and political economy themes. Officials generally considered that current (2016) technical capacities were largely adequate but that agencies and other institutions were unable to access and use information effectively because of policy and institutional barriers. The following themes of drought management needs emerged, in rough order of frequency. More detail is provided on each in Annex B.

1. Clear and predetermined institutional roles and coordination mechanisms;
2. Tiered intervention and ease of declaration;
3. Groundwater overdraft must be addressed;
4. Watershed agency (ABH) capacity is uneven;
5. Connecting drought management with other long-term policy interests and development projects;
6. Understanding changing irrigation needs; and
7. Soil conservation.

## 1.5 Section Summary

*Conceptual Overview of Drought Management.* Conceptually, governmental drought management incorporates law, policies and governance. Drought management is rarely prescribed in detail through law—as a statement of what governments must do, must not do, or can do. Rather, drought management is most typically enacted through policy; that is, what governments do in practice, and by governance, the ways in which governments implement policies. Further, drought management is rarely codified in an integrated or even official policy document, and is most often the result of past practice and/or ‘layering’ across multiple policy documents.

This can result in drought management approaches that are primarily oriented toward crisis response rather than proactive risk management through preparedness planning or preimpact programs for mitigation. However, an increasing body of evidence is pointing to improved welfare outcomes and economic efficiency achieved through proactive risk management in comparison to reliance on postimpact interventions.

*Drought Management and Its Objectives in the Project Countries.* Findings from the initial stakeholder needs assessment indicated that stakeholders focus primarily on drought impacts in relation to water resources, municipal water supply and irrigated and rainfed agricultural systems, inclusive of pastoralism. The governments of the project countries have undertaken a range of preparedness and mitigation actions that are broadly oriented toward food and water security, and they likewise undertake a range of drought crisis response actions as well. Both sets of actions reflect the political economy of the project countries in which agriculture is of outsize importance for labor markets, and particularly rural populations, as well as overall economic production.

The implicit policy objectives of preexisting drought management response actions in all these countries include maintenance of:

1. food and water security for the population;
2. livestock herd sizes and output of high-value crops;
3. the credit position of landholders involved in the formal financial sector (by definition, larger landholders given the low financial sector participation rates in the countries); and
4. the productive capacity of rangelands.

They also generally include optimizing intersectoral water allocation based on economic output. Of the three project countries, only Morocco currently implements wide-scale financial risk reduction (hazard insurance) or livelihood support (income replacement) measures.

*Public and Private Sector Stakeholders’ Stated Needs to Improve Drought Management.* When considered broadly, the common stakeholder needs stated across countries reflect factors that are logical starting points to assess and analyze drought management systems generally (Jedd et al. 2020): policy settings, financial systems, governance and institutional coordination mechanisms, drought management plans and institutional capacities to deliver them, extension services and crop planning, and water management regimes.

Overall, various stakeholders focused on the need for technically robust drought definitions and associated indicators and declaration mechanisms. Likewise, they sought improved coordination and information sharing mechanisms, and drought responses to reflect monitoring of drought conditions. These suggestions reflect stakeholders' desire to improve the transparency of decision-making and intervention processes, the equity of their outcomes, and generally to embody norms associated with risk reduction.

## 2. MENAdrought Approach: Supporting Agencies to Implement Pillar 3

In this section, we describe the MENAdrought approach to supporting agencies in implementing Pillar 3 activities. We focus on our principles of engagement with national entities, considering the advisory role we played, as well as the specific steps to develop the DAPs and their status at the time of writing. These elements inform the subsequent Sections 3–5 which provide a narrative of how that work was undertaken and has played out in each country.

### 2.1 Principles of Engagement

MENAdrought is a demand-led applied research and technical assistance project that involves external staff and consultants (i.e., the authors not affiliated with government ministries or agencies in the project countries). These actors work hand in hand with government officials and policymakers to deploy various tools to predict, prepare for, respond to and mitigate drought impacts. It is a development aid project funded by USAID's Bureau for the Middle East, and it has the objective of supporting the governments of the project countries to build self-reliance in managing drought impacts on water and food security and so limit the social and economic losses resulting from these events.<sup>10</sup>

This characterization conveys the context in which we worked with national agencies to develop DAPs and associated governance structures: external staff and consultants acted as invited advisors and guides for the policy development process and content, and officials from national agencies decided on those policy and governance processes and the resultant content. As such, we can describe MENAdrought as taking a 'working with the grain' approach (Levy 2014).

By this, we mean that, overall, we worked within existing policy and governance structures and norms with our "point of departure [being] the way things actually are on the ground—not some normative vision of how they should be" (Levy 2014). We primarily undertook "targeted efforts to improve public management—focused on specific functions, sectors, public agencies and locales where there exist credible champions and an appetite for reform" (Levy 2014).

As Jedd et al. (2020) found, some stakeholders and government officials in the project countries clearly desire to shift toward risk management approaches. Thus, appetite for reform exists, and we supported agencies to take steps in that direction. However, meeting this goal requires significant changes to the status quo, with attendant institutional and resourcing trade-offs. Officials at different levels of bureaucratic hierarchies, and in different institutions, view these trade-offs from different angles; surfacing, articulating and negotiating competing views is a key aspect to supporting the long-term change toward risk management approaches.

In this context, and within the project structure and to the extent possible, we also supported steps to enable "multi-stakeholder initiatives which bring to center stage the participatory engagement of non-governmental as well as governmental stakeholders in the (micro-level) processes of formulating the relevant rules and policies, and assuring their implementation" (ibid:143). In particular, the needs assessments, publication of eCDI outputs, stakeholder validation efforts (see the Pillar 1 report and Fragaszy et al. 2020) and impact monitoring (see Sections 3–5) are early steps in this direction. They may, over time, establish the initial conditions that facilitate multistakeholder drought monitoring and management coalitions to coalesce.

<sup>10</sup> <https://menadrought.iwmi.org/>



## 2.1.1 Pillar 3 Working Goals in the Light of the Principles of Engagement

In the project countries, drought management has previously been relatively ad hoc in terms of strategic and/or operational policy, as well as governance. Of course, that does not mean that drought management did not occur, just that it did not occur at the operational level (and in some cases even at the executive level) within specific preexisting and prestructured policy frameworks.

In such a context, new policies or governance arrangements can challenge the status quo, which always has beneficiaries, whether it is a “personal institution” (see, for example, Wallis 2010), established economic interests, or other elements. Also, the development of policies and governance arrangements takes significant resources, implementation of them notwithstanding.

Therefore, the MENAdrought team worked closely with focal-point individuals—“boundary partners”—from government agencies (Earl et al. 2001). These individuals were “policy entrepreneurs” (Kingdon 2011) for drought risk management. They worked to develop these new policy mechanisms in ways and at a pace that suited them, and they attempted to influence decision-making by their superiors, their agencies and their interagency collaborators.

Our boundary partners were Tier 3 officials from technical departments.<sup>11</sup> Working with them effectively required recognizing and respecting the limits of their authority and the culture of the bureaucratic hierarchies they work in, and then supporting them appropriately. No agency of any government takes on additional responsibilities lightly given the ongoing human and capital resourcing requirements. Interagency collaboration has even higher transaction costs given the demand for and criticality of coordination and collaboration across institutions. We built these considerations into how we went about the DAP development process.

To summarize, our principles of engagement for this work were:

- Understanding and respecting the authority, institutional context and interests of boundary-partner focal-point individuals and their organizations;
- Advising and guiding agencies to achieve their objective of moving to a risk management policy and governance framework; and
- Supporting boundary partners and their organizations in reforms of policy, governance and working norms necessary to achieve the objective of shifting to a risk management framework.

In each project country, these principles played out differently in terms of our focused engagement with the boundary partners, their agencies and their interagency collaborators. In Jordan, we focused on working through the competing organizational interests of DTC members and supporting DTC members to engage with their own institutional leadership in relation to those matters. In Lebanon, we focused more on building institutional demand for the drought early warning system and DAP development process. In Morocco, given the ABH Souss-Massa’s remit, we focused on exploring the intersectoral challenges of drought management and articulating potential points of interaction with other institutional actors. Generally, we also worked through norms around governmental information sharing and transparency that affect government-to-government as well as public-to-private interactions in a wide range of contexts.

## 2.2 The DAP Development Process

Given the objective to develop a policy and governance foundation for drought crisis and risk management, we supported agencies to take a typical policy analysis approach. By this we mean that officials from relevant and interested agencies first assessed the core and highest priority problems to address through public policy interventions. Second, they assessed the root causes of those problems. Subsequently, they evaluated, in a relatively structured manner, the viability, costs and benefits of various options to address those problems.

This process was informed by the impact and vulnerability assessments we described in the Pillar 2 reports as well as the stated needs described in Section 1. However, it was undertaken with a policy analysis viewpoint—focusing on

<sup>11</sup> Directors, with Tier 1 officials being the Secretary-General or Chief Executive, and Tier 2 officials being Deputy Director-General or Deputy Secretary.

assessment of underlying problems and the most practicable and useful approach for policy interventions to address those problems. This is quite different than an articulation of needs, which has as a starting point the specific things or outcomes that various stakeholders desire.

In other words, policymakers focused on what was most urgent and/or important for them to address first, from their point of view and with the available resources, personnel, knowledge and information and political context, and within the extant policy and governance constructs including the mandate(s) of member agencies. Those characteristics and constraints,<sup>12</sup> and their specific manifestation in each country, strongly influenced the DAP development process and content.

For all DAPs, officials undertook the following staged policy development process:

- 1. Identification of core drought impacts:** Officials developed and/or checked long-lists of core drought impacts;
- 2. Prioritization of impacts to address:** Officials prioritized specific core impacts on which to exclusively focus the DAP. While the DTCs do aim to expand the range of impacts on which the DAPs focus over time, they all, quite logically, kept the initial iteration relatively narrow. (More detail is provided on this process for Lebanon and Jordan in the Pillar 2 reports, and for Morocco in Section 5);
- 3. Assessment of root causes of priority impacts:** Officials developed problem trees whereby they articulated the root causes of the priority impacts. In Figure C1 in Annex C we provide an example problem tree for the priority impact ‘reduced availability of domestic water’ in Lebanon;
- 4. Long-list of options (interventions) to address root causes of vulnerability:** Officials developed a range of potential interventions to address the root issues;
- 5. Evaluation of intervention options:** Officials undertook a staged process to evaluate intervention options:
  - a. First, they reviewed their own legal and policy frameworks to examine alignment between potential drought management and risk reduction interventions and their own mandates as well as their strategies, national adaptation plans, preexisting proposals to Treasury and international donors, etc. This is necessary because it is easy to develop a very long shopping list of interventions for any action plan, but unless there is clarity on which actor is mandated to undertake and has resourcing for specific types of interventions, the resultant action plan will not be practicable;
  - b. Second, they categorized viable interventions—those not removed during Step 5a above—as mitigations for drought, responses to drought, or accepted risks (those root causes for which officials are comfortable not undertaking interventions); and
  - c. Third, they scored the interventions—except those associated with accepted risks—against preestablished criteria of relevance for decision-making including their anticipated efficacy in addressing the problem, equity (pro-poor) and pragmatism (feasible, possible, practical). Officials assessed the pragmatism of potential interventions in relation to financial, governance and human capability and capacity (including technological) considerations. In Table C1 in Annex C we provide an example of this scoring exercise from Jordan in relation to potential interventions to address the ‘declining drinking water services’ impact.
- 6. Iterative drafting of DAP based on the identified interventions:** Once officials scored the interventions, they based discussions on the DAP content around them.

## 2.2.1 DAP Development as a Negotiation Process

Given these DAP development steps, and the general characteristics and constraints of policy development described above, we can consider the whole process to develop the DAPs as a series of interactions and negotiations between the MENAdrought team and individuals, agencies and collectively as working groups in each country.

<sup>12</sup> We note that these characteristics and constraints exist for all government agencies universally and are not specific to MENA countries.

These interactions and negotiations are mediated first and foremost by the local policy (inclusive of governance) and norms, and the political economy backdrop of the state. The MENAdrought team's involvement in those interactions and negotiations, in contrast, is mediated by the principles of engagement. These principles of engagement are not value-neutral in relation to policy, governance, norms or political economy; however, relevant values primarily did drive advice related to the content of policy and governance rather than guiding the process or directly focusing specifically on shifting norms or the political economy. We visualize this interaction and negotiation process in Figure 1 below.

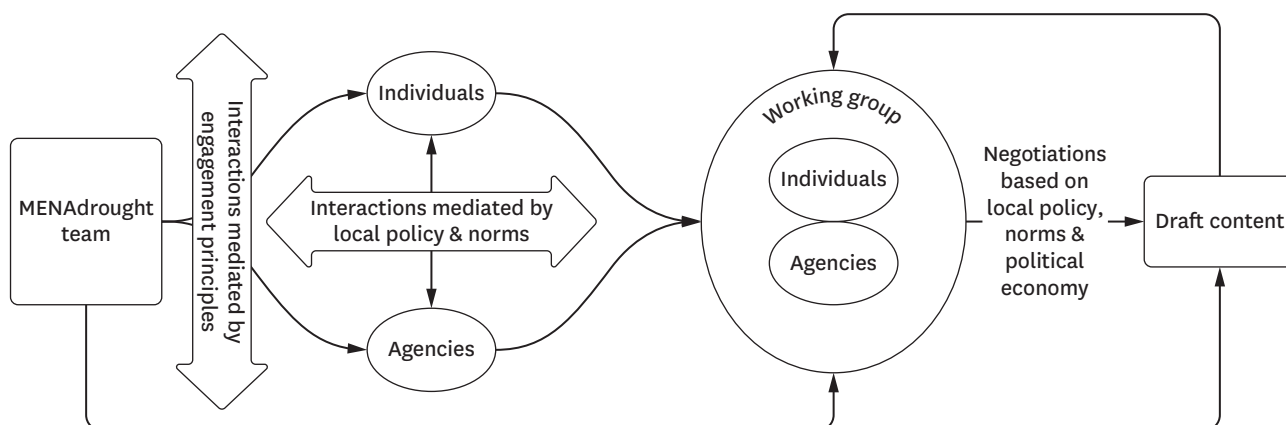


Figure 1. The DAP development process as a series of interactions and negotiations.

The development of DAPs is therefore a policy process informed by evidence of core impacts and sources of vulnerability. The negotiation component comes in linking actions, resourcing and governance arrangements. For mitigation and response actions to come through in final plans and, more importantly, implementation, they must be within the relevant agencies' mandates, aligned with their overarching strategies, technically feasible, able to be resourced and politically acceptable.

## 2.3 Status of DAPs in the Project Countries

Before we describe the drought policy and governance regimes the DAPs prescribe, it is important to know their official status. In short, at the time of writing in September 2022, the DAPs were not yet official government policy in any of the project countries; they had not been approved formally by any agency's executive leadership or a political body.

Until they are formally approved, they should be considered as draft policy and guidance to relevant agencies. This status does not devalue their content. Rather, it simply indicates that the DAP does not bind the governments or agencies to any specific commitments.

Nonetheless, at the time of writing, the DTCs had approved the draft DAPs, and many aspects of the DAPs were already being implemented. For example, the DTCs are active in Lebanon, Jordan and Morocco and are undertaking the duties described in Section 2.5. In Section 6, we reflect further on the status of the DAPs, and we provide additional specificity in relation to each country in the relevant sections.

## 2.4 Section Summary

MENA governments requested technical support to improve drought monitoring and management at the WMO-convened High-Level Meeting on National Drought Policy in 2013. The MENAdrought project resulted from this request and was structured as a demand-led applied research and technical support project with the objective of supporting the governments of the project countries to build self-reliance in managing drought impacts on water and food security and so limit the social and economic losses resulting from these events.

*Principles of Engagement.* Therefore, the MENAdrought team took a ‘working with the grain’ approach to their engagement with national agencies (boundary partners) according to the following principles:

- Advise and guide agencies to achieve their objective of moving to a risk management policy and governance framework;
- Support boundary partners in reforms of policy, governance and working norms necessary to achieve the objective of shifting to a risk management framework; and
- Encourage and facilitate the adoption of norms that we consider necessary to achieve that objective.

DAP Development Process. We applied these principles during our engagements with national agencies to develop DAPs through typical policy analysis approaches. Agency officials first identified and prioritized the core drought impacts to address through public policy interventions. Second, they assessed the root causes of those problems and identified potential interventions to address them. Subsequently, they evaluated those interventions in a structured manner.

This included a review of their own legal and policy frameworks to examine alignment between potential preparedness, mitigation and drought response interventions and their own mandates and strategies as well as national adaptation plans, preexisting proposals to Treasury and international donors, etc. It also included scoring of interventions against the following criteria: anticipated efficacy, equity, pragmatism and practicality.

In summary, we supported agencies to consider what was most important for them to address first and how to do so with the available resources, policy context and constraints they face.

*Status of DAPs.* At the time of writing in September 2022, none of the DAPs developed had been approved formally by any agency’s executive leadership or a political body, though they had been approved by the relevant DTCs. Therefore, they should be considered as draft policy or guidance for relevant agencies.

Lengthy formalization processes are not uncommon in natural hazard policy development. Often, such plans are not formalized until the hazard hits again and agencies must respond. Therefore, this status does not devalue the content of the DAPs; it simply indicates that the DAPs do not bind the agencies or governments to any specific commitments. Nonetheless, many aspects of the DAPs are already being implemented.

## 3. MENAdrought Pillar 3 in Jordan

This section covers the preexisting drought-related legal, policy and governance arrangements in Jordan and then summarizes how we worked with boundary partners in that country. Next it summarizes the DAP-prescribed governance arrangements and describes the key contents of the DAP.

### 3.1 Summary of Drought-related Legal, Policy and Governance Arrangements

#### 3.1.1 Drought-related Law

The legislation, including subsequent amendments, that is most immediately relevant for drought management in Jordan includes the following:

- Agricultural Risk Management Fund Law No. 5 of 2009;
- Law No. 14 of 2014 by which Jordan’s Ministry of Water and Irrigation (MWI) regulates water and sanitation;

- The Water Authority of Jordan Law No. 18 of 1988;
- The Jordan Valley Authority Bylaw No. 30 of 2001;
- The Agricultural Law No. 13 of 2015;
- The Public Health Law No. 47 of 2008; and
- Security and disaster risk related legislation shown in Annex 2.1 of the National Disaster Risk Reduction Strategy (NCSCM 2019).

As is evident, drought management in Jordan falls within the strategic and operational policy remit of several ministries and national centers. In recent years, the Jordanian MWI has taken on a primary technical and operational coordination function, particularly since its issuance of the Water Sector Policy for Drought Management, which was supported by the MENAdrought team (MWI 2018).

### 3.1.2 Water Sector Policy for Drought Management and National Risk Reduction Strategy

This policy forms an integral part of the National Water Strategy (MWI 2016), which we can term an integrated strategy, as defined in Section 1.1. Both the Water Sector Policy for Drought Management and the National Water Strategy are closely linked to the National Risk Reduction Strategy (2019) issued by the National Center for Security and Crises Management (NCSCM). The NCSCM was formed in 2015 to coordinate among relevant national entities in relation to crisis response; it also has a role in developing strategies and policy and endorsing plans and programs related to disaster risk reduction (NCSCM 2019). As such, it performs an important executive coordination and decision-making function in crisis management and risk reduction planning. Annex D has more information on how drought is incorporated within the National Risk Reduction Strategy, as well as how it relates to the National Water Strategy more broadly.

The Water Sector Policy for Drought Management outlines existing policy gaps and the objectives it intends to achieve. In summary, these policy objectives are related to water supply and minimization of drought impacts on water bodies and resources, affected populations and economic sectors. It also includes policy implementation objectives—avenues through which it will deliver the aforementioned aims—that include development of:

1. drought monitoring and early warning systems;
2. national risk management and impact mitigation plans incorporating coordination mechanisms including via the NCSCM; and
3. education, training and public awareness programs related to private sector adoption of risk management measures.

We provide more specifics on the objectives of this policy in Annex D.

### 3.1.3 Governance Prescribed by the Water Sector Policy for Drought Management

In order to realize its objectives, the policy establishes:

1. a National Drought Management Committee (NDMC) drawing members from relevant institutions that have the authority to make executive decisions; and
2. a Drought Management Unit (DMU) with a remit that relates to all 3 IDMP pillars and, in summary, includes:
  - a. establishment of a Drought Early Warning System (DEWS);
  - b. undertaking and/or coordination of risk and vulnerability studies;
  - c. support to development and implementation of drought management plans and sectoral drought action plans inclusive of risk management and impact mitigation measures;
  - d. setting of technical criteria for drought management decision-making;

- e. drought impact monitoring; and
- f. data and information collection, analysis and provision related to all functions described above.

These objectives drove the approach to develop the Jordanian DAP and its core content. They reflect the explicit incorporation of Sendai principles into Jordanian policymaking.

## 3.2 Working with Boundary Partners in Jordan

We started the DAP development process in Jordan with these preexisting governance arrangements stemming from the Water Sector Policy for Drought Management:

- It established the DMU, which the MWI leadership subsequently created, populated and tasked with duties;
- It signaled the creation of the NDMC, an interagency body; and
- It marked the involvement of the NCSCM in drought emergency planning and response.

The boundary partner is the director of the DMU, which works within the MWI. The DMU and related working groups (shown in Figure 2) include Tier 3 and Tier 4 members who are responsible for influencing decisionmakers in their respective agencies.

### 3.2.1 DAP Development Timeline

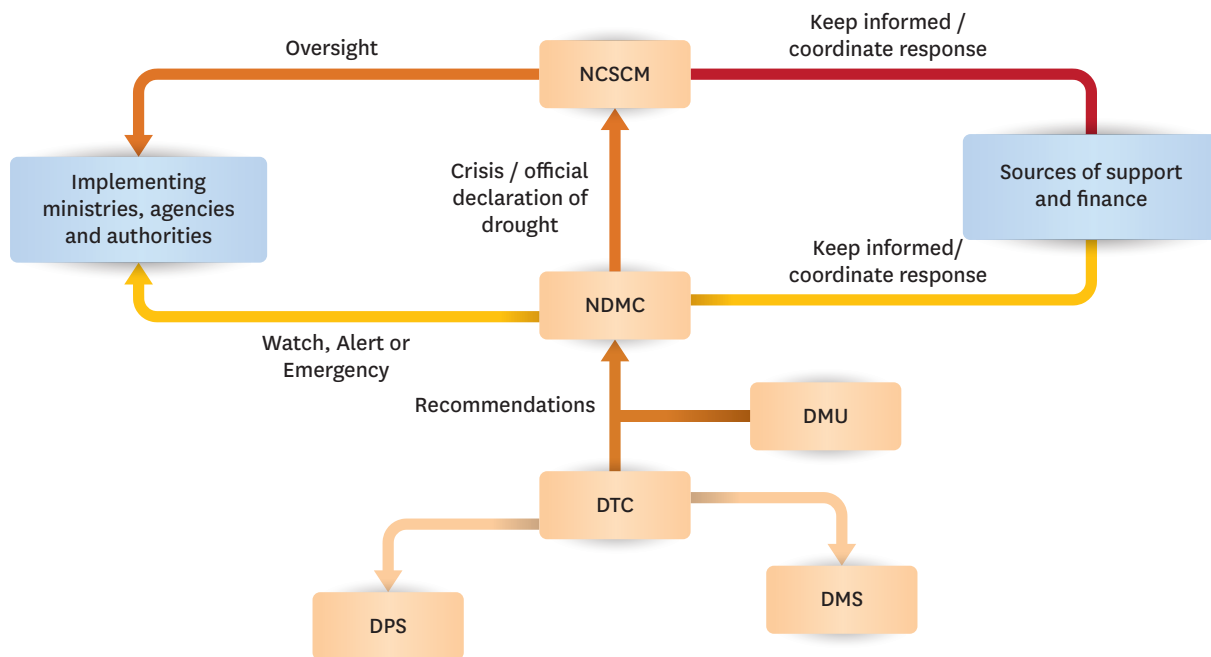
In October 2019, the DMU was authorized by the Secretary-General of MWI to begin developing the DAP. In November 2019, the DMU activated the Drought Technical Committee (DTC-Jordan) and requested nominations from relevant and interested government agencies. The DAP was developed according to the steps described in Section 2.2. The development milestones include the following:

- December 2019: First workshop with newly formed DTC to develop the DAP; DTC identification of priority drought impacts.
- December 2019: Outline and structure of DAP agreed between IWWMI and MWI.
- February 2020: Identification of mitigation and response actions.
- March 2020: Jordan enters Covid-19 lockdown.
- June 2020: DTC members comment on 'draft zero' of the DAP.
- July 2020: DTC members attend a drought simulation training workshop on use of the DAP and drought monitor in decision-making.
- September 2020: DAP v1.1 endorsed by DTC.
- December 2020: DTC begins monthly meetings to monitor the drought season.
- December 2020: Secretary-General of MWI retires; temporary Secretary-General appointed.
- June 2021: DAP v1.2 endorsed by DTC; it includes procedures for monitoring drought impacts.
- July 2021: New permanent Secretary-General of MWI appointed.
- July 2021: Recommendations prepared for the secretaries general of MWI and MoA (Ministry of Agriculture of Jordan) on responses to the drought in Tafilah Governorate.
- September 2021: High-level workshop in Amman with the Secretary-General of MWI to encourage formal adoption of DAP.
- October 2021: DAP circulated to ministries for review and revision.
- March 2022: DMS and DTC conduct a drought simulation workshop.
- September 2022: DTC accepts and endorses the revised DAP.

## 3.3 Drought Governance Structure, Composition and Function in the Jordanian DAP

The Jordanian DAP produced by the DTC provides the governance structure as shown in Figure 2 and described here summarily from the operational to executive level (bottom up according to Figure 2). It reflects the cascade of policy

from the most immediate level (Water Sector Policy for Drought Management) to the more overarching levels of the National Water Strategy and then the National Risk Reduction Strategy.



**Figure 2.** The drought governance structure in the Jordanian DAP. DMS = Drought Monitoring Subgroup; DPS = Drought Policy Subgroup; DTC = Drought Technical Committee; DMU = Drought Management Unit; NDMC = National Drought Management Committee; NCSCM = National Center for Security and Crises Management.

