Local Water Security Action Planning Manual

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This manual is a step-by-step guidebook for practitioners who are developing local water security action plans (LWSAPs) in local communities. The authors have compiled an original methodology comprising seven interrelated activities, some supported by a separate tailored methodology, which cover stakeholder analysis, public opinion assessment, local water security assessment, and problem analysis and prioritisation. Each of the seven activities comprises two or more steps, making a total of 20 steps in the LWSAP process. All 20 steps, and the deliverables related to each one, are described in detail in the manual.

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CONTENTS

Introduction 6

THE WATER SUM PROJECT 8

DEFINING WATER SECURITY 8
- What is water security? 8
- What are the key dimensions of water security? 9
- What are the elements of water security? 12
- What are the main water security challenges in the 21st century? 12
- What are the threats to water security? 12
- Countries in the MENA region 12

LOCAL WATER SECURITY ACTION PLANNING 15
- REC methodologies for action planning 15
- Overview of the LWSAP process 16
- Organisation of LWSAP team 21

Activity 1: Defining scale and scope 22

STEP 01: INITIAL ASSESSMENT 24

STEP 02: SCOPING AND SCALING 26
- Spatial definition 26
- Topics of substantive focus 26

Activity 2: Setting up the local planning team 28

STEP 03: STAKEHOLDER ANALYSIS 30
- Why analyse stakeholders? 30
- A methodology for stakeholder analysis 31

STEP 04: FORMAL ESTABLISHMENT OF THE PLANNING TEAM 37

Activity 3: Assessing the current status of water security 38

STEP 05: PUBLIC OPINION ASSESSMENT 40
Why do a public opinion assessment? 40
Stages in the public opinion assessment 42

STEP 06: LOCAL WATER SECURITY ASSESSMENT 50
Defining the scope and availability of data for the assessment process 50
The indicator-based assessment 51
The final LWS assessment 51

Activity 4: Analysing and prioritising problems 58

STEP 07: FORMULATION OF PROBLEM STATEMENTS 62
STEP 08: DEFINITION OF PROBLEM STATEMENTS 63
STEP 09: PRIORITISATION OF PROBLEMS 63

Activity 5: Designing the action plan 64

STEP 10: DEVELOPMENT OF A VISION 66
STEP 11: DEFINITION OF GOALS AND OBJECTIVES 68
STEP 12: IDENTIFICATION OF ACTIONS 71
STEP 13: SPECIFICATION OF ACTIONS 73
STEP 14: PRIORITISATION OF ACTIONS 74
STEP 15: FORMULATION OF A FRAMEWORK ACTION PLAN 77

Activity 6: Implementing the action plan 78

STEP 16: DEFINITION OF THE IMPLEMENTATION STRUCTURE(S) 80
STEP 17: DEVELOPMENT OF AN IMPLEMENTATION PLAN 80
STEP 18: DOCUMENTATION OF IMPLEMENTATION 83

Activity 7: Monitoring and evaluation 84

STEP 19: PERFORMANCE MONITORING 86
STEP 20: EVALUATION AND IMPACT ASSESSMENT 87

Annexes 88

ANNEX 1: TEMPLATE AND WORKED EXAMPLE OF INITIAL LWS ASSESSMENT REPORT 90
Template for the initial LWS assessment 90
Initial LWS assessment report for Al Karak, Jordan 91

ANNEX 2: CALCULATION OF INDICATORS FOR LWS ASSESSMENT 95
Resources (availability, supply, demand) 95
Ecosystem health (quality, stress) 96
Infrastructure (demand, condition, treatment) 97
Human health (access, reliability, impact) 99
Capacities (financial, education, training) 100

ANNEX 3: DRAFT VERSION OF THE PROPOSED PUBLIC OPINION ASSESSMENT QUESTIONNAIRE 102
Section 1: Introduction 102
Section 2: Questions related to project objectives 103
Section 3: Information about water availability, use and quality 106
Section 4: Information about the respondent 107
Section 5: Indicators of socioeconomic status 108

ANNEX 4: SAMPLE PUBLIC OPINION ASSESSMENT 109

References 110

Introduction

7 Activities • 20 Steps

The WATER SUM project

Professor Dr. Radoje LAUŠEVIĆ

In response to the rapid depletion of water resources, deterioration in water quality, increased water demand, and changes in water endowments that are affecting environmental quality, food security, municipal infrastructure and economic development in most societies in the Middle East and North Africa (MENA), the Regional Environmental Center (REC, www.rec.org) is implementing the project "Sustainable Use of Transboundary Water Resources and Water Security Management" (WATER SUM) (watersum.rec.org). The project is funded by the Government of Sweden (Swedish International Development Cooperation Agency [Sida] contribution ID 52030234) and is being implemented between April 2014 and April 2017.

The overall objective of the project is to promote and enhance sustainable water resources management and to foster a comprehensive and integrated approach to water security and ecosystem services for sustainable development in beneficiary countries in the MENA region in order to help halt the downward spiral of poverty, biodiversity loss and environmental degradation.

The project is divided into two components: "Water Resources Management Good Practices and Knowledge Transfer" (Water POrT); and "Water and Security" (WaSe). The goal of the Water POrT component is to accelerate the more sustainable use of the region's water resources and to promote a strategic approach to climate change adaptation. The WaSe component aims to foster a comprehensive and integrated approach to water security and ecosystem services for sustainable development in eight selected administrative territories in Jordan and Tunisia. The WaSe component is a part of efforts to combat water scarcity and increase overall human well-being within the wider context of ensuring regional peace and stability.

Two main results are envisaged:

- Increased capacities on the part of the respective national authorities to apply an integrated water resources management (IWRM) approach; a framework for common understanding promoted among water practitioners and stakeholders regarding the need for cooperation and a regional approach to managing water problems; and strengthened abilities among practitioners for dealing with the impacts of climate change on the region's water resources (WATER POrT component).
- The process of introducing and drafting local water security action plans (LWSAPs) initiated and supported in target administrative territories in Jordan and Tunisia, while partner communities work jointly towards sustainable development; and local environmental governance in partner countries benefiting from the LWSAP concept (WaSe component).

This manual is part of the second project result as it supports the process of introducing and drafting LWSAPs. Following the inception phase of the project, Jordan and Tunisia were selected as focus countries for the WaSe component (Milutinović et al. 2015), and based on stakeholder consultations in the initial phase of the project eight administrative territories were selected for the development of LWSAPs:

In Jordan:

- Al Karak Municipality
- Jerash Municipality
- Al-Salt Municipality
- Ajloun Municipality

In Tunisia:

- Nefza Delegation
- Bir Mcherga Delegation
- Matmata Delegation
- Sidi Ali Ben Aoun Delegation

The present manual will be used in these eight administrative territories for the drafting of LWSAPs. However, the authors hope that the manual will also be of use in other local communities interested in developing LWSAPs.

Defining water security

Professor Dr. Slobodan MILUTINOVIĆ

What is water security?

There are several definitions of water security available in the literature:

- Water security is defined as the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socioeconomic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability (UNU 2013).
- Water security, at any level from the household to the global, means that every person has access to enough safe water at affordable cost to lead a clean, healthy, and productive life, while ensuring that the natural environment is protected and enhanced (GWP 2000).
- Water security is the availability of an acceptable quantity and quality of water for health, livelihoods, ecosystems and production, coupled with an acceptable level of water-related risks to people, environments and economies (Grey and Sadoff 2007).

The issue of water security (according to the Grey and Sadoff definition) has been the object of increased academic and policy interest over the past decade. In 2009, the World Economic Forum (WEF) prioritised water security as a global concern, stating that "water security is the gossamer that links together the web of food, energy, climate, economic growth, and human security challenges that the world economy faces over the next decades" (WEF 2011). In 2013, the UN-Water Task Force on Water Security proposed a working definition of water security developed from contributions made by the broad range of organisations, agencies, programmes and institutions that form UN-Water. It aims to capture the dynamic and constantly evolving dimensions of water and water-related issues, offering a holistic outlook for addressing water challenges through the umbrella of water security, and is intended to serve as a starting point for dialogue on water security in the UN system.

Water security involves the sustainable use and protection of water systems, protection against water-related hazards (floods and droughts), the sustainable development of water resources, and the safeguarding of (access to) water functions and services for humans and the environment.

Water security is a precondition for any effective poverty reduction strategy, and for effective environmental sanitation, wastewater management and flood control. Water security will only be reached when high-level decision makers actually take the lead, make tough decisions about the different uses of water, and follow through with financing and implementation.

What are the key dimensions of water security?

Of all our natural resources, water underpins sustainable development as perhaps none other. Food, energy, health, industry, biodiversity — there is no sphere of planetary life or human endeavour untouched by water. Water use has grown at more than twice the rate of population increase in the last century. A central challenge for sustainable development is how to balance the competing uses of water; ensure that the needs of all — especially the poor and marginalised — are met; and maintain healthy and diverse ecosystems. It is therefore no surprise that water appears explicitly as a recurring theme in many of the newly established Sustainable Development Goals (UN General Assembly 2015), and in the proposed targets that serve as signposts towards their achievement.

Water is recognised as a central plank of the green economy. It is critical to the sustainable management of natural resources and is embedded in all aspects of development — poverty reduction, food security and health — and in sustaining economic growth in agriculture, industry and energy generation (van Beek and Arriens 2014). Water security is therefore not only about having enough water: It involves all water-related issues. In simple terms, water security addresses the "too little", "too much" and "too dirty" issues of water management. Water security has three key dimensions: social equity, environmental sustainability, and economic efficiency (Figure 1).

Water security is about far more than the problems that many people face, and that good water management should solve — or at least alleviate. It is about adapting to and mitigating water-related risks, such as floods and droughts; addressing conflicts that arise from disputes over shared water resources; and resolving tensions among the various stakeholders who compete for a limited resource.

Nor is water security only about the availability of water as a resource. It is also about the availability of the infrastructure to harness that resource and provide water services, and the capability to manage and maintain this infrastructure. Reliable service delivery depends on the serviceability and robustness of facilities and on the financial, technical and human capability of service organisations to operate and maintain them. This attention to social-technical infrastructure is one of the differences between "sustainable water" and "water security". Many existing water

> "The international water community began using the term 'water security' much earlier. During the II World Water Forum in 2000 the concept of water security was introduced in two prominent declarations, namely (i) World Water Council (WWC) introduced its vision for 'A Water Secure World — Vision for Water, Life, and the Environment' (WWC 2000) and (ii) the GWP published 'Towards Water Security: A Framework for Action'." (GWP 2000)

FIGURE 1 THE THREE DIMENSIONS OF WATER SECURITY

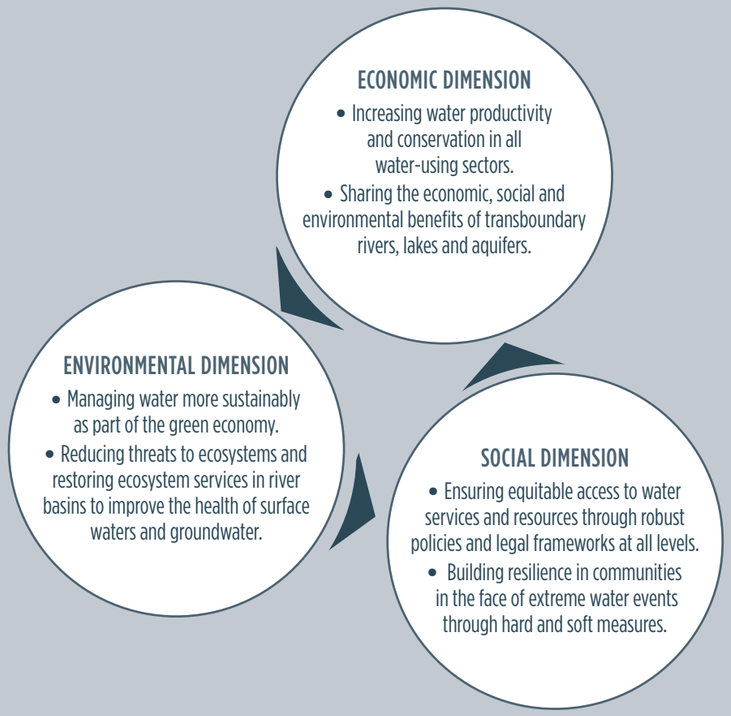
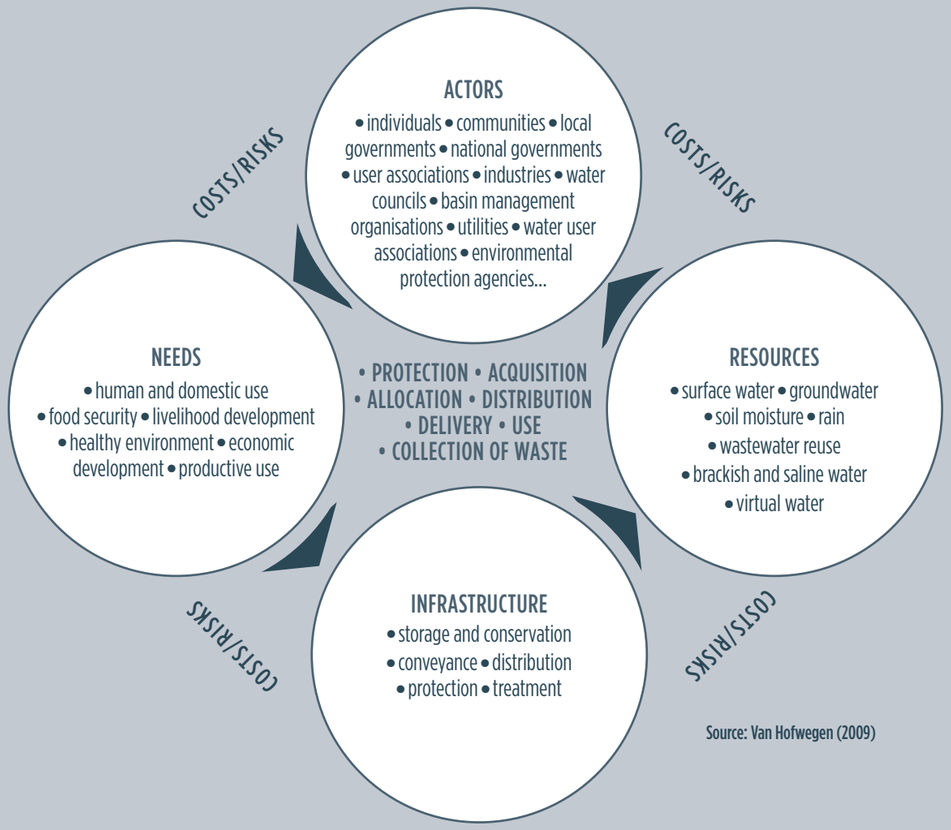


