



Drought Risk and **Resilience Assessment** **Methodology**

A Proactive Approach to Managing Drought Risk

EXECUTIVE SUMMARY

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Executive Summary

The Drought Risk and Resilience Assessment (DRRA) framework provides guidance for assessing drought risk and identifying interventions for increasing drought resilience.

The methodology is built on four blocks, which consist of 10 sub-blocks that describe a comprehensive and structured approach to strengthening drought responses and preparedness. The DRRA considers context by scoping implementing institution capacity and organization, client, donor and partner engagement, and coordination across governments in the given jurisdiction. Overall drought risk is then assessed by characterizing past and future drought hazards, impacts, and vulnerabilities, followed by a gap analysis reviewing current drought response and preparedness measures to comprise the resilience assessment. The last step is identifying and prioritizing possible investments to alleviate drought risk and foster resilience. The DRRA is flexible in that it allows individual applications to be tailored to different country contexts and builds on existing datasets, studies, analyses, and programs while focusing on specific needs and priorities. Instead of replicating existing methodologies and tools, the DRRA brings them together, fills gaps, and points implementers to suitable resources that can inform the assessment in a specific region or country. The objective of the DRRA is to provide a handbook for transitioning from reactive to proactive drought management.

Droughts have been increasing in frequency, duration, and global coverage, impacting approximately 55 million people annually. Since 2000, drought frequency and duration have risen by a third (UNCCD 2022a). Projections indicate that land areas and populations facing extreme droughts could increase 7–8 percent by the late 21st century (Zaveri, Damania, and Engle 2023). In the last five decades, the number of “dry shock” episodes has increased by about 233 percent (Damania et al. 2017). Such dry spells have ramifications for many sectors of the economy, disrupt ecosystems, and have a lasting impact on human well-being. Due to their cascading and wide-ranging impacts, droughts are known to be the most complex and severe weather-related hazard. Studies indicate that droughts are disproportionately detrimental to the Global South and its economic growth.

It is estimated that droughts have reduced gross domestic product per capita growth rates in developing countries by 0.39 percent to 0.85 percent (Zaveri, Damania, and Engle 2023).

Droughts manifest as slow-onset disasters, which are typically associated with delayed disaster relief responses. Although their impacts could be lessened with timely and coordinated action, droughts historically have been overlooked until they develop into full-fledged emergencies. More recently, flash droughts, the more rapid-onset counterpart of more “conventional” droughts, have received increasing attention. Importantly, the extent of drought impacts can be best mitigated by implementing drought management plans. Donald Wilhite (2012) coined the term “hydro-illogical cycle” to describe the reactive nature of drought management that entails broad awareness of droughts only once the event has reached a critical stage and that turns into apathy in times of wetter periods. However, planning for droughts in non-drought periods can reduce or even avoid impacts, minimizing physical and emotional suffering in the process (De Nys, Engle, and Magalhães 2017).

The World Bank has developed the DRRA as a cross-sectoral coordinating mechanism for prioritizing drought investments to help countries transition from reactive to proactive drought management. The DRRA builds on previous reports by the World Bank and on internationally recognized concepts, such as the “three pillars approach for drought resilience”: (1) monitoring and early warning, (2) risk and impact assessment, and (3) risk mitigation, preparedness, and response. The DRRA consolidates methodologies, such as Assessing Drought Risks and Hazards and the EPIC Response framework, to provide comprehensive and systematic guidance for understanding and managing droughts. In addition, the DRRA is designed to draw from and inform broader climate resilience assessments, such as the World Bank Climate Change and Development Reports (CCDRs) and the Adaptation and Resilience Diagnostics. In that it aims to identify measures to reduce drought risks and impacts before an event occurs, the DRRA is different from the Post-Disaster Needs Assessment (PDNA), which is conducted following a drought crisis to understand relief measures.

The DRRA prioritizes investment options in the context of country-specific or regional capacities, impacts, vulnerabilities, and needs across a range of relevant sectors and systems. The DRRA will help countries assess drought risks and costs or damages (including avoided costs) to justify and prioritize investment options.





This report targets task teams, sector specialists, and their client counterparts to facilitate collaborative programming for drought resilience. Implementation of the methodology requires deep knowledge of drought management, country

context, and sector specifics. Deploying an interdisciplinary and intersectoral team is paramount to ensure the methodology's successful application and to identify suitable interventions.

This report permits users to quickly compare available analytical tools. It brings together established and often complementary tools for each DRRA sub-block (figure ES.1) and provides guidance for selecting and combining them. It references case studies illustrating implementation of each building block.

FIGURE ES.1

Building Blocks and Sub-Blocks of the Drought Risk and Resilience Assessment

Block I	Scope coordination and capacity
	<ul style="list-style-type: none"> ■ Scope coordination within the implementing institution ■ Scope coordination between government, donors, development partners, and other stakeholders ■ Scope coordination across government
Block II	Assess drought risk
	<ul style="list-style-type: none"> ■ Assess current and recent drought hazards ■ Assess main trends of future drought hazards ■ Assess current and recent drought impacts ■ Assess country/region vulnerability to drought
Block III	Evaluate current resilience
	<ul style="list-style-type: none"> ■ Evaluate current drought response ■ Evaluate current drought preparedness
Block IV	Prioritize areas for action
	<ul style="list-style-type: none"> ■ Prioritize measures to reduce drought risks and increase drought resilience

Source: Original figure for this publication.