The Drought Monitoring Subgroup (DMS) and the Drought Planning Subgroup (DPS) are working groups overseen by the DTC. The Jordanian DTC is chaired by the Director of the DMU, and it includes agencies whose role is solely to provide information and expertise (the Department of Statistics, the Jordan Meteorological Department [JMD] and the National Agricultural Research Center), as well as agencies that also have a remit to advise higher authorities on decision-making and allocating resources to actions, including the MWI, MoA, Ministry of Public Health, Ministry of the Environment and the NCSCM. Differences in the agencies’ functional and resourcing roles do affect DTC and DMU proceedings; while it is a working group, some agencies, especially MWI and MoA, have more skin in the game, leading to differential influence on outcomes.

The DMU’s role is stipulated in the Water Sector Policy for Drought Management (MWI 2018; see Annex D), and it and the DTC play the role described below.

### 3.3.1 Role of the DTC and DMU

The DTC and DMU oversee a range of operational, technical and policy roles, including:

- data and information collection, collation, analysis and sharing, including from the DEWS, and impact monitoring from other sources;
- convening meetings for interagency planning;
- drafting of DAPs;
- in principle, regular issuance of drought bulletins including advice on decision-making; at present, reporting to the Secretary-General of MWI from each meeting with recommendations;
- undertaking or commissioning studies of drought vulnerabilities and impacts including monitoring of drought impacts;
- in principle, coordination of delimited drought mitigation/response actions (as determined by drought level and operational capacity, considering resourcing); and
- in principle, supporting NDMC and NCSCM during severe and crisis drought periods.

In principle, DTC and DMU also have longer-term technical and policy effectiveness monitoring, evaluation and learning roles. They fulfil these functions through:

- regular monthly meetings during the agricultural/hydrological season to review all available information and develop recommendations for the NDMC including any outputs from the early warning system and impact monitoring;
- an annual meeting to review the evolution of the drought season and progress with implementation of mitigation and preparedness actions, and subsequently to submit a report to the NDMC;
- production of drought monitoring and forecasting products during the hydrological year, and advice on drought responses to higher management committees;
- seasonal events such as full committee meetings to recommend some decisions to the NDMC;
- ongoing projects with their own specific timelines, such as the drafting of the DAP; and
- specific work programs during drought emergencies, such as undertaking of drought impact studies.

Furthermore, the DTC meets yearly each June to review progress on implementation of the DAP and discuss revisions needed for it. In October each year, it meets to conduct a drought simulation exercise to strengthen preparedness; and further exercises may be held in years without reported drought impacts. Findings from these exercises should be incorporated into revisions of the DAP.

### 3.3.2 NDMC and NCSCM within the DAP Operational Framework

In summary, the DAP proposes that the NDMC is responsible for oversight of drought preparedness and mitigation planning, as well as response actions that do not impinge on the mandate of the NCSCM, which is responsible for crisis-level response management.

The Jordanian DAP also lists the proposed membership of the NDMC. This includes the Secretary-General of MWI as the chair, members including Tier 1 or Tier 2 officials from the same institutions as the DTC, as well as additional members from the University of Jordan and the Ministry of Planning and International Cooperation. At the time of writing, the NDMC had not yet met.

The DAP proposes that the NDMC has responsibilities related to decision-making, strategic coordination of drought preparedness and mitigation, oversight of the DTC, and oversight of drought impact mitigation/response actions that *do not require financing* beyond existing budgets (i.e., they may require reallocation and/or reprioritization within existing agency baselines but not new funding). Further, it proposes that the NDMC also has a strategic role in drought preparedness by supporting institutional reforms that aid drought policy and action plans in the relevant sectors. As with the DMU, some agency actors within the NDMC are likely to have outside influence on decision-making given their heightened institutional responsibilities.

Lastly, the NDMC is the liaison with the NCSCM once the Cabinet confirms a crisis level of drought. When the government declares a national drought crisis, the NCSCM may assume supervisory control of the drought response, including coordination and additional resource mobilization functions.

### 3.3.3 Status of Operational Governance

At present, the DMS, DPS, DTC and DMU are active as described above. The NDMC has been officially formulated, comprising the secretaries general of designated agencies and non-ministerial members including from academia. But it has not met. The involvement of the NCSCM in active governance is nascent; at the time of writing, it had recently requested the DTC to nominate two members to participate in the DTC. Its own strategy incorporates drought as a focal topic, although only as a mid-tier priority (as shown in Annex D).

Therefore, the governance structure is partially operational:

- The technical and policy teams and middle management are active;
- Rather than having an active senior management committee (the NDMC) as intended in the DAP, senior management is functionally limited to the MWI and specific interagency agreements; for example, between the



JMD and MWI in relation to operation of the DEWS; and between MWI and MoA for the application of the Takaful social security program in Tafilah during the 2021 drought; and

- The top executive level, intended to be the NCSCM, exists and is active, but without the active senior management layer and/or a formally approved DAP, there is no formal and institutionalized direct line between the technical and policy teams and the executive leadership beyond MWI.

## 3.4 Summary of the Jordanian DAP

This subsection discusses the contents of the DAP roughly in terms of drought timing:

- **Predrought:** First, we describe the priority impacts the DAP attempts to address, and the associated preparedness and mitigation actions they entail;
- **Monitoring drought and drought management decision-making:** Second, we describe drought definitions and their relationship with the DEWS as described in the Pillar 1 report, as well as impact monitoring included in the DAPs, decision-making frameworks and drought response actions; and
- **Postdrought:** Lastly, we describe the monitoring, evaluation, research, learning and policy review components of the DAPs.

### 3.4.1 Priority Impacts and Preparedness and Mitigation Actions

All DAPs are predicated on the priority impacts to address. In Jordan these include: water resource degradation; declining quality of drinking water services; production losses in irrigated and rainfed agriculture; rangelands and forest degradation; and incidence of diarrhoeal diseases. Full descriptions of these priority impacts addressed by the Jordanian DAP are given in Annex D. The 14 preparedness actions and 83 mitigation actions are shown in Appendix E of the Pillar 2 report. In summary, they include:

- Policy and institutional development, including the formulation of legislation, policies, strategies, plans, instruments and budgets;
- Improving underlying data and information sharing, including public awareness-raising, in relation to managing drought risks;
- Monitoring and analysis to support drought early warning and the design, timing, targeting and evaluation of drought actions; and
- Resilience strengthening (e.g., investing in public infrastructure).

### 3.4.2 Drought Definitions

All the DAPs use definitions for *drought class*, *triggers* and *drought response level* to identify the onset and end of drought conditions, and the scale of responses to them.

**Drought Class.** This refers to the severity of the drought detected. It is assessed through biophysical indicators and proxies for rainfall, vegetation health, evapotranspiration and soil moisture anomalies using the eCDI (and for Lebanon and Souss-Massa, also the cumulative eCDI) described in the Pillar 1 report. Drought classes are defined according to the expected return period.

**Triggers.** These tie information on drought class to drought response levels. Triggers reflect increasing severity and/or duration of drought. In summary (see the Pillar 1 report for more detail), these triggers were developed using expert judgement based on correlation of historical records of drought (eCDI values from 2000 to 2020) and production statistics for key food security crops that are predominantly rainfed. The DTCs use these triggers and other information to recommend drought response levels. The DAP incorporates different triggers for the winter (Dec–Feb) and spring (March–May) seasons.

**Drought Response Level.** This refers to the activities of government and other stakeholders in reducing drought vulnerabilities and impacts. Drought response levels reflect the resource intensity and robustness of governmental actions. In principle, the NDMC decides drought response levels based on advice from the DTC, including information on drought class and triggers as well as other relevant sources including impact monitoring. Table 6 summarizes this.

Table 6. Drought definitions in the Jordanian DAP.

Drought Class	Trigger	Drought response level and key aspects of response actions
Normal: Absence of drought.	N/A	Watch: Focus on monitoring and mitigation and preparedness actions.
Moderate: 5-year return period. Affects the most vulnerable groups.	Winter and spring: Detection of moderate Drought Class.	Alert: Information sharing, monitoring conditions and impacts, prepare to launch additional responses as needed.
Severe: 10-year return period. Significant impacts on most vulnerable groups; can impact water balance and wider economy.	Winter: At least 1 month of moderate Drought Class and 1 month of severe Drought Class. Spring: At least 2 months of severe Drought Class.	Emergency: Response actions typically implemented by agencies with baseline budgets and likely reallocation and reprioritization of existing resources.

### 3.4.3 Drought Impact Monitoring

The process for drought declaration and intervention decision-making that is outlined in the DAP allows for, and explicitly includes, multiple sources of information. The eCDI provides a critical source of information but not the only one because, as described in the Pillar 2 reports, drought is a socionatural phenomenon, and its impacts are a function of cascading effects through socioenvironmental systems.

The Jordanian DAP has monthly, quarterly and annual impact indicators that feed into decision-making and are, to the extent possible, disaggregated by governorate:

- Monthly: Reports of drought-related crop loss and damage, diarrhoeal outbreaks, forest fires and subsidized feed distribution and feed sales;
- Quarterly (March and June): Percentage increase in livestock mortality and spring feed prices; and
- Annual (June): Water storage in key dams, and barley harvested area.

Sources for this information include ministerial bulletins, investigation records and databases as well as review of public media.

### 3.4.4. Drought Management Response Actions

The intended drought management decision-making framework is described in Section 3.3. The DAP includes 67 recommended response actions to implement when drought occurs, and they are tied to the drought response levels.<sup>13</sup>

In all cases, the DTC's recommendations should be accompanied by guidance to support decision-makers, specifying not only what it is recommended, but when, where, by who, with what objective and who else needs to be informed.

**Alert.** The 'Alert' drought response level is commensurate with moderate drought conditions that might be expected with a return period of 5 years. While some highly vulnerable groups may experience elevated levels of hardship, the focus of drought risk management is to raise awareness among key stakeholders in case drought conditions worsen and cause more severe and widespread hardship. Drought response actions therefore focus on providing warnings and updates of drought locations and impacts to relevant agencies, checking preparedness to implement contingency plans, and issuing public notices, such as encouraging lower levels of water consumption.

**Emergency.** The 'Emergency' drought response level is commensurate with severe drought conditions that might be expected once every 10 years. Such conditions might have severe and widespread social and economic impacts, particularly for the most vulnerable people, and negatively affect the country's water balance for several years. However, because drought conditions are unlikely to meet the threshold for a national humanitarian crisis, it is

<sup>13</sup> The full list of response actions is shown in Appendix E in the Pillar 2 report.

unlikely that additional resources will be made available for drought responses. Actions at this level therefore focus on alleviating drought impacts on highly vulnerable sectors and people through highly targeted interventions using the existing budgets and resources available to ministries and agencies.

Identified response actions at this level include reallocating water supplies between sectors and locations, initiating water rationing and/or mobilizing contingency water reserves, imposing restrictions on the use of rangelands and forests, market interventions to regulate livestock feed prices, increased monitoring, redeploying staff and equipment, and alerting international partners and relief agencies before conditions worsen.

*Crisis.* ‘Crisis’ drought response levels imply deep and widespread social, economic and political impacts equivalent to a national humanitarian crisis—drought conditions that might be expected to occur once or twice in a century. Early detection and action during the ‘Alert’ and ‘Emergency’ drought response levels would help reduce the costs of such impacts, but alleviating the impacts of such a drought will still require significant additional resources for response actions from governmental contingency funds or international humanitarian partners. Response actions may include cash transfers to affected areas and households, emergency food and water provision or market interventions, public works schemes, mobilization of strategic water reserves and stricter restrictions on uses of water, rangelands and forest.

### 3.4.5 Policy Monitoring, Evaluation and Learning

Ongoing collation of existing impact-related information as well as collection of new information during drought periods provides empirical, though contextually complex, information on the emergence and evolution of drought on the ground. We cannot overstate the importance of this impact monitoring/reporting for adaptive drought management responses, validation and long-term improvement of the drought monitoring system and the DAP, and an understanding of policy effectiveness.

This is because the eCDI incorporates biophysical indicators that are drivers of drought impacts but not, in and of themselves, measures of immediate impacts.<sup>14</sup> For example, the fact that eCDI scores show drought conditions does not, in and of itself, mean that the quality of drinking water services has declined or will decline; rather, the priority impacts result from a complex interplay of factors within socioenvironmental systems, as described in detail in the Pillar 2 reports.

Determining the precise interplay, let alone causality, of drought drivers and impacts within complex socioenvironmental systems is a global challenge (Van Loon et al. 2016). This is a likely contributor to drought-related research (both in the MENA region and globally) focusing more on drought drivers rather than impacts (Kchouk et al. 2022).

Beyond impact monitoring, the DAP suggests that the DTC:

1. Deliver annual reports to the NDMC on the progress of DAP preparedness and mitigation actions;<sup>15</sup>
2. Provide a postdrought assessment report to the NDMC on drivers of drought, responses taken, impacts of drought, performance of responses and any recommendations for amendments to the DAP;
3. Periodically improve vulnerability-related information to reflect changing circumstances and, as appropriate, expand the scope of the DAP to additional priority impacts; and
4. Undertake a comprehensive review of the DAP once every 5 years in relation to evolving policy and governance arrangements as well as drought risks and vulnerabilities.

The second and fourth reporting elements suggested above particularly rely on impact monitoring as well as clear record-keeping related to drought response actions.

<sup>14</sup> The Normalized Difference Vegetation Index (NDVI) input into the eCDI is the closest of the four input indices to a direct impact measure related to rangelands and/or rainfed agriculture productivity.

<sup>15</sup> In the Souss-Massa DAP, this annual report is prescribed rather than suggested.

## 3.5 How the Principles of Engagement/Negotiation Shaped the State of the DAP

The finalized draft DAP provides a solid framework for drought risk management that aligns with established ways of working within and between agencies of the Government of Jordan and supports appropriate reforms of policy, governance and norms. At the time of writing, it has been endorsed by DTC representatives and is awaiting formal ministerial approval prior to implementation. The task of guiding it through that process will ideally be undertaken by a USAID-funded implementation project, the Water Governance Activity, which works at the ministerial level.

This achievement reflects the value of our engagement principles in developing the DAP, particularly in terms of respecting the authority, boundaries and interests of our partners in the MWI and DTC. The initial agreement to prepare a DAP was made with the then Secretary-General of MWI in 2019, who appointed the Director of MWI's Drought Management Unit as our focal point. The DMU Director then convened the DTC with representatives of other ministries and agencies. This working group was the forum for the analysis, discussion and development of the DAP.

However, a series of changes in MWI's senior leadership between 2020 and 2021 led to a shift from a top-down process explicitly endorsed by the MWI Secretary-General toward a middle-out strategy. This was already envisioned for most group members, who were not only middle-ranking representatives of their agencies in the DTC but also potential advocates for the DAP to senior decision-makers within their own ministries and agencies. However, we now also supported the DMU Director in seeking endorsement from the new MWI leadership.

Without direct leadership or input from senior decision-makers, the DTC ensured the DAP minimized the likely barriers to endorsement. A key issue was identifying actions with none-to-minimal budgetary implications. For example, most mitigation actions included in the DAP were selected from preexisting proposals or budgeted activities. Similarly, selection of response actions for 'Alert' and 'Emergency' drought response levels was biased toward those that could be implemented with existing budgets and resources.

Furthermore, the role of the NCSCM was respected in our work. The NCSCM acts when ordered to do so by the government in response to a national crisis, the threshold for which is very high. The purpose of the DTC and DAP, by contrast, is to reduce the costs of drought by mitigating risk and responding early to lower-level impacts. The DAP respected this mandate by allocating responsibilities for mitigation and management of 'Alert' and 'Emergency' drought responses to the DTC and NDMC, while recognizing the NCSCM's role of assuming oversight during a 'Crisis' response level. The DMU Director also diligently engaged with NCSCM staff, which eventually led to NCSCM representatives joining the DTC.

## 4. MENAdrought Pillar 3 in Lebanon

This section covers the preexisting drought-related legal, policy and governance arrangements in Lebanon and then summarizes how we worked with boundary partners. Next, it summarizes the DAP-prescribed governance arrangements and describes the key contents of the DAP.

### 4.1 Summary of Drought-related Legal, Policy and Governance Arrangements

As Lebanon is a relatively water-abundant country compared to its MENA peers, Lebanese policymakers historically have not focused on drought management extensively. This has changed relatively quickly since the deep drought of 2014. In Annex E we provide a summary of the drought management status quo as of 2019 and additional context on legal, policy and governance arrangements. Here, we describe significant legal and policy developments since 2019.

Governmental drought management is not explicitly and thoroughly enshrined in law in Lebanon, and only recent policy documents discuss it directly. Rather, drought management occurs primarily through the operational policy of several central government agencies including the Lebanese Ministry of Energy and Water (MoEW), Ministry of Agriculture (MoA Lebanon), Ministry of Environment (MoE) and others, the Regional Water Establishments, the Litani River Authority, and local government authorities. To a lesser extent, it also occurs through wider budgetary processes.

#### 4.1.1 Water Sector Policy Relevant to Drought

However, water laws and policies in Lebanon have recently undergone significant reforms: The Water Code 192 of 2020 and the National Water Sector Strategy Update of 2020 represent significant attempts to streamline laws and regulations, improve institutional coordination and information sharing, and prioritize near- and mid-term actions to improve water management generally.

While the Water Code only uses the word ‘drought’ once (in Article 6 on sustainability goals relevant to public water management, where it is used in relation to public health matters), Chapter 7 relates to natural hazards. Articles 87 and 88 of that chapter deal with management within ‘water deficit areas’. These are defined as areas (or the whole country) in which there is a noticeable decrease in the quantity of available freshwater to levels insufficient to meet typical water needs (including that of ecosystems).

Article 87 describes the specification of water deficit areas as occurring in the general water master plan, and the MoEW’s implementation of activities to rationalize water use in those areas while, if possible, meeting ecosystem needs. Further, it states that in those areas, meeting domestic water needs of the population is the top priority, and then wider water needs; it clarifies that unconventional water can be used to meet deficits if it conforms to health standards.

Article 88 goes on to state that the Minister will make decisions on ensuring sustainable water management in line with the general master water plan or proposal from the public water investment institutions (the Litani River Authority and the four Regional Water Establishments), or, in exceptional measures, by a decree. During situations of water deficit, these decisions can include temporary suspensions (or reductions) in water rights for specific uses or transferring water between basins.

In terms of wider governance, Water Code 192 also expands the range of ministries involved in the National Water Authority (an interagency policy advisory body) to include Environment, Industry, Agriculture, Public Works and Transportation, Health, Finance, Interior and Municipalities, and Tourism (Article 14).

The National Water Sector Strategy Update explicitly includes drought monitoring and management under ‘Axis II—Fighting Climate Change’. Drought-related themes feed into the Integrated Hydrological Information System with the core component being the development of a national-scale drought mitigation plan as shown in Table 7. The Drought Action Plan developed through the MENAdrought project (see Section 4.4) serves this purpose and therefore directly contributes to the realization of the Strategy.

**Table 7.** The drought mitigation component of Lebanon’s Integrated Hydrological Information System (IHIS).

IHIS: TIMESCALE & REQUIRED STUDIES & IMPLEMENTATION										
	Duration (months)	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9
Drought mitigation (Nation scale drought mitigation plan)	9	[Red bar spanning all 9 months]								
Define the conceptual and legal framework, methodology,	2	[Red bar]								
Data collection including historical drought events	1		[Red bar]							
Establish indicators and thresholds for drought classification	3			[Red bar]						
Develop a program of measures, mitigations and recommendations for a nation scale strategy	6				[Red bar]					
Establish drought early warning protocol	2								[Red bar]	
Establish organizational framework for the production, implementation and update of the drought mitigation plan	1									[Red bar]

If implemented successfully, the development of a national drought mitigation plan with the envisioned components would help fill the major policy and governance gaps that stakeholders identified through the MENAdrought needs assessment and other national reviews (e.g., ECODIT 2015).

## 4.2 Working with Boundary Partners

We started the DAP development process in Lebanon with the following preexisting governance arrangements stemming from Water Code 192 and the National Water Sector Strategy Update 2020:

- The Water Code established the National Water Council with the Prime Minister as Chair, and stated which Ministers are members. However, this body has not yet met.
- The National Water Sector Strategy Update signaled the intention to develop a national-scale drought mitigation plan and operational framework (Table 7).

Our project's focal point and boundary partner was the Director of Water Resources of the Lebanese MoEW. Formal Pillar 3 activities in Lebanon had a later start than in Jordan due to the challenges of working with agencies in the context of the economic and political crisis in the country, the Beirut Port explosion and Covid-19-related disruptions. However, in May 2021, the Director of Water Resources verbally agreed to begin developing the DAP, and intended members of the DTC were convened shortly thereafter. We note that at the time of writing, the DTC had not been formally established by ministerial documentation and remains an informal but highly active working group. For the sake of simplicity, we refer to 'the DTC' hereafter without additional caveats on its formal status.

In comparison to Jordan, the DTC in Lebanon is a slightly smaller group with fewer institutions. All the members had worked together prior to being involved with the DTC, which supported effective and efficient collaboration.

Shortly after convening, the DTC began development of the DAP through the steps described in Section 2.2. The full timeline of DAP development is as follows:

- May 2021: Verbal agreement with the Director of Water Resources of MoEW (Tier 3) to begin developing an outline DAP.
- August 2021: Outline DAP; guidance document delivered to MoEW.
- February 2022: First workshop with DTC to elaborate the DAP.
- April 2022: DTC comments on draft-zero DAP.
- August 2022: Endorsement of DAP draft 1.0 by DTC.

## 4.3 Drought Governance Structure, Composition and Function in the Lebanese DAP

The proposed governance structure for the Lebanese DAP is shown in Figure 3. We summarily describe below its composition and function from the operational to executive level.

The Lebanese Drought Monitoring Subgroup (DMS in Figure 3) is composed of a subset of members of the DTC. They run the drought monitoring and early warning system and provide technical information to the DTC.

The DTC is chaired by a Tier 3 representative from MoEW, and is intended to draw its members from Tiers 2 and 3 (depending on the size of the agency and their interest) of Lebanon's MoEW, Ministry of Agriculture, Ministry of Environment, Lebanese Agricultural Research Institute, Meteorological Department of the Civil Aviation Authority, National Center for Remote Sensing, Litani River Authority, Beirut and Mount Lebanon Water Establishment and Southern Lebanon Water Establishment.

The DTC undertakes the same set of activities and performs the same set of functions as the Jordanian DMU and DTC as described in Section 3.3. We note that all the DTC agencies were involved in drafting the DAP except the Litani River Authority, Ministry of Environment, and the Southern, Bekaa and Northern Lebanon Water Establishments.

The DAP proposes that agencies form a Higher Drought Committee (HDC) chaired by the MoEW and with senior executive members (Tier 1 or 2) drawn from relevant agencies and institutions. Its proposed functions relate to decision-making on drought status and drought mitigation response actions that do not require financing beyond existing budgets (i.e., they may require reallocation and/or reprioritization within existing agency baselines but not new funding). The HDC's role also includes oversight of the DTC, interagency as well as public-private coordination and information sharing, and recommending additional preparedness, mitigation and response actions to senior political leaders.

The DAP proposes that the HDC be mandated authority under either the Cabinet of Ministers or the National Water Council, to be determined at a later date. The designated body for senior political leadership will have executive authority for drought crisis response and risk management (see Annex E for more on this Council). This would include the authority to make an official declaration of drought, take decisions on mitigation/response actions requiring supplementary budget as well as political coordination for financing of those actions and oversight of them, and give strategic direction on drought risk management and associated institutional development.

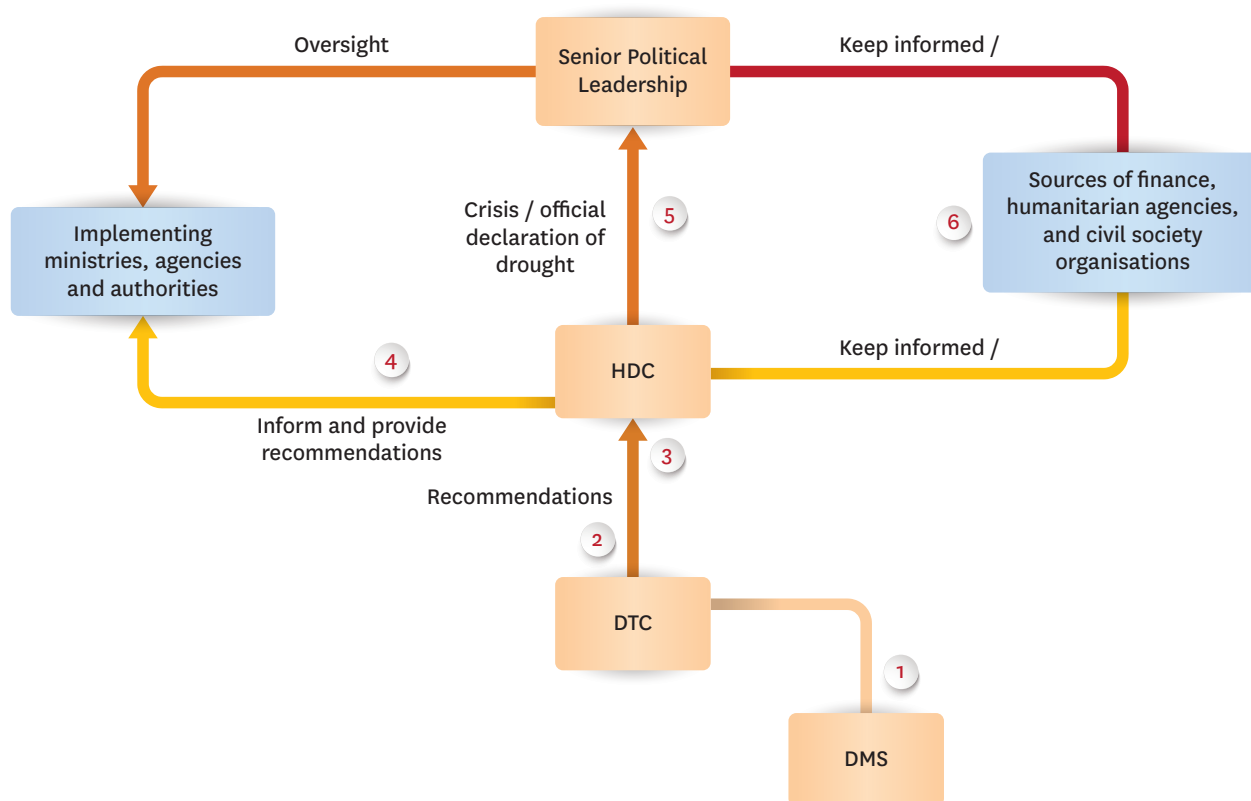


Figure 3. Drought governance structure in the Lebanese DAP. DMS = drought monitoring subgroup; DTC = drought technical committee; HDC = Higher Drought Committee.