FIGURE 2 ELEMENTS OF WATER SECURITY



Source: Van Hofwegen (2009)

FIGURE 3 WATER SECURITY ELEMENTS: A CHECKLIST

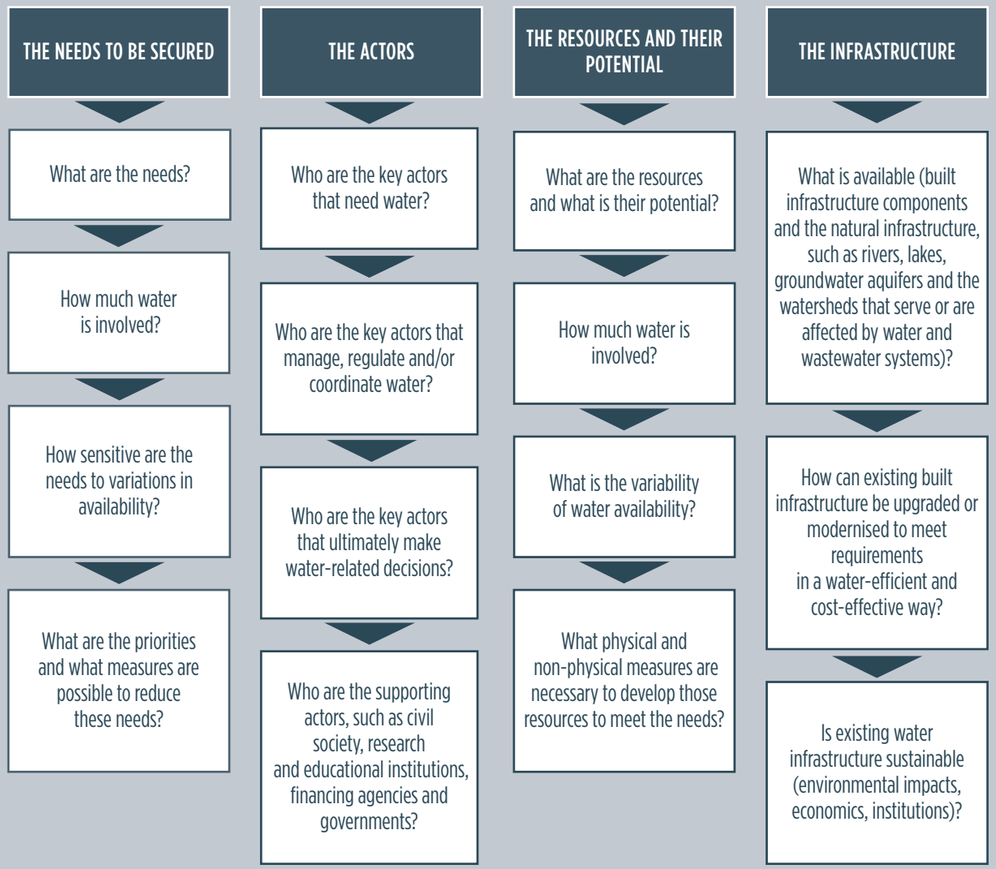


FIGURE 4 SEVEN CHALLENGES TO ACHIEVING WATER SECURITY

Source: World Water Forum (2000)

security problems are due to a lack of the right mix of human and financial resources and incentives to properly operate, maintain and repair service infrastructure, be it for water supply, irrigation, flood or drought protection, pollution control or environmental purposes.

Water security also involves the protection of water resources from water-related hazards. This protection depends on political factors, cooperation within national and transboundary basins and aquifers, and the level of peace and stability in a region. Local people in each community have to be considered, along with their culture, values and social and economic situation, and their traditions and coping mechanisms in relation to water excess and shortage, aggravated by the effects of climate change. In this respect, water security can also be considered as bottom-up capacity building for climate change adaptation and mitigation.

The development of water security should be shaped by local characteristics and should include local knowledge, local standards, local approaches and local solutions, incorporated into the extensive system of knowledge and instruments provided by institutions and governments (Van Hofwegen 2009).

What are the elements of water security?

Developing water security requires balancing the needs for water and the availability of water with the institutions and infrastructure required to provide an acceptable level of security at an acceptable level of costs and risks (Figure 2).

When planning water security, it is essential to understand the elements shown in Figure 2 and their mutual interactions. A checklist approach can be useful, as outlined in Figure 3.

What are the main water security challenges in the 21st century?

The essence of water security is that concern for the resource base itself is coupled with concern that the services that exploit the resource base for human survival and well-being, as well as for agriculture and other economic enterprises, are developed and managed in an equitable, efficient and integrated manner. The Ministerial Declaration of the Second World Water Forum (held in the Hague in 2000), "Water Security in the 21st Century", listed seven main challenges to achieving water security (Figure 4). This concept implies that in thinking about water security we really need to be thinking about "nexus security".

Water security diagnoses include programmes to assess the state and evolution of these seven main challenges. Such analysis should identify the vulnerabilities of users, sectors and geographical areas, and reveal causal relationships between human and non-human drivers and water-related consequences. This information is a prerequisite for any of the priority actions that lead to the integration of the three E's (equity, economy and environmental sustainability) of water management. It is clear that to solve water issues that are so strongly related to the allocation (and provision) of scarce water resources, and that are so interdependent at various scales and between sectors, integrated and holistic approaches are required.

What are the threats to water security?

Communities face multiple threats to their water security. Together, these threats have an impact on access to water supplies of sufficient quantity and quality for basic needs. For people who lack access to safe water, the primary problem is rarely one of physical scarcity, in which demand outstrips available supply, but rather one of socioeconomic water scarcity. Water resources may be present but not where or when they are needed most. They may be contaminated, located a great distance from households or inaccessible because of difficult terrain, or they may have been depleted by uncontrolled abstraction. WaterAid (2012) has identified seven groups of factors that comprise the main threats to water security (Figure 5).

Achieving water security thus requires cooperation between different kinds of water users, and between those sharing river basins and aquifers, within a framework that allows for the protection of vital ecosystems from pollution and other threats. Water security is a precondition for any effective poverty reduction strategy, and for effective environmental sanitation, wastewater management and flood control. Water security will only be achieved when high-level decision makers actually take the lead, make tough decisions about the different uses of water, and follow through with financing and implementation.

Countries in the MENA region

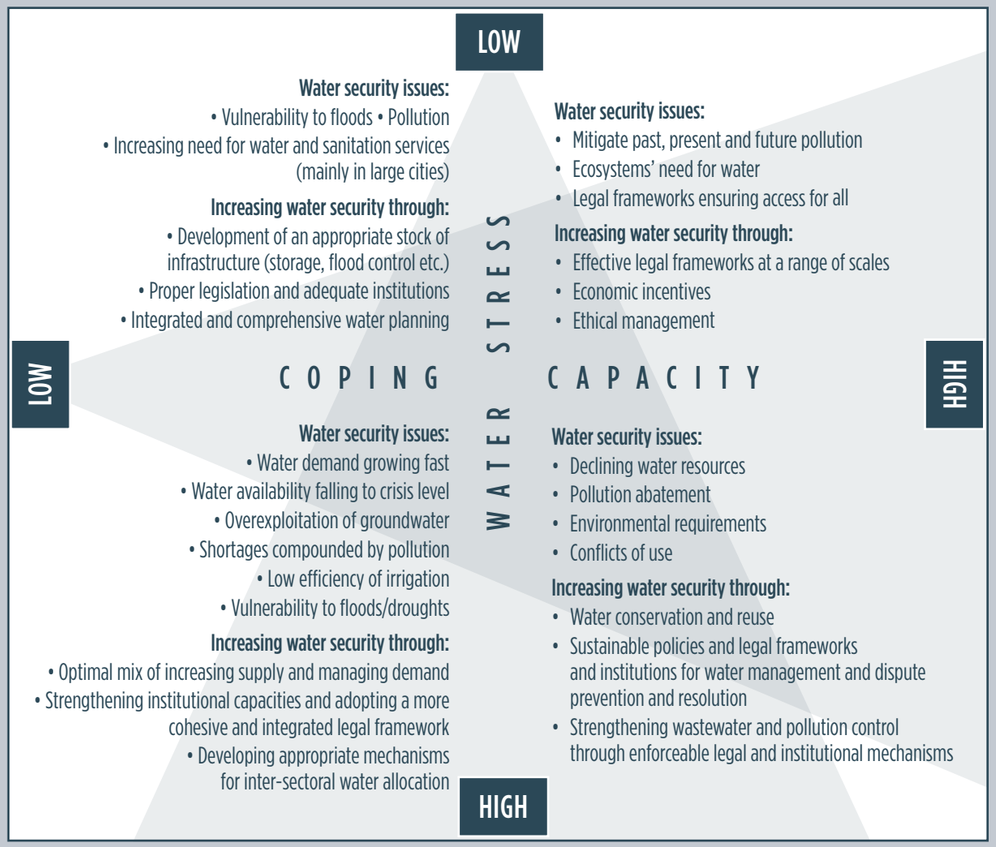
Whatever definition of water security is used, acceptable standards of water security have to be identified and agreed upon in policies and laws. These should embed monitoring and compliance processes that can be regularly reviewed on a case-by-case basis, at local, national, regional and international levels as conditions evolve. Such standards, including the legal frameworks that support them, must recognise that water security, or the lack of it, is felt at the household level, by farmers and industries, in cities, in the natural environment of river basins, and in communities that are building resilience to adapt to change, including climate change (GWP 2010).

FIGURE 5 MAIN THREATS TO WATER SECURITY

- Weak political will and low institutional capacity to manage water resources and water supply services
- Social and political exclusion (due to inability to pay, political affiliation, disability, race, caste, gender, age or social status)
- Poverty
- Low community resilience to cope with stress
- Poor hygiene and sanitation for water supply
- Rapid population growth and urbanisation
- Climate change and climate variability

Source: WaterAid (2012)

FIGURE 6 DEGREES OF WATER STRESS



Source: www.gwp.org

Figure 6 positions countries according to their degree of water stress and their financial and governance capacities to cope (including, perhaps, their determination to act).

According to Figure 6, most MENA countries certainly belong in the lower left quadrant, characterised by high water stress and low coping capacity. Water resources are overexploited and the situation will probably worsen in the future. Currently, total water demand exceeds naturally available water supplies by almost 20 percent. Today, demand is met primarily by unsustainably mining fossil groundwater reserves, and partially by increasing water supplies through desalination. As a result, water tables have fallen significantly in recent years, with the salinisation of some (mainly coastal) groundwater, particularly in North African countries (Milutinović et al. 2015).

The main weaknesses of water systems in the analysed countries are outlined below:

- In general, the water pipe network is outdated and inadequate and in serious need of refurbishment, reinforcement, repair and maintenance. An enormous amount of water produced is non-revenue water.
- The wastewater infrastructure is outdated and in chronic need of maintenance.
- Water use per sector is inefficient, with high water allocations to agriculture.
- Water pricing is not efficient in terms of cost recovery for service provision, nor is allocative efficiency achieved.
- Adequate water conservation programmes and government subsidies to encourage conservation are limited or lacking.
- The product structure in the agricultural sector is inappropriate, including the cultivation of water-intensive crops.
- Political instability in the region has exacerbated water scarcity issues.
- The deterioration in water quality is closely linked to water scarcity.

Recognition of the political importance of water seems to be improving in the region, and water is increasingly seen as a priority area by governments. Although there has been notable progress at the level of institutions and governance approaches, the institutional set-up in the water sector in the analysed countries is largely centralised and managed mostly at the national level with little local stakeholder or civil society participation. Coordination between different water-related institutions is a major water governance issue. The implementation of water policies shows modest levels of cross-sectoral coordination with ineffective permanent structures or institutions. The enforcement of laws, the implementation of water pricing reforms and water governance–related issues are still a challenge. Most efforts have failed due to inadequate compliance or poor enforcement.

The financing gap in the water sector represents one of the main shortcomings in the implementation of water plans and strategies. The majority of infrastructure investments are still covered by a significant portion of financial support from donors through loans and grants. Cost recovery is generally low and this has an impact on the financial sustainability of water services. There are opportunities for improving allocative efficiency through pricing and the reform of abstraction management systems.

Population growth will exacerbate the already existing water crisis. The expected rise in water stress related to population growth will affect most countries in the MENA region, although groundwater-based countries (Algeria, Tunisia, Libya and Jordan), which already suffer from water stress, will be the most severely affected. The picture is further complicated by urbanisation, which makes matters both worse and better.

Political instability represents another important factor that exacerbates water crisis. An influx of people displaced by conflicts across borders has led to an increase in the number of water-insecure areas in the MENA region. This implies a necessity to strongly consider the water–peace nexus.

Climate change threatens may worsen the situation to the point where social conflicts arise as water resources become scarcer and access to water more difficult. More or less all MENA countries are exposed to similar weaknesses that can deepen their vulnerability to climate change. They are over-dependent on water-sensitive economic sectors such as agriculture, grazing, eco-tourism and aquaculture. The ecological base has already been harmed, particularly by water pollution, land degradation, desertification and biodiversity loss. In addition, the technological skills and financial and human resources needed to improve the water sector's resilience to climate change are relatively limited. In response to these future challenges, most MENA countries have identified a number of potential actions that could be taken to reduce their vulnerability, particularly with respect to their water and agricultural resources. However, in terms of their water-related adaptation policy framework, various assessments show that progress tends to be limited or moderate.

Stakeholder participation in water issues is modest in terms of water planning, and inadequate with respect to plan implementation. Although a participatory approach is relatively well recognised through the implementation of water use agreements (WUAs), effective participation in water management and decision making remains weak and, in some countries, lacks supporting legislation.