The DRRRA is embedded in its regional and institutional context, defining its success. A preliminary participatory scoping exercise determines in which context a DRRRA is conducted. First, the scoping must consider the collaboration and interest of local agencies and various sectors' stakeholders in upgrading drought management. It must then judge the readiness and capacity of ongoing government, donor and stakeholder engagement and coordination in the given country. Organizing a workshop that brings relevant external and internal, as well as cross-sectoral, stakeholders to the table can ensure inclusivity and understanding of both challenges and opportunities. The workshop is helpful in identifying existing work and studies that can inform the assessment while avoiding duplication of efforts. The outcome of this scoping exercise (block I) will lay the groundwork for and set the direction of the DRRRA and will align priorities for and expectations regarding implementation objectives. Furthermore, as the first building block of the DRRRA, this exercise ensures stakeholder involvement, buy-in, and ownership, which are essential for its success.

Comparing hazard characteristics with knowledge of drought impacts and vulnerabilities reveals drought risk hotspots that inform prioritization of efforts and resource allocation. Drought risk results not only from hazards, but also from exposure and vulnerability. Generally, the risk of drought causing damage and socioeconomic/ecological losses reflects the severity and probability of occurrence, exposure, and vulnerability (Vogt et al. 2018; Limones et al. 2020). By conducting a drought risk assessment (block II), teams can identify where the drought hazard is most significant and the areas and sectors that are the most vulnerable to drought. The DRRRA emphasizes understanding of drought risk and recommends a thorough assessment of each of the elements of overall risk, as dictated by data and information availability, as well as time and resources. The recommended methods are (1) qualitative risk assessments, (2) empirical semi-quantitative assessments, and (3) data-driven quantitative assessments. The World Bank conducted a machine learning-based, data-driven drought risk assessment in Romania that applied the European Commission's EDORA Framework to show how drought hazards can lead to impacts, to identify thresholds-of-hazard indices that trigger impacts in different sectors, and to determine the likelihood of respective anomalies being experienced due to drought.

Understanding hazard characteristics and trends of future droughts lays the foundation for informed decision-making. A DRRRA may start with an analysis of historical or current drought hazard metrics and thus look at precipitation, evapotranspiration, flows, vegetation conditions, soil moisture, and other parameters. The analysis is followed by an assessment of future drought hazards, including climate change projections. Due to the complexity and multifaceted nature of droughts, use of several indices and indicators is recommended to characterize drought hazards. The DRRRA framework offers four approaches: (1) using the data and knowledge from an established drought monitoring system in the country/region, (2) relying on drought portals that provide temporal maps of indices, (3) working with preprocessed indices served in web portals, and (4) constructing indices with on-the-ground information from local agencies. The selection of approaches will depend on data availability, resources allocation, and time constraints. Where drought monitoring systems do not exist, their establishment is recommended. For example, Brazil developed a drought monitoring system that measures indicators on a monthly basis, and depending on pre-defined thresholds, helps trigger specific actions.

Drought impacts evolve gradually and are thus often not immediately evident. Droughts affect all economic sectors, individuals, communities, society as a whole, and various ecosystems. Their impacts can range from stunting due to malnutrition, to the death of hundreds of dolphins in the Amazon due to low water flows, to community anxiety associated with water shortages and failing crops. Unless the DRRRA has a clear sectoral focus, all potential drought impacts should be assessed. Knowledge of these impacts reveals drought risk hotspots and vulnerabilities that inform the prioritization of efforts and resource allocation. Information on drought impacts can be gained through drought impact chain identification, estimation of drought macroeconomic impacts, human impact assessments, PDNA/Damage and Loss Assessments, or simply a review of an existing impact database or monitoring system in the country. Additional tools and methodologies for drought impact assessments range from established impact database monitoring systems in the country or region to remote sensing-based analyses.

A high level of vulnerability to drought threatens livelihoods and capacity to meet the most basic needs. Although drought impacts are felt across society, impacts manifest to varying degrees, depending on the level of vulnerability. Vulnerability can be understood as a system's susceptibility to and inability to handle the adverse effects of drought. The DRRRA should include an assessment of vulnerability, which aims to determine what causes risk and how it is managed. By indicating areas with the highest needs, this assessment will inform prioritization of drought responses and preparedness measures. King-Okumu (2019) categorizes vulnerability assessments as one of three types: (1) people-centered, (2) land-based mapping and models of ecosystem-service production, or (3) hydrometeorological assessments, including water balance accounting. The DRRRA provides a comprehensive overview of ways vulnerability can be evaluated.

Investments in drought preparedness and pre-arranged drought responses maximize risk management and resilience. Notably, drought-risk assessment toolkits, approaches, and methodologies rarely account for current drought response and preparedness and how these systems can be best upgraded, thereby missing the resilience dimension. Approaches to resilience assessment (block III) include (1) desk-based stock-taking of drought response and

drought preparedness mechanisms, (2) in-depth assessment of drought management plans and climate adaptation actions, and (3) identification of key program areas around which to prioritize investments relevant to drought. The EPIC Response framework provides a template to identify the relevant stakeholders and program areas while gauging their level of development and effectiveness. To identify drought investments, drought risks (block II) must be mapped against the current level of drought resilience and challenges facing the current drought management system (block III).

Systematically assessing the benefits of drought investment options permits the efficient allocation of limited resources to areas where they can make the most significant impact. The DRRRA results in a list of evaluated and prioritized investment options to mitigate drought risk and build resilience (block IV). To properly assess investment options, the long-term benefits of a program or project must be weighed against costs. Assessing the benefits entails comparing project outcomes with expected drought impacts in the business-as-usual scenario.

This report is intended to guide collaborative program development. The report will be updated to reflect lessons from DRRRA implementation in various country and regional contexts.



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