### 4.3.1 Status of Operational Governance

As noted above, the DTC remains an active but informal working group. The HDC has not been established, but the DAP proposes that it include Tier 1 or Tier 2 members from the following agencies: MoEW, Ministry of Agriculture, Ministry of Environment, Ministry of Social Affairs, the Municipalities Department of the Ministry of Interior and Municipalities, and others as needed. The National Water Council has not yet met. As such, the DAP governance structure is not operational, although the DTC is undertaking the activities described above, and, in principle, could undertake the activities prescribed for it in the DAP.

In summary, the technical team and middle to senior policy managers (members of the DTC who have led policy development) are active. However, there is no senior or executive management oversight beyond the DTC. As such, the DAP has not been formally approved or adopted, and the executive management layer has not been involved to date.

## 4.4 Summary of the Lebanese DAP

As with the summary of the Jordanian DAP, this subsection is arranged roughly according to the DAP contents' relationship with drought timing.

### 4.4.1 Priority Impacts and Preparedness and Mitigation Actions

The Lebanese DAP has priority impacts that include reduced quality of domestic water services, reduced availability of domestic water, reduced storage levels in reservoirs and dams and reduced yields in irrigated and rainfed agriculture (inclusive of mixed pastoral agricultural systems). Full descriptions of these priority impacts taken from the DAP are included in Annex E.

The preparedness actions contained in the Lebanese DAP are generally similar to those described for Jordan and include actions related to legislation, policy, governance, coordination mechanisms, data collection and information sharing, and policy effectiveness. We provide an overview of these preparedness actions in Annex E.

The Lebanese DAP's 83 mitigation actions targeted to specific root causes or sources of vulnerability include actions to formulate and revise legislation, improve compliance with regulations, formulate strategic and operational policy, strengthen information sharing systems, develop technical tools and research capability, and strengthen financial capacity.

Specific examples include components related to variable water pricing and support for water user associations, and several others focused much more on utilities' institutional capacity and capability (e.g., auditing systems), water pricing structures, underlying information on water resources, and transparency and equity issues.

### 4.4.2 Drought Definitions

The drought definitions in the Lebanese DAP are very similar to those in the Jordanian DAP shown in Section 3.4. Like for Jordan, drought class is defined according to the expected return period. The Lebanese DAP has triggers that are the same as in the Jordanian DAP and are based on drought severity and duration. Note that, as described by Bergaoui et al. (2022), there were also potential triggers developed using the Drought Severity and Coverage Index as well as the same agricultural production relationships as in Jordan given the absence of reliable water resources or agricultural production data.

The drought response levels reflect resource intensity and robustness of governmental actions, and in principle, the HDC will decide the drought response levels based on advice from the DTC as for Jordan with the NDMC. Table 8 summarizes drought definitions in the Lebanese DAP.

**Table 8.** The drought mitigation component of Lebanon's Integrated Hydrological Information System (IHIS).

Drought Class	Trigger	Drought response level and key aspects of response actions
Normal: Absence of drought.	N/A	Watch: Focus on monitoring and mitigation and preparedness actions.
Moderate: 10-year return period, affects most vulnerable groups.	Winter and spring: Detection of moderate Drought Class.	Alert: Information sharing, monitoring conditions and impacts, prepare to launch additional responses as needed.
Severe: 20-year return period, significant impacts on most vulnerable groups, and can impact water balance and wider economy.	Winter: At least 1 month of moderate Drought Class and 1 month of severe Drought Class. Spring: At least 2 months of severe Drought Class.	Ongoing drought: Response actions typically implemented by agencies with baseline budgets and likely reallocation and reprioritization of existing resources.
Exceptional: 50-year return period. Likely serious impacts across populations, economy and social cohesion.	Winter: At least 1 month of exceptional Drought Class consecutive with 1 month of severe Drought Class.  Spring: At least 1 month of exceptional Drought Class consecutive with 1 month of severe Drought Class.	Crisis: More robust response actions likely to require additional resources (including budget) and higher political oversight.



### 4.4.3 Drought Impact Monitoring

The Lebanese DAP includes drought impact monitoring related to two priority impact areas: reduced availability of domestic water and reduced yields in rainfed and irrigated agriculture.

For water availability, the Beirut and Mount Lebanon Water Establishment has proposed two indicators for drought impacts on domestic water availability, drawing on regularly collected data and long-term data sets. The first indicator compares current storage of the Chabrouh Dam to the long-term average. The second tracks the gap between water demand and water supply in supply zones.

For yield reduction, in response to eCDI alerts and other drought monitoring tools, the Ministry of Agriculture can request rapid surveys from local agricultural offices in at-risk areas. The DTC can also use the incidence of complaints from farmers made to the Ministry of Agriculture and reports of drought in newspapers and other media as presence/absence data to indicate where drought impacts may be occurring and where field surveys should be targeted.

### 4.4.4 Drought Management Response Actions

Like the Jordanian DAP, the 43 response actions contained in the Lebanese DAP follow an escalation ladder depending on the drought level and the specific targeted impact. Also, as with the Jordanian DAP, advice on recommended response actions is meant to specify relevant actors, what they are meant to do, when and how. Response actions aim to address the following root causes and/or causes of vulnerability:

- **Domestic water services:** Actions to respond to drought impacts on water quality, the equity and equality of water distribution, degradation of installed equipment, the financial sustainability of utilities, and customer satisfaction.
- **Reduced availability of domestic water:** Actions to respond to drought impacts on the physical availability of water, energy supplies, non-revenue water and competition between water users.
- **Reduced storage levels in reservoirs and dams:** Response actions to enable the stocking and restocking of reservoirs, and to better manage water demand.
- **Reduced yields in irrigated agriculture:** Actions to rationalize water use and strengthen resilience in irrigated agriculture including in relation to drying springs, lack of climate information, increased risks of pests and disease, and poor soil water management.
- **Reduced yields in rainfed agriculture (inclusive of mixed pastoral agricultural systems):** Actions to improve resilience in rainfed agricultural systems by improving access to climate information, drought-tolerant varieties and techniques, strengthening support and extension services, and reducing livestock losses.

More specifically, these include the following types of interventions:

1. **Information collection and provision**
  - a. **Increase in monitoring** of water quality, water infrastructure operational performance, water use, service delivery, regulatory compliance, etc.
  - b. **Provision of information** (to agencies and/or the private sector and the broad public) about the drought situation and climate, expected shortfalls in water availability (for specific uses or in specific areas), impacts seen to date, crop seasons, etc.
2. **Supporting voluntary/non-regulatory efforts**
  - a. **Appeals for voluntary demand management**, typically associated with provision of information;
  - b. **Supporting cooperation and/or non-regulatory water reallocation**—inclusive of inter- and intrasectoral allocation, irrigation season timing, etc.
3. **Training and process improvement or optimization**
  - a. **Infrastructure maintenance and optimization for drought conditions**—related to well equipment,

- pumps, flow meters and electricity supply;
- b. Training** by agricultural extension services with focus on soil water management;
- 4. Undertake and/or facilitate resource reallocation**
  - a. Water reallocation amongst users and rationing**—inclusive of inter- and intrasectoral allocation, irrigation season timing, etc.
  - b. Energy supply prioritization to utilities;**
  - c. Redeploy government staff and equipment** including veterinary staff;
  - d. Water supply redistribution**—trucking between municipal reservoirs;
- 5. Market mechanisms**
  - a. Water tariff structures**—use of drought-specific water pricing;
  - b. Subsidies for feed;**
- 6. Regulatory interventions**
  - a. Scaling regulations**—bans on specific water uses, escalation of regulatory water demand management; deescalation of some regulations on groundwater pumping;
  - b. Stricter enforcement of existing regulations**, including those around pumping of groundwater;
- 7. Direct goods and services delivery to people and/or organizations**
  - a. Provision of agricultural and livestock support** related to pest control, veterinary services;
  - b. Water supply-side augmentation** such as water trucking, support for on-site water recycling in industry;
  - c. Water provision for municipal services (trucking)** including from strategic reserves.

#### 4.4.5 Policy Monitoring, Evaluation and Learning

As in the case of Jordan, and for similar reasons, impact monitoring is a critical component for ongoing policy monitoring, evaluation and learning. Beyond impact monitoring, the Lebanese DAP suggests that the DTC has the same annual reporting, postdrought reporting, vulnerability assessment, and policy review and revision duties as in the Jordanian DAP.

### 4.5 How the Principles of Engagement/Negotiation Shaped the State of the DAP

Unlike Morocco and Jordan, Lebanon has no established policy framework for drought risk management. Following our engagement principles, we took our lead from the DTC, which proposed including draft policy elements within the DAP, and treating the DAP as a draft policy document. The ongoing political and economic crises in Lebanon—and the comparatively low levels of drought hazard—reduced opportunities for engaging senior and political decision-makers on the issue of drought, but through the approach taken, policy elements will be ready for presentation when and if demand arises. This meant more effort was spent considering the policy and institutional aspects of the DAP, including the potential roles of existing institutions such as the National Water Council.

Consequently, at the time of writing, the draft DAP is more propositional than its counterparts in Jordan and Morocco. It also contains recommendations for finalizing the DAP and implementing an enabling policy and governance framework when the conditions are right for enactment.

## 5. MENAdrought Pillar 3 in Morocco

This section covers the preexisting drought-related legal, policy and governance arrangements in Morocco and then summarizes how we worked with boundary partners in that country. Next, it summarizes the DAP-prescribed governance arrangements and describes the key contents of the DAP.

## 5.1 Summary of Drought-related Legal, Policy and Governance Arrangements

Morocco has had a legal framework for executive decision-making on drought confirmation and coordination of drought responses for decades (Ouassou et al. 2007). At the national level, operational responses have become somewhat institutionalized since the 1980s, and one can generally characterize the progression of national drought management responses as follows:

- In the early 1980s, drought responses focused on ensuring basic food and water security for the population;
- by the 1990s, responses had expanded to minimize livestock losses; and
- from the late 1990s, responses expanded to address impacts on water quality, human health and rural education (women), electrification and access to water to enhance incomes and livelihoods.

In sum, at the executive and senior management levels of the central government, there are relatively institutionalized procedures related to drought management. However, Moroccan drought management policy has shifted in the recent past<sup>16</sup> in connection with decentralization drives as well as new legal regimes. In 2016, Water Law 36-15 came into effect and replaced Water Law 10-95 (dating from the mid-1990s), as did the entirely new Rangelands Law 113-13.

### 5.1.1 Water Law and Drought Management Governance

The primary aspects of drought management in Morocco now occur under the aegis of:

- water and agricultural law including Water Law 36-15 and Rangelands Law 113-13;
- strategic and operational water, agricultural and food policies such as Plan Maroc Vert, and others related to fodder, feed and food importation and subsidies; and
- wider governmental disaster risk policy and budgetary mechanisms; for example, Morocco has developed climate-related disaster risk financing mechanisms with the World Bank; it recently (World Bank 2021a) created a Disaster Risk Management directorate within the Ministry of the Interior (Moi); and in 2021 promulgated a Disaster Risk Management Strategy (Moi 2021; see Annex F for more details).

Water Law 36-15 was introduced during a deep drought in 2016 (see the Pillar 2 report). It focuses heavily on sustainable groundwater use and participatory management mechanisms. It requires ABHs to set up integrated water monitoring and information systems. It also establishes processes for ABHs to develop water shortage management plans (focused on human and livestock water provision) in consultation with central government agencies, public institutions, local authorities and the concerned local water commissions, which include civil society representatives (Articles 126 and 134). The Delegated Ministry for Water (Ministère Délégué Chargé de l'Eau) together with the Moroccan Ministry of Agriculture has the mandate to oversee the ABHs in their production of these shortage management plans as well as master water plans, and related DRA (Direction Régionale de l'Agriculture) and ORMVA (Office Régional de Mise en Valeur Agricole) plans.

The law (Articles 124-126) stipulates that in the event of drought, ABHs request the central government to declare a state of water scarcity in a defined zone (or zones). Drought confirmations, including the areas eligible for specific interventions, are made by a committee that includes the Ministers of the Interior, Finance, Agriculture and Water (World Bank 2021a). Once the confirmation is made, the ABHs enact planned measures within their water shortage management plan. The law stipulates this plan must:

1. be developed in consultation with stakeholders (mainly from the agriculture, industry, municipalities and tourism sectors);

<sup>16</sup> Ouassou et al. (2007) provide an excellent overview of drought management policy from at least the early 2000s through 2016. In 2016, the passage of the Water Law 36-15 changed the legislative process for drought management by devolving key components to the ABHs (watershed agencies).

2. contain intervention measures relative to the degree of shortage; and
3. integrate all user sectors for proactive management.

Plan implementation is overseen by prefectural commissions or provincial authorities. The prefectural or provincial water commission is chaired by the *Wali* (governor, or his representative) and is responsible for coordinating and monitoring the implementation of actions.

### 5.1.2 Role of ABHs and the National Water Utility

The ABHs are overseen by the government authority responsible for water (Ministère Délégué Chargé de l'Eau). World Bank (2021b) describes the role of the ABHs as:

“carry[ing] out all local water resource-related measures at the basin level, including groundwater gauging and hydrological studies, hydrogeological planning and water management both quantitatively and qualitatively. They must also take the necessary measures for the preservation or restoration of water quality, manage and control the use of mobilized water resources, and develop the necessary infrastructure investments for the prevention and fight against floods. They are likewise responsible for elaborating and ensuring implementation of integrated water resource development plans (Le plan directeur d'aménagement intégré des ressources en eau, PDAIRE) within their jurisdictions. They issue permits and concessions for use of public water resources in accordance with the PDAIRE. Each ABH plans, authorizes, and collects water extraction charges. Thus, water withdrawals for irrigation and other agricultural purposes at the basin level are authorized in the respective PDAIRE.”

The ABHs therefore have regulatory powers over groundwater abstraction and use. Likewise, they are partially in control of dam infrastructure and access to water in public irrigation areas administered by ORMVA, which are primarily fed from surface water reservoirs. However, it is not a utility or otherwise in charge of water provision as that is under the purview of the Office National de l'Eau Potable (ONEP).

Before the introduction of Water Law 36-15, the National Water Strategy (Stratégie Nationale de l'Eau, SNE, 2012) led to the consolidation of the urban and rural water supply sector into one entity, the ONEP. SNE, and the subsequent National Water Plan (DGE 2015) developed to speed up its implementation, emphasize supply-side development, interbasin transfers and large-scale conversion from flood agriculture to drip systems.

### 5.1.3 Rangelands Law and Drought Management

The Rangelands Law 113-13 provides a wide-ranging authorizing environment for governance of rangelands and pastoral areas by national and regional authorities. It creates a National Rangelands Commission led by the Minister of Agriculture which oversees regional committees headed by governors and including the ABH, the regional departments of agriculture (DRA, which deal with rainfed agriculture and rangelands) and ORMVA for irrigated agriculture. These regional committees have broad powers to regulate grazing and herd movements, including for nomads and transhumants. The law stipulates processes for declaration of pastoral emergency zones during droughts (Article 15) and zoning of pastoral protection areas that can last for years to facilitate rangeland rehabilitation (Articles 7-8). Directives issued under this law specify the conditions of herd mobility and access to pastoral and sylvo-pastoral areas, and the obligations incumbent on livestock owners in relation to environmental preservation and rehabilitated areas.

### 5.1.4 Decentralization and Drought Policy and Governance in Morocco

Both laws exhibit broader Moroccan governance trends toward devolution and decentralization that began about 20 years ago and have sped up considerably in the last decade. They will likely ultimately result in ABHs and DRAs becoming critical agencies related to drought management. The shift to basin-level management regimes reflects governmental recognition of the severity and breadth of drought impacts across socioeconomic sectors. Hopefully, it will also enable and support participatory hazard management processes and improve hazard risk management.

## 5.2 Working with Boundary Partners at the Central and Local Government Levels

Given the focus of Moroccan drought risk management policy and the desire to work explicitly with local government, we took a two-pronged approach with Pillar 3 activities. Firstly, at the national level, we supported the Ministry of Agriculture (specifically, the Directorate of Strategy and Statistics, DSS) to develop, install and operate the DEWS described in the Pillar 1 report. Secondly, on a suggestion by the DSS and the Department of Land and Water Management, we worked with ABH Souss-Massa to develop an outline for a DAP to replace the existing drought plan described in the Pillar 2 report (Hydraumet 2010).

Our focal point and boundary partner in the national project was the DSS. We also worked directly with ABH Souss-Massa on DAP development. As such, the Director of the ABH Souss-Massa was our local government boundary partner.

Other stakeholders at the national level included the regional departments of agriculture (DRAs) and their staff, the national meteorological agency (DMN) and the core staff there, and the High Commission for Planning (HCP) which receives the DEWS outputs. Our interactions with them were mediated through the DSS even if we worked with them directly.

Likewise, at the local level, other stakeholders included the DRA of Souss-Massa and the regional agricultural promotion agency in irrigated areas, the ORMVA for Souss-Massa as well as participants in the regional validation network (members of various DRAs) described in the Pillar 1 report.

### 5.2.1 Supporting National Efforts

MENAdrought's support for national drought management efforts in Morocco is primarily limited to drought monitoring in rainfed agricultural areas including cereal areas and rangelands. We supported the DSS to install and run the DEWS described in the Pillar 1 report. Following production of the information, the DSS provides the results to the rangelands department within the Ministry of Agriculture, the HCP, the ABHs including Souss-Massa, and eventually posts it online.<sup>17</sup> The committee that recently confirmed drought in Morocco based its decision-making partially on the DEWS and ordered a recovery program of around USD 1 billion (Benargane 2022).

### 5.2.2 Establishing a Working Relationship with ABH Souss-Massa and the Activities Chronology

From the project outset in 2018, the DSS and MENAdrought team agreed to focus Pillar 3 activities on regional government entities. From 2019, we began reviewing documentation from the ABH Souss-Massa including the existing drought management plan (Hydraumet 2010) and drought-related decision-making and interventions from recent years. Following completion of this review and associated SWOT analysis in summer 2020, we began conversations with officials from the DSS and ABH Souss-Massa to plan the Pillar 3 activities.

By autumn 2020, we were undertaking regular meetings with ABH Souss-Massa officials to consider the appropriate focus for the DAP. In early 2021, the MENAdrought team and ABH had discussions around the possible involvement of the Office of the Wali, the Souss-Massa DRA, ORMVA and others; ABH officials signaled strong interest in developing a holistic DAP for the Souss-Massa region comparable to those developed for Jordan and Lebanon. However, shortly thereafter, Morocco closed its borders (February 2021–February 2022) due to the Covid-19 pandemic, and it was no longer possible to schedule meetings with all stakeholders.

As a result, the ABH and other Moroccan stakeholders decided that the project focus should be narrowed to working with the ABH only. Discussions with ABH officials continued down the initially intended path to develop a holistic plan for the entire region but encountered the complexity of reaching that objective due to the variety and scale of drought-related considerations in the region.

<sup>17</sup> [https://www.google.com/maps/d/u/o/viewer?ll=32.596541148055024%2C-4.964161271601978&z=5&mid=1yALZG5WYge76BeRiV\\_YNbhV-zJigyBnT](https://www.google.com/maps/d/u/o/viewer?ll=32.596541148055024%2C-4.964161271601978&z=5&mid=1yALZG5WYge76BeRiV_YNbhV-zJigyBnT)

Therefore, the ABH decided to limit the thematic scope of the DAP to what ABH officials described as their core mandate focused on intersectoral water allocation for municipal (drinking, industry and tourism) and agricultural uses in Chtouka Ait Baha. The ABH's staff are primarily hydrologists and engineers, and the ABH considers itself as a technical agency. In terms of developing a new DAP, they decided that they wanted to:

1. improve the set of indicators they are using to detect hydrological drought;
2. use new indicators and information to develop their Water Scarcity Plan including drought (as a technical theme);
3. use the Souss-Massa DAP to be developed with MENAdrought support to focus on triggering actions for managing municipal water use;
4. explore appropriate indicators to test for use as triggers for water supply management purposes; and
5. focus geographically on a relatively small but particularly challenging area, the Chtouka sub-basin.

At that stage, ABH officials precluded the DAP from explicitly addressing wider risk management components for irrigated and rainfed agriculture, or other themes. However, we note that ultimately all local decision-making related to drought management is undertaken by the *Wali*, who is a representative of the Minister of the Interior. Also, we note that the wider range of governmental stakeholders were interested in participating in a holistic management planning process; disruptions due to the pandemic merely precluded it from occurring at the time. We discuss the regional and national decision-making interactions further in Section 5.3. In Section 5.4, we describe how the DAP itself includes consideration of these wider range of issues and themes but does not explicitly address them.

Through workshops held between the summer and winter of 2021, ABH staff sequentially incorporated proposed mitigation and response actions and drought triggers into the draft DAP, which was completed in March 2022, as described here. Like the national DAPs of Jordan and Lebanon, it can serve as a foundation for future development. The underpinning impact and vulnerability assessments, including rigorous identification of root problems, is complete and the relevant local government agencies are interested in expanding the scope of policy content and considering operational governance arrangements. Another prospect is to integrate the observed and predicted precipitation with water resources-related data to derive triggers for water management. This could be of high interest to USAID and other development agencies operating in watersheds like the Souss-Massa and beyond (for example, the ABH Oum Rabia).

## 5.3 Drought Governance Structure, Composition and Function in the Souss-Massa DAP

Water Law 36-15 outlines drought governance nationally and describes the role of local government in requesting drought declarations. The governance structure described in the Souss-Massa DAP is predicated on this as well as preexisting governance structures from the 2010 drought management plan. ABH officials wished to explore operational drought monitoring and management incorporating use of the DEWS before considering changes to these preexisting governance arrangements, and national government agencies supported this decision (the governance structure is visualized in Figure 4. Note that the DSS is one of the key national government agencies).

However, the law does not prescribe how local government officials decide to request declaration of drought. The DAP, therefore, focuses on clarifying the evidence basis used by the ABH to support its advice to the *Wali* and the committees involved in drought declaration requests.

### 5.3.1 Office of the Wali, Drought Management Committees and the ABH

The Office of the *Wali* is responsible for requesting drought confirmation/declaration and has ultimate oversight of intervention actions. In this role, the *Wali* is advised and assisted by a Regional Steering Committee (Comité de Pilotage Régional, CPR), the Provincial Coordination Committee (Comité de Coordination Provinciale, CCP) and the Local Monitoring Committee (Comité de Suivi Local, CSL).

The CPR's missions include:

1. ensuring coordination between the various regional drought management bodies;
2. directing interventions to the localities most vulnerable to and/or affected by drought;
3. establishing the timetable for the implementation of actions; and
4. mobilizing the necessary financial resources.

The CCP ensures coordination between the local drought monitoring and management committees and provides quarterly evaluation reports to the CPR. The CSL is responsible for monitoring the situation of local areas (communes/counties, villages/douars and urban centers) in terms of water availability, and it implements the actions decided and scheduled by the CPR.

ABH Souss-Massa staff are members of all these committees and the ABH is able to undertake some drought management actions on its own without requesting permission from other regional organizations, the *Wali* or national government agencies. Thus, there are multiple avenues for the ABH to influence drought management decision-making. The drought definitions described below, and the monitoring information produced monthly in relation to them, are the policy basis for the ABH's advice to decision-makers.

### 5.3.2 ABH Souss-Massa and DAP Structure

In terms of the governance structure, then, the DAP focuses on the ABH and information and advisory flows within the organization to support it in advising the ultimate decision-makers on drought declaration and interventions. It prescribes a Drought Monitoring Group (Groupe de surveillance de la sécheresse, GSS) that receives drought monitoring information from the DSS, collates other sources of information, and undertakes relevant analysis. This group is formed of engineers and other technical staff, and it provides analysis and advice to the Drought Working Group (Groupe de travail sur la sécheresse, GTS), which is composed of ABH senior and executive managers.

The GTS's role includes decision-making on drought management interventions that do not require additional budget or authorization. It makes recommendations to the regional committees and the Office of the *Wali* for interventions that do require additional budget, regulatory authority or actions by other entities.

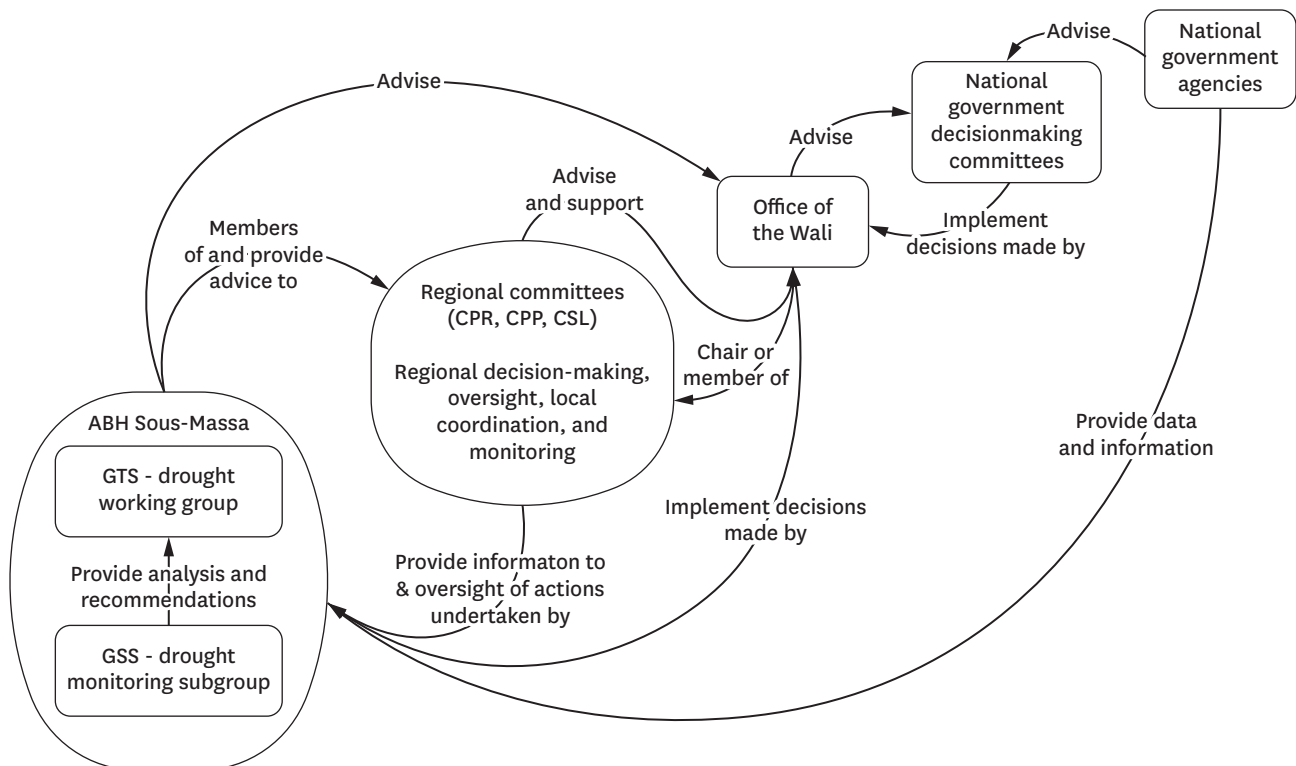


Figure 4. Drought governance structure in Souss-Massa.