Local water security

Professor Dr. Radoje LAUŠEVIĆ

Why local water security? At the local level, lack of water security — either water scarcity or poor-quality water — may lead to political instability or conflict, often exacerbated by attempts at profiteering through private, uncontrolled sales of water. Threats to water resources or ecosystems can further aggravate the situation (UNU 2013). In order to achieve water security, good water governance is essential. It requires capable institutions supported by well-developed legislative and policy instruments. However, the implementation of any policy in the fields of poverty reduction, sustainable development and the conservation of biodiversity is impossible without active participation and ownership on the part of local communities and local governments, with the help of strategic partners such as national authorities, civil society organisations and businesses. Local water governance is therefore an essential element of robust water security planning and implementation.

Local water governance can be improved by initiating and supporting the process of developing local water security action plans (LWSAPs). While LWSAPs reflect national, regional and international policy priorities, addressing water security issues at local level is a precondition for the well-being of local populations. The development of LWSAPs also ensures an integrated approach to water management as a means to enhance water security, and showcases the direct and tangible results of supporting water-related dialogue and capacity building. At the same time, the implementation of measures to achieve water security locally can have important impacts regionally, particularly for downstream users.

Focusing on local water security contributes to improving water access for local populations. It is important to note that this does not necessarily mean water security for all water users. It does not, for example, focus on the large-scale irrigation network or on the energy-producing sector, nor is it a framework for comprehensive national water security planning that should focus on all water users. Although the LWSAP focuses on the provision of water services for the local population (e.g. the municipality), it acknowledges that other water users are important and that their needs are interlinked with local ones.

An action plan is...

... a results-oriented, time-bound and actor-specific plan negotiated among stakeholders within an agreed strategy framework.

Local water security action planning

Professor Dr. Slobodan MILUTINOVIĆ

The term "action planning" refers to the process that guides the day-to-day activities of an organisation, programme or project. It is the process of planning what needs to be done, when it needs to be done, who needs to do it, and what resources or inputs are needed. It is the process of operationalising strategic objectives.

Participatory planning is a process by which a community works actively to fulfil a given socioeconomic goal by consciously defining its problems and planning a course of action to resolve those problems. Experts are typically needed, but only as facilitators. Besides, no one likes to participate in something that is not of their own creation. Plans prepared by outside experts, regardless of their technical soundness, cannot inspire people to participate in their implementation.

REC methodologies for action planning

Mr. Srdjan SUŠIĆ, Ms. Ana POPOVIĆ

Since its establishment in 1990, the Regional Environmental Center (REC) has been assisting local communities to build their capacities for sustainable development and environmental planning, management and financing (Hak 1996).

In collaboration with the Institute for Sustainable Communities (ISC), the REC developed a methodology for drafting and implementing local environmental action plans for sustainability (LEAPs) (Markowitz 2002). The methodology has been used to develop LEAPs in Central and Eastern Europe and has served as a cornerstone for developing various development projects at local, national and regional level. In the former Yugoslav Republic of Macedonia and Kosovo*, for example, the methodology has been adopted as official guidance for developing LEAPs due to its "grassroots" approach, ease of understanding and implementation, and wide stakeholder involvement. In terms of the proportion of the total population benefiting from the results of the initiative, the figures are 1.65 percent in Kosovo* and 6.51 percent in the former Yugoslav Republic of Macedonia (Popović 2009).

* This designation is without prejudice to positions on status, and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo declaration of independence.

The REC's local development methodologies provide a forum for bringing together diverse groups of individuals who work together to agree on common priorities and actions for addressing environmental issues in their communities. The process involves assessing and ranking environmental problems, setting priorities and developing an action plan to address the main priorities — all with broad public involvement and in a way that creates a framework for potential investments. The result is a "living" operational document that can take a local community from a state of ongoing crisis management towards more strategic environmental management, even helping communities to move towards compliance with relevant national and international environmental standards.

In the last decade alone, the REC has worked with over 150 municipalities across its partner countries. The organisation has addressed the issue of improving local governance for sustainability, sharing its experience in bringing the process of change to the local governance level as the one closest to the people.

The REC has capitalised on various existing initiatives and projects that provide support at local level. One of the most recent was the regional project "Local Environmental Action Planning for Sustainability in South Eastern Europe", supported by the Swedish International Development Cooperation Agency, which resulted in the development of LEAP documents and the implementation of over 75 priority environmental investment projects in 20 municipalities in South Eastern Europe. Around 60 to 70 percent of the municipal population has been positively affected by this initiative.

The REC believes that the key to a sustainable future for local communities lies not in making local initiatives more competitive, but in making them more perceptive and capable of identifying what a community has and what it needs, and what are the long-term consequences of short-term choices identified in environmental and other planning processes.

Based on the REC's experience of the effectiveness of "peer learning", and the sound results that can be achieved, the organisation's local development planning methodologies are based on inviting stakeholders from partner communities to be presenters, trainers and experts in capacity-building activities.

The REC's local development methodologies aim to achieve the following results:

- Lasting environmental citizens' groups incorporated into the municipal administration.
- Enhanced capacities of key experts from local authorities and other institutions to receive targeted training on developing and financing environmental investment projects.
- Gender balance in the process of developing local plans, as this will improve quality of life in municipalities by creating conditions for future environmental investments that benefit the community as a whole.
- Priority environmental investment projects, with co-financing and guidance on transparent international standards, resulting in the improved quality of municipal services and infrastructure, better environmental management, and greater awareness of environmental issues in partner communities.
- Cross-sectoral integration, which has proved to be a catalyst for fulfilling the long-term task of local sustainable development planning, while taking into account the sustainable development agenda and other strategic development documents of local communities.
- Vertical governance integration, which is crucial in ensuring the long-term sustainability and viability of programme results. Such integration is achieved by involving representatives of relevant national environmental and other administrations and national associations of local authorities. It is expected to result in greater capacities on the part of representatives of the national administration to replicate the process of creating local development methodologies in other local communities.

Overview of the LWSAP process

Professor Dr. Slobodan MILUTINOVIĆ

Local water security action planning comprises seven interrelated activities, as shown in Figure 7. Each of the activities comprises two or more steps, making a total of 20 steps in the LWSAP process (see Table 1). These 20 steps are described in detail in the chapters of this manual.

FIGURE 7 LOCAL WATER SECURITY ACTION PLANNING CYCLE

Local water security action planning (LWSAP) is a participatory process that comprises seven interrelated activities, as illustrated above. Each of the seven activities comprises two or more steps, making a total of 20 steps in the LWSAP process, as shown in Table 1. Each step has a particular deliverable. All 20 steps and their deliverables are described in detail in the chapters of the manual.

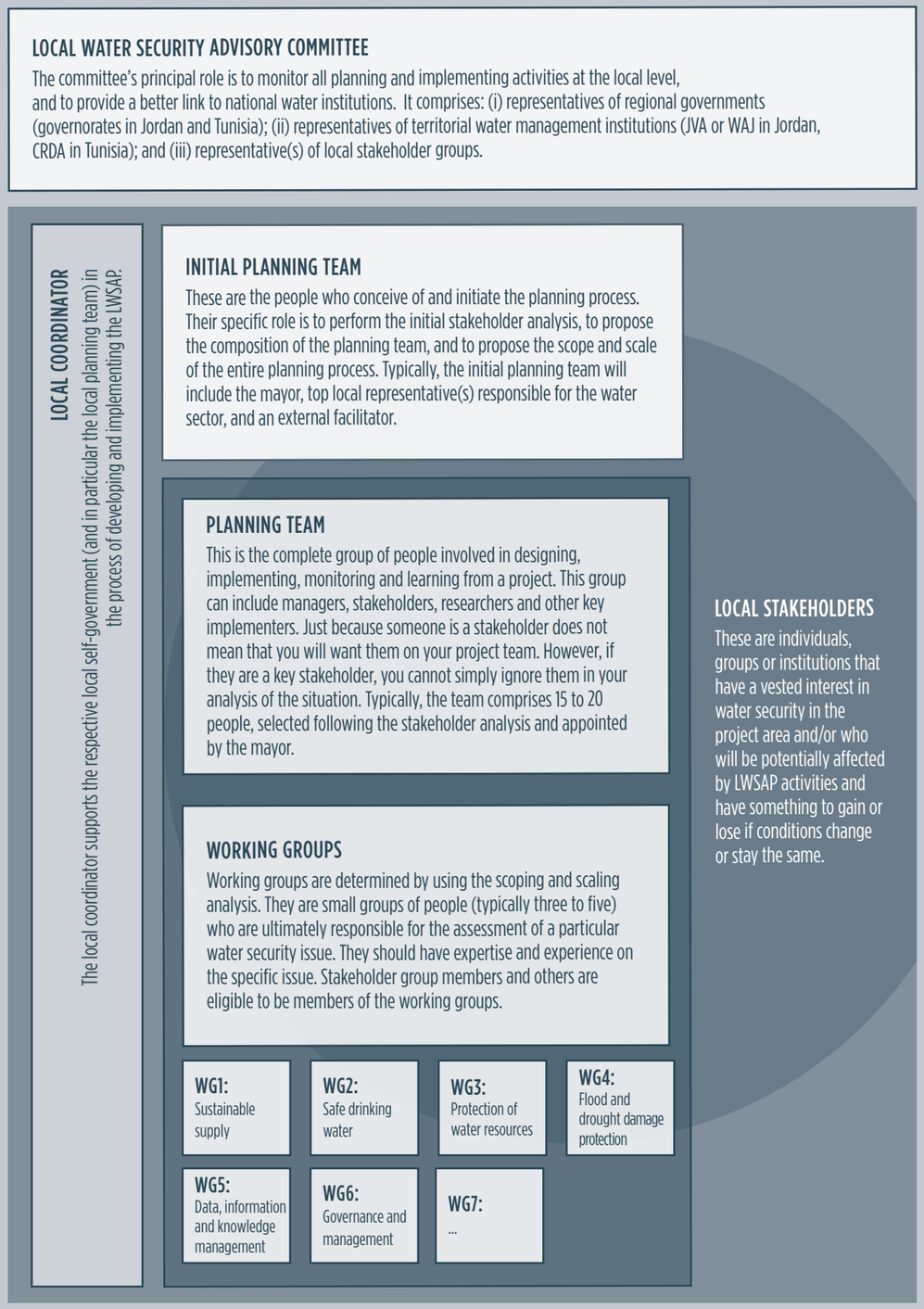
TABLE 1 STEPS IN THE LOCAL WATER SECURITY ACTION PLANNING PROCESS

ACTIVITY	STEP	DESCRIPTION	DELIVERABLES
1 Defining scale and scope	01 Initial assessment	Initial planning team, coached by local coordinator, carries out initial assessment in order to collect and systematise the data necessary to define the spatial scale, the topics of substantive focus and the principles to be operationalised during the planning process.	• Initial assessment report
	02 Scoping and scaling	Initial planning team, in consultation with local coordinator and stakeholders, determines the scope and scale of the LWS planning exercise and proposes goals and objectives. This should include a preliminary campaign to generate public interest and support.	• Scope and scale of the LWSAP
2 Setting up local planning team	03 Stakeholder analysis	Initial planning team, in consultation with local coordinator, carries out the stakeholder analysis.	• REC's "green sheet" table on stakeholder analysis
	04 Formal establishment of the planning team	Local self-government decision-making authority formally appoints local planning team by a written decision (order), thereby establishing the terms of reference for the planning team.	• Order on the establishment of the local planning team
3 Assessing the current status of water security	05 Public opinion assessment	Planning team, supported by external experts, carries out the public opinion assessment, including identification of key issues, sample design and framing, data acquisition and analysis, and interpretation of results.	• Report on public opinion assessment
	06 Local water security assessment	Planning team and working groups carry out indicator-based assessment of the current status of water security and deliver the assessment report. • Definition of scope and data availability for the assessment process • Indicator-based assessment • Final LWS assessment	• REC's "green sheet" assessment table on LWS • Narrative LWS assessment report
4 Analysing and prioritising problems	07 Formulation of problem statements	Working groups analyse manifestations of problems listed in the assessment report and "deconstruct" them in order to define root causes.	• Draft problem statements
	08 Definition of problem statements	Working groups define lists of problem statements.	• Developed problem statements
	09 Prioritisation of problems	Planning team, facilitated by local coordinator, discusses the lists of problems defined by the working groups and formulates a list of priority problems.	• List of priority problems

TABLE 1 (CONTINUED)

ACTIVITY	STEP	DESCRIPTION	DELIVERABLES
5 Designing the action plan	10 Development of a vision	Planning team discusses and decides on the definition of the LWS vision at a planning team meeting or workshop, facilitated by local coordinator.	• Developed vision
	11 Definition of goals and objectives	Planning team discusses and decides on the goals and objectives at a planning team meeting or workshop facilitated by local coordinator.	• REC's "green sheet" table on LWS goals and objectives
	12 Identification of actions	Working groups identify and formulate appropriate actions for the respective topics of substantive focus. Planning team further discusses and decides on the actions at a planning team meeting or workshop facilitated by local coordinator.	• REC's "green sheet" table on identification of LWS actions
	13 Specification of actions	Planning team determines the responsibilities, timeframe, technical and legal issues, resources, possible negative effects and communication issues for each specified action. Planning team discusses and makes decisions at a planning team meeting or workshop facilitated by local coordinator.	• REC's "green sheet" table on specification of LWS actions
	14 Prioritisation of actions	Planning team selects prioritisation criteria and applies them in order to prioritise actions. Planning team carries out the ranking exercise and prioritisation at a planning team meeting or workshop facilitated by local coordinator.	• Prioritised actions
	15 Formulation of a framework action plan	Planning team, facilitated by local coordinator, develops framework action plan.	• Draft action plan
6 Implementing the action plan	16 Definition or establishment of implementation structure(s)	Planning team, facilitated by local coordinator, develops a framework for action plan implementation, including the assignment of existing structures and/or recommendations for new structures. This step must be carefully coordinated with all stakeholders and discussed with the local administration and decision makers.	• Structure of implementation plan
	17 Development of implementation plan	Planning team develops an implementation plan.	• Implementation plan
	18 Documentation of implementation	Planning team develops procedures for documenting the implementation of the plan.	• Documentation
7 Monitoring and evaluation	19 Performance monitoring	Planning team develops a monitoring plan.	• Monitoring plan
	20 Evaluation and impact assessment	Planning team develops an evaluation plan.	• Evaluation plan

FIGURE 8 PROPOSED STRUCTURE OF THE LWSAP TEAM



Organisation of LWSAP team

The proposed structure of the LWSAP team at the level of local administrative unit is shown in Figure 8.

LOCAL WATER SECURITY ADVISORY COMMITTEE

The principal role of the local water security advisory committee is to monitor all planning and implementation activities at local level and to provide better links with national water institutions. The structure of the committee depends on the set-up and responsibilities of the national water sector, as well as the level of decentralisation in the particular country. Ideally, the committee should comprise:

- a representative of the central governance body responsible for water management;
- representatives of the regional government (governorates);
- representatives of territorial water management institutions (JVA or WAJ in Jordan, CRDA in Tunisia); and
- representative(s) of local stakeholder groups.

INITIAL PLANNING TEAM

The principal role of the initial planning team is to conceive and initiate the planning process. The team performs the initial assessment and defines the spatial scale, the topics of substantive focus, and the principles, goals and objective(s) to be operationalised during the planning process. The initial planning team also carries out the stakeholder analysis and proposes the composition of the planning team.

Typically, the initial planning team involves the mayor, high-level local representative(s) responsible for the water sector, and a local coordinator.

LOCAL COORDINATOR

The local coordinator supports the planning team in the process of developing and implementing the LWSAP. He/she should be trained or experienced in leading a participatory process and facilitating discussions, consultations and meetings, and must have the skills to make joint activities more efficient and participatory.

PLANNING TEAM

Planning team members are involved in designing, implementing and monitoring the LWSAP. The group may include managers, stakeholders, researchers and other key implementers. It serves as a board of directors for the planning effort and governs the planning process, including decision making. It typically comprises selected stakeholder representatives who are coordinated into thematic working groups, public forums and workshops to analyse problems and opportunities; propose actions, targets and triggers; and prepare the draft action plan. The planning team is typically made up of 15 to 20 people, selected following the initial stakeholder analysis and appointed by the mayor.

Although not all stakeholders are automatically included in the planning team, key stakeholders should not be ignored in any analysis of the situation.

WORKING GROUPS

Because the LWSAP process involves a variety of activities, the planning team is likely to want to form partner-based organisational structures, or working groups, to implement specific elements of the process. An issue-specific working group is a small body of stakeholder representatives and experts who meet to address a cross-cutting issue of common concern. Members possess mutually complementary information, expertise, policy and implementation instruments and resources, which they use in collaboration in the framework of the participatory process.

Action plan development is usually an iterative process in which specialist working groups prepare specific proposals and submit them to the planning team or forum for review, comments, changes and decisions. The number of working groups and the topics they address are determined following the results of the scoping and scaling analysis. (Typically, each topic of substantive focus will have its own working group.) Working groups are nominated by the planning team and comprise three to five people who are ultimately responsible for assessing a particular water security issue. Each working group should include people that have expertise and experience in the particular issue. Planning team members and external experts are both eligible to be nominated as working group members.

LOCAL STAKEHOLDERS

Any individuals, groups, institutions or firms that may have a relationship with the project or programme are defined as stakeholders. In the case of LWSAP, stakeholders are individuals, groups or institutions that have a vested interest in water security in the project area, and/or that will be potentially affected by LWSAP activities and have something to gain or lose if conditions change or stay the same. They may — whether directly or indirectly, positively or negatively — affect or be affected by the process and by the outcomes of projects or programmes.

In the context of participatory decision making, the term "stakeholder" is applied to groups, organisations (formal and informal; public and private) and individuals who have an important "stake" in the process of local water management and governance.

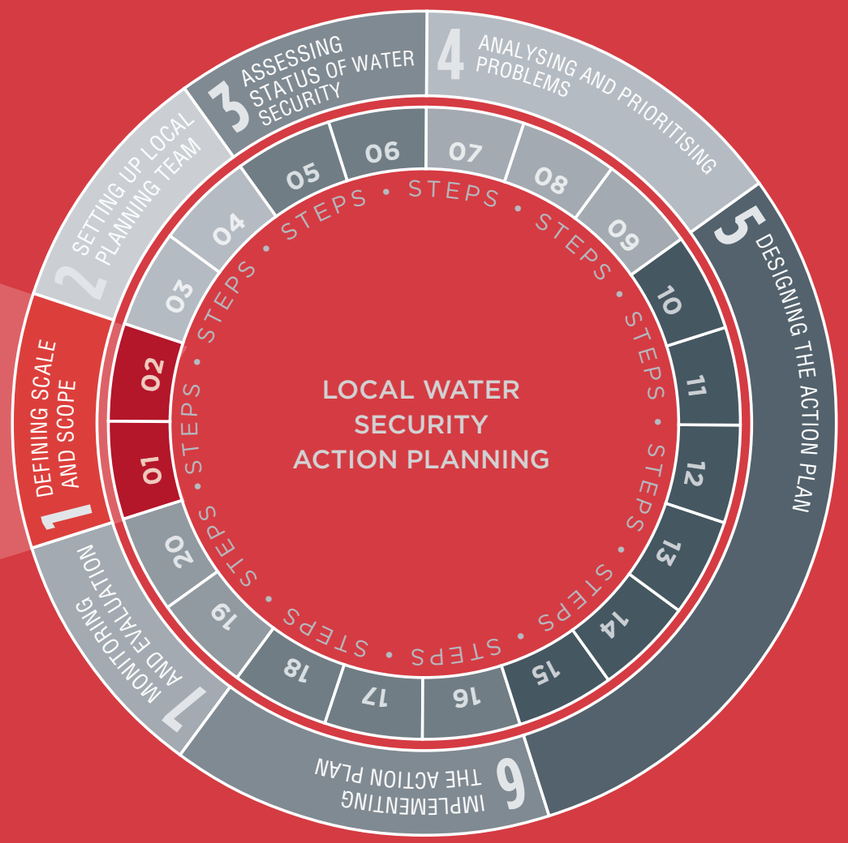
1 Defining scale and scope

01 Initial assessment
02 Scoping and scaling

Professor Dr. Slobodan MILUTINOVIĆ

Planning is only valuable if it generates action. The first step in any planning exercise should therefore be to define the "scene" — that is, the issues, locations and time period of action. By defining the scale and scope of the LWSAP process, the initial parameters for the entire planning exercise are established. These initial parameters involve two main factors:

- spatial definition; and
- substantive focus.



STEP 01

Initial assessment

Initial planning team, coached by local coordinator, carries out the initial assessment in order to collect and systematise the data necessary to define the spatial scale, the topics of substantive focus and the principles to be operationalised during the entire planning process.

The initial assessment (sometimes referred to as "community profiling") involves building up a picture of the nature, needs and resources of a community. It is a useful first stage in any community planning process in order to establish a context that is widely agreed on. The initial LWSAP assessment report is used to initiate the planning process and to develop a proposal for the scope and scale of the planning, for further discussion by stakeholders. The typical structure of the initial assessment report is illustrated in the box on page 25.

By way of an example, the initial LWS assessment report for the municipality of Al Karak can be found in Annex 1 (page 90).

INITIAL LWS ASSESSMENT

PURPOSE

The aim is to:

- develop a preliminary profile of the local self-government unit with respect to water security issues, to be further used in the LWSAP;
- propose the scope and scale of the entire planning process, including the spatial scale and the topics of substantive focus; and
- propose the goal and objective(s) of the LWSAP process.

INPUTS

The assessment should be based on existing data and experience (no new research is necessary) that covers (but is not limited to) the following main issues:

- water quantity;
- drinking water supply;
- sanitation; and
- water quality (including environmental issues, impacts on human health and impacts on the health of aquatic ecosystems).

SUGGESTED CONTENT

1. Country and regional context

- Political, economic and social context.
- Constraints facing the water sector at the national and regional level (a list and brief explanation).
- Main national and local-level initiatives and ongoing processes related to water security (a list and brief explanation).

2. Local context

- Overview of water management challenges:
  - brief regional overview (geography, climate, hydrology and hydrogeology, socioeconomic characteristics); and
  - water-related drivers and challenges (water use and demand; vulnerability to extreme hydrological events and climate change; land and water quality degradation).
- The "governing" dimension of water security:
  - institutions and actors involved (initial list of stakeholders; public participation and stakeholder involvement issues); and
  - efforts and local initiatives on water-related issues (past and ongoing).
- Initial problem analysis (narrative, plus initial list of problems).

3. Proposed topics of substantive focus (clear list)

STEP 02

Scoping and scaling

Initial planning team, in consultation with local coordinator and stakeholders, determines the scope and scale of the LWSAP exercise and proposes goals and objectives. This should include a preliminary campaign to generate public interest and support.

The scope of the planning is usually determined by five factors:

- the subject of concern (in the case of LWSAP the subject is clearly defined as local water security, as defined in the introduction to the present manual);
- the geographical area covered by the planning (e.g. neighbourhood, municipality, region, watershed);
- the relevant jurisdictions (e.g. political, geographical or service jurisdiction);
- time (including both the urgency of the problem or problems addressed and the number of years to be covered by the final plan); and
- the institutional and community resources available for planning activities.

These factors will ultimately determine how comprehensive or focused the planning effort will be. In this phase of the LWSAP process, specific attention should be paid to including all voices in scoping and scaling.

Spatial definition

By definition, the LWSAP focuses on a local self-government territory in a particular country, a geographical area that is legally defined by existing legislation. The LWSAP process should address a geographical area that is sufficiently large to ensure that plan implementation will address all the major sources and causes of impairments and threats to water security, as defined in the introduction to the present manual. Although there is no rigorous definition or delineation of this concept, the general intention is to avoid a focus on single neighbourhoods or other narrowly defined areas that do not provide an opportunity for addressing watershed stressors in a rational, efficient and economical manner, at least in the early stages of the planning process. At the same time, the scale should not be so large that it hampers the possibility to conduct detailed analyses, or minimises the probability of involvement by key stakeholders and successful implementation. Selecting too broad a scale may mean only being able to carry out cursory assessments, making it difficult accurately to link impacts back to sources and causes. It is also useful to make a distinction between the scale at which the problem/challenge is experienced and the scale at which effective interventions can be made.

In Jordan, LWSAPs should be implemented in category 1 municipalities (governorate centres and any other municipality whose population exceeds 100,000), despite the fact that municipalities are not formally seen as local public entities with broader local responsibilities. However, (1) the municipal level is the only level of government with an elected mayor and executive council that can be instrumentalised for a participative local planning process; (2) municipalities in other categories are smaller than category 1 municipalities, with consequently fewer internal capacities; and (3) some encouraging efforts and innovative practices can be observed in Jordanian municipalities, such as the establishment of a participative mechanism in Al Karak. All the above indicates that the results of project activities will be more effective in bigger municipalities. Given the complexity of the post-2011 territorial and political organisation in Tunisia, the LWSAP exercise will have the best results at the level of delegations (*mutamadiyat*) (Milutinović et al. 2015).

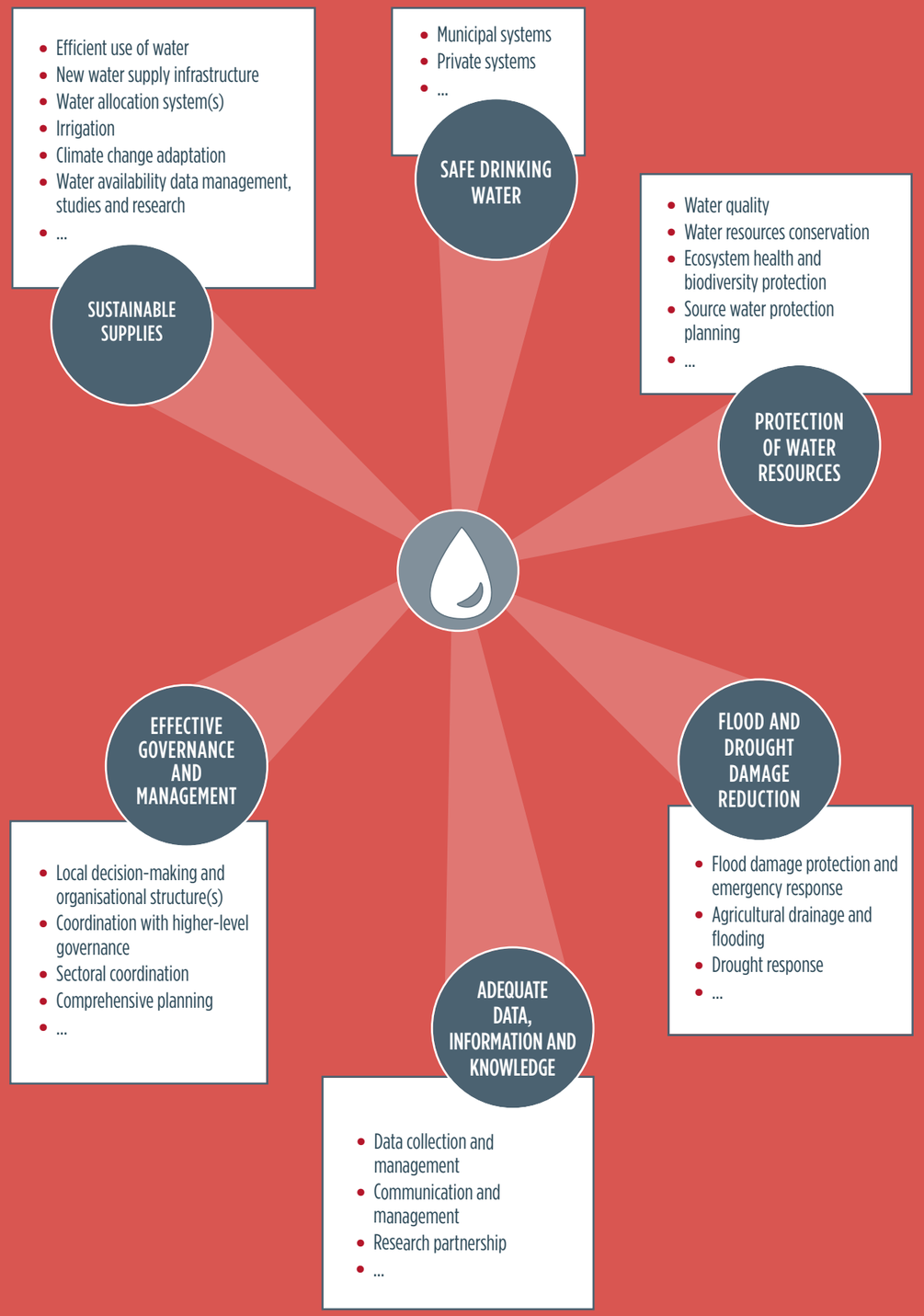
Topics of substantive focus

Given that local water security is a complex issue, predefined by many factors (e.g. the position of the local self-government in the national system, power issues, geographical situation and water-related circumstances), the local self-government will need to decide to what extent the LWSAP process can be narrowed down. This is often referred to as the "Where do you enter?" question.