Note: Other agencies too are involved in drought management; this figure only depicts the components explicitly and implicitly included in the DAP.

## 5.4 Summary of the Souss-Massa DAP

As with the other DAP summaries, this subsection is arranged roughly according to the DAP contents' relationship with drought timing.

### 5.4.1 Priority Impact and its Relation to Preparedness and Mitigation Actions

As described above, the priority impact for the Souss-Massa DAP is the degradation of groundwater in the Chtouka Ait Baha subcatchment of the Massa basin. The ABH has already delineated a safeguard zone for the aquifer under the rubric of Law 36-15 in relation to water shortages due to reasons other than drought. In other words, the ABH has already recognized that structural overabstraction affects the area, and so the DAP aims to identify drought preparedness, mitigation and response actions, and appropriate triggers for response actions, to slow the rate of increased degradation that occurs in drought situations.

However, the prescribed preparedness, mitigation and response actions are limited to those directly within the ABH's perceived mandate. Still, the DAP acknowledges multiple root causes of vulnerability to the exacerbation of groundwater degradation during situations of drought and includes the identification of a set of preparedness, mitigation and response actions that are outside of the ABH's mandate. Thus, the DAP, and the Pillar 2 assessments that underpin it, provide the foundation for more wide-ranging societal drought management policy planning and governance consideration process.

### 5.4.2 Preparedness and Mitigation Actions

Preparedness actions in the Souss-Massa DAP are somewhat comparable in theme, but more limited in specific scope, than the Lebanese or Jordanian DAPs. They include:

- capacity building of drought monitoring and management working groups through simulation of drought events;
- keeping policies and the DAP updated to reflect new knowledge and changing economic, institutional and environmental contexts;
- developing drought contingency plans and mainstreaming drought risk management into strategic and operational water sector planning, including aspects related to supply mobilization and inter- and intrasector allocation (and reallocation) during drought events;
- establishing information sharing mechanisms and maintaining contact lists and protocols for disseminating drought information;
- improving data quality and monitoring systems for weather, surface water and groundwater, and the processes and systems for sharing those data and information; and
- compiling data on potential drought impact indicators relevant to priority impacts and sectors, and observing them as part of the drought monitoring process.

Mitigation measures prescribed in the Souss-Massa DAP include:

- institutional development, such as the formulation of laws, policies, strategies, plans, instruments and budgets including those related to intersectoral water allocation and reallocation during drought;
- Information sharing and awareness raising on drought risk management;
- ongoing monitoring and analysis, to support drought early warning and the design, timing, targeting and evaluation of drought response actions; and
- building resilience (i.e., investing in public infrastructure).

The prescribed measures (those within the ABH's perceived remit) focus heavily on regulatory enforcement and associated social norms, primarily those related to groundwater abstraction:

- increasing the coordination and resourcing for regulatory enforcement, and developing technical tools to support regulatory enforcement;
- undertaking information campaigns to raise awareness of water sustainability issues among various publics,



- normalize compliance with regulations and increase acceptance of the values underpinning the regulations; and
- supporting social processes including multistakeholder platforms, related to long-term water use.

Other prescribed measures include those related to dam management (such as flushing silt); studies for managed aquifer recharge; development of market interventions for farmers; and working with other agencies that support uptake of market mechanisms and subsidies by farmers for improved irrigation systems or other water-saving measures.

The ABH can undertake these preparedness and mitigation measures without any special authorization from the Office of the Wali other than typical oversight functions.

### 5.4.3 Drought Definitions

The drought definitions contained in the Souss-Massa DAP (Table 9) are comparable to those in the Jordanian and Lebanese DAPs. The Souss-Massa DAP has triggers based on monthly eCDI values as well as cumulative eCDI values that aggregate and weight monthly eCDI values through time.

Table 9. Drought definitions in the Moroccan DAP.

Drought Class (for the eCDI)	Trigger	Drought response level and key aspects of response actions
Normal: Absence of drought.	N/A	Watch: Focus on monitoring and mitigation and preparedness actions.
Moderate: 5-year return period; affects most vulnerable groups.	Any month with more than 30% of the region showing 'severe' or 'exceptional' Drought Class with the eCDI.	Alert: Information sharing, monitoring conditions and impacts; prepare to launch additional responses as needed.
Severe: 20-year return period; significant impacts on most vulnerable groups; can impact water balance and wider economy.	Two consecutive months with more than 30% of the region showing 'severe' or 'exceptional' Drought Class with the eCDI.	Emergency: Response actions typically implemented by agencies with baseline budgets and likely reallocation and reprioritization of existing resources.
Exceptional: 50-year return period; likely serious impacts across populations, economy and social cohesion.	Either 1. three or more consecutive months with more than 30% of the region showing 'severe' or 'exceptional' Drought Class with the eCDI; Or 2. a cumulative eCDI value greater than 0.36 in any month.	Crisis: More robust response actions likely to require additional resources (including budget) and higher political oversight.

### 5.4.4 Drought Impact Monitoring and Drought Management Response Actions

The Souss-Massa DAP includes the development of impact monitoring indicators as a preparedness action to be undertaken in the future.

The ABH can undertake most response actions agreed by the GTS without any special authorization from the Office of the Wali, the regional or local committees, or other stakeholders. The higher levels of decision-makers (Office of Wali, etc.) come into play where additional budget or authority is required. Like the Jordanian and Lebanese DAPs, advice on recommended response actions to the GTS, or from the GTS to higher authorities, is meant to specify relevant actors, what they are meant to do, when and how.

The DAP outline includes 34 drought response actions of which the ABH has the mandate to undertake 18. Actions for which they have a mandate include the following:

- increase fines and regulatory monitoring and enforcement actions;
- install flowmeters and monitor control meters regularly;
- provide non-conventional water for agricultural use;
- share information and raise awareness with, and request demand management from, various publics;
- convene multistakeholder discussions to feed into drought emergency management planning;

- implement intersectoral allocation regimes according to the guidelines and priorities;
- reform water pricing structures including increasing tariffs during droughts; and
- require the installation of shades for ponds and canals.

The actions for which the ABH does have the mandate to undertake include the following:

- construct surface water storage or rainwater retention infrastructure;
- support conservation agriculture to reduce erosion and crop water demand;
- control land use and land-use change;
- promote MAMDA insurance or develop other funds to compensate farmers and pastoralists for losses;
- limit agricultural incentives for water overexploitation;
- organize agriculture sector water users or cooperatives;
- restrict cropping patterns or agricultural practices; and
- strengthen technical capacities for design and manufacture of pond roofs.

#### 5.4.5 Policy Monitoring, Evaluation and Learning

The DAP suggests the development of drought impact monitoring to support, among other things, policy refinements over time. Like the Lebanese and Jordanian DAPs, the Souss-Massa DAP incorporates a reporting framework from the GSS to the GTC. However, unlike those DAPs, it does not have an explicit component focused on policy effectiveness evaluation and learning beyond the general preparedness component related to reevaluation of the DAP over time.

### 5.5 How the Principles of Engagement/Negotiation Shaped the State of the DAP

Compared to Jordan or Lebanon, Morocco has more well-developed policy and governance frameworks addressing natural hazards in general and drought in particular. As described above (Section 5.1), Morocco has enacted various reforms to address drought hazard since the devastating droughts experienced in the 1980s. Over the same period, Morocco has also been deconcentrating and devolving authority to local and subnational regional authorities. Consequently, drought governance in Morocco is complex. There are various, differentiated and sometimes overlapping roles, responsibilities and forms of coordination between authorities at different administrative levels as well as between authorities governing different sectors.

We have described how, following our principles of engagement to work with the grain (Section 5.2), the work to develop a DAP in Morocco focused on the ABHSM. As in Jordan and Lebanon, we advocated for engagement with a broad set of cross-sectoral stakeholders. However, ABHSM expressed clearly and strongly their preference that the DAP focus on supporting their technical role in water-related decision-making, which was unambiguously within their mandate. Following our engagement principles of respecting our partners' boundaries, we adapted the approach and process developed in Jordan and Lebanon to align with the ABHSM's expressed demand.

The resulting DAP is, therefore, quite distinct to that prepared for Jordan and Lebanon, in that it focuses on just one organization, and on a relatively localized area—the Chtouka aquifer—rather than the national level. During the process of selecting mitigation and response actions, some options were identified over which the ABHSM has no mandate or authority, and over which the responsible agencies were not consulted. In Jordan and Lebanon, by contrast, agricultural and other officials were engaged in identifying and screening options, ensuring recommendations were broadly aligned with their agencies' capabilities and interests. This is a potential weakness of the ABHSM DAP, although ABHSM can of course recommend these mitigation and response actions to the appropriate agency.

Conversely, however, the ABHSM DAP has a significant advantage over the Jordanian and Lebanese DAPs in that it was commissioned directly by ABHSM's Director, who has the direct authority for its approval and implementation. This stands in contrast to the Jordanian and Lebanese DAPs, which are, at the time of writing, awaiting demand and attention from senior decision-makers.

Ultimately, however, complex issues around water management and drought risk governance in the Souss-Massa basin require multi-institutional preparedness, mitigation and responses. The current DAP supports decision-making by ABHSM in its role, while making recommendations to strengthen intersectoral drought policy, governance and preparedness in the Souss-Massa Wilayat (governorate).

## 6. Achievements, Challenges and Next Steps

In this section we describe the achievements of the MENAdrought project, the challenges it faced while supporting national agencies and the challenges our boundary partners faced in the development of DAPs. We also offer suggestions for future work to support the embedding of drought risk management approaches in Jordan and Lebanon and in the ABHs in Morocco, particularly in Souss-Massa.

### 6.1 Achievements

In relation to Pillar 3, MENAdrought accomplished several objectives:

- It established reliable and operational systems for drought monitoring that are run and trusted by national government officials. These systems meet the stakeholders' need for robust scientific evidence on which to base drought management decision-making.
- The project developed a comprehensive understanding of drought impacts and sources of vulnerability, including hazard maps, and worked with government officials to understand the root causes of these sources of vulnerability in a policy development context.
- It supported national and local government agencies to begin integrated drought management planning—a first in the region. This includes development of DAPs that have been approved by mid-level management across multiple ministries (Jordan and Lebanon) and senior managers in Souss-Massa, Morocco.
- The project supported interagency and multidisciplinary teams of young engineers and managers to build their own technical capacities and work together effectively on drought monitoring and management themes.
- It supported governmental transparency and broader participation in policy processes through establishment of mechanisms for local feedback to central government via drought impact reporting networks and some publication of drought monitoring outputs. This sets the basis for possible permanent local feedback networks and/or public information sharing.

#### 6.1.1 Formalizing Drought Risk Management in the MENA Region

Fundamentally, the establishment, whether formal or informal, of national drought technical committees with their given remits represents the beginning of formalization of operational drought management policies and governance arrangements. It implies that the governments view explicit drought management and risk reduction as important political and economic objectives fully under the purview of the state.

Ultimately, the creation of purpose-built drought monitoring and early warning systems, and their articulation with action plans—as well as maintaining the staff to undertake the duties—signals the governments' commitment. It represents a foundation and a major step in what will hopefully be (and in other countries has been<sup>18</sup>) a long and ongoing process to improve drought crisis management and risk reduction.

With these considerations in mind, we can say that MENAdrought has contributed to nascent institutional (largely governmental) and human capability and capacity to undertake drought risk management in the ways in which we were invited to do so. We supported government officials to write plans that will help them strengthen drought risk

<sup>18</sup> See Fragaszy et al. (2020) for more discussion of coalitions in relation to drought monitoring and management.

management if resourced to do so, and we consider that with longer-term commitment (technical assistance and/or considerable investment from the relevant local agencies), they will be able to take the next, longer strides.

## 6.2 Challenges National Agencies Faced in Developing DAPs

In developing the DAPs, the national agencies faced a range of challenges associated with:

1. the science-policy interface—using information from sophisticated technical tools that has important uncertainties and ambiguities for policymaking, which itself contains its own uncertainties and ambiguities;
2. trade-offs between improving drought resilience and other policy objectives; and
3. potentially conflicting interests of different actors which may affect policy- and decision-making.

### 6.2.1 The Science-Policy Interface: Boundaries and Authority

A foundational goal of the MENAdrought project is to support boundary partners in the development and deployment of sophisticated, but relatively simple to operate, drought early warning tools (modeling systems using remote sensing inputs) to facilitate planning for drought risk reduction and management responses. A key objective of the project is to support agencies so that they can generate timely, reliable and accurate information about environmental conditions, and link response management plans to that information.

However, the “linear approach” to science-policy interactions, whereby scientists (including government staff) produce information that officials then incorporate straight into policy, rarely if ever occurs along a straight line (Rose et al. 2017). For us, this challenge came about because of the uncertainty and ambiguity vis-à-vis the drought monitoring outputs and impacts that agencies seek to address, and their own mandates at the intersection of those themes.

As the Pillar 2 reports clearly show, the relationships between, for example, drought severity and municipal water supply are challenging to determine, and would be so even with greatly improved environmental and/or infrastructure performance monitoring data. Socioenvironmental systems are even more complex: establishing causal linkages is highly challenging, and data are often incomplete. Therefore, the drought early warning system outputs can only ever be proxies for impacts, and proxies based on imperfect inputs. Still, technical staff from agencies consider these proxies to be the best available choice, the most salient, credible and legitimate proxies (Cash et al. 2003) for information to support advice on decision-making. Senior and executive management logically anticipate intense media and political scrutiny of their decisions building up to and during crisis response. They must also be convinced that the information is adequately credible and legitimate, and that the policy and governance arrangements built around it cohere and integrate with their own agency’s policy, wider government policy and political constraints.

Planning for governance and implementation of preparedness, mitigation and response actions is challenging; and it is a negotiating process because of associated resourcing requirements. No one agency has the remit or resources to tackle a whole impact theme on its own, and it takes time to convince each agency’s leadership to be involved in governance and progress implementation of individual parts of the whole. In particular, agency leaders in countries with highly constrained public finances and confronting multiple immediate challenges are understandably reluctant to assume responsibility for or invest in preparedness and mitigation actions with no immediate or quantifiable return. The governments of Jordan and Lebanon in particular are confronting multiple simultaneous crises, including crises in their economies and public finances. By comparison, the potential impacts of future droughts appear relatively remote, and consequently drought preparedness and mitigation actions are not prioritized. Similarly, agencies may be reluctant to accept responsibility for even low-cost response actions to be funded under existing budgets, preferring to do nothing until drought impacts are sufficiently evident to warrant the mobilization of central government contingency funds or resources from humanitarian agencies. The cross-sectoral nature of drought risk management also implies further risks associated with interagency work, including high transaction costs and the potential for conflict or redrawing of institutional boundaries and organizational responsibilities to one’s disadvantage.

These challenges are inescapable, and they shaped the DAP development process. This was particularly clear in terms of how our governmental partners preferred to define the scope of the process, the actors engaged in the DTCs and

their role in it, and the authority delegated to them. In Morocco, the ABHSM preferred to avoid interagency interaction and for the DAP to guide their decision-making only. In Lebanon, the interagency DTC was composed of relatively senior officials, but was informal rather than officially mandated. In Jordan, the interagency DTC had an official mandate but was composed of middle-ranking technical officials who generally did not have the authority to negotiate policy on behalf of their agencies. Therefore, for example, the DAP process in Jordan focused on mitigation and response actions that were clearly within existing institutional roles and mandates. Where actions fell outside existing mandates and responsibilities, or required new forms of interagency coordination, for example to resolve trade-offs between policy objectives, these were noted as preparedness actions; i.e., to be defined as part of the long-term interagency process for strengthening drought risk management.

## 6.2.2 Consideration of and Trade-offs between Resilience and Adaptation

Drought resilience and adaptation are not new themes of work for our boundary partners or their organizations; the bibliography of relevant government documents attests to this fact. Many of the preparedness and mitigation actions contained in the DAPs derive from preexisting plans or strategies. There is therefore already a policy and institutional rationale for their inclusion, and presumably also a technical rationale.

However, the DAP development process did not take a system or long-term view for consideration of trade-offs between resilience and adaptation.<sup>19</sup> The criteria for consideration of interventions focused on a given intervention's efficacy in addressing a specific root problem, equity in terms of being pro-poor, and pragmatism. None of these criteria requires assessment of whether the action may be maladaptive in the long-term; indeed, many actions come from preexisting practices or drivers and so could lead to further path dependency, whether institutional or economic. For example, there is ample evidence that in many circumstances, improving crop-water productivity through improved irrigation or other means can result in greater water abstraction, thereby exacerbating water supply challenges over time, due to a range of political economy factors (Lankford 2013; Molle and Clossas 2020). Likewise, fodder subsidies have led to major expansions in livestock herds and rangeland overgrazing, which, in association with other aspects of pastoral management, has contributed to rangelands degradation and perverse incentives (Hazell et al. 2001).

In and of themselves, both actions cited above can be effective, pro-poor and pragmatic interventions to address rural livelihoods and the income impacts of drought. They may also contribute to greater resilience in the production systems. However, over time, they may also be maladaptive in terms of building up systems of production that cannot be sustained long term for either financial, market or socioenvironmental reasons. Yet national policies for crop-water productivity and feed subsidies reflect outcomes of broader institutional processes. Our view is and was that, on the scale of action-research we were engaged with, the pragmatic approach was to attempt feasible, incremental changes in the existing policy landscape rather than tilt at transformational changes that were beyond MENAdrought's scope and resources. Over the long term, however, strengthened capability for drought impact monitoring and policy effectiveness evaluation and learning can contribute to better understanding of these issues, and provide evidence for policy reforms in other policy domains.

## 6.2.3 Political Economy of Natural Resource Governance

Natural resource governance serves political economy objectives. Political economy imperatives for governments in the project countries (and most others) entail increasing consumption of natural resources. Recent sustainability discourses and emerging social norms have begun to challenge this imperative slightly; government agency objectives of eventually achieving sustainable use of groundwater is an example of such discourse. However, putting in place the reforms necessary to meet those objectives fully would require leaders to amend, openly, truth claims they have made about natural resource plentitude and socioeconomic growth within current economic production systems, or they would require significant devotion of social resources to meet them while continuing to improve standards of living. Both routes are rife with challenges.

<sup>19</sup> Governmental processes of this type rarely do. With this statement, we are not casting aspersions on the process or the agencies that undertook it; we are simply stating that such truly systemic analysis is rare in policy processes because they are not undertaken in a vacuum and instead must build on existing conditions and tread through existing paths.

More immediately and practically, considering which drought-related interventions to undertake is an exercise in political economy. In particular, in these countries where even in normal conditions sustainable water supplies cannot meet demand, mitigating and responding to many of drought's impacts implies restricting water usage. This entails higher trade-offs between users and uses of water, creating winners and losers. For example, high-value crop production is typically concentrated in specific areas and undertaken by specific sections of society. If drought mitigation and/or response actions privilege high-value crop production over other social and economic uses of water, it will incentivize and reward those landowners and farmers while potentially impoverishing others, or at least allowing them to become impoverished over time.

Determining which social and economic activities, and therefore the specific businesses and people, to protect preferentially through DAP-prescribed actions is an inherently political exercise. Having it written down and formalized gives those preferences the additional weight of transparent approval—it becomes a concrete statement of what the government intends to do and whom it intends to serve most immediately through that instrument. As time goes on, it may be revised and updated with new information and resources, as circumstances change.

Once again, this challenge is inherent in the process of consideration of and decision-making about drought management activities. Addressing it entailed policymakers actively considering these issues in the light of their own contexts and political environments and putting down on paper their intentions—a significant act of transparency.

## 6.3 Challenges We Faced Supporting National Agencies

Broadly, the challenges the MENAdrought team faced in supporting the national agencies can be boiled down to those related to challenges typical of working at the science-policy interface, adapting to specific national institutional contexts, and logistics as well as public service responses to and impacts from the Covid-19 pandemic and their effects on project boundary partners.

### 6.3.1 Challenges Typical of Working at the Science-Policy Interface with Boundary Partners

The specific challenges we faced in navigating the science-policy interface with boundary partners and stakeholder organizations related to:

1. their core remits and mandates, and their resultant thematic comfort zones; and
2. the fact that most of our work was with technical staff and middle management who had to be policy entrepreneurs for the work they undertook and the resultant DAPs.

The organization within which each boundary partner works has a specific remit and mandate that, while generally broad and somewhat flexible within its thematic content, overall, left them few policy levers for drought risk management themes outside of their immediate control. Those other policy levers rest with agencies or institutions not involved in the DAP process. This is normal, but it is a challenge for agencies when attempting to consider how to address socionatural phenomena such as drought that interact with numerous socioenvironmental systems. This challenge resulted in the DAPs generally having a narrower focus than agencies had initially hoped to incorporate.

We worked directly with technical staff and middle management who predominantly had physical sciences or engineering backgrounds and stable positions. While they are all competent public servants accustomed to navigating the hierarchies of power within their own institutions and across government, the senior and executive leadership who will be required to approve the DAPs often come from very different backgrounds and work in agencies with very different remits and focus themes. Given the DAPs' technically complex material related to drought definitions, our most immediate boundary partners had to advise and influence their own senior or executive management, as well as influence (and get their management to influence) senior and executive management of other agencies. Communicating information effectively while eliciting and sustaining executive interest and attention over a prolonged period for such processes is difficult. We consider this challenge to have contributed to the lack of DAP formalization.

### 6.3.2 Adapting to National Institutional Contexts

The ministries and the basin agency that we worked with to develop the DAPs have very different operating contexts, including in relation to drought, which required a different approach in each country. Also, none of the boundary partners had a firm and explicit legislative remit for drought or wider disaster management response. Indeed, Jordan, Lebanon and Morocco all have national disaster management bodies (NCSCM in Jordan, the National Committee for Disaster Risk Reduction under the Prime Minister's Office in Lebanon, and the Disaster Risk Management Directorate within the Ministry of the Interior in Morocco), though they focus on crisis response. Thus, DAP development occurred with line agencies, which is logical given their role in preparing for, mitigating and supporting wider responses to natural disasters.

In Jordan, the MWI has a remit focused on water management: it deals extensively with state-owned entities that own and operate infrastructure related to municipal water supply, sanitation and irrigation water provision, and historically, it has had relatively little direct interaction with drought management beyond the water sector. In many ways, as a ministry, it is highly technical and primarily focused on infrastructure development and operation, as well as service delivery functions. As a result, and due to executive leadership changes during the course of the project, it has relatively less freedom to maneuver in relation to interagency processes that fall outside its primary remit. The DTC in Jordan therefore took longer to settle into its working arrangements, but that also reflects one of the achievements of the project: supporting the MWI to improve interagency collaboration regarding a core aspect of climate change adaptation.

In Lebanon, the MoEW too is a technical ministry with a primary remit focused on infrastructure development and operation as well as service delivery. Like Jordan's MWI, it too had not previously dealt extensively with drought management beyond the water sector. But in Lebanon there was relatively little centralized governmental drought management occurring; as described earlier, it is a relatively new governmental focus. The DTC in Lebanon therefore had fewer entrenched interests and actors in relation to drought management, but also less top-down demand for the DAP, especially given the ongoing wider political (and associated bureaucratic) upheaval.

In Morocco, the DSS had worked extensively on drought themes including through the application of a CDI and in relation to agricultural insurance. Also, there was a longstanding national drought management governance system in place. Therefore, at the outset of the project, DSS's policy context was clear and its staff were more experienced in some aspects of drought monitoring and management than their counterparts in Lebanon and Jordan. Likewise, the ABH Souss-Massa had a preexisting drought plan that focused solely on the water sector. DAP development in MENAdrought set the stage for wider collaboration across water, energy and agriculture themes.

### 6.3.3 Logistical Challenges

As an applied research and technical assistance development project, MENAdrought did not have staff on the ground in each country and instead relied on missions from regional staff and local consultants. Covid-19-related lockdowns precluded international and in many cases domestic travel. This posed challenges to training and DAP development workshops, particularly with stakeholders for whom online interactions had not been common beforehand. These challenges slowed momentum on DAP development in every country. In Lebanon, the Beirut Port explosion and electricity and internet outages exacerbated these problems.

### 6.3.4 Public Service Responses to and Impacts from Covid-19

The world over, governmental responses to and impacts from the Covid-19 pandemic entailed numerous public servants changing their focus of work and agencies having significant changes in resourcing, both at very short notice and due to reprioritization or overall expenditure reductions associated with recession. The Ukraine war and the associated spike in commodity prices (especially staple foods and agricultural inputs) have extended these issues and resulted in additional reprioritization of resources.

In the project countries, this led to changes in senior and executive leadership of boundary partners, as well as technical and policy staff. It also led to a reduction in the amount of time and focus boundary partners and other stakeholders were able to devote to the work. Overall, this slowed momentum of DAP development as well as finalization and/or approval processes.