Figure 9 shows typical topics of substantive focus.

The initial planning team may decide that resources for planning are not adequate for a simultaneous review of the full range of water security issues facing the local community. In this case, the planning approach would be designed to focus on priority issue(s) (to be determined), while simultaneously considering the impact on it of activities in other areas.

FIGURE 9 TOPICS OF SUBSTANTIVE FOCUS IN THE LWSAP

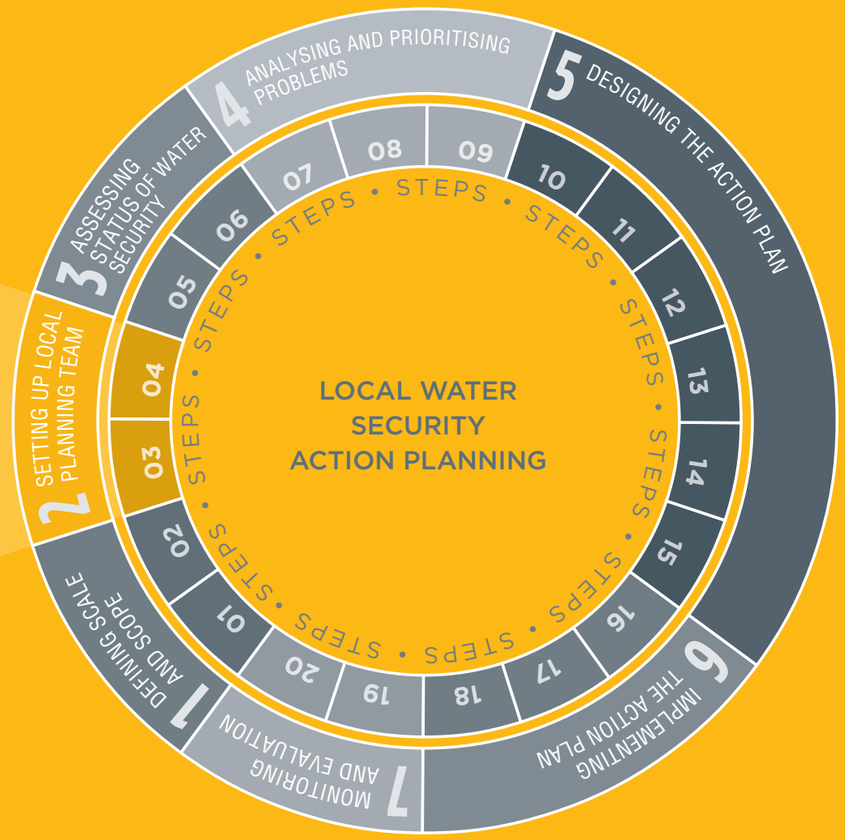


2 Setting up the local planning team

03 Stakeholder analysis
04 Formal establishment of the planning team

Professor Dr. Mark REED
Professor Dr. Slobodan MILUTINOVIĆ

Activity 2 of the LWSAP process, Setting up the local planning team, is divided into two steps: Stakeholder analysis (Step 03) and Formal establishment of the planning team (Step 04).



STEP 03

Stakeholder analysis

Professor Dr. Mark REED

Initial planning team, in consultation with local coordinator, carries out the stakeholder analysis.

The LWSAP process requires a systematic initial assessment of stakeholders in each beneficiary country in order to identify and prioritise stakeholders for inclusion in the action planning process. In order to do this, project teams within each country need to carry out a stakeholder analysis, and this chapter of the manual provides a detailed methodology for doing so.

After giving a clear definition of stakeholders and stakeholder analysis, and providing illustrative examples of stakeholders, the present chapter continues with a detailed and replicable method for conducting a stakeholder analysis in each beneficiary country, including templates that can be used to systematically collect and organise information about relevant stakeholders.

Why analyse stakeholders?

It may seem self-evident that all the relevant stakeholders should be identified prior to any attempt to engage. However, it is surprising how often this step is omitted in projects that need to work with stakeholders. In many cases this omission can significantly compromise the success of a project. For example, the project may miss crucial information that could have been provided, had the project team engaged with the right people. In cases where very few stakeholders are identified or engaged with, there is a lack of ownership of the project goals, which can sometimes turn into opposition. In cases where a single important stakeholder has been omitted from the process, that organisation may challenge the legitimacy of the work and undermine the credibility of the wider project.

Stakeholder analysis helps solve these problems by:

- identifying who has a stake in the work you are doing (see box on page 32);
- categorising and prioritising stakeholders with whom you need to invest the most time (see box on page 33); and
- identifying (and preparing you for) relationships between stakeholders (whether conflicts or alliances).

A successful stakeholder analysis will help you:

- **Start talking early to the right people.** This will help you to identify any major barriers to your work and to identify the people who can help you overcome those barriers. There is evidence that projects that engage with stakeholders early engender a greater sense of ownership among stakeholders, who are then more likely to engage throughout the lifetime of the project and implement the recommendations of the work you have done together.

STAKEHOLDER

A stakeholder is any person, organisation or group that is affected by or who can affect a decision, action or issue — for example water management. Rather than just identifying "beneficiaries", a stakeholder analysis seeks to identify people, organisations or groups that may be either positively or negatively affected by water security action planning. In addition to identifying those affected by the planning process, stakeholder analysis seeks also to identify those who might affect the outcome of the planning process, either positively or negatively. These stakeholders might not directly benefit from or be negatively affected by water management, but they may have the power to enable or block the planning process and/or the desired outcomes of that process.

- **Know who you need to talk to.** Don't just open your address book or talk to the "usual suspects". Find out who might lose out, as well as who will benefit. Find out who is typically marginalised and left out, as well as the people and organisations that everyone knows and trusts. Those who are left out are usually the first to question and criticise work over which they feel no sense of ownership.
- **Know what they are interested in.** You need to have a clear idea of the decision or issue at stake before you can effectively identify stakeholders. However, that does not mean that the decision or issue should be set in stone. As you begin to identify stakeholders, you will find out more about the nature of their stake in the decision or issue, and you may need to broaden your view of what is included in your work if everyone is to feel that their interests are taken into account.
- **Find out who has the most influence to help or hinder your work.** Some people, organisations or groups are more powerful than others. If there are highly influential stakeholders who are opposed to your project, then you need to know who they are so that you can develop an influencing strategy to win their support. If there are those who support your work, then it is also important to know who these stakeholders are, so you can join forces with them to work more effectively. There will be some influential stakeholders who have relatively little interest in your work. They may, for example, have a broad remit that includes many issues that are more important and urgent to them than the specific remit of your work. Influential individuals are often busy and inaccessible, and you may need to spend significant time and energy getting their attention before you are able to access their help.
- **Find out who is disempowered and marginalised.** Stakeholder analysis is often used to prioritise more influential stakeholders for engagement. Although time and resources may be limited, it is important not to use stakeholder analysis as a tool to further marginalise groups that are already disempowered and ignored. Many of these groups may have a significant interest in water resources management, but very little influence over those resources.
- **Identify key relationships.** This will help you to avoid exacerbating conflicts and can create alliances that empower marginalised groups. It can be incredibly valuable to know in advance about conflicts between individuals, organisations or groups, so that you can avoid inflaming conflict and, where possible, resolve disputes. Through stakeholder analysis it can sometimes become possible to create alliances between disempowered groups and those with more power who share similar interests and goals, thereby empowering previously marginalised groups.

A methodology for stakeholder analysis

The following methodology has been developed for application by project teams across each of the municipalities and delegations involved in the WATER SUM project. The following steps are designed to be straightforward and replicable, but this does not mean that they should be applied inflexibly. Local circumstances may require that the steps be adapted in order to ensure that the stakeholder analysis is a tool that brings stakeholders together and facilitates action planning.

1. **Initial planning team identifies two to four cross-cutting stakeholders in each municipality/delegation**. The key criterion for selection is the stakeholder's breadth of interest in the issue. They should be familiar with the widest possible range of organisations that might have a stake in the issue (e.g. an NGO with an interest in water availability linked to health, livelihoods and environment across the municipality, rather than one that works specifically with women or young people in a small number of villages). Aim to include organisations that represent a range of different perspectives on the issue, so that you can facilitate debate about the relative interests and influence of the different stakeholders (e.g. someone from a government department or agency and someone from an NGO, not just people from different government departments).
2. **Invite cross-cutting stakeholders to a half-day workshop**. Only two to four stakeholders plus the project team should be present at the workshop, as the aim is not to represent all stakeholders (this is not possible as we have yet to systematically identify them). The workshop should last approximately four hours, although if there is time it is more relaxed to have a day-long event:
   a. Clearly establish the focus of the project or issue that organisations might have a stake in. It is important to be as specific as possible about your focus, so that you can clearly identify who has a stake and who does not. You might want to consider the geographical or sectoral scope of the project (e.g. Are you interested only in stakeholders at municipality level, or is this a national issue that may involve national stakeholders? Are you looking primarily at the domestic or industrial use of water?). A discussion about this at the start of the workshop should clarify any differing perceptions among the group, in order to avoid confusion later (approximately 15 minutes).
   b. Choose a well-known stakeholder organisation and run through the stakeholder analysis for this organisation as an example.

Identifying stakeholders

PROMPTS

A number of questions may be asked to help identify stakeholders, for example:

- Who will be affected by the work?
- Will the impacts be local, national or international?
- Who has the power to influence the outcomes of the work?
- Who are potential allies and opponents?
- What coalitions might be built around the issues being tackled?
- Are there people whose voices or interests in the issue may not be heard?
- Who will be responsible for managing the outcome?
- Who can facilitate or impede the outcome through their participation, non-participation or opposition?
- Who can contribute financial or technical resources towards the work?

Identifying stakeholder categories

CATEGORIES

Alternatively, identify stakeholder categories and ask if there are stakeholders from them that you should include:

- Government departments, politicians and government agencies
- Industry/producer representative bodies/associations, and trading partners
- Media
- Landowners and land managers
- Special-interest/lobby groups
- National representative and advisory groups
- Research organisations
- Professional groups and their representative bodies
- Representative groups (e.g. for consumers or patients)
- NGOs and community groups

TABLE 2 REC'S "GREEN SHEET" TABLE ON STAKEHOLDER ANALYSIS: A WORKED EXAMPLE

NAME OF ORGANISATION/ GROUP	INTEREST (H/M/L)	WHAT ARE THEIR CURRENT LEVELS OF INVOLVEMENT IN WATER MANAGEMENT PLANNING, AND WHAT ASPECTS OF THE LWSAP PROCESS ARE THEY (LIKELY TO BE) MOST INTERESTED IN?	IF INVOLVEMENT AND/OR INTEREST IS L/M, HOW MIGHT WE MOTIVATE THEIR ENGAGEMENT WITH LWSAP? WHAT BENEFITS MIGHT THEY DERIVE FROM BEING MORE INVOLVED IN LWSAP?	LEVEL OF KNOWLEDGE ABOUT WATER-RELATED ISSUES (H/M/L)		ACCESS TO HIGH-QUALITY INFORMATION ABOUT WATER-RELATED ISSUES (H/M/L)	INFLUENCE ON WATER MANAGEMENT (H/M/L)	COMMENTS ON INFLUENCE (E.G. ATTITUDES TO WATER MANAGEMENT PLANNING, TIMES OR CONTEXTS IN WHICH THEY HAVE MORE/LESS INFLUENCE)	ANY IMPORTANT RELATIONSHIPS WITH OTHER STAKEHOLDERS? (E.G. CONFLICTS/ALLIANCES)
Households	H	Involvement in water management planning varies significantly between households, but all households are water users and thus significantly affected by water management.	N/A	L		L	L	None	Many households in the area rely on agriculture for at least part of their income, hence strong links with both types of farming stakeholder below.
Farmers using irrigated land	H	Farmers with land close to water sources growing crops that depend on irrigation water are heavy water users and are significantly affected by water quality and quantity issues.	N/A	M		L	M	Those within the farming union and cooperatives have a more organised and stronger voice.	Strong relationships with the wider farming community, including upland rain-fed farmers.
Upland rain-fed farmers	L	Interested indirectly as householders, or where they also own irrigated lowland fields, but otherwise not directly affected by changes in water flow or quality.	Given low interest and influence, it is not a priority to engage with this group.	L		L	L	None	Strong relationships with community of farmers using irrigation, often through family ties.

TABLE 2 (CONTINUED)

NAME OF ORGANISATION/ GROUP	INTEREST (H/M/L)	WHAT ARE THEIR CURRENT LEVELS OF INVOLVEMENT IN WATER MANAGEMENT PLANNING, AND WHAT ASPECTS OF THE LWSAP PROCESS ARE THEY (LIKELY TO BE) MOST INTERESTED IN?	IF INVOLVEMENT AND/OR INTEREST IS L/M, HOW MIGHT WE MOTIVATE THEIR ENGAGEMENT WITH LWSAP? WHAT BENEFITS MIGHT THEY DERIVE FROM BEING MORE INVOLVED IN LWSAP?	LEVEL OF KNOWLEDGE ABOUT WATER-RELATED ISSUES (H/M/L)		ACCESS TO HIGH-QUALITY INFORMATION ABOUT WATER-RELATED ISSUES (H/M/L)	INFLUENCE ON WATER MANAGEMENT (H/M/L)	COMMENTS ON INFLUENCE (E.G. ATTITUDES TO WATER MANAGEMENT PLANNING, TIMES OR CONTEXTS IN WHICH THEY HAVE MORE/LESS INFLUENCE)	ANY IMPORTANT RELATIONSHIPS WITH OTHER STAKEHOLDERS? (E.G. CONFLICTS/ALLIANCES)
Union of Farmers	H	The Union of Farmers has been putting pressure on the government for some time not to restrict access to irrigation water, and to invest in schemes to pipe water from other regions to this area.	N/A	H		M	M	Despite having strong relationships with some politicians, the Union of Farmers has failed to achieve the objectives for which it has been campaigning.	Farmers using irrigation water are well represented in the Union of Farmers, but upland farmers feel under-represented and membership from this group is far lower.
Local small businesses that depend on regular flows of clean water (e.g. food and drink sector)	H	Without adequate alternative supplies, water quality and quantity concerns can be a major problem for some businesses in the area.	N/A	L		L	L	None	Few small businesses have strong links with the government, the farming community or the NGO community, which reduces their influence.
Multinational businesses	L	The local steel works is water intensive but is located upstream from most other water users, thus has preferential access to low flows. It has little interest in the problems this creates downstream, especially during drought years.	Explore how more efficient water use might reduce costs and hence increase profits for the company. Look for evidence of failures to meet regulatory requirements to see if legal action could be taken. Explore potential for public campaigns (including via print and social media) to exert pressure on the company.	L		H	H	Water use by the steel works is one of the key causes of low flows and increased pollution levels.	The CEO has married into a wealthy local family who have farming interests.
Government public health agencies	M	High interest in specific areas where pollution is leading to health problems, and during drought years, but otherwise less directly interested in water management.	N/A	L		M	L	There is a lack of communication between government departments and agencies.	Generally disconnected from other stakeholders affected by these issues.
Government Environmental Protection Agency	H	Statutory obligation to monitor and manage water resources.	N/A	H		H	M	Due to limited resources, the agency has historically not been able to bring about significant changes in water resources management.	There is a conflict between the Environmental Protection Agency and the environmental NGOs that have been putting pressure on it to improve water management.
IUCN water management project	H	High interest within the project team that is focusing on water management.	N/A	H		H	M	At this point, the project is not sufficiently well known for its influence to be estimated. However, if the project achieves its goals, it will have been highly influential. Of course, if it does not achieve its goals then its influence will have been low.	Strong relationships with environmental NGOs and government (one of the only environmental organisations to have positive relationships with the Environmental Protection Agency).
Other environmental NGOs	M	Other environmental NGOs are focusing on a wide range of topics and do not have specific programmes related to water management. However, they are indirectly interested when water management problems compromise species and habitats on which they are working.	N/A	M		M	L	Do not tend to work specifically in the field of water management, so have relatively little influence over water management issues.	Involved in a number of longstanding conflicts with the government over nature conservation and natural resources management.
Local university	H	There is a strong research group focusing on integrated water management that is collaborating with the IUCN project.	N/A	H		H	L	The group has not been greatly engaged with stakeholders in the past.	Although links with other stakeholders are weak, the group is widely trusted by others.

Make a blank copy of the extendable matrix (Table 2) on flipchart paper and stick it to the wall so that everyone can see what is being done. Explain that interest and influence can be both positive and negative (e.g. a group's interests might be negatively affected and they may have sufficient influence to block as well as to facilitate) (approximately 10 minutes).

c. Ask participants to identify organisations, groups or individuals that are particularly interested and/or influential. List them in the first column of the matrix. Table 2 provides a worked example of the matrix in order to illustrate how the process works. Use the questions in the box as prompts to help you identify as many stakeholders as possible (approximately 15 minutes).

d. As a group work through each of the columns in the matrix. Focus on one stakeholder at a time, discussing the nature of their interest and reasons for their influence and capturing the discussion as well as possible in the matrix (get participants to record points on post-it notes where necessary to avoid taking too long) (one to two hours).

e. Take a break, and then invite participants to use the remaining time working individually to complete the columns for all the remaining stakeholders. Participants can add rows for less interested and influential stakeholders as they go. Remind people to try and identify groups that might typically be marginalised or disadvantaged, but that still have a strong interest (one hour).

f. Ask participants to check the work done by other participants. Participants can add their own comments using post-it notes where they disagree or do not understand (15 minutes).

g. Facilitate a discussion of the key points about stakeholders that people feel should be discussed as a group. Focus on points where there is particular disagreement or confusion and resolve these issues where possible (accepting the differing views where it is not possible to overcome differences) (30 minutes).

h. Identify key individuals with whom to triangulate findings after the workshop. Up to five individuals from particularly influential organisations should be selected, trying to get as wide a spread of different interests as possible. (To do this, it may be necessary to start with a longer list and then identify people who are likely to provide similar views in order to reduce the length of the list.) Finally, consider if there are any particularly important stakeholders who have high levels of interest but low influence, whom you do not want to marginalise, and go through the same process in order to arrive at a list of around seven or eight individuals with whom you can check the findings of the workshop.

3. **Interview key individuals to check that no important stakeholders have been missed**. Depending on the sensitivity of the material collected, you may want to share only the list of stakeholder organisations and their interests (rather than their level of interest or anything else). In the case of some individuals, it may be possible to check all columns in the matrix, but beware that some organisations may be upset that workshop participants perceive them to have a low level of interest and/or influence. If the list of stakeholders from the workshop is sent in advance, these interviews should take no longer than 30 minutes each and can be done by telephone.

4. Depending on how much the analysis changes after the workshop, you may want to **check the amended version with workshop participants** and make final tweaks.

5. **Write up results**. Some of the columns can easily be converted into graphs where there are numerical data or categories involved. Consider carefully whether you want all qualitative data to be made publicly available in a form that is linked to specific named organisations and individuals, especially where this concerns conflicts between organisations. For a publicly available version of the report, types of conflict may be summarised and the nature of stakes and types of influence may also be summarised for different types of stakeholder, accompanied by graphs of numerical data/categories. Farming organisations, for example, are most likely to be interested in certain aspects and have most influence over certain policy areas. The full stakeholder analysis matrix should be retained for use by the project team.

STEP 04

Formal establishment of the planning team

Professor Dr. Slobodan MILUTINOVIĆ

Local self-government decision-making authority formally appoints the planning team by a written decision (order), thereby establishing the terms of reference for the planning team.

Following the results of the stakeholder analysis, the local planning team needs to be officially established. This is done by means of a formal written decision (order) of the local self-government unit's decision-making authority (i.e. a mayor in Jordan or the head of the delegation in Tunisia).

As terms of reference, the formal written decision should contain the following elements:

- A list of planning team members.
- The mandate of the planning team, including, but not limited to:
  - activities to be jointly undertaken in the planning process;
  - the roles of the different participants in the planning process, including the specific activities to be performed, information to be provided, and schedules for their input and contribution;
  - standards for the sharing of information to be used in the process, including confidentiality agreements;
  - decision-making methods, including dispute resolution and review;
  - resources to be provided by each partner; and
  - agreements on how the outcomes of the planning process will be integrated into the statutory planning activities of the local self-government unit.

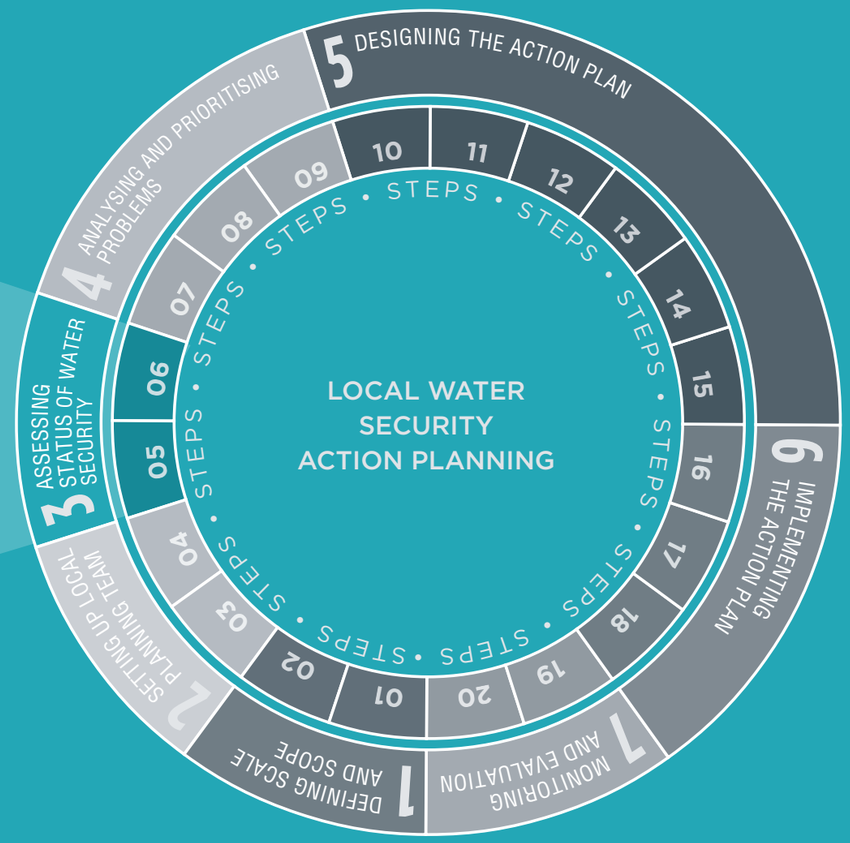
Just because someone is a stakeholder it does not mean that you will want them on your planning team. However, if they are a key stakeholder, you cannot ignore them in your analysis of the situation.

3 Assessing the current status of water security

05 Public opinion assessment
06 Local water security assessment

Dr. Anil GRAVES
Dr. Mirjana BARTULA
Dr. Jacob PETERSEN-PERLMAN
Professor Dr. Slobodan MILUTINOVIĆ

Activity 3 of the LWSAP process, Assessing the current status of water security, is divided into two steps: Public opinion assessment (Step 5); and Local water security assessment (Step 6).



STEP 05

Public opinion assessment

Dr. Anil GRAVES
Dr. Mirjana BARTULA

Planning team, supported by external experts, carries out the public opinion assessment, including identification of key issues, sample design and framing, data acquisition and analysis, and interpretation of results.

Public opinion surveys are designed to gauge the opinions, attitudes and experiences of a sample group of the population.

Why do a public opinion assessment?

Public opinion surveys are carried out in order to obtain an understanding of the aggregate opinions, attitudes and experiences of an entire population, and of different social groups within that population. The results of the public opinion assessment represent the first input for assessing the current status of water security. The planning team should use the report on the public opinion assessment to ensure that the development of the action plan is based on real local needs.

The methods are drawn from the social sciences and generally tend to take the form of closed-format questions addressed to individuals. Responses can then be aggregated and subjected to quantitative analysis in order to provide statistical data.

In the WATER SUM project, the public opinion survey will help to gain an understanding of the opinions, attitudes and experiences of people in Jordan and Tunisia, particularly in relation to water management, water governance and water security, as well as in relation to information on water and information on water development and management projects.

While it is important to understand how the sample group as a whole responds to these issues, it may also be important to understand how the individual groups vary, for example by geographical location (e.g. Is information provision better in some places then others?) and by social grouping (e.g. Are some people able to access more or better information than others? And why might this be the case?).

The survey will thus provide the basis for possible future action, where specific issues are seen to be important in improving water security, reducing poverty and halting biodiversity loss and environmental degradation.

Stages in the public opinion assessment

A public opinion assessment comprises several important steps, some of which are associated with the planning team, while others are undertaken in the field by the interviewers.

The stages in the assessment process, as illustrated in Figure 10, are described in detail in this chapter. The approach taken here has been developed largely on the basis of Bryman (2012). The first part of each box provides generic advice on how to complete the given stage in the assessment, while the text in blue highlights activities to be undertaken by the planning team at a planning team meeting, which might be organised in the form of a workshop with the help of a local coordinator.

It is worth noting that the process presented here can be seen as a generic framework for conducting public opinion surveys and reflects the approach taken in the WATER SUM project. In practice, the precise approach may vary from context to context and project to project. For example, who undertakes the stages may depend on the resources available to the project, the size of the public opinion assessment being undertaken, and the skills available within the project team.

FIGURE 10 STAGES IN THE PUBLIC OPINION ASSESSMENT

STAGE 1: IDENTIFICATION OF KEY ISSUES TO BE ASSESSED

It is difficult to commence any assessment without first identifying the key issues and context. Generally speaking, assessment commences with a broad understanding of the issues to be assessed, and, through a process of iteration, is gradually narrowed down to more specific questions. In this context, the formulation of key issues is important as it sets the direction for all subsequent steps in the development of the public opinion assessment.

Along with the local coordinator, identify and note the key issues related to water resources, and in particular to water security and water governance, in the given region. The information gained from the stakeholder analysis and engagement with local experts and key informants can be used when developing the direction of the public opinion assessment. You will need to answer the following question: How are these challenges linked to poverty, biodiversity loss and environmental degradation? Discuss the identified challenges. How do the challenges compare? Are there any contrasts?

STAGE 2: REVIEW OF LITERATURE AND THEORIES RELATING TO THE TOPIC

Narrowing down the issues to be assessed in order to formulate the assessment aims and objectives is usually associated with a review of the literature and prior theory relating to the topic. It is usually an advantage to identify whether any prior assessment has taken place in the area, whether locally or internationally. This helps to provide a context for the assessment, as well as providing precedents and possible approaches for the current assessment. For example, from a review of the literature it might become clear that water governance is a key concept. However, its investigation has various dimensions, and these have to be identified and explored before meaningful assessment questions and assessment instruments can be developed in order to study water governance in a particular location.

You may find this step difficult. However, a review of the literature and previous assessments is an important part of developing good survey tools.