## 6.4 The Next Steps to Embed Drought Risk Management Approaches

The DAPs provide a structured outline of actions needed to (a) prepare for and mitigate drought risks, and (b) plan for alleviation of impacts during crises. Several of the required actions pertain to the development of more detailed institutional and/or sector-specific drought risk management plans. Here, we describe several routes to help embed drought risk management approaches, and we also refer readers to the Pillar 2 reports, each of which has a country-specific set of potential research-for-development activities that are arranged thematically.

### 6.4.1 Embedding Drought Risk Management Planning Across Institutions and Sectors

There is a major opportunity for development agencies to embed this work and support the institutionalization of drought risk management through medium- to long-term technical assistance programs of work. Indeed, the USAID-funded Water Governance Activity may commit to carrying forward this work in Jordan. Although the DAPs do contain proposals for appropriate institutional arrangements, MENAdrought did not have the mandate, resourcing or thematic focus to strengthen institutions for implementation of the national- and regional-level action plans developed through the project.

A drought simulation role-play exercise held in Jordan in May 2022 demonstrated the importance of advance preparedness within the institutional framework for operationalizing and managing drought responses. In this exercise, simulating the evolution and impacts of a historical flash drought, members of the DTC interpreted drought monitoring and impact data using the DAP to produce recommendations for a second group playing the roles of decision-makers from government and international donors.

While the DTC's recommendations would have significantly reduced vulnerability and supported recovery, if implemented, the decision-making group struggled to approve the recommendations. The key factors underlying these difficulties included a reluctance to assume responsibility for additional government spending, shortfalls in senior political leadership, and underpreparedness in institutional arrangements for resourcing and implementation. The time taken to negotiate and resolve these issues greatly reduced the timeliness and effectiveness of drought responses in the simulation.

This illustrates the obvious point that the DTCs and DAPs have value in providing expert recommendations, but this value is only realized when the appropriate institutional systems are prepared and ready to act on the DTC's recommendations. Supporting their implementation is a worthwhile endeavor and one that would require sustained support of a different kind than MENAdrought was intended to provide.

### 6.4.2 Enabling Public Participation through Support of Regional Validation Networks

In addition to supporting planning, we consider that there are significant opportunities to facilitate the formation and activities of regional validation networks, including government officials and non-government actors. In other national contexts, such groups have been critical to forming 'coalitions' that advocate for long-term action on drought monitoring and risk reduction. The stakeholder needs assessments show various publics' (including government officials') desire for such interaction and participation.

## 6.5 Section Summary

In relation to Pillar 3, MENAdrought accomplished several objectives:

- The project established reliable and operational systems for drought monitoring that are run and trusted by national government officials. These meet stakeholders' needs for robust scientific evidence on which to base drought management decision-making.



- It developed a comprehensive understanding of drought impacts and sources of vulnerability, including hazard maps, and worked with government officials to understand the root causes of these sources of vulnerability in a policy development context.
- The MENAdrought project supported national and local government agencies to begin integrated drought management planning, a first in the region. This includes development of Drought Action Plans that have been approved by mid-level management across multiple ministries (Jordan and Lebanon) and senior managers in Souss-Massa, Morocco.
- It supported interagency and multidisciplinary teams of young engineers and managers to build their own technical capacities and work together effectively on drought monitoring and management themes.
- The project supported governmental transparency and broader participation in policy processes through establishment of mechanisms for local feedback to central government via drought impact reporting networks and some publication of drought monitoring outputs. This sets the basis for possible permanent local feedback networks and/or public information sharing.

Broadly, the challenges the MENAdrought team faced in supporting the national agencies can be boiled down to adapting to national contexts; logistics and public service responses to and impacts from the Covid-19 pandemic and their effects on project boundary partners; and those typical of working at the science-policy interface.

The national agencies faced a range of challenges in developing the DAPs. These challenges were associated with:

1. the science-policy interface—using information from sophisticated technical tools that has important uncertainties and ambiguities for policymaking, which itself contains its own uncertainties and ambiguities;
2. trade-offs between improving drought resilience and other policy objectives; and
3. potentially conflicting interests of various actors that may affect policy- and decision-making.

Overall, we consider that we have contributed to nascent institutional (largely governmental) and human capability and capacity to undertake drought risk management in the ways in which we were invited to do so by national and local government agencies. We supported government officials to write DAPs that will help them improve drought risk management if resourced to do so, and we consider that, with longer-term commitment (donor-funded and/or considerable investment from the relevant local agencies), they will be able to take the next, longer strides.

We consider that the most immediate and impactful opportunities to support them require longer-term assistance to embed drought risk management planning across institutions and sectors. This would help realize an implicit objective in the DAPs—to create integrated strategies across actors. Likewise, we consider that enabling public participation through support for regional impact reporting networks would set the conditions necessary for the coalitions that in other countries and contexts have been critical for embedding risk management approaches.

# References

- Abel, G.J.; Brottrager, M.; Cuaresma, J.C.; Muttarak, R. 2019. Climate, conflict and forced migration. *Global Environmental Change* 54:239–249. Available at <https://doi.org/10.1016/j.gloenvcha.2018.12.003>
- Al-Habbab, M.; Haddad, N. 2006. *Policies and programs for drought mitigation in Jordan*. Consultancy report for TCP/JOR/3001, National Drought Mitigation Strategy, June 2006. Amman, Jordan: Ministry of Water and Irrigation (MWI).
- Al-Karablieh, E. 2016. *Institutional and stakeholder analysis*. Report for the UNDP program Mainstreaming Rio Convention provisions into national sectoral policies, analytical framework for drought governance in Jordan and a national drought resilience strategy and action plan. Amman, Jordan: United Nations Development Programme. Available at <https://www.jo.undp.org/content/jordan/en/home/projects/RIO.html>
- Al-Karablieh, E. 2017a. *Analytical framework for drought governance in Jordan and a national drought resilience strategy and action plan: Institutional and stakeholder analysis*. Amman, Jordan: UNDP.
- Al-Karablieh, E. 2017b. *Analytical framework for drought governance in Jordan and a national drought resilience strategy and action plan: Institutional setup and regulatory framework to drought management*. UNDP. (Mainstreaming Rio Convention Provisions into National Sectoral Policies Project). Amman, Jordan: UNDP.
- Al-Karablieh, E. 2017c. *Analytical framework for drought governance in Jordan and a national drought resilience strategy and action plan: Drought management policy for a resilient water sector*. UNDP. (Mainstreaming Rio Convention Provisions into National Sectoral Policies Project). Amman, Jordan: UNDP.
- Amery, H.A. 2002. Water wars in the Middle East: A looming threat. *The Geographical Journal* 168:313–323. <https://doi.org/10.1111/j.0016-7398.2002.00058.x>
- Arif, S.; Doumani, F. 2012. *Kingdom of Morocco: Cost of the degradation of water resources in the Oum Er-Rbia Basin*. Brussels, Belgium: Sustainable Water Integrated Management (SWIM) – Support Mechanism. Available at [http://www.swim-sm.eu/files/COED\\_MO\\_final.pdf](http://www.swim-sm.eu/files/COED_MO_final.pdf)
- Baubion, C.; Sayah, A.; Schieb, P.A. 2017. *OECD review of risk management policies: Morocco*. Paris, France: OECD Publishing. <https://doi.org/10.1787/9789264276482-en>
- Benargane, Y. 2022. Maroc: Le gouvernement dévoile son programme visant à atténuer les effets du déficit pluviométrique. Yabiladi, Feb. 17, 2022. Available at <https://www.yabiladi.com/articles/details/124383/maroc-gouvernement-devoile-programme-visant.html>
- Bergaoui, K.; Belhaj Fraj, M.; Fragaszy, S.; Ghanim, A.; Al-Hamadin, O.; Al-Karablieh, E.; Fakih, M.; Salama, S.; Fayad, A.; Yessef, M.; Belghrissi, H.; Hassels, T.; Ali, M.; Badr, H.; Hazra, A.; Nie, W.; Arsenault, K.; Hayes, M.; Svoboda, M.; McDonnell, R. 2022. *MENAdrought synthesis of drought monitoring, early warning, and seasonal forecasting tools and capability development: Final report*. Project report prepared by the International Water Management Institute (IWMI) for the Bureau for the Middle East of the United States Agency for International Development (USAID). Washington, DC, USA: USAID; Colombo, Sri Lanka: International Water Management Institute (IWMI). 74p. doi: <https://doi.org/10.5337/2023.202>
- Bijaber, N.; El Hadani, D.; Saidi, M.; Svoboda, M.D.; Wardlow, B.D.; Hain, C.R.; Poulsen, C.C.; Yessef, M.; Rochdi, A. 2018. Developing a remotely sensed drought monitoring indicator for Morocco. *Geosciences* 8(2):55. <https://doi.org/10.3390/geosciences8020055>
- Cash, D.W.; Clark, W.C.; Alcock, F.; Dickson, N.M.; Eckley, N.; Guston, D.H.; Jäger, J.; Mitchell, R.B. 2003. Knowledge systems for sustainable development. *Proc. Natl. Acad. Sci.* 100:8086–8091.
- Closas, A.; Molle, F. 2016. *Groundwater governance in the Middle East and North Africa*. Colombo, Sri Lanka: IWMI; Washington, DC, USA: USAID. (IWMI Project Report no. 1: Groundwater Governance in the Arab World.) Available at <https://publications.iwmi.org/pdf/HO48385.pdf>

CNEA (Centre National des Études Agricoles). 2003. *Etude relative a la strategie de gestion des periodes de secheresse dans le secteur parcours-elevate: Plan de gestion dynamique des periodes de secheresse* (Study relative to the strategy of management of drought periods in the livestock sector: Dynamic management plan for periods of drought). Tunis, Tunisia: CNEA.

De Nys, E.; Engle, N.; Magalhães, A. 2017. *Drought in Brazil: Proactive management and policy*. Boca Raton, Florida, USA: CRC Press. (Drought and Water Crises Series). Available at <http://hdl.handle.net/10986/28559>

DePauw, E. 2005. Monitoring agricultural drought in the Near East. In: Boken, V.K.; Cracknell, A.; Heathcote, R.L. (eds.) *Monitoring and predicting agricultural drought*. Oxford, UK: Oxford University Press. pp. 208–226.

DGE (Direction Générale de l'Eau). 2015. *Plan Nationale de l'Eau (National Water Plan): Rapport Générale*. Rabat, Morocco: DGE, Kingdom of Morocco.

Earl, S.; Carden, F.; Smutylo, T. 2001. *Outcome mapping: Building learning and reflection into development programs*. Ottawa, ON, Canada: International Development Research Centre. Available at <https://www.idrc.ca/en/book/outcome-mapping-building-learning-and-reflection-development-programs>

ECODIT. 2015. *Strategic Environmental Assessment for the New Water Sector Strategy for Lebanon*. Baabda, Lebanon: ECODIT. (Regional Governance and Knowledge Generation Project.) Available at <http://www.studies.gov.lb/getattachment/Sectors/Environment/2015/ENV-15-14/ENV-15-14.pdf>

El Hafre, A. 2019. Moroccan coverage regime for the consequences of natural and man-made disasters: Presentation at the 16th International Association of Insurance Supervisors Consultative Forum on Climate and Disaster Risk, June 12-13, 2019, Johannesburg, South Africa. Rabat, Morocco: Treasury and External Finances Department, Ministry of the Economy and Finance, Kingdom of Morocco. Available at <https://a2ii.org/en/media/677/download>

El Khatri, S.; El Hairech, T. n.d. *Drought conditions and management strategies in Morocco*. Casablanca, Morocco: Direction de la Météorologie Nationale.

EPC (Economic Policy Council). 2018. *Jordan Economic Growth Plan: 2018-2022*. Amman, Jordan: EPC, Hashemite Kingdom of Jordan. Available at <https://faolex.fao.org/docs/pdf/jor170691.pdf>

FAO (Food and Agriculture Organization of the United Nations). 2015. *The impact of disasters on agriculture and food security*. Rome, Italy: FAO. Available at <http://www.fao.org/3/a-i5128e.pdf>

FAO. 2020. *Special report: FAO mission to assess the impact of the financial crisis on agriculture in the Republic of Lebanon*. Available at <http://www.fao.org/3/cb1164en/cb1164en.pdf>

Fragaszy, S.; Jedd, T.; Wall, N.; Knutson, C.; Belhaj Fraj, M.; McDonnell, R.; Svoboda, M. 2020. Drought monitoring in the Middle East and North Africa (MENA) region: Participatory engagement to inform early warning systems. *Bulletin of the American Meteorological Society* 101(7):1148–1173. <https://doi.org/10.1175/BAMS-D-18-0084.1>

Fragaszy, S.; Belhaj Fraj, M.; McKee, M.; Jobbins, G.; Al-Karablieh, E.; Bergaoui, K.; Ghanim, A.; Lawrenson, L.; McDonnell, R. 2022a. *MENAdrought synthesis of drought vulnerability in Jordan: Final report*. Project report prepared by the International Water Management Institute (IWMI) for the Bureau for the Middle East of the United States Agency for International Development (USAID). Washington, DC, USA: USAID; Colombo, Sri Lanka: International Water Management Institute (IWMI). 93p. <https://doi.org/10.5337/2021.231>

Fragaszy, S.; Belhaj Fraj, M.; McKee, M.; Jobbins, G.; Fayad, A.; Fakhri, M.; Lawrenson, L.; McDonnell, R. 2022b. *MENAdrought synthesis of drought vulnerability in Lebanon: Final report*. Project report prepared by the International Water Management Institute (IWMI) for the Bureau for the Middle East of the United States Agency for International Development (USAID). Washington, DC, USA: USAID; Colombo, Sri Lanka: International Water Management Institute (IWMI). 67p. <https://doi.org/10.5337/2022.205>

Gerber, N.; Mirzabaev, A. 2017. Benefits of action and costs of inaction: Drought mitigation and preparedness—A literature review. Geneva, Switzerland: WMO; Stockholm, Sweden: GWP. IDMP Working Paper 1. Available at [https://library.wmo.int/doc\\_num.php?explnum\\_id=3401](https://library.wmo.int/doc_num.php?explnum_id=3401)

Hayes, M.; Svoboda, M. 2008. *An assessment of drought management activities in Morocco prepared for USAID's Integrated Agriculture and Agribusiness Project*. Lincoln, Nebraska, USA: National Drought Mitigation Center, University of Nebraska-Lincoln. (Contract No. 608-M-00-05-0043-01).

Hazell, P.B.R.; Oram, P.; Chaherli, N. 2001. *Managing droughts in the low-rainfall areas of the Middle East and North Africa*. Cairo, Egypt: International Food Policy Research Institute (IFPRI). (EPTD Discussion Paper No. 78). Available at <https://www.ifpri.org/publication/managing-droughts-low-rainfall-areas-middle-east-and-north-africa>

Howlett, M.; Rayner, J. 2007. Design principles for policy mixes: Cohesion and coherence in 'New Governance Arrangements.' *Policy and Society* 26:1-18. [https://doi.org/10.1016/S1449-4035\(07\)70118-2](https://doi.org/10.1016/S1449-4035(07)70118-2)

Hydraumet. 2010. *Etude du plan de gestion de la sécheresse dans le bassin du Souss Massa (Study of the drought management plan in the Souss-Massa basin)*. Agadir, Morocco: Agence du bassin hydraulique du Souss-Massa et du Draa (Marché N°: 54/2009/ABHSMD).

Imani, Y. 2014a. *Technical report on the way to the implementation of a drought management plan in Morocco: Review of the past activities and planned activities for 2015*. New York, USA: United Nations Department of Economic and Social Affairs (UN DESA). (Development Account Project 121C ROA-207: Strengthening National Capacities to Manage Water Scarcity and Drought in West Asia and North Africa). Available at [https://sustainabledevelopment.un.org/content/documents/1669UN\\_DESA\\_Project\\_Deliverable5\\_Morocco.pdf](https://sustainabledevelopment.un.org/content/documents/1669UN_DESA_Project_Deliverable5_Morocco.pdf)

Imani, Y. 2014b. *Technical Report on the planning and coordination process to develop and implement a national drought management plan in Morocco*. New York, USA: UN DESA. (Development Account Project 121C ROA-207: Strengthening National Capacities to Manage Water Scarcity and Drought in West Asia and North Africa). [https://sustainabledevelopment.un.org/content/documents/1659UN\\_DESA\\_Project\\_Deliverable3\\_Morocco\\_AV\\_edits.pdf](https://sustainabledevelopment.un.org/content/documents/1659UN_DESA_Project_Deliverable3_Morocco_AV_edits.pdf)

Jedd, T.; Fragaszy, S.; Wall, N.; Knutson, C.; Belhaj Fraj, M.; McDonnell, R.; Svoboda, M. 2020. Drought management norms: Is the Middle East and North Africa (MENA) region managing risks or crises? *Journal of Environment and Development* 30(1): 3-40. <https://doi.org/10.1177/1070496520960204>

Kchouk, S.; Melsen, L.A.; Walker, D.; Van Oel, P.R. 2022. A geography of drought indices: mismatch between indicators of drought and its impacts on water and food securities. *Natural Hazards and Earth System Sciences* 22(2):323-344. <https://doi.org/10.5194/nhess-22-323-2022>

Khabour, A.M. 2006. *The role of the major stakeholders in drought mitigation in Jordan*. Consultancy Report for TCP/JOR/3001 National Drought Mitigation Strategy, June 2006. Amman, Jordan: MWI.

Kingdon, J.W. 2011. *Agendas, alternatives, and public policies*. Boston, USA: Longman. (Updated 2nd edn., Longman Classics in Political Science).

Kooiman, J. 2003. *Governing as governance*. London, UK: SAGE Publications. <https://doi.org/10.4135/9781446215012>

Lankford, B. 2013. *Resource efficiency complexity and the commons: The paracommons and paradoxes of natural resource losses, wastes and wastages*. London, UK: Routledge. (1st edn.). <https://doi.org/10.4324/9780203520888>

Levy, B. 2014. *Working with the grain: Integrating governance and growth in development strategies*. Oxford, UK: Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780199363803.001.0001>

Louati, H.; Mellouli, H.; El Elchi, M. 2005. Tunisia. In: Iglesias, A.; Moneo, M. (eds.) *Drought preparedness and mitigation in the Mediterranean: Analysis of the organizations and institutions*. Zaragoza, Spain: CIHEAM. pp.155-190. (Options Méditerranéennes: Série B. Etudes et Recherches 51). <http://om.ciheam.org/om/pdf/b51/06600013.pdf>

Lowi, T.J. 2003. Law vs. public policy: A critical exploration. *Cornell Journal of Law and Public Policy* 12(3):2. Available at <https://scholarship.law.cornell.edu/cjlp/vol12/iss3/2>

MAMDA (Mutuelle Agricole Marocaine D'assurances). 2018. *Assurance agricole au Maroc cas de l'assurance multirisque climatique*. Presented at the MENA RDMS project conference, September 25, 2018, Dubai.

Martins, E.S.; De Nys, E.; Molejon Quintana, C.; Biazeto, B.; Vieira, R.F.; Engle, N. 2015. *Monitor de Secas do Nordeste, em busca de um novo paradigma para a gestão de secas (Northeast drought monitor: In search of a new paradigm for drought management)*. Brasília, Brazil: Banco Mundial. (Série Água Brasil 10). <https://www.doi.org/10.13140/RG.2.1.4238.8886>

McDonnell, R.; Fragaszy, S.; Sternberg, T.; Veeravalli, S. 2019. Drought policy and management. In: Dadson, S.J.; Garrick, D.E.; Penning-Rowsell, E.C.; Hall, J.W.; Hope, R.; Hughes, J. (eds.) *Water science, policy and management*. Hoboken, New Jersey, USA: John Wiley & Sons. pp.233–253. (1st edn). <https://doi.org/10.1002/9781119520627.ch13>

McKee, M.; Belhaj Fraj, M.; Bergaoui, K.; McDonnell, R. 2019. *MENA drought baseline report: Jordan*. Colombo, Sri Lanka: IWMI. Unpublished. (Technical Report.)

MEDA Water Programme. 2003. Medroplan: Mediterranean Drought Preparedness and Mitigation Planning—2003-2007. Zaragoza, Spain: Mediterranean Agronomic Institute of Zaragoza; Madrid, Spain: Universidad Politécnica de Madrid. <http://www.emwis.org/initiatives/medaeau/fol719001/folo33012>

MoA Jordan (Ministry of Agriculture, the Hashemite Kingdom of Jordan). 2022. National Sustainable Agriculture Strategy 2022-2025. Amman, Jordan: MoA, the Hashemite Kingdom of Jordan. Available at [https://moa.gov.jo/ebv4.o/root\\_storage/ar/eb\\_list\\_page/%D9%85%D9%84%D8%AE%D8%B5\\_%D8%A7%D9%84%D8%AE%D8%B7%D8%A9\\_9\\_1\\_2022\\_%D9%86%D9%87%D8%A7%D8%A6%D9%8A.pdf](https://moa.gov.jo/ebv4.o/root_storage/ar/eb_list_page/%D9%85%D9%84%D8%AE%D8%B5_%D8%A7%D9%84%D8%AE%D8%B7%D8%A9_9_1_2022_%D9%86%D9%87%D8%A7%D8%A6%D9%8A.pdf)

MoA Lebanon (Ministry of Agriculture, Lebanese Republic). 2014. *Ministry of Agriculture Strategy 2015-2019*. Bir Hassan, Lebanon: MoA, Lebanese Republic. Available at <https://faolex.fao.org/docs/pdf/leb149670.pdf>

MoA Lebanon (Ministry of Agriculture, Lebanese Republic). 2020. Lebanon National Agriculture Strategy 2020-2025. Bir Hassan, Lebanon: MoA, Lebanese Republic. Available at <http://www.agriculture.gov.lb/getattachment/Ministry/Ministry-Strategy/strategy-2020-2025/NAS-web-Eng-7Sep2020.pdf?lang=ar-LB>

MoE Lebanon (Ministry of Environment, Lebanese Republic). 2011. *Lebanon's second national communication report to the UNFCCC*. Beirut, Lebanon: MoE, Lebanese Republic. Available at [http://www.lb.undp.org/content/lebanon/en/home/library/environment\\_energy/lebanon\\_s-second-national-communication-to-the-unfccc.html](http://www.lb.undp.org/content/lebanon/en/home/library/environment_energy/lebanon_s-second-national-communication-to-the-unfccc.html)

MoE Lebanon; UNDP; GEF (Global Environment Facility). 2015. *Economic costs to Lebanon from climate change: A first look*. Beirut, Lebanon: MoE Lebanon.

MoEW Lebanon (Ministry of Energy and Water, Lebanese Republic). 2010. *National water sector strategy (NWSS) report*. Beirut, Lebanon: MoEW, Lebanese Republic.

MoEW Lebanon. 2020. *Lebanon national water sector strategy update—2020*. Beirut, Lebanon: MoEW, Lebanese Republic. Available at [https://www.pseau.org/outils/ouvrages/mee\\_lebanon\\_national\\_water\\_strategy\\_update\\_2020.pdf](https://www.pseau.org/outils/ouvrages/mee_lebanon_national_water_strategy_update_2020.pdf)

MoEW Lebanon; UNDP. 2014. *Assessment of the groundwater resources of Lebanon*. Beirut, Lebanon: MoEW, Lebanese Republic & UNDP. Available at <https://www.undp.org/sites/g/files/zskgke326/files/migration/lb/Assessment-of-Groundwater-Resources-of-Lebanon.pdf>

Mol (Ministry of the Interior, Kingdom of Morocco). 2021. *Strategie nationale 2020-2030 de gestion des risques des catastrophes naturelles: Livret de presentation*. Rabat, Morocco: Kingdom of Morocco. Available at [https://www.gestionrisques.ma/web/files/Livret\\_de\\_la\\_SNGRCN.pdf](https://www.gestionrisques.ma/web/files/Livret_de_la_SNGRCN.pdf)

Mol. 2022. *Programme de gestion intégrée des risques de catastrophes naturelles & de la résilience: Projets en cours*. Rabat, Morocco : Kingdom of Morocco. Available at [https://www.gestionrisques.ma/Realisations/projets\\_en\\_cours.aspx](https://www.gestionrisques.ma/Realisations/projets_en_cours.aspx)

Molle, F.; Closas, A. 2020. Why is state-centered groundwater governance largely ineffective? A review. *WIREs Water* 7(1): e1395. <https://doi.org/10.1002/wat2.1395>

MWI (Ministry of Water and Irrigation, the Hashemite Kingdom of Jordan). 2016. *National Water Strategy: 2016-2025*. Amman, Jordan: MWI, the Hashemite Kingdom of Jordan. Available at <https://faolex.fao.org/docs/pdf/jor156264E.pdf>

MWI. 2018. *Water sector policy for drought management*. Amman, Jordan: MWI, the Hashemite Kingdom of Jordan.

NCSCM (National Center for Security and Crises Management). 2019. *Jordan national natural disaster risk reduction strategy: 2019-22*. Amman, Jordan: NCSCM. Available at <https://www.undp.org/jordan/publications/national-natural-disaster-risk-reduction-strategy>

O'Brien, K.L.; Eriksen, S.H.; Schjolden, A.; Lygaard, L. 2005. *What's in a word? Interpretations of vulnerability in climate change research*. Oslo, Norway: Center for International Climate and Environmental Research (CICERO). (Working Paper 2004:04). Available at <https://bit.ly/3u7dRZG>

Ouassou, A.; Ameziane, T.; Ziyad, A.; Belghiti, M. 2007. *Application of the drought management guidelines in Morocco. Part 2: Examples of application*. In: Iglesias, A.; Moneo, M.; López-Francos, A. (eds.) *Drought management guidelines technical annex*. Zaragoza, Spain: CIHEAM/EC MEDA Water. pp.343-372 (Options Méditerranéennes: Série B. Etudes et Recherches no. 58).