STAGE 3: FORMULATION OF ASSESSMENT AIMS AND OBJECTIVES

Clearly formulated assessment aims and objectives will guide the eventual form of the assessment, for example whether qualitative or quantitative assessment is needed, or whether closed or open format questionnaires are used. They will also help in the drafting of questions for respondents in the study.

At a planning team meeting, identify a clear overall assessment aim for the public opinion assessment, then identify what specific objectives might be needed in order to achieve that overall assessment aim. Again, local experts and stakeholders can give advice and help to refine the aims and objectives of the public opinion assessment.

STAGE 4: IDENTIFICATION OF POPULATION AND LOCATION OF STUDY

The “population” is essentially the universe of people from which a sample is taken. The population may be a nation, a city or a collection of cities, or a municipality. A sample is a group selected for investigation from out of the population.

The sample needs to be drawn from a population that is relevant to the topic of investigation and to the assessment questions in order to provide useful data and information. In terms of location, it is important to ensure that the appropriate population is investigated. In many cases, the practicalities and logistics of the assessment also need to be considered. Is the population too remote to be accessed within the project budget or timeframe, for example? Does the whole population need to be sampled, or only a certain part of it?

Spend some time considering the population and the location of the assessment. What are the characteristics of the location and the population? In particular, how might these present challenges in terms of undertaking and completing a public opinion assessment? Are there isolated communities that need to be reached, for example? Are there certain sectors of society that are difficult to talk to? Do the populations have a complicated structure, with many different social groups that need to be represented? How might these challenges be overcome? Discuss the issues at a planning team meeting.

STAGE 5: IDENTIFICATION OF SAMPLE DESIGN, SAMPLING FRAME AND SAMPLE SIZE

The sample may take the form of a probability sample, where respondents are selected randomly; or a non-probability sample, where selection is based on certain criteria. Probability samples include simple random samples, systematic samples, stratified random samples, or multi-stage cluster samples. Probability samples are representative and allow for generalisation from the sample to the population. They also make possible inferential statistical tests, which can be used to make inferences about the population.

Non-probability sampling includes convenience sampling, snowball sampling and quota sampling. In these approaches, as the sample is not selected to represent the population, it is difficult to use the results to make inferences about the general population.

In the WATER SUM project we used a probability-based sample design, where, as noted above, the sample size is important. However, total sample size is more important than the size of the sample relative to the population. In a well-implemented study, the precision and representativeness of the sample increases as the sample size increases, since sampling error (the mismatch between sample respondents and the population) decreases the bigger the sample. However, beyond a certain sample size there is little increase in precision, so as the sample size increases the study becomes less and less cost-effective.

In practice, there do not appear to be any fixed rules for sample size, and actual size is likely to be determined by a number of factors, which may include the amount of time and money available. The rate of non-response or incomplete responses also needs to be considered. If, for example, it is expected that 20 percent of the sample will not reply to a questionnaire, then the sample needs to be 20 percent larger than the target sample size. A very heterogeneous population may also imply the need for a larger sample, especially if there is a need to analyse the data according to different social groups within that sample. Finally, some analytical techniques also require larger sample sizes than others.

It should be noted that error is an unavoidable part of any assessment. The proportional representation of selected social groups in the sample may not, for example, properly represent the proportions of those social groups within the population (sampling error). There may also be errors associated with the implementation of the survey, for example an inadequate sampling frame (number of respondents) due to the low response rate, which in turn means that the sample results cannot be generalised to the population as a whole (sampling-related error). The data collection instruments may be poorly developed (e.g. confusing questions), resulting in respondents not actually answering the question that is intended (data collection error). Finally, the collected data may be incorrectly processed, meaning that data from the field collection instruments (e.g. paper-based field questionnaires) are incorrectly copied into a computer for analysis (data processing errors).

At a planning team meeting, and in light of Stage 4, consider how you might select a sample to interview. You may, for example, feel that you need to obtain the views of certain social groups (e.g. men and women; rich and poor) in a representative way in order to determine whether they are affected differently by water resources and water governance issues. Are social data available to help you develop a representative sample? If not, how will you ensure that you are getting a representative sample of the population? Present your ideas to the other planning team members.

STAGE 6: IDENTIFICATION OF THE MODE OF ADMINISTRATION OF THE SURVEY INSTRUMENT

There are two major approaches to obtaining social data in a survey: structured interviews and self-completed questionnaires. Structured interviews are usually undertaken face to face or by telephone. Self-completed questionnaires are administered by the respondents themselves and may, for example, be sent by post or email, or set up on a website. In the WATER SUM project, the approach taken is that of structured, face-to-face interviews.

Structured interviews are one of the most commonly used approaches in surveys and research. The approach is closely associated with quantitative research. Using a standardised interview format, all respondents are asked exactly the same questions, in the same order, in order to minimise variations between interviews. This is important not only because the same interviewer is able to conduct interviews in an identical way, reducing intra-interviewer variability, but also because different interviewers are able to conduct interviews in the same way, reducing inter-interviewer variability.

Structured interviews often use closed-format questions with predefined response choices, which makes the subsequent data analysis more convenient and less time-consuming, and also reduces the level of coding variability and coding error.

Consider the practicalities of structured interviews that are undertaken face to face. How should the interviews be conducted? In particular, will the interviewers be able to speak to and interview all the necessary social groups? Might some of the interviewers need to be women, for example, so that they can interview other women? Discuss with the other planning team members.

STAGE 7: DEVELOPMENT OF PILOT QUESTIONNAIRE

A questionnaire can be developed using open questions or closed questions. Open questions are useful in terms of looking for unexpected or new data, as respondents are able to provide their own answers. However, the interviews are time-consuming, and it is both time-consuming and difficult to code such data afterwards.

The advantage of closed questions is that they are faster and easier to answer and process, and there is greater comparability of responses. The disadvantage is that it is difficult to identify all the answers that a respondent might be able to give, thus the range of possible responses is limited.

When developing the questions it is important to bear in mind the assessment aims, to be specific about what needs to be found out, and to imagine how the questions would appear to you if you were answering them. Can they be considered irrelevant, marginally relevant, vague or confusing? If so, they need to be re-written or deleted from the questionnaire.

The questions should be clear and precise and the selected responses should be clearly and logically related to the question that is being asked. Ambiguous words in answer sets (e.g. the scales used, such as “strongly agree”, “agree”, “neither agree or disagree”, “disagree”, or “strongly disagree”), for example “often” or “frequently”, should be

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avoided as they can mean many different things to different people. Excessively long questions, vague questions, leading questions, questions with two parts, questions asking more than one thing, questions containing negative terms, and questions containing technical terms that people may not understand should all be avoided.

Clear instructions on how respondents should answer must be provided for each question. It should be made clear, for example, whether respondents need to tick, circle, underline or delete from the answer set, and whether they should select only one or more answers from the set.

Good questionnaire development is time-consuming and several rounds of improvement are usually needed before a questionnaire is ready for use. A draft questionnaire has been developed (see Annex 3). Read the questionnaire and consider how the questions might appear to potential interviewees. Are they appropriate? Are they clear or confusing? Will people understand them? Does the questionnaire contain all the necessary questions to meet the aims and objectives identified and discussed in Step 3? If not, what do you think is missing?

STAGE 8: PILOTING, REVISION AND FINALISATION OF THE QUESTIONNAIRE

It is important to pilot test the questionnaire as improvements can always be made. It may be found, for example, that the questionnaire is too long or that some questions are confusing. The pilot can be used to see whether the questionnaire flows smoothly or is disjointed. It can also be used to determine whether the questionnaire instrument works as intended, or if improvements are needed. Piloting is also an opportunity for the interviewers to gain experience and to practise their interviewing skills before they interview people whose responses will be coded and used in the main part of the study.

The planning team, in cooperation with the local coordinator, needs to prepare health and safety guidance for the interviewers (regarding, for example, working after dark, working in risk zones, or gender issues).

Respondents who have been interviewed for a pilot study should not be included again in the final study.

A good pilot study is essential during questionnaire development. At a planning team meeting it is clearly not feasible to conduct a pilot, but you can still have a look at the questions and consider how they might appear to the people who you might typically interview. How will you conduct the pilot? Remember that a pilot study helps interviewers to get familiar with the questionnaire so that they will be better able to conduct the main interviews. Discuss the challenges of piloting at a planning team meeting. Will it be feasible? Present your ideas to the other workshop participants.

STAGE 9: SELECTION OF POPULATION SAMPLE AND ADMINISTRATION OF QUESTIONNAIRE

In the main part of the assessment, the interviews are conducted according to the sampling frame developed in Stage 5.

When conducting the main interview, it is important that the interviewer is familiar with and properly understands the interview format and the questions it contains. It is critical that different interviewers share the same understanding of the interview schedule and the questions.

At the beginning of the interview, it is good practice and polite for interviewers to introduce themselves, their organisation and their assessment topic, and to explain briefly how the interview will be conducted. It is important to reassure the respondent that their participation is voluntary, and that the data they provide will remain anonymous and confidential, thus any information they offer during the interview cannot be used against them or to identify them. It is also important to explain to the interviewee that they have the right to withdraw from the interview at any point, and that they may choose not to respond to a particular question if they find it embarrassing or inappropriate. They should also be informed that they are free to ask questions.

During the interview it is important to keep to the order of the questions and to record all the answers given. Generally speaking, during the questionnaire design it is best to put the most relevant questions first. This means putting questions concerning the participant's background to the very end. It is also considered best practice to ask general questions on a topic before specific questions, and to leave sensitive or difficult questions until the end of the questionnaire.

If a respondent does not answer a question properly, it is possible to probe them. However, it is important that this is done impartially, without leading the respondent towards a particular answer. If the respondent has not responded to a set of answer options, for example, both the question and the options can be repeated. Ideally, probing should be kept to a minimum as it could introduce interviewer bias or unintended interviewer effects into the survey.

An alternative strategy might be to use answer prompts. In closed-format questions, prompts are, in effect, already included in the form of a set of predefined answers. Reading out these predefined answers in the case of every question is quite tedious, so the respondent may be happy to read the prompts directly themselves, or from separate flash cards that can be given to the respondent during the interview. If the respondent cannot read, there may be no other choice but to read out the answers.

Once the interview is finished, the interviewer should be sure to thank the respondent for their time before they leave.

A key aspect of managing a survey is to ensure that it can be achieved within the resources that are available for it. Have a look at the draft questionnaire in Annex 3 and consider how long it might take to go through it. Consider also the time that might be needed between questionnaires to find other respondents. How many respondents might you be able to interview in one hour, and how many interviewers would be needed to conduct the required number of questionnaires? Is this possible within your budget constraints?

STAGE 10: ENTERING DATA INTO THE DATABASE FOR STATISTICAL ANALYSIS

Data entry is a relatively straightforward process when using closed-format questions. The key issue here is to ensure that the interview data are entered accurately, and that incomplete responses are identified.

Obtaining questionnaire data requires a lot of effort from a lot of people. It is therefore essential to ensure that the data are kept safe, and that interview sheets get safely from the interviewer to you so that they can be stored securely. A good practice is to examine the questionnaires as they come in to ensure that there are no systematic errors occurring in the completion of the forms and that all the questions are being properly answered. For this purpose it is useful to start entering the data into a spreadsheet programme as soon as they come in. Discuss how you would make sure that the data collected by interviewers reach you safely, and what you can do to ensure that they are stored securely in both paper and electronic format.

STAGE 11: ANALYSIS OF DATA AND INTERPRETATION OF FINDINGS

There are many ways in which closed-format questions can be analysed, depending on whether the data are interval or ratio data, ordinal data, or category data.

The types of analysis include univariate analysis, in which one variable at a time is analysed; bivariate analysis, in which two variables at a time are analysed to determine whether or not there is a relationship between them; and multivariate analysis, where three or more variables at a time are analysed to see how they relate to one another and whether some relationships are in fact likely to be associated with other variables.

A great number of statistical methods exist to explain how data variables relate to each other. Descriptive statistics, for example, include frequency tables, histograms, bar charts, pie charts, measures of central tendency (e.g. mode, mean, median) and measures of dispersion (e.g. range or standard deviation). These can all be used to describe the data.

Inferential statistics can be used to determine how well a sample represents the general population from which it was drawn. This method identifies the probability with which it is possible to draw conclusions about the population from which a sample was taken. Inferential statistics are used to identify different levels of statistical significance (risk) in falsely concluding that there are relationships in variables that can be inferred for the population from which the sample data came.

We may, for example, decide that we are happy to take a 1 in 20 risk (probability < 0.05) of falsely concluding that there is a relationship between two variables when there is no such relationship in the population from which the sample was taken. We could demand a higher threshold for our data — for example that there should be only a 1 in 100 chance of falsely concluding that there is a relationship between two variables

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(probability, or p, < 0.01) when there is no such relationship in the population from which the sample data were taken. A p value of 0.05 (a 1 in 20 chance of being wrong) is suitable for most purposes in the social sciences. A higher tolerance might be required if falsely concluding that a relationship between two variables exists could have very damaging consequences.

In practice, this stage may be managed by the planning team, supported by external experts and working groups (if and when needed). However, it is very important for those who are analysing the data to be able to talk to those who collected it, as this can help in interpreting the findings in a broader context. Were there, for example, questions that the interviewers felt respondents had systematically failed to understand?

STAGE 12: INTERPRETATION OF FINDINGS AND CONSIDERATION OF IMPLICATIONS FOR THE ASSESSMENT AIMS AND OBJECTIVES

The data and the results of the statistical analysis should be used to help meet the aims and objectives of the assessment and to answer the assessment questions.

The results are typically written up in the form of a report on the public opinion assessment, which should be simple, clear and to the point. Such a report typically includes a title page; acknowledgements; table of contents; list of figures; list of tables; executive summary; introduction and literature review; methods; results; discussion; conclusions; references; and appendices.

This is the final stage of the assessment process, and the stage at which the collected data are used to meet the assessment aims and objectives. While it is again likely that this stage will be largely the responsibility of the planning team, in practice it is useful if the interviewers are able to help interpret the findings and answer questions if needed.

STEP 06

Local water security assessment

Professor Dr. Slobodan MILUTINOVIĆ
Dr. Jacob PETERSEN-PERLMAN

The planning team and working groups carry out an indicator-based assessment of the current status of water security and deliver the LWS assessment report.