Ouraich, I; Tyner, W.E. 2014. *Climate change impacts on Moroccan agriculture and the whole economy: An analysis of the impacts of the Plan Maroc Vert in Morocco*. Helsinki, Finland: United Nations University World Institute for Development Economics Research (UNU-WIDER). (WIDER Working Paper No. 2014/083). <https://doi.org/10.35188/UNU-WIDER/2014/804-9>

Rose, D.C.; Mukherjee, N.; Simmons, B.I.; Tew, E.R.; Robertson, R.J.; Vadrot, A.B.M.; Doubleday, R.; Sutherland, W.J. 2017. Policy windows for the environment: Tips for improving the uptake of scientific knowledge. *Environmental Science & Policy* 113:47-54. <https://doi.org/10.1016/j.envsci.2017.07.013>

Sadiki, M. 2016. Comment gerer les episodes de secheresse au Maroc? Quelques enseignements tirés à partir de l'expérience 2016 [How to manage drought episodes in Morocco? Some learnings from the 2016 experience]. *CIHEAM Watch Letter* 37.

Taha, S.; Rabi, A.; Touzi, S. 2014. *Regional assessment of past drought and flood episodes and their management in selected SWIM-SM PCS (Tunisia, Jordan and Palestine)*. Brussels, Belgium: Sustainable Water Integrated Management (SWIM) - Support Mechanism. (SWIM-SM Report, WP1, Water Governance and Mainstreaming, Activity 1.3.3.1).

UN DESA. 2014. Progress report on developing and implementing a country-specific national drought management plan in Jordan and the advisory service on supporting the national consultants, hired in the other pilot countries under the project, in developing and implementing a country-specific national drought management plan in the pilot countries. Amman, Jordan: UN DESA. (Development Account Project 121C "ROA-207": Strengthening National Capacities to Manage Water Scarcity and Drought in West Asia and North Africa). Available at <https://sustainabledevelopment.un.org/content/documents/6679Developing%20and%20Implementing%20a%20Country-Specific%20National%20Approach%20in%20Jordan%20Progress%20Report%202014.pdf>

UNDRR (United Nations Office for Disaster Risk Reduction). 2015. *Sendai framework for disaster risk reduction 2015-2030*. Geneva, Switzerland: UNDRR. [http://www.wcdrr.org/uploads/Sendai\\_Framework\\_for\\_Disaster\\_Risk\\_Reduction\\_2015-2030.pdf](http://www.wcdrr.org/uploads/Sendai_Framework_for_Disaster_Risk_Reduction_2015-2030.pdf)

Urquijo-Reguera, J.; Gómez-Villarino, M.T.; Pereira, D.; De Stefano, L. 2022. An assessment framework to analyze drought management plans: The case of Spain. *Agronomy* 12:970. <https://doi.org/10.3390/agronomy12040970>

Van Loon, A.F.; Gleeson, T.; Clark, J.; Van Dijk, A.I.J.M.; Stahl, K.; Hannaford, J.; Di Baldassarre, G.; Teuling, A.J.; Tallaksen, L.M.; Uijlenhoet, R.; Hannah, D.M.; Sheffield, J.; Svoboda, M.; Verbeiren, B.; Wagener, T.; Rangelcroft, S.; Wanders, N.; Van Lanen, H.A.J. 2016. Drought in the Anthropocene. *Nature Geoscience* 9(2): 89-91. <https://doi.org/10.1038/ngeo2646>

Verner, D.; Ashwill, M.; Shen, M.S.; Christensen, J.; McDonnell, R.; Redwood, J.; Jomaa, I.; Saade, M.; Massad, R.; Chehade, A.; Bitar, A.; Treguer, D.O. 2018a. *Droughts and agriculture in Lebanon: Causes, consequences and risk management*. Washington DC, USA: World Bank Group. Available at <http://documents.worldbank.org/curated/en/892381538415122088/Droughts-and-Agriculture-in-Lebanon-Causes-Consequences-and-Risk-Management>

Verner, D.; Tréguer, D.; Redwood, J.; Christensen, J.; McDonnell, M.; Elbert, C.; Konishi, Y.; Belghazi, S. 2018b. *Climate variability, drought and drought management in Morocco's agricultural sector*. Washington, DC, USA: The World Bank. Available at <https://documents1.worldbank.org/curated/en/353801538414553978/pdf/130404-WP-P159851-Morocco-WEB.pdf>

Wallis, J. 2010. Institutions, organizations, impersonality and interests: The dynamics of institutions. Paper presented at the conference 'Dynamics of Institutions in Perspective: Alternative Conceptions and Future Challenges', October 3-4, 2008, Paris, France. Available at <http://econweb.umd.edu/~wallis/Papers/Wallis.Institutions.JEBO.Feb2010.pdf>

Wilhite, D.A.; Botterill, L.; Monnik, K. 2005. National drought policy: Lessons learned from Australia, South Africa and the United States. In: Wilhite, D.A. (ed.) *Drought and water crises: Science, technology and management issues*. Boca Raton, Florida, USA: CRC Press. pp.137-172.

Wilhite, D.A.; Svoboda, M.D.; Hayes, M.J. 2007. Understanding the complex impacts of drought: A key to enhancing drought mitigation and preparedness. *Water Resource Management* 21:763-774. <https://doi.org/10.1007/s11269-006-9076-5>

Wilhite, D.A.; Sivakumar, M.V.K.; Pulwarty, R. 2014. Managing drought risk in a changing climate: The role of national drought policy. *Weather and Climate Extremes* 3:4-13. <https://doi.org/10.1016/j.wace.2014.01.002>

Wodon, Q.; Liverani, A.; Joseph, G., Bougnoux, N. (Eds.) 2014. *Climate change and migration: Evidence from the Middle East and North Africa*. Washington, DC, USA: The World Bank. <https://doi.org/10.1596/978-0-8213-9971-2>

WMO (World Meteorological Organization); GWP (Global Water Partnership). 2014. National drought management policy guidelines: A template for action. Geneva, Switzerland: WMO; Stockholm, Sweden: GWP. (Integrated Drought Management Programme (IDMP) Tools and Guidelines Series 1).

World Bank. 2017a. *Beyond scarcity: Water security in the Middle East and North Africa*. Washington, DC, USA: World Bank. (MENA Development Series). Available at <https://www.worldbank.org/en/topic/water/publication/beyond-scarcity-water-security-in-the-middle-east-and-north-africa>

World Bank. 2021a. *International Bank for Reconstruction and Development Program Paper on a Proposed Additional Loan in the Amount of US \$100 Million to the Kingdom of Morocco for the Morocco Integrated Disaster Risk Management and Resilience Program-for-Results*. Washington, DC, USA: The World Bank. Available at <https://documents1.worldbank.org/curated/en/898331623722452604/pdf/Morocco-Integrated-Disaster-Risk-Management-and-Resilience-Program-for-Results-Additional-Financing.pdf>

World Bank. 2021b. *Program information documents*. Washington, DC, USA: The World Bank. (Morocco Integrated Disaster Risk Management and Resilience Program). <https://ewdata.rightsindevelopment.org/files/documents/49/WB-P176349.pdf>

Yata, F. 2017. Hicham Belmrah, président du directoire, MAMDA: MAMDA assure près de 80% de la Surface Agricole Utile nationale (Hicham Belmrah, Chairman of the Board, MAMDA: MAMDA insures nearly 80% of the national utilised agricultural area). *La Nouvelle Tribune*, April 20, 2017. Available at <https://lnt.ma/hicham-belmrah-president-directoire-mamda-mamda-assure-pres-de-80-de-surface-agricole-utile-nationale/>

# Annex A. Additional Detail from Section 1

## A1. Summary Description of Relevant Reports and Policies on Drought Management in MENA

According to Jedd et al. (2020), studies on drought in the MENA region have primarily focused on drought hazard characterization and impacts related to food and water security (e.g., DePauw 2005; World Bank 2017a; FAO 2015), migration (e.g., Wodon et al. 2014) and conflict (Abel et al. 2019). Other sets of studies focus on assessment of drought history (Bijaber et al. 2018; MEDA Water Programme 2003).

The gray literature and national agency reports focus more on hazard management and existing drought management policy and governance settings [e.g., Imani 2014a, 2014b; Louati et al. 2005; Ouassou et al. 2007; Taha et al. 2014; the national drought plans collated by the United Nations Convention on Combatting Desertification (UNCCD)], or assessments of their challenges and avenues to improve them (e.g., Al-Karablieh 2016; CNEA 2003; Hayes and Svoboda 2008; Hazell et al. 2001). UN DESA (2014) described activities related to drought monitoring and management from a range of international institutions including UNCCD, United Nations Office for Disaster Risk Reduction (UNDRR), United Nations Environment Programme (UNEP), Food and Agriculture Organization of the United Nations (FAO), International Center for Agricultural Research in the Dry Areas (ICARDA), Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD), WMO, United Nations Economic and Social Commission for Western Asia (ESCWA) and CIHEAM Centre International de Hautes Etudes Agronomiques Méditerranéennes). In other words, drought management is a busy thematic space.

For Lebanon, the most immediately relevant documents and reports include the following:

- Special Report—FAO Mission to Assess the Impact of the Financial Crisis on Agriculture in the Republic of Lebanon (FAO 2020)
- Lebanon National Agriculture Strategy 2020-2025 (MoA Lebanon 2020)
- National Water Sector Strategy (NWSS) Report (MoEW Lebanon 2010)
- National Water Sector Strategy Update – 2020 (MoEW Lebanon 2020)
- Assessment of the Groundwater Resources of Lebanon (MoEW Lebanon and UNDP 2014)
- Lebanon’s Second National Communication Report to the UNFCCC (MoE Lebanon 2011)
- Droughts and Agriculture in Lebanon: Causes, Consequences and Risk Management (Verner et al. 2018a)

For Jordan, the most immediately relevant documents and reports include the following:

- Policies and Programs for Drought Mitigation in Jordan (Al-Habbab and Haddad 2006)
- The Role of the Major Stakeholders in Drought Mitigation in Jordan (Khabour 2006)
- Regional Assessment of Past Drought and Flood Episodes and their Management in Selected SWIM-SM PCs (Tunisia, Jordan and Palestine). (Taha et al. 2014)
- Analytical Framework for Drought Governance in Jordan and a National Drought Resilience Strategy and Action Plan: Institutional and Stakeholder Analysis (Al-Karablieh 2017a)
- Analytical Framework for Drought Governance in Jordan and a National Drought Resilience Strategy and Action Plan: Institutional Setup and Regulatory Framework to Drought Management (Al-Karablieh 2017b)
- Analytical Framework for Drought Governance in Jordan and a National Drought Resilience Strategy and Action Plan: Drought Management Policy for a Resilient Water Sector (Al-Karablieh 2017c)
- National Water Strategy: 2016-2025 (MWI 2016)
- National Sustainable Agriculture Strategy 2022-2025 (MoA Jordan 2022)
- Proceedings of the conference Revisiting Jordan’s Agriculture Strategy to Achieve Sustainable Development Goals (SDGs) held in Amman on 3-4 March 2022<sup>20</sup>
- Jordan National Natural Disaster Risk Reduction Strategy (NCSCM 2019)
- Jordan Economic Growth Plan (EPC 2018)

<sup>20</sup> Documents available at <https://archive.unescwa.org/workshop-agriculture-strategy-jordan-sustainable-development>.



For Morocco, the most immediately relevant reports include the following:

- An Assessment of Drought Management Activities in Morocco Prepared for USAID's Integrated Agriculture and Agribusiness Project (Hayes and Svoboda 2008)
- Application of the Drought Management Guidelines in Morocco (Ouassou et al. 2007).
- Drought Conditions and Management Strategies in Morocco (El Khatri and El Hairech n.d.)
- Kingdom of Morocco Cost of the Degradation of Water Resources in the Oum Er-Rbia Basin (Arif and Doumani 2012).
- OECD Review of Risk Management Policies: Morocco (Baubion et al. 2017)
- Climate Variability, Drought, and Drought Management in Morocco's Agricultural Sector (Verner et al. 2018b)
- Technical Report on the Planning and Coordination Process to Develop and Implement a National Drought Management Plan in Morocco (Imani 2014b)

# Annex B. Additional Detail on Stakeholders' Stated Needs

## B1. Full Description of Stakeholder-described Drought Management Needs in Jordan

### B1.1 Pair Drought Announcement with Financial Relief Programs

Stakeholders in Jordan saw a need for financial support to farmers in times of drought in the form of subsidies for livestock feed or deferred loan repayment. To bridge the current gap between drought information and drought intervention, they wanted a connection established between drought monitoring and monetary relief for losses associated with drought. Implementing financial relief programs would require skills and capacity building for the agriculture staff who monitor drought, connecting financial mechanisms to drought monitoring may improve the clarity of roles and responsibilities and lead to a clearer articulation of how drought information can be used. At present, Jordanian farmers do not have access to drought insurance products for financial risk management.

Financial measures and interventions, according to our participants, must be pre-prepared so as to ease drought declaration processes and interventions. Such relief programs represent a significant departure from current operating procedures; at present, according to participants, crisis management is lacking, and as one government official said, “there’s no preparation and preparedness.”

In our engagements, stakeholders repeatedly mentioned the need to connect drought with the Risk Fund and Crisis Fund in particular, though they provided mixed responses on whether these funds were active and capitalized. They

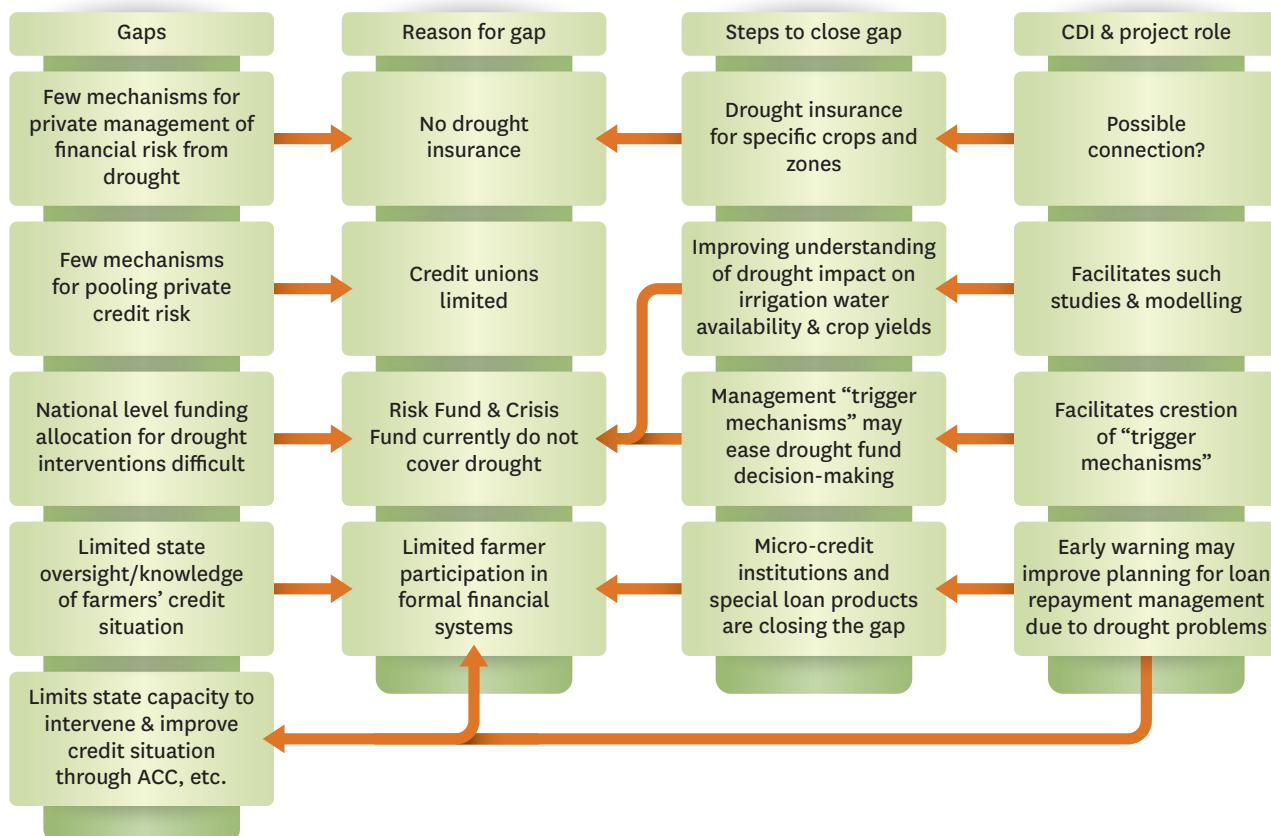


Figure B1. Gaps in Jordan’s agricultural finance sector and potential linkages to eCDI. (Note: ACC = Agricultural Credit Corporation.)

pointed out that drought payouts in the past have only been made for irrigated agriculture but not rainfed systems; so a well-designed drought-mapping tool would equalize relief efforts. Stakeholders said the Crisis Fund is supposed to provide mitigation in years of poor production but in reality it does not work well. Therefore, our participants suggested the strategy to connect drought monitoring with the Department of Crisis Management—specifically tie their activities with the Risk Fund. Knowing clear thresholds of drought levels ahead of time and actively monitoring conditions would reduce uncertainty and make it easier to provide equitable access to the Crisis Fund. Figure B1 provides more information on gaps in Jordan’s agricultural finance system and throws light on why the gaps exist and how the eCDI and the broader drought management system might help fill those gaps.

## **B1.2 Coordinate Groundwater Management**

Stakeholder comments regarding water management begin with the observation that limiting agricultural expansion would reduce water consumption, especially in groundwater-dependent areas. These conversations invariably shift to the monitoring and control of well drilling operations. Our participants were particularly concerned with the levels of policing and what they view as more favorable treatment of certain groups. Controlling illegal wells is viewed as key to effective water management, but groundwater governance is not effective even though a regulatory framework is in place. Participants wanted more active coordination with the Ministry of the Interior and the Ministry of Defence to enforce groundwater regulations. Participants noted a connection between illegal well drilling and land speculation and believe it is the government’s duty to curb both activities. Inconsistent enforcement signals to illegal well owners and diggers that, in the words of one participant from a civil society organization, they should simply “wait a while and then pick up like normal”. This has become a key source of tension between legal and illegal well owners. Farmers who have legal wells are often left on their own to pressure illegal well-owners. Underreporting of well location contributes to the overall number of illegal wells. Engaged citizens and farmers could be potential actors in a future action plan to deal with illegal drilling. GPS tagging and reporting is a good idea for creating a database of well locations, but stakeholders expressly reiterated that the core problem at present is lack of enforcement.

## **B1.3 Clarity on Relation between Monitoring and Management**

Stakeholders report that the Jordanian MoA needs clear mechanisms to declare drought. This would allow information to be disseminated to relevant users once the monitoring thresholds are reached, which can be the basis for drought intervention policies. As it stands, the government avoids issuing drought declarations because they view it as having severe financial implications (e.g., feed subsidy and compensation for yield reduction). Clarifying the mechanisms of drought declaration would reduce the uncertainty regarding agency roles and reliance on foreign donors. As one stakeholder put it, “this monitoring information must connect with an actual strategy and action plan for managing drought”. Participants think that while the monitoring capacity within government agencies is strong, there is still a need for capacity building to enable staff to create drought management strategies in collaboration with outside stakeholders. For example, while the meteorological department sends out good information, pairing it with analysis of drought mitigation measures would enhance the monitoring information. Also, establishing a drought unit or committee with political decision-making power would help to meet the need for clear definitions and management of drought.

## **B1.4 Link Drought Management with Other Issue Areas**

Stakeholders also reported a need to link the eCDI and DAP development to climate change in the context of increasing water scarcity as a result of population growth and a long-term trend of declining precipitation. This makes drought management and climate change adaptation similar in many ways. Linkages between drought monitoring and other programs (e.g., frost) were offered as potential models to follow in which remediation actions are paired with monitoring tools. Stakeholders also want to connect drought management to long-term municipal water supply programs. They describe the Wadi Araba project as being complementary to the Red Sea-Dead-Sea connection. Using surface water canal systems and pumping stations would provide governorates with supplementary municipal supplies. Understanding how climate change will affect this infrastructure is critical, as also response to desertification and social vulnerability trends.

Lastly, stakeholders underlined the need for enforcement of zoning regulations to slow down land-use change. As land parcels are converted from rangelands and fields to housing, vulnerable populations are being removed from

their grazing lands by considering them as unused areas, though they are in fact cultivated on a small scale. Drought mapping that is cognizant of land use and zoning regulations would accommodate the needs of such impoverished communities.

## **B1.5 Intersectoral Allocation and Understanding of Demands**

Stakeholders describe the need to understand more thoroughly how demand for water shifts in urban and agricultural settings. Since drought impacts extend beyond agriculture, stakeholders request strategic preparations for drought in connection with municipal water supply. As saline water utilization grows, blending water for municipalities and agricultural communities becomes increasingly viable, and stakeholders want to engage in careful planning to manage between these competing needs.

Our participants said staff upskilling in evapotranspiration/crop mapping would build management capacity in the agricultural sector because it would help agencies conduct regional water demand and efficiency balances that can feed into sectoral arbitration frameworks. Since there is no clear law or regulation for water use in agriculture at present, it is difficult to understand how it connects with municipal needs. Participants do not think that drinking water is presently threatened, but they are concerned that it is a long-term challenge that will require preplanning.

## **B1.6 Agricultural Water Demand Management**

Beyond having drought planning in place in advance, participants say there is a major role for demand management. Smallholders in the Jordan Valley acknowledge that the range of cropping and irrigation systems in existence there creates unique needs and constraints throughout the valley. The drought monitoring system, therefore, must work to include monitoring and expanding good irrigation practices, timing and other measures. To facilitate additional water efficiency improvements, participants want agencies to raise awareness in local communities about efficiency and conservation strategies.

It was also suggested that government oversight would help in achieving more efficient coordination and functioning of groundwater well-fields than is currently attained by individual farmers linking up informally. Another avenue of improvement is through using technological treatments and conservation practices such as saline irrigation and low tillage to reduce water consumption and soil erosion. These practices could be coordinated to achieve the targets of soil improvement and better soil moisture retention. Especially in tree-based farming, there is a need for training and equipment and for flexibility to adopt new practices. Reducing water consumption at the level of irrigation practices would decrease pressure on groundwater systems in particular.

## **B1.7 Understand Drought Impacts Across Sectors**

In order to manage the effects of drought, participants wanted an improved understanding of drought impacts. Extension services led by agencies and research groups would play a key role in collecting this information. This is an important endeavor for Jordanians because they want to understand how societal and industrial entities are affected by changes in precipitation. In order to be comprehensive, such an assessment must aim to uncover issues cutting across multiple sectors.

Stakeholders see potential for extension programs to facilitate interaction and technical cooperation between agencies in order to develop integrated management strategies. Having minimal coordination amongst stakeholders across multiple sectors is one of the biggest gaps identified in current management practices. Going forward, better research by key agencies about the basic ways in which droughts affect society is seen as an important need.

## **B1.8 Enhanced Public-Private Engagement**

A drought map would increase cooperation amongst government stakeholders and ensure that government agencies share their experience with non-government stakeholders. Farmers are used to dealing with water scarcity and can be key information leaders in monitoring water availability. They can also monitor and improve enforcement of management practices and regulations regarding usage and consumption. As program development and funding move

to ‘marginal’ (saline and TWW) water usages, irrigation efficiency and determining minimum crop water needs very precisely will be critical. One commenter noted that “highly qualified” water engineers tend to prefer employment in the private sector or relocate abroad rather than go into government. One way to fill the resultant human resources gap in the government was to connect agencies more closely with farmers in order to build the relationships necessary for proper implementation of drought management plans. Farmers can be conduits for building trust among citizens and agencies.

## **B2. Full Description of Stakeholder-described Drought Management Needs in Lebanon**

### **B2.1 Enact a National Water Management Policy and Connect It with Drought**

Quite aside from drought, participants in Lebanon overwhelmingly emphasized the need for a national water management strategy and an updated and integrated water law. As one agency official said, “there’s no national coordination on [water]; in (our) department we don’t know our own authority in some cases”. Central coordination and planning would enable proper authorization and allocation of funds to various departments from the central government. Many participants see coordination as the basis on which future policy should rest.

A national plan would ease competitive tensions between water-use sectors, especially in areas with a changing pattern of development. For example, one participant estimated that in the Kasimie irrigation district in Southern Lebanon, 10-20% of the total irrigation water is diverted to industry. It is difficult to set out a coherent framework for Regional Water Establishments to improve their technical capacity when a national strategy is lacking.

A national strategy would provide a framework within which water supply and demand in the municipal, irrigation and industrial sectors could be balanced. Furthermore, an appropriately linked strategic drought policy would consider the challenges at various levels of governance—which is a critical need given the different water governance regimes in force throughout Lebanon. Thus, national water and drought planning efforts can help connect municipalities as they manage their needs in relation to those of others and can also lead to improved oversight of the process by central agencies.

### **B2.2 Enhance Outreach and Education for Civil Society, Work Directly with Farmers to Issue Crop Planting Guidance and to Understand Market Needs**

Drought management consists of a suite of actions based on available information. Farmers and civil society stakeholders expressed a strong desire for increased guidance on seasonal water availability and crop planting. This need connects to drought monitoring but also to more basic water management issues. In rainfed areas, issuing advice earlier in the year could help farmers reduce risks and optimize their planting choices. This sometimes requires advanced tools and monitoring (which the eCDI can provide) to generate solid evidence. However, the guidance can be relatively straightforward, such as advising farmers on the best times and crop varieties to plant given a particular set of climatic and water availability conditions.

As a solution to drought, irrigation is not available in all places and at all times. Given that reality, farmers feel that extension services offer few specific strategies and little alternative advice. In some areas, groundwater systems are non-renewable or have little natural recharge; so the impacts of abstraction for irrigation during droughts can be permanent. In coastal areas, sea water intrusion is another impact that cannot be ameliorated. A USAID project on apple production in Mount Lebanon (likely the Lebanon—Industry Value Chain Development [IVCD] project) was referenced as a helpful example that provided clear guidelines on integrated soil and pest management to help maintain production levels even in poor years. Farmers say they are more likely to be engaged with research projects than by extension officers, who they wish to see more frequently. In the absence of extension services, agricultural product sales agents are the main source of information. However, farmers question their neutrality since they are perceived to push certain products regardless of actual need.

The MoA Lebanon, NGOs and cooperatives are not expected to manage drought issues on their own but could do better given a flexible operating environment. However, at present the centralization of authority stifles local extension agents from issuing guidance independently and does not provide them adequate funds to initiate their own interventions; likewise, the lack of funding from the center precludes adequate outreach efforts and information campaigns during periods of drought. This mismatch in capacity and authority is a major barrier to drought management.

### **B2.3 Use Efficient Irrigation Methods, New Technologies for Water Supply and Maintain Yield Productivity**

Participants said they want complementary solutions for challenges related to water resources in Lebanon. This requires increasing uptake of modern irrigation methods, expansion of storage capacity, improved management of groundwater resources and improved municipal and irrigation infrastructure. In terms of irrigation, this incorporates the need for better information on current consumption because few wells or irrigation networks are adequately metered. Stakeholders described irrigation from spring and surface water systems as most vulnerable to drought, and so demand forecasting to anticipate volumes required to maintain yield productivity is a major concern.

At present, flood irrigation is still commonplace. Stakeholders mentioned numerous barriers to uptake of improved irrigation techniques:

- Lack of awareness about new technologies or the cooperative arrangements to use them;
- Lack of incentives because irrigation water pricing is determined by area cultivated rather than volume used; in some areas, irrigation scheduling is related to time shares rather than volume shares;
- Unreliable water supply leads farmers to overirrigate since they do not know whether water will continue to be available;
- Inability to utilize modern systems because of water quality problems, especially siltation (Amery 2002); and
- Lack of capital and/or reliable electricity supply for drop systems.

Efficient irrigation is increasingly important in the coastal strip of Lebanon, where most agriculture is rainfed and well-supplied and bananas are a common crop. These crops require large volumes of water and are impacted by salinity, making them particularly vulnerable during drought. Increasing localized saline intrusion is a further threat here as it increases during droughts due to greater groundwater abstraction.

New technologies and methods have been implemented unevenly in Lebanon. For instance, as water treatment capacity increases, there is interest in using treated wastewater for irrigation. Guidelines have been issued by organizations, but none from the central government, and so there is no overarching regulatory clarity. Given this absence, farmers continue to try to access treated wastewater and even untreated wastewater.

## **B3. Full Description of Stakeholder-described Drought Management Needs in Morocco**

In the context of Moroccan drought management, participants focused on the need to improve institutional cooperation and collaboration. The focus has shifted from the need for technically-oriented risk assessment to a greater need for dissolving institutional barriers to addressing those risks. Earlier evaluations of drought management needs (Ouassou et al. 2007) focus to a much greater extent on technical capacity for reliable seasonal forecasting and the development of comprehensive early warning systems. Stakeholders we interacted with said the purely technical matters associated with those needs have to a large extent been addressed in recent years. However, Ouassou et al. (2007) also described major institutional barriers that have not been addressed in the interim, especially the lack of data availability and clear mechanisms for the circulation of information as required for proactive drought management.

Since the technological landscape has shifted a great deal in the past ten years, new capacity exists for monitoring and modeling drought processes. Drought monitoring based solely on meteorological and hydrological measures requires weather station and stream gauge data, while use of remotely sensed products is a way to work around these

data input needs where station networks are lacking. Translating this information into actionable outputs requires a thorough analysis of local and regional vulnerabilities as described in the Pillar 2 report.

However, as one of our Moroccan participants stated, “The main obstacle in planning for drought management is the institutional component of how the agencies will work together. Because drought has such broad impacts on so many stakeholders, it’s difficult for all to work together well. There’s a lot of money involved in drought management as well, so it’s highly politicized. When there’s that much money around, there’s political posturing, which can impact the institutional management of drought.”

We provide below additional detail on the suggested needs shown in Section 1.4.

### **B3.1 Clear and Predetermined Institutional Roles and Coordination Mechanisms**

The lack of a regulatory text stipulating the role of specific government agencies in drought management precludes effective coordination. While agencies have overall remits in drought management, there is no operational framework to structure collaboration, and no single agency is in charge of overall drought management and coordination. As a result, drought management planning does not begin until the crisis has arrived, and aside from knowing what interventions will be made, the coordination starts from a basis of weak information and leadership. Often, stakeholders do not receive highly relevant drought information until that coordination begins in earnest, hence the need to start it sooner. Multiple stakeholders used almost identical language to describe the need to have preexisting collaboration mechanisms and cemented institutional roles in drought management.

### **B3.2 Tiered Intervention and Ease of Declaration**

Stakeholders described a need for tiered or sector-specific drought declaration depending on drought severity. This is because specific types of interventions require an official drought declaration, which is politically difficult and necessarily comes after drought impacts have begun to accumulate. Stakeholders consider that having some level of drought declaration defined by technical indicators alone would greatly facilitate drought management and improve coordination. More generally, stakeholders believe that increasing the technical nature of drought declaration would improve outcomes.

### **B3.3 Assessing Groundwater Levels through Monitoring and Research on Use and Recharge**

Increased groundwater abstraction is the main drought mitigation tactic in large swathes of Morocco, but long-term resilience is declining as aquifers are depleted or water quality degrades with intensive use. In southern Morocco, especially in the Souss Basin, groundwater overdraft has become a critical growth limitation. Moroccan agencies are looking to integrate meteorological and groundwater recharge models to improve long-term management efforts, and improving the understanding of drought impacts on recharge is a critical facet. The new water law focuses heavily on groundwater management as a long-term strategy to maintain water security, and so this drought management need is deeply connected to core water policy streams.

### **B3.4 Addressing Uneven ABH Capacity**

The ABHs in Morocco play increasingly prominent roles in drought management and the arbitration of competing sectoral water uses. Their role in water and drought management has expanded greatly under the new water law. However, some of these agencies still lack the technical resources and staff to use all available information and the ability to gather all stakeholders effectively.

Generally, stakeholders emphasized that ineffective information sharing, agency territoriality and weak coordination are core barriers to effective drought management. Core drought monitoring agencies are not

directly involved in making decisions around drought declaration, and the separation of roles slows responses to drought, increasing the cost of mitigation efforts. Stakeholders provided several specific suggestions to reduce these barriers.

### B3.5 Connecting with Other Long-term Projects

Participants mentioned several climate and development projects that could be natural partnerships with the work to develop the eCDI and DAP and emphasized that feasible mitigation efforts will build on existing work and projects. If the drought monitoring system is built with the understanding that there is a range of previous work encompassing drought monitoring and management, it will be more successful. Two examples of this are:

- The Triple A Initiative, which is focused on adaptation of African agriculture, follows from the Conference of the Parties (COP 22) meetings in Morocco in 2016 and aims to encourage equitable adaptation and mitigation in response to climate change while strengthening agricultural capacity.
- The Crop Growth Monitoring System project has brought together three separate agencies for data integration quite successfully. Building on this momentum to pair agricultural, statistical and meteorological information would be a major success for the MENAdrought technical work on drought monitoring.

### B3.6 Understanding Changing Irrigation Needs

Such an understanding in response to the repartition of rainfall would assist water managers in planning for water prioritization during drought. Knowing when a decrease in rain will occur during a year can assist planners in selecting appropriate crops and the timing of planting. Further consideration of irrigation needs should encompass well siting and monitoring.

### B3.7 Soil Conservation

Effective soil monitoring and management is important because soils can provide a preliminary warning when dry conditions begin. Additionally, water storage is tied to soil retention, as erosion into barrage areas can lead to dam siltation and eventually clog irrigation supply lines. Participants in our kick-off meetings and interviews mentioned that they are aware of this connection and would like to build soil monitoring into the process of managing for drought.

## B4. Stakeholder Needs Across Countries Related to Drought Definitions and Declaration

### B4.1 Drought Definitions and Declaration Processes

Stakeholders across the project countries were highly consistent in their stated needs relating to drought definitions and declaration processes. They focused first and foremost on the need to have specific indicators and technical definitions of drought, more transparency and timeliness in declaration processes, and tiered declarations to facilitate early intervention. To address these issues, stakeholders stated that they want to develop drought trigger mechanisms based on technical definitions that would precipitate immediate and preplanned interventions.

A Ministry of Agriculture official in Morocco gave a good example of ongoing work toward this objective. He described a state-led program to develop agricultural insurance “to automate drought declaration and *zones sinistrées* [declared areas],” which will make decision-making easier, more transparent, cost-effective and faster.



## B4.2 Transparency and Timeliness in Declaration Processes

Our interviewees in all project countries described drought declaration as a “black-box” operation in which decision-making criteria are not fully known. While political figures and/or top-ranking civil servants (and also, in the case of Tunisia, civil society leaders) are provided climatological, hydrological, agricultural and some social data, the stakeholders we interviewed were not sure how the information is used in making decisions on drought declarations. The overriding sentiment expressed by one mid-level government official is applicable in all project countries: “To be honest, we provide the requested [drought monitoring] information and don’t know exactly how it’s used because that happens at a higher level than our offices.”

Furthermore, stakeholders perceive drought declarations as coming too late and after drought impacts have already become severe. A regional government official expressed the sentiment of government and civil society stakeholders in all countries, especially those from rural areas: “The capital asks for drought monitoring and impacts information and then they take a very long time to make a decision on drought declaration; so by the time they make a decision, the interventions we requested are no longer relevant, but that’s what they approve.”

## B4.3 Tiered Drought Declarations

Stakeholders desire tiered drought declarations to permit a range of intervention options and to avoid the current high-stakes approach to drought declaration. Also, because drought declaration happens at the central level, it can be difficult with current frameworks to declare drought before impacts are felt in multiple regions. A regional government official described these issues in a way similar to officials in other countries: “We need authorization and funds from the central government for the department to take any action. There are competing needs among regions, which makes crisis management hard because it’s so highly centralized.”

## B4.4 Drought Declaration Trigger Mechanisms

Stakeholders recognize the challenge in developing acceptable trigger thresholds across multiple sectors. There are competing demands between simplicity and timeliness of drought declaration versus robustness and rigor of the established trigger thresholds.

Developing a single threshold as a trigger mechanism for drought declaration and interventions across sectors could be an adequate and reasonable avenue to facilitate rapid, if not necessarily widespread or deep, interventions. Given the political difficulty of and lengthy process for official drought declarations, and the delay between declaration and action on the ground, stakeholders see developing these thresholds as a worthwhile objective. Still, some of them think triggers for drought declaration may have to be sector-specific, though they identified numerous inherent challenges in providing accurate information to support this goal.

Stakeholders anticipate that specific interventions would be preplanned per sector, and in some cases prepared for in advance (e.g., stockpiling livestock vaccines) through a management planning process (i.e., development of a Drought Action Plan).

## B4.5 Technical Definitions of Drought

Stakeholders inside and outside of government in all countries described the need for official and technical definitions of drought. The three reasons for this link directly to issues of transparency and timeliness in drought decision-making and the need to have tiered declaration and scales of intervention:

- The absence of technical definitions of drought means that drought declaration is not based on a standard, agreed-upon technical threshold.
- Without technical drought definitions, criteria for declaration and demarcation are not explicit, are often unstated, and may vary significantly from year to year.
- These two issues above increase the politicization of declaration procedures.

Technical definitions of drought could include measures of intensity and longevity, which could inform tiered drought declarations, which stakeholders believe would be helpful.

Stakeholders do not underestimate the challenge and importance of reaching consensus on the specific definition(s), as was summarized by an official associated with a meteorological agency who stated, in sum, that there must be a complete buy-in of the indicator(s) or index/indices, as a lack of agreement would make it very difficult to base policy mechanisms around it/them.

## **B5. Stakeholder Needs Across Countries Related to Drought Management Plans and Governmental Guidance**

### **B5.1 Drought Management Plans and Institutional Capacity to Deliver Them**

These themes emerged because stakeholders said that the existing drought management plans lacked clarity regarding the agencies responsible for specific intervention programs and failed to provide an adequate authorizing environment for those agencies to carry out the required tasks. While agencies do have overall remits in drought management, operational frameworks were either absent or highly convoluted, and the lack of coordination and collaboration mechanisms noted above weakened the response potential.

Two government officials we interviewed in water-related ministries stated these challenges facing the countries clearly:

- “There are many stakeholders involved, too many, and we need texts which specify the roles of each in given drought interventions.”
- “[drought] intervention execution is scattered, capacity for monitoring is scattered, data is scattered, response management is scattered—each agency works for itself and its own objectives and there is no integrated planning or management strategy.”

### **B5.2 Planting and Crop Guidance**

These themes relate to the role of extension agencies writ large, specifically in relation to drought management. As agriculture sectors are organized differently in each country, they reflect the objectives of farmers, extensions agents and agriculture ministries to link DEWS with appropriate guidance for farmers.

For example, stakeholders described situations in which cropping guidance (including information on water availability during the year) arrived after the latest sowing date. Without direction on water availability and advice on cropping, farmers planted crops with high water demand and then did not have enough water to irrigate them through the year. As a result, an already bad year worsened considerably.

Farmers and other stakeholders suggested themes of guidance from agencies including overarching crop planning features: how much of which crop varieties to plant and when, as well as technical and practice-based features, such as advice about deficit irrigation schedules, moisture conservation practices, and other themes.

### **B5.3 Locally Tailored Management Guidelines and Directives**

This need reflects stakeholders’ desire for flexibility in drought management. It also reflects the dissatisfaction regional government agencies and civil society organizations felt about highly centralized decision-making processes, which are common to the project countries.

## B6. Stakeholder Needs Across Countries Related to Water Management

### B6.1 Groundwater Management

This theme was consistently and prominently expressed across all aspects of stakeholder discussions, including drought monitoring, impacts and management. It was ranked as highly important in all of these aspects. Unlicensed and illegal wells being common in all the project countries (Closas and Molle 2016), stakeholders believe that uncontrolled groundwater overexploitation has greatly increased farmers' vulnerability to drought.

This was described as an intergenerational shift away from sustainable practices given that groundwater is the main buffer against drought impacts in most parts of these countries and that present irrigation systems are to a large extent groundwater-dependent. A civil society representative told us that his own parents had migrated to his current locale during a drought year and were saved by the resilience provided to them by groundwater wells; but the wells were now running dry due to overabstraction.

Specific management needs described in our interactions included improved regulatory codes related to groundwater abstraction and their enforcement, as well as much better knowledge of how, when and where drought affects groundwater recharge and discharge processes.

### B6.2 Surface Water Infrastructure and Management Systems

These themes too appeared in all aspects of our stakeholder discussions. While most comments revolved around the need to increase storage and otherwise improve local water retention, many stakeholders discussed the need to apply conservative land management practices to improve the efficacy of existing storage and decrease crop water demand. Also, stakeholders described the potential to increase integration of surface and groundwater management, especially with greater usage of treated wastewater.

Officials and civil society representatives said there have been only mixed results from major infrastructure projects while generally praising smaller, typically locally managed hill-lakes. These latter projects are more likely to be local demand-driven with local government as major partners.

Overall, stakeholders discussed this theme more in relation to long-term resilience than as an immediate drought management intervention. However, some components, such as improving demand forecasting through improved drought monitoring and sharing water storage data with farmers and civil society stakeholders to improve their planning capacity do connect to immediate surface water infrastructure management concerns.

## B7. Stakeholder Needs Across Countries Related to Financial Programs and Insurance<sup>21</sup>

Stakeholders in all project countries hope that improved drought monitoring tools can contribute to the development of drought insurance or other public- or private-sector financial relief mechanisms. The current lack of financial risk mitigation options severely reduces the capacity of governments, private sector entities and individual landholders for drought risk management:

- In the absence of drought insurance, individuals and firms cannot mitigate financial risks independently.
- The agriculture sector's reliance on informal credit in the project countries means that formal debt restructuring and credit relief schemes almost exclusively benefit large landholders who are involved in the formal financial sector.

<sup>21</sup> Source: Jedd et al. 2020.

- The lack of capitalized natural hazard risk funds that cover drought means that interventions must be paid for from baseline or exceptional funding, which minimizes and/or delays actions.

Thus, the need for improved financial relief mechanisms was highly relevant in all project countries except Morocco. We surmise that there are likely three major reasons for the conspicuous absence of this need there. First, in Morocco, we spoke primarily with central government and research stakeholders rather than businesses and individuals affected financially by drought. Second, Morocco undertakes expansive rural job creation programs during declared droughts. Third, MAMDA, an agricultural insurance firm, offers a multi-hazard climate risk insurance product subsidized by the state at a variable rate that covers drought for rainfed cereals and other crops in major growing areas; farmers, with state subsidies, purchase policies that cover over 1 million ha of farmland (MAMDA 2018; Sadiki 2016; Yata 2017).

Elsewhere, drought insurance schemes are being considered but are not available yet. Tunisian agencies and institutes have begun research on potential drought insurance products and stakeholders in Lebanon and Jordan expressed strong interest in such products.

Our participants were concerned that without adequate financial relief mechanisms from the public and private sectors, early warning and official drought declarations would only go so far toward improving drought management. As one official in the Jordanian Ministry of Agriculture noted, the Risk Fund and the Crisis Fund do not currently deal with drought, and other interventions must be paid for by a special parliamentary budget allocation, which greatly delays interventions. A Jordanian academic stated that, when reformed, “financial measures must be pre-prepared so that it’s not a scramble for money if drought is declared”; stakeholders in all the other project countries echoed this suggestion.

Figure B2 illustrates stakeholder-identified gaps related to financial risks, the reasons for those gaps, possible steps to address them, and how drought monitoring can facilitate those efforts. Overall, these issues relate to improving both crisis and risk management.

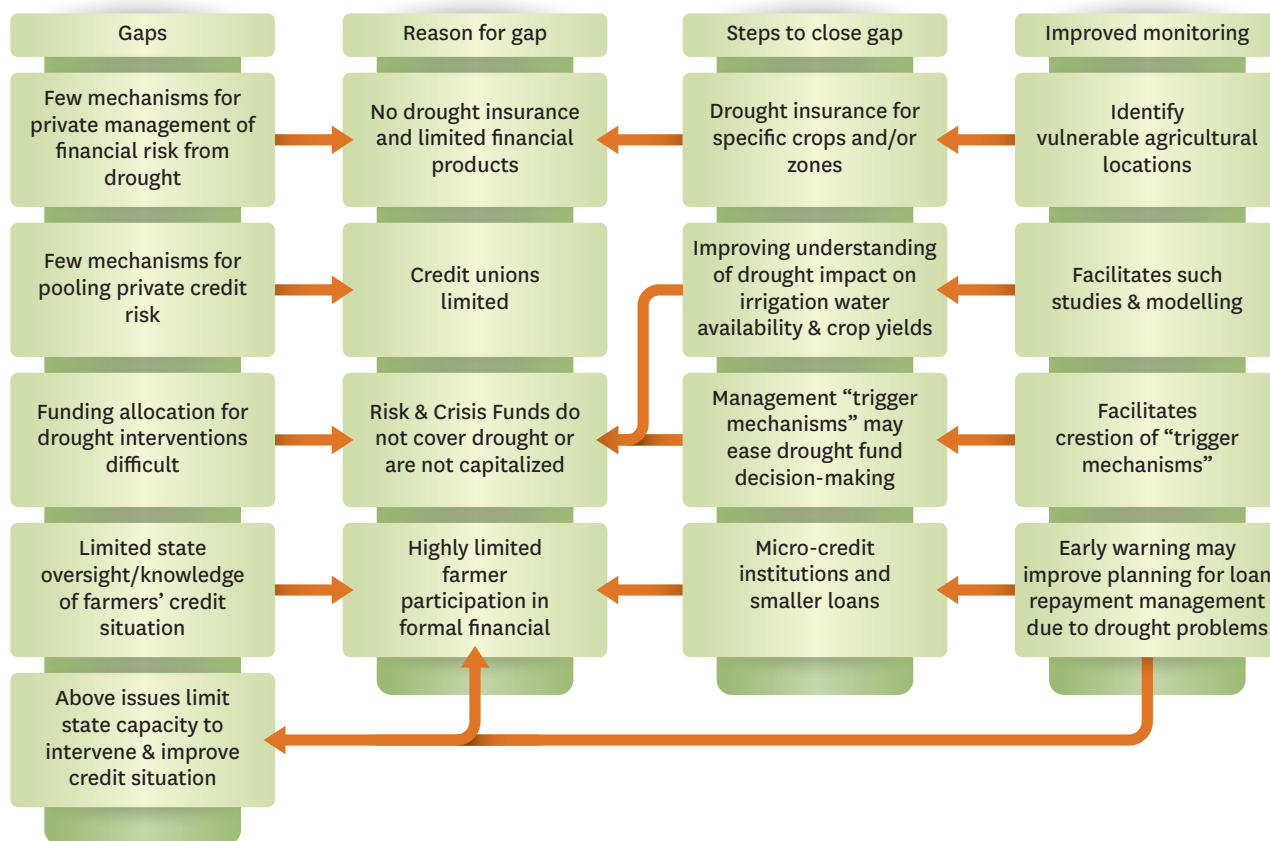


Figure B2. Stakeholder-identified gaps related to financial risks.

## B8. Stakeholder Needs Across Countries Related to Multilevel Governance Coordination<sup>22</sup>

Improved institutional coordination mechanisms within and between government agencies—as well as among government, private sector and civil society—are needed. Stakeholders (except in Lebanon) used remarkably similar language to discuss the fact that such mechanisms exist but are inadequate until crisis declaration forces action, at which time significant delays result from weak pre-crisis preparedness. An official in the Moroccan Ministry of Agriculture made this point clearly, saying, “We need better coordination at the initiation of the crisis point: predetermined roles and objectives for each agency and automatic triggers for when they should gather at the onset of the crisis.”

An official in Jordan’s Ministry of Agriculture spoke of the problematic lack of coordinated effort (and at times competition) between state organizations that have overlapping remits. In short, institutional mechanisms do not permit effective and proactive near-term drought management planning.

This theme also relates to vertical information flows within government and the desire for non-governmental stakeholders to be more directly involved in drought monitoring and management. In general, central government agencies reported receiving timely information from local government agencies, but local government representatives do not receive timely information and instructions in a reciprocal fashion. Discussions on drought management decentralization efforts in Morocco via basin planning (e.g., Water Law 36-15) and in Tunisia via broader governance shifts toward decentralization and liberal democratization focused on this issue. As such, drought risk reduction relates to wider governance themes.

<sup>22</sup> Source: Jedd et al. 2020.

## Annex C. Additional Detail from Section 2

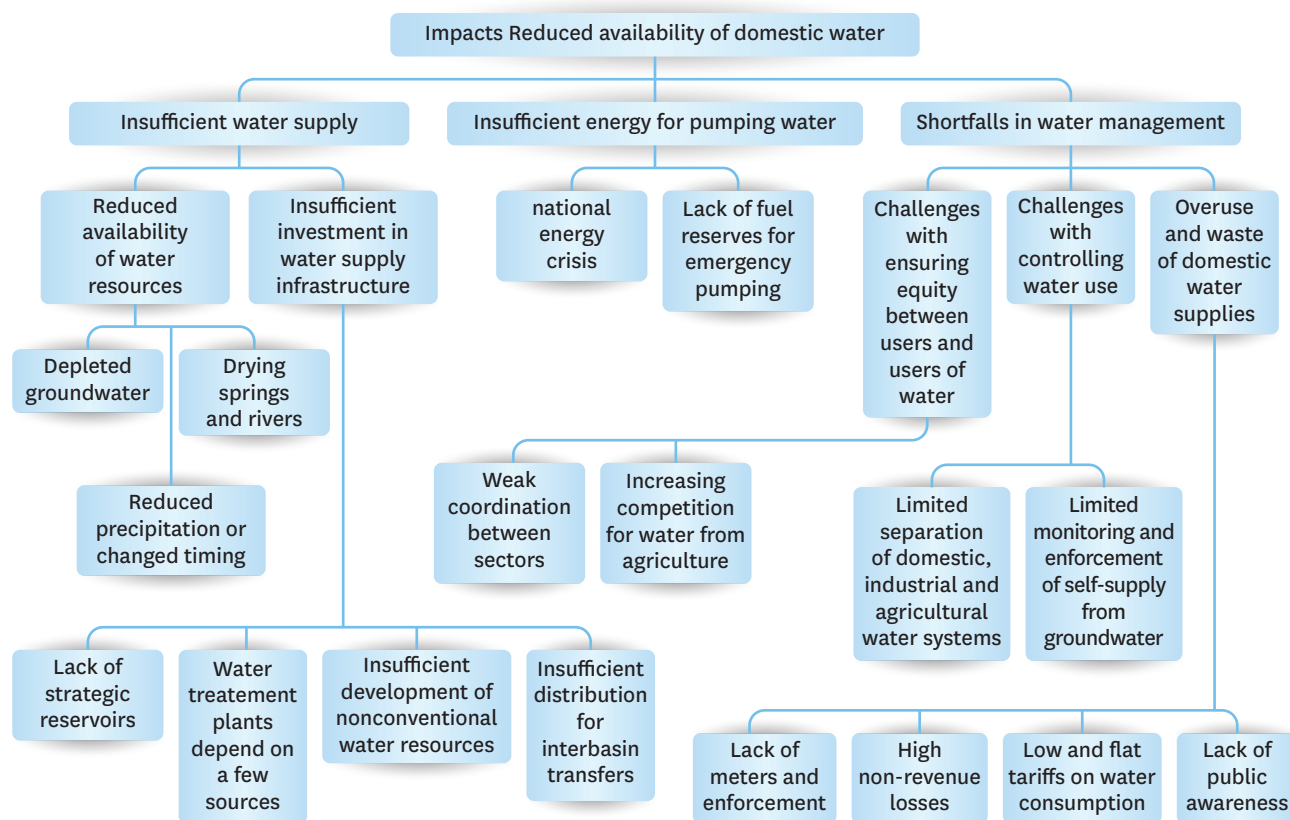


Figure C1. Problem tree for 'reduced domestic water availability' in Lebanon.

Table C1. Evaluation of options to address the root causes of 'declining quality of water services' in Jordan.

Causes of vulnerability	Possible action	Mitigation (M), Response (R), or Accepted Risk (AR)	Feasible/ possible/ practical	Effective?	Pro-poor?
Loss of universal coverage	Develop infrastructure and increase network coverage allowing reallocation from multiple sources	M	Moderate	Moderate	High
Loss of universal coverage	Provide emergency supplies using tanker trucks	R	High	Moderate	Moderate
Drought undermines financial sustainability	Increase investment on network maintenance/ rehabilitation to reduce non-revenue water	M	Moderate	Moderate	Moderate
Less water available per person per day	Increase water supply from desalination	M	High	High	Moderate
Less water available per person per day	Reduce demand through raising awareness and demand management	M	High	Low	Moderate/ Low
Poor quality customer service from water providers	Hire/reallocate temporarily to customer satisfaction teams	R	High	Moderate	Moderate
Poor quality customer service from water providers	Provide training to customer service teams	M	Moderate	Moderate	Moderate
Poor quality customer service from water providers	Upgrade customer service policies for water providers	M	Moderate	Moderate	Moderate
Provider preparedness	Issue early warning of drought to senior Water Authority officials	R	High	Moderate	Moderate
Provider preparedness	Provide monthly updates to Water Authority on drought trends and forecast	R	High	Moderate	Moderate
Provider preparedness	Issue drought advisories to water utilities	R	High	Moderate	Moderate

# Annex D. Additional Detail from Section 3

## D1. Drought-relevant Policy in Jordan

### D1.1 Drought Within the Jordan National Natural Disaster Risk Reduction Strategy

In summary, the objectives of the National Natural Disaster Risk Reduction Strategy are to support policy coherence and effective governance between levels of government as well as in collaboration with the private sector; prioritize action areas; and support capacity development for disaster risk reduction. These objectives were developed by the NCSCM in line with the Sendai Framework (UNDRR 2015).

The NCSCM held a workshop to score the risk profiles of various natural hazards in order to prioritize their action areas. They used the typical formulation of risk = (hazard X vulnerability)/coping capacity. Three drought-related parameters were included: drought, extreme heat and flash floods. (As described in the Pillar 2 report [Fragaszy et al. 2022a, 2022b], drought can contribute to and/or exacerbate the impacts of flash flooding.)

It was not stated how drought hazard was specifically assessed, though within the ranking exercise writ large, the NCSCM (2019) used a World Health Organization model of heat wave hazard distribution in Jordan as shown in Figure D1. Also, it was not stated which parameters were used to quantify vulnerability or coping capacity. The results of this prioritization exercise are shown in Table D1.

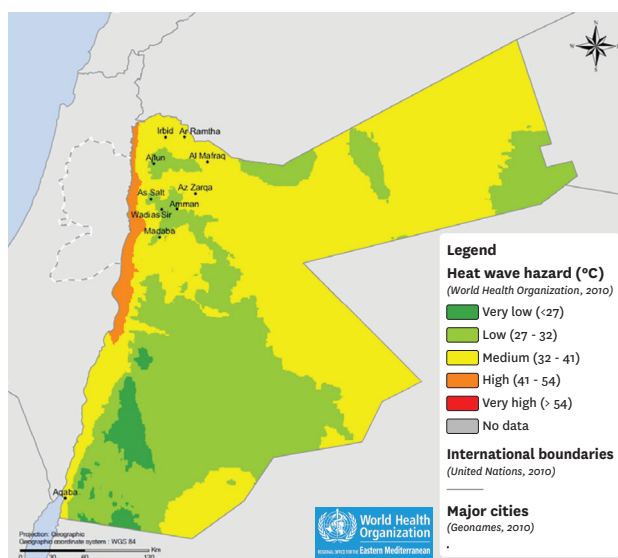


Figure D1. Heat wave hazard distribution in Jordan. (Source: NCSCM 2019)

Table D1. Natural disaster risk ranking for Jordan. (Source: NCSCM 2019.)

Risks	Coping Capacity	Vulnerability	Hazard	Risk = (Hazard * Vulnerability) / (Coping Capacity)	Priority
Earthquakes	1.70	2.80	2.66	4.38	1
Flash Floods	1.80	2.60	3.00	4.33	2
Landslides	1.50	2.20	2.00	2.93	3
Extreme Temp	2.10	2.00	2.33	2.22	4
Drought	2.00	1.80	2.33	2.07	5
Snow Storms	2.30	1.80	2.33	1.80	6
Sandstorms	1.60	1.20	2.00	1.50	7
Locust	2.10	1.60	1.33	1.01	8

The Disaster Risk Reduction Strategy is explicitly linked to the National Water Strategy (MWI 2016) because water is “central to a nexus of social, economic and political issues that affect agriculture, energy, cities, trade, finance and national security”. The National Water Strategy identifies drought as a challenge, while the Disaster Risk Reduction Strategy considers drought “as one of the main risks at national level”. Key issues raised in relation to water and drought include the volatile regional security context and potential impacts on water flows and acts against infrastructure, refugee influx (especially related to Water, Sanitation and Hygiene [WASH] issues), and climate change challenges (NCSCM 2019).

## D1.2 Additional Detail on Water Sector Policy for Drought Management

The Water Sector Policy for Drought Management lists 9 objectives. We replicate these verbatim here but group them according to whether they focus on an underlying policy goal (1-3) or whether they focus on delivery of those first 3 objectives, which we term policy implementation objectives (4-9).

The broad policy goals include the following:

1. Ensure adequate supply of water to meet the basic needs of the population to ensure good health and preserve lives during all phases of drought;
2. Minimize the negative impacts of drought on water resources and bodies, especially freshwater resources, dams and surface and groundwater; and
3. Reduce the negative impacts of drought on agriculture and other economic activities, in accordance with the priority given in the national water strategy and other drought-related plans and strategies.<sup>23</sup>

The policy implementation objectives include the following:

4. Strengthen national capacities through the establishment of a national drought forecasting and early warning system;
5. Develop and implement national drought management plans based on proactive risk management rather than crisis management in order to address various types of drought in coordination with the public and private sectors;
6. Ensure effective coordination of institutional response to drought mitigation measures;
7. Develop, coordinate and evaluate action plans and contingency plans to address various types of drought through the National Center for Security and Crisis Management and in coordination with vital public institutions and the private sector;
8. Plan and implement educational, training and public awareness programs related to drought management; and
9. Encourage affected economic sectors and population groups to adopt self-reliance measures that enhance risk management.

## D2. Priority Drought Impacts from the Jordanian DAP

Drought has widespread impacts on Jordan’s people, economy and environment. The DTC has identified eight priority drought impacts to target in the first iteration of the DAP. These are:

- Water resource degradation;
- Declining quality of drinking water services;
- Production losses in irrigated agriculture;

<sup>23</sup> In general, this is based on economic output per unit of water input. See the Pillar 2 report for more information on this theme.



- Production losses in rainfed agriculture;
- Production losses in livestock;
- Rangeland degradation;
- Forest degradation; and
- Increasing incidence of diarrhoeal disease.

Drought can contribute to water resource degradation by increasing demand for available resources—for example, for irrigation—at a time when less water is available. The Drought Action Plan includes drought mitigation and response actions targeting chronic water stress and insecurity, shortfalls in governance capacity and increasing water stress during drought periods.

Drinking water services often deteriorate during drought conditions. Tangible impacts to consumers include supply becoming less reliable, more expensive and less equitable. Utilities and service providers also face impacts from declining customer satisfaction and declining revenues. The DAP includes drought mitigation and response actions targeting impacts on customer service and loss of universal and equitable service delivery during drought periods.

Productivity of irrigated agriculture is generally less vulnerable to drought conditions than rainfed agriculture. During emergency conditions, irrigation permits may be revoked or restricted, however, and water-intensive crops are highly vulnerable to irrigation shortages. The DAP includes drought mitigation and response actions to rationalize water allocations during drought periods, and to share costs and benefits between irrigators and other members of society.

Productivity of rainfed agriculture and productivity of livestock are highly vulnerable to drought impacts. Small farmers, pastoralists and those living in rural poverty are disproportionately affected by drought, which directly impacts their livelihoods and principal sources of income. The DAP includes drought mitigation and response actions targeting drought impacts on yield losses and poverty of rainfed farmers and pastoralists during drought periods.

Drought degrades rangelands and forests with higher temperatures and less water affecting vegetation growth and making them vulnerable to overgrazing and, in the case of forests, fire. Underlying vulnerabilities include long-term ecosystem degradation from land-use change, overexploitation and weaknesses in the enforcement of regulation. The DAP includes drought mitigation and response actions targeting drought impacts on the degradation of forests and rangelands and forest fires during drought periods.

Diarrhoeal diseases often increase during drought periods, particularly in the Jordan Valley and in agricultural communities using treated wastewater in irrigation. Underlying vulnerabilities include shortfalls in monitoring water and food quality, access to sanitation and personal hygiene, and capacity of local health centers to respond to outbreaks. The DAP includes drought mitigation and response actions targeting higher levels of pathogens in water and food and health impacts on children during drought periods.

# Annex E. Additional Detail from Section 4

## E1. Drought-relevant Policy in Lebanon

### E1.1 Summary of Drought Management Challenges in Lebanon as of 2019

As of 2019, there were no specific drought monitoring systems, drought management plans, mitigation measures or drought policies at the national or river-basin scale in Lebanon. As such, the necessary definitions, legal mechanisms for declaration, management plans, coordination mechanisms or coordinated interagency drought response activity checklists were also not in place. So officials cannot identify or declare the onset of drought conditions in both technical and legal senses. As a result, individual actors (farmers, businesses, individual agencies, etc.), acting on behalf of their own interests and/or within their own remit, undertake nearly all drought management actions. Ultimately, these actions affect numerous other stakeholders.

Policy and governance settings, in addition to regulatory enforcement, are core components in Lebanon's vulnerability to drought. Drought remains a very low political priority due to the widespread perception of the country as water-rich and the lack of political action and leadership on drought management issues. Recent drought events such as the 2014 drought have been handled with reactive policy approaches. Most governmental efforts relevant to drought revolve around water security strategies and projected climate change impacts.

In this context, the Lebanon's MoEW has developed specific plans and strategies to target water shortages. The Ministry of Environment (MoE), on the other hand, oversees preparing the National Communication on Combating Desertification and the National Communication on Climate Change under the framework of the United Nations Framework Convention on Climate Change (UNFCCC). Although the MoE reports are climate-related, they do not address specific aspects of drought events, and instead focus on long-term climatic shifts.

The MENAdrought baseline report (McKee et al. 2019) summarizes governmental efforts related to drought in the water and agriculture sectors between 2000 and 2018 (summarized below), and Section 4.1 describes the major updates since then.

### E1.2 Drought-relevant Water and Agriculture Sector Policy Developments from 2000 to 2018

The MoEW undertook the following reforms and introduced policies and action plans to mitigate water challenges during the period 2000-2018:

- 2000:** Restructured departments in charge of water resources, and amalgamated 21 regional water authorities into the current four Regional Water Establishments;
- 2005:** The updated 10-year water strategy plan (2000-2009) was endorsed by the Lebanese Government and Parliament. It emphasizes Integrated Water Resources Management (IWRM) planning;
- 2008:** Prepared the Water Code based on IWRM principles;
- 2012:** Update of the National Water Sector Strategy; and
- 2018:** Water Law (77 of 2018) was endorsed by the Council of Ministers in October 2017 and put into force in early 2018. This was repealed and replaced by Water Code 192 (described in Section 4.1), primarily for legal drafting reasons and transitional arrangements (legal clarity on what laws and regulations were superseded with the introduction of the new law).

The Lebanese MoE oversees the preparation of environmental laws and regulations as well as the national communications on climate change and desertification. The drought-relevant laws and reports prepared by MoE include:

**2002:** Law 444, Protection of the Environment;

**2010:** State of the Environment Report (SOER);

**2011:** Lebanon's Second National Communication to the UNFCCC (as well as its Biennial Update Reports in 2015 and 2017);

**2012:** Regulation 8633, preparation of environmental impact assessment reports;

**2015:** Strategic environmental assessment report for the new water sector strategy for Lebanon; and

**2015:** Economic Costs to Lebanon from Climate Change: A First Look (MoE Lebanon, UNDP and GEF 2015).

The Ministry of Agriculture (MoA Lebanon) prepares the 5-year agricultural strategies (2005-2009, 2009-2014 and 2015-2019), in addition to yearly agricultural reports and special reports on fisheries and animal production. However, the 2015-2019 agricultural strategy (MoA Lebanon 2014) mentioned drought explicitly only in relation to afforestation/ reforestation in response to climate change impacts.

More generally, however, the main objectives of the MoA strategy related to agriculture under drier and warmer conditions (not specific to drought) include the following:

- improving government institutions' capacity and capability to respond to crises (inclusive of drought); promoting sustainable management of natural and genetic resources; improving irrigation and animal health systems; supporting development of private sector cooperatives;
- supporting development of financial resilience measures such as mutual funds and insurance schemes; and
- increasing and improving extension services.

## E2. Priority Drought Impacts Identified by the Lebanese DAP

Drought has widespread impacts on Lebanon's people, economy and environment. The DTC has identified five priority drought impacts to target in the first iteration of the DAP. These are:

- reduced quality of domestic water services;
- reduced availability of domestic water;
- reduced storage levels in reservoirs and dams;
- reduced yields in irrigated agriculture; and
- reduced yields in rainfed agriculture.

Domestic water services often deteriorate during drought conditions. Tangible impacts to consumers include supply becoming less reliable, more expensive and less equitable. Utilities and service providers also face impacts from declining customer satisfaction and revenues. The DAP includes actions to mitigate and respond to drought impacts on water quality, equity and equality of water distribution, degradation of installed equipment, financial sustainability of utilities and customer satisfaction.

Drought periods also lead to shortfalls in the availability of domestic water for various reasons. These include increased demand for water, limited resilience in distribution networks and the additional energy needed to pump water over greater distances and heights. The DAP includes actions to mitigate and respond to drought impacts on the physical availability of water, energy supplies, non-revenue water and competition between water users.

As inflow declines and demand increases during droughts, water stored in reservoirs and dams is drawn down. The DAP includes mitigation and response actions to enable the stocking and restocking of reservoirs, and to better manage water demand.

**Irrigated agriculture** is generally more resilient to drought conditions than rainfed agriculture, as long as water is available for irrigation. Intense droughts can see restrictions placed on irrigation, however, leading to yield losses in drought-sensitive crops. The DAP includes drought mitigation and response actions to rationalize water use intensity and strengthen resilience in irrigated agriculture, including in relation to drying springs, lack of climate information, increased risks of pests and disease, and poor soil water management.

**Rainfed agriculture** is highly exposed to drought impacts, and small farmers and those living in rural poverty are disproportionately affected by the direct impacts of drought on their livelihoods and principal sources of income. The DAP includes actions to improve resilience in rainfed agriculture by improving access to climate information, drought-tolerant varieties and techniques, strengthening support and extension services, and reducing livestock losses.

## E3. Overview of Preparedness Actions in the Lebanese DAP

### Legislation

- Review and/or revise laws and regulations to ensure the water sector has appropriate powers for responding to drought emergencies.

### Operational policy, governance and coordination

- Formal establishment of the operational framework described in the DAP and this report (i.e., obtain formal approval for the DTC and wider governance structure).
- Develop detailed contingency plans for drought events and conduct drills.
- Develop water resource contingency plans and incorporate drought risk management into strategic and operational plans across relevant sectors, including for mobilization and reallocation of resources (water, human, equipment, capital, etc.) during drought conditions.
- Convene higher management committees annually to review progress on mitigation measures and response preparations.
- Coordinate GIS and remote sensing capabilities between agencies for drought risk management.

### Data collection and information sharing

- Improve and/or extend and/or network weather, surface and groundwater, and soil moisture monitoring stations, as well as upgrade platforms and systems for data sharing.
- Maintain information-sharing contact lists for dissemination of drought information.
- Develop a list of media contacts for sharing public information during drought emergencies.
- Identify and/or add to drought impact indicators relevant to priority sectors and regularly collate information during the drought season.

### Policy effectiveness

- Review and revise drought policies and/or the DAP to reflect new knowledge and change in context over time.

# Annex F. Additional Detail from Section 5

## F1. Drought-relevant Policy in Morocco

### F1.1 Summary of Drought-relevant Policy Arrangements in Morocco

The government of Morocco has from the 1980s implemented programs designed to reduce drought impacts for farmers. The modern approach has both proactive risk management and reactive mitigation components. The mitigation components are described in Section 1.3; here we focus on policies that direct long-term drought risk management.

Governmental long-term drought risk management efforts occur primarily under the auspices of the agriculture-focused Green Morocco Plan (Ouraich and Tyner 2014), the National Water Strategy and the National Water Plan (DGE 2015). Green Morocco Plan investments include agricultural water demand management, supply augmentation, soil conservation and governance programs. For example, this includes the large-scale conversion of marginal cereal production land to olive cultivation areas, subsidized introduction of drip irrigation systems, training in soil conservation techniques, dam-building operations to facilitate transfer of water from the North to the South, and additional public irrigation system (PPI in the French acronym) governance units.

The National Water Strategy and the National Water Plan primarily emphasize supply-side solutions including the construction of multiple large storage dams, new desalination and waste-water treatment and reuse capacity, and water transfer infrastructure like the planned 450 km North-to-South pipeline that is intended to reduce pressure on the Rabat, Marrakesh and Casablanca basins. Demand-focused measures include water metering, water charges, developing allocation decision-making frameworks and urban education campaigns (El Khatri and El Hairech n.d.; Baubion et al. 2017).

Water Law 36-15 focuses heavily on sustainable groundwater resource management and participatory management mechanisms, including clarifying the entire concept of the public water domain. The law inscribes the principle of sustainable groundwater abstraction and strengthens the existing legal framework of water management institutions: It improves the legal standing of ABH governance structures and includes the elaboration of more effective consultation and participatory processes in water resource management, especially through the creation of eight river basin committees. It also provides improved planning mechanisms by linking the National Water Plan, regional Master Plans and promoting integrated development of water resources at the basin level. Lastly, it provides clarity around nonconventional water resources and reuse of wastewater in agriculture (Verner et al. 2018b).

### F1.2 Government-wide Hazard Risk Management Policy

As discussed in Section 5.1, the Government of Morocco has been building institutional capability, and the underpinning information systems related to drought risk management, since the 1980s. In particular, the government has focused on institutional improvements, financial risk transfer and reduction, and resilience mechanisms. In the agriculture sector, and related to drought, MAMDA is the preeminent example alongside livestock feed and fodder trade and subsidy policies.

In 2016, the Government of Morocco passed Law 114-10 for disaster insurance. While it does not cover drought (El Hafre 2019), likely because there are other preexisting policy mechanisms including MAMDA insurance, this law did reform the principles on which primary funding for drought risk management occurs. In short, it changed what was a 'Fund for the Fight against the Impacts of Natural Disasters', which focused on compensation for damages, into a 'National Resilience Fund' that co-finances local-level structural and nonstructural disaster risk reduction projects (World Bank 2021b).

Some of the funded projects (MoI 2022) are relevant for drought risk management through the improvement of environmental monitoring information and associated modeling, but it is unclear to what extent the numerous funded studies related to general hazard risk management and vulnerability include drought within their remits.

Further, this law laid the institutional groundwork for subsequent development of the national DRM strategy, which was adopted in 2021 (MoI 2021; see Figure F1 for a synthesis diagram of the strategy). This strategy has five main axes:

- reinforcement of governance of natural hazard management;
- improvement of knowledge and evaluation of hazard risk;
- prevention of hazard risks and improvement of resilience;
- preparation for rapid relief and improved reconstruction from natural disasters; and
- promotion of scientific research, international cooperation and improvement of material capacity for natural hazard risk management.

In relation to institutional changes, in 2020, the Ministry of the Interior created the Directorate of Natural Risks Management which includes 5 divisions and 16 units. Again, the specific relation it will have to drought management will become clearer over time as strategic and institutional changes work their way through systems (World Bank 2021b).

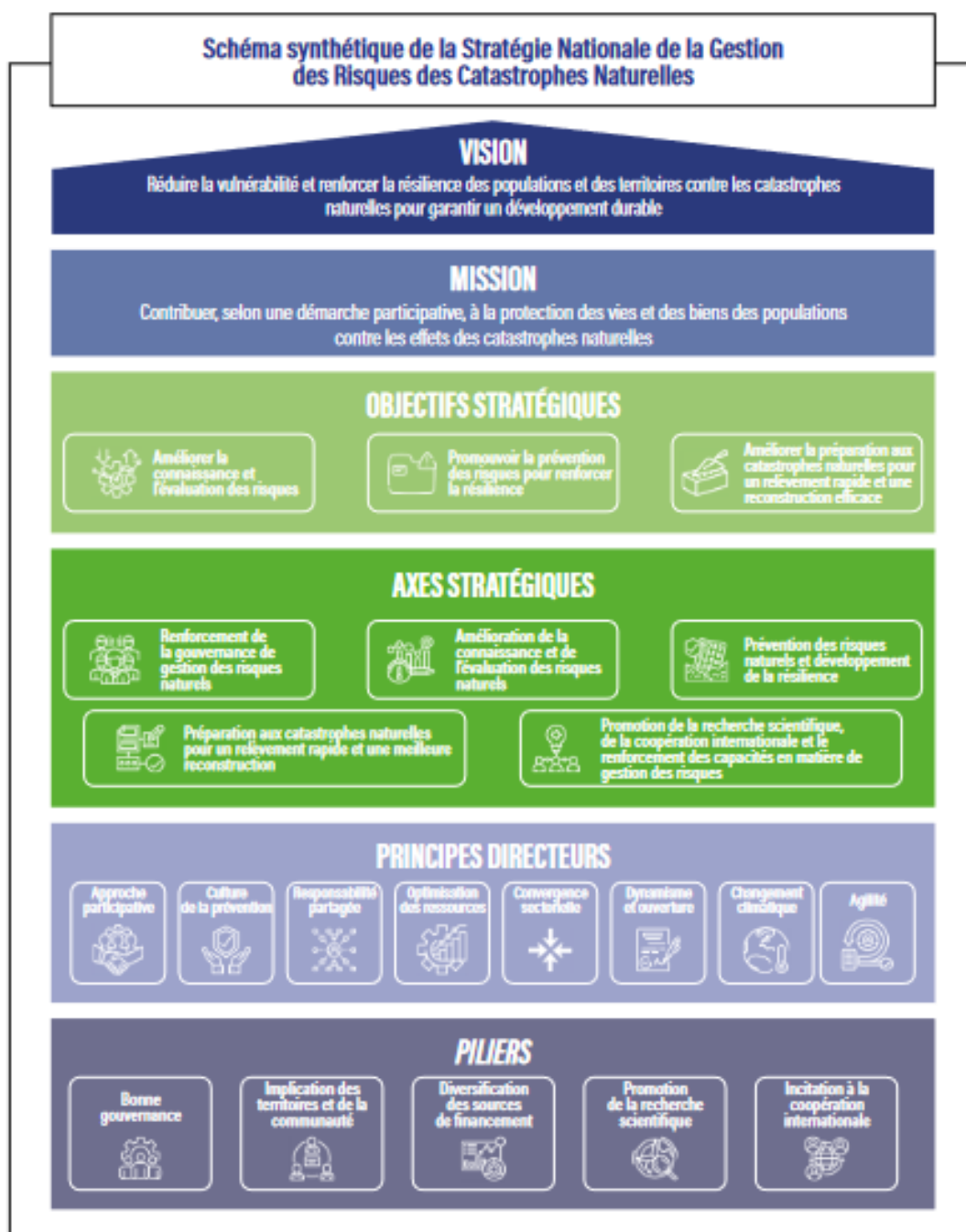


Figure F1. Synthesis diagram of the Moroccan national DRM Strategy 2020-2030.

## Partners

**Primary partners:** International Water Management Institute (IWMI); National Drought Mitigation Center, University of Nebraska-Lincoln; Daugherty Water for Food Global Institute, University of Nebraska; Goddard Space Flight Center, National Aeronautics and Space Administration (NASA); and Johns Hopkins University

### National leaders:

**Jordan:** Ministry of Water and Irrigation

**Lebanon:** Ministry of Energy and Water

**Morocco:** Directorate of Strategy and Statistics (Ministry of Agriculture, Fisheries, Rural Development, Water and Forests, MAFRWF); ABH Souss-Massa (Ministry of Equipment, Transport, Logistics and Water)

### National partners:

**Jordan:** Department of Statistics; Jordan Meteorological Department; Ministry of Agriculture; Ministry of Health; Ministry of Environment; National Agricultural Research Center; National Center for Security and Crisis Management; and the University of Jordan

**Lebanon:** American University of Beirut; Beirut and Mount Lebanon Water Establishment; Lebanese Agricultural Research Institute (LARI); Lebanese Meteorological Department-Directorate General of Civil Aviation; Litani River Authority; Ministry of Agriculture; Ministry of Environment; South Lebanon Water Establishment; National Center for Remote Sensing.

**Non-governmental organizations:** Agency for Technical Cooperation and Development (ACTED) and STAMMOSE

**Morocco:** Hassan II Institute of Agronomy and Veterinary Medicine; Ministry of Equipment, Transport, Logistics and Water; National Department of Meteorology (DMN); various regional directorates of agriculture (DRA); various river basin agencies (ABH); and various regional offices for agricultural development (OMRVA)

## Contact details

**Project website:** <https://menadrought.iwmi.org/>

**Contact:** Rachael McDonnell, Deputy Director General - Research for Development, IWMI ([R.Mcdonnell@cgiar.org](mailto:R.Mcdonnell@cgiar.org))



*This document was made possible through the support of the Office of Technical Support, Bureau for the Middle East, U.S. Agency for International Development, under the terms of Award No. 7200-ME-18-10-00001. The opinions expressed in this publication are those of the authors and do not necessarily reflect the views of the U.S. Agency for International Development or the United States Government.*

## Innovative water solutions for sustainable development

### Food · Climate · Growth

The International Water Management Institute (IWMI) is an international, research-for-development organization that works with governments, civil society and the private sector to solve water problems in developing countries and scale up solutions. Through partnership, IWMI combines research on the sustainable use of water and land resources, knowledge services and products with capacity strengthening, dialogue and policy analysis to support implementation of water management solutions for agriculture, ecosystems, climate change and inclusive economic growth. Headquartered in Colombo, Sri Lanka, IWMI is a CGIAR Research Center with offices in 15 countries and a global network of scientists operating in more than 55 countries.

**International Water Management Institute (IWMI) Headquarters**  
127 Sunil Mawatha, Pelawatta  
Battaramulla, Sri Lanka

Mailing address:  
P. O. Box 2075  
Colombo, Sri Lanka  
Tel: +94 11 2880000  
Fax: +94 11 2786854  
Email: [iwmi@cgiar.org](mailto:iwmi@cgiar.org)  
[www.iwmi.org](http://www.iwmi.org)