The starting point for the LWS assessment, the initial assessment (Activity 1, Step 1), has been defined on page 24. The planning team reconsiders the scope and scale defined in the initial assessment using the results in the report on the public opinion assessment, with a particular emphasis on the list of topics of substantive focus and the list of problems. The planning team may:

- adopt the list of topics of substantive focus as proposed in the initial assessment; or
- review the list of topics of substantive focus and make their own list.

The same approach may be used for the list of problems, which will be further discussed during the problem analysis step (Activity 4, Step 7).

Defining the scope and availability of data for the assessment process

IDENTIFYING KEY WATER-RELATED INDICATORS FOR LWS

Before completing the first part of the assessment, the key water-related issues and values need to be determined. In the water security context, all indicators can be classified according to five components: indicators related to resources; indicators related to ecosystem health; indicators related to infrastructure; indicators related to human health; and indicators related to capacities. Working groups will identify which components and indicators are important for topics of substantive focus, as defined in Step 2: Scoping and scaling. Suggested components and indicators for the indicator-based assessment process are shown in Table 3. This list can be expanded if needed.

The calculation process for each of the indicators is presented in Annex 2.

IDENTIFYING PRIOR WATER-RELATED STUDIES AND ACCESS TO INFORMATION

Earlier studies, if available, can be used as sources of information for the current assessment, thus it is worth considering whether there are lessons to be learned from previous experience(s).

COLLECTING AVAILABLE INFORMATION AND DATA

The data required to assess water security are likely to be dispersed across a number of organisations and government agencies. After identifying which indicators and components will be used, and how they will be weighted, working groups should identify organisations and/or departments that may have the required data — that is, on water quality, water quantity, infrastructure, ecosystem and human health, and capacities. In order to identify methods for data collection, the questions that need to be answered include:

- Are the reporting units and collection methods the same or different between datasets?
- Are there data for surface water and groundwater?
- Are the data accessible?
- Over what time periods are data collected (is data collection ongoing or sporadic)?

Responsibility for collecting information and data should be divided among already established working groups, according to the scope of their work. The planning team is in charge of compiling the final numerical score and identifying prior water-related studies.

If data are not available, it is useful to identify the data gaps. In the short term, these data gaps can be filled by the use of proxies.

The indicator-based assessment

IDENTIFYING AND CALCULATING INDICATORS

This part of the assessment combines the indicators agreed on by the planning team. The indicators measure different aspects of water security and result in a numerical score. Each of the 15 indicators shown in Table 3 is assigned its own score, ranging from 0 to 100. A higher score means that the community is closer to having ideal conditions for that particular indicator. Although the scores for each indicator may not entirely reflect threats to local water security, it can be generally assumed that:

- scores above 80 are close to ideal;
- scores between 60 and 79.9 indicate deficiencies; and
- scores below 60 indicate vulnerability within that indicator.

The 15 indicators are grouped into five component scores, each of which comprises the average score for three indicators. The five components are then averaged to calculate the final score.

The procedure for calculating the indicator scores is shown in Annex 2.

After all of the indicators have been calculated, component-level scores are determined by taking the average scores for the three indicators that make up that component. The worksheet provided can be used to keep track of the indicator and component scores.

The final LWS assessment

Once the working groups have determined the values of the indicators, the final LWS assessment should be initiated. The final assessment should be based on the data collected in the previous steps (including the previous experiences of planning team members) and should answer the following questions:

- What is the current status of water-related issues in the local self-government?
- What are the challenges that the local self-government may face in the future in relation to LWS?

The final assessment is compiled on the basis of the REC's "green sheet" assessment table for LWS (Table 4).

Responsibility for completing the assessment table is shared between working groups and the planning team. Initial data for the table (including indicators) should be provided by the working groups, and the planning team should give the final approval of the table.

TABLE 3 COMPONENTS AND INDICATORS FOR THE INDICATOR-BASED ASSESSMENT PROCESS

COMPONENT	INDICATOR	DESCRIPTION
Resource	Availability	The amount of renewable fresh water that is available per person
	Supply	The vulnerability of the supply, as affected by seasonal variations and/or decreasing groundwater resources
	Demand	The level of demand for water use based on water licence allocations
Ecosystem health	Stress	The amount of water that is removed from the ecosystem
	Quality	The Water Quality Index score for the protection of aquatic life
	Fish	Population trends for economically and culturally significant fish species
Infrastructure	Demand	How long before the capacity of water and wastewater services will be exceeded due to population growth
	Condition	The physical condition of water mains and sewers as reflected by system losses
	Treatment	The level of wastewater treatment
Human health	Access	The amount of potable water that is accessible per person
	Reliability	Indicator of service disruption days per person
	Impact	The number of waterborne illness incidents
Capacity	Financial	The financial capacity of the community to manage water resources and respond to local challenges
	Education	The human capacity of the community to manage water resources and address local water issues
	Training	Training levels that water operators and wastewater operators have received

TABLE 4 REC'S "GREEN SHEET" ASSESSMENT TABLE FOR LWS

BACKGROUND DATA			
NAME OF LOCAL ADMINISTRATIVE UNIT	AREA (KM^2)	POPULATION (LSG UNIT)	POPULATION (CITY OR TOWN)
Climate	Average temperature (°C)	Average precipitation (mm)	
	Further explanation (descriptive)		

TABLE 4 (CONTINUED)

BACKGROUND DATA (CONTINUED)				
Economy	Dominant economic activities (please provide a list)			
	Poverty rate (%)	Unemployment rate (%)	Income inequality (Gini coefficient or high/medium/low)	
	Further explanation (descriptive)			

WATER MANAGEMENT CHALLENGES				
Water availability	TOTAL WATER AVAILABILITY (MILLION M^3/YEAR)	AMOUNT OF RENEWABLE FRESHWATER AVAILABLE PER PERSON (M^3/CAPITA/YEAR)	AMOUNT OF WATER ANNUALLY ALLOCATED (MILLION M^3/YEAR)	
	Source(s) and location(s)			
	Source	List of sources/locations, quantity of utilised water and short description	Indicators	
	Surface water (base flows and reservoirs)		Runoff exceeded 5% of the year	
			Runoff exceeded 95% of the year	
			Total annual renewable surface flow (m^3/year)	
	Groundwater (sustainable groundwater yield, m^3/year)		Percentage of wells with rising water levels over a year or longer	
			Percentage of wells with no change in water level over a year or longer	
	Treated wastewater			
	Desalinated water			
	Harvested water in households			
	Water runoff ratio for surface water (0–1)		Groundwater supply vulnerability ratio (0–1)	
	Water supply ratio (0–1)			
Water demand	Annual water consumption (million m^3/year)		Annual water consumption per capita (l/day)	
	Municipal consumption rate (%)	Industrial consumption rate (including tourism) (%)	Agricultural consumption rate (%)	
	Water demand ratio (0–1)			
	Further explanation (descriptive)			

TABLE 4 (CONTINUED)

WATER MANAGEMENT CHALLENGES (CONTINUED)				
Infra-structure: Water supply network	Length (m)	Water pressure	System losses in water mains (%)	
	Rate of households connected to piped water (%)	Number of people currently being served by water system	Number of people that can be served at 100% capacity of existing system	
	Water supply service provider			
	List all water plants and the population served by each			
	Plant name		Population served	
	Further explanation (descriptive)			
	List of problems encountered		Geographical coverage: Locations	
Infra-structure: Sewerage network	Length (m)	Number of people currently served by sewerage system (all areas)	Number of people that can be served at 100% sewerage system capacity	System losses in sewerage network (%)
	Rate of households connected to sewerage network (%)		Rate of households connected to sewerage network (urban area) (%)	Rate of households connected to sewerage network (rural area) (%)
	Percentage of population served by sewers without treatment	Percentage of population served by sewers with primary treatment	Percentage of population served by sewers with secondary treatment	Percentage of population served by sewers with tertiary treatment
	List all wastewater plants and the population served by each			
	Plant name			Population served
	Alternative sewerage systems(s) in use (descriptive)			

TABLE 4 (CONTINUED)

WATER MANAGEMENT CHALLENGES (CONTINUED)			
Infra-structure: Sewerage network (continued)	Grey water treatment capacity (million m^3/year)		
	Further explanation (descriptive)		
	List of problems encountered		Geographical coverage: Locations
Water quality issues and degradation of natural resources	Percentage of culturally or economically significant fish populations that are increasing	Percentage of culturally or economically significant fish populations that are stable	Water Quality Index score (0–100)
	Overview of water quality issues (descriptive)		
	Water-related degradation of natural resources (list of problems encountered)		Geographical coverage: Locations
Water-related human health issues	Potable water available per capita (l/day)	Number of service disruptions experienced in a year	Number of people affected by each disruption
	Duration of each service disruption		Number of reported cases of waterborne diseases and illnesses in the past year
	Further explanation (descriptive)		

TABLE 4 (CONTINUED)

WATER MANAGEMENT CHALLENGES (CONTINUED)			
Vulnerability to extreme hydrological events and climate change	Droughts: Frequency and severity (descriptive + geographical coverage and locations)		
	Floods: Frequency and severity (descriptive + geographical coverage and locations)		
	Vulnerability to droughts and floods (list of problems encountered)	Geographical coverage: Locations	
THE "GOVERNING" DIMENSION OF WATER SECURITY			
Strategic and regulatory framework	List of national/regional strategies/action plans/studies relevant to LWS		
	List of strategic priorities/objectives drafted in national/regional documents relevant to LWS		
Internal capacities	Maximum provincial/territorial average for local government per capita surplus	Minimum provincial/territorial average for local government per capita surplus	Community's per capita surplus/debt
	Maximum provincial/territorial percentage of population aged 20–64 with a high-school education or higher	Minimum provincial/territorial percentage of population aged 20–64 with a high-school education or higher	Community's percentage of population aged 20–64 with a high-school education or higher
	Percentage of operators per plant that are industry certified		Percentage of operators per plant that have some other form of training
	Capacities (list of problems encountered)		

TABLE 4 (CONTINUED)

THE "GOVERNING" DIMENSION OF WATER SECURITY (CONTINUED)			
Level of public awareness	Public awareness and stakeholder involvement (descriptive)		
	Public awareness and stakeholder involvement (list of problems encountered)		
	Efforts and local initiatives in water-related issues (past and ongoing) (list)		

INDICATOR-BASED LWS VULNERABILITY ASSESSMENT			
COMPONENT	INDICATOR	SCORE (0–100)	Vulnerability indices (low for score above 80; medium for score between 60 and 80; high for score below 60)
Resource	Availability		
	Supply		
	Demand		
Ecosystem health	Stress		
	Quality		
	Fish		
Infrastructure	Demand		
	Condition		
	Treatment		
Human health	Access		
	Reliability		
	Impact		
Capacity	Financial		
	Education		
	Training		
	FINAL SCORE		

PROBLEM IDENTIFICATION	
List of problems identified (compile a list of manifestations of problems; avoid solutions in the problem definition)	

4 Analysing and prioritising problems

07 Formulation of problem statements

08 Definition of problem statements

09 Prioritisation of problems

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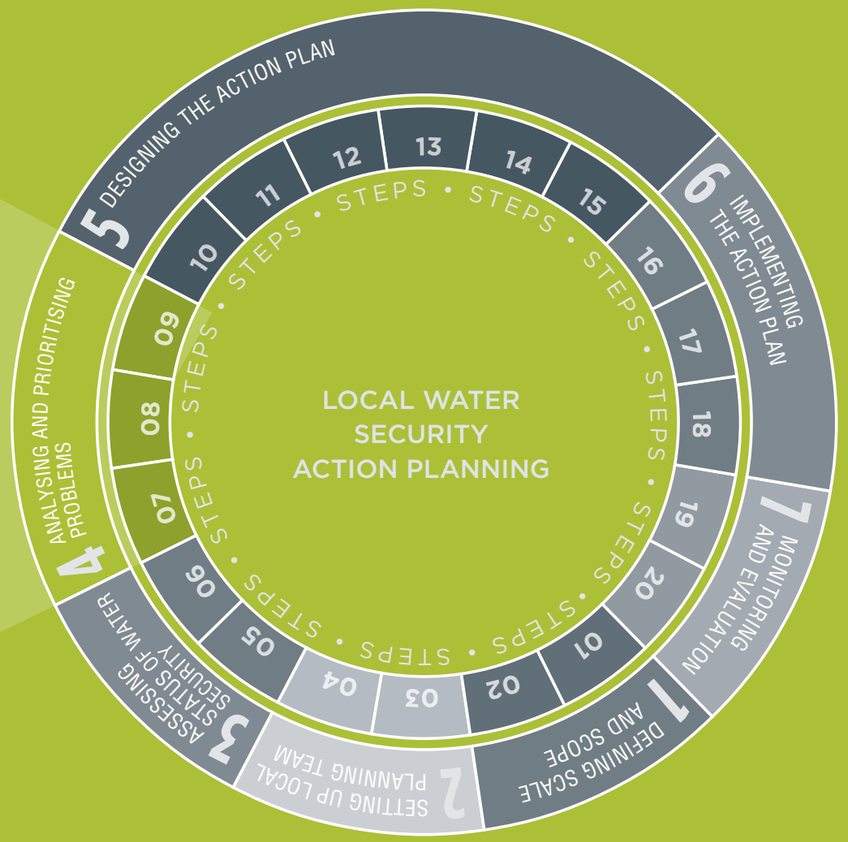
Activity 4 is divided into three steps: Construction of problem statements (Step 7), Definition of problem statements (Step 8) and Prioritisation of problems (Step 9).



After completing the assessment of the current status of water security, participants should be able to identify problems that they face. The next activity, Activity 4 of the LWSAP process, Analysing and prioritising problems, is aimed at:

- identifying the negative aspects of an existing situation and establishing the cause and effect relationships between existing problems; and
- identifying the real bottlenecks that stakeholders wish to overcome.

The problem analysis approach incorporates four core principles that can be used to enhance the possibility of success in a variety of sectors and in a variety of contexts and jurisdictions (Figure 11).

Principle 1: Identify root causes of problems

After conducting the first assessment, the problems faced by the municipal water system should have been identified. Any subsequent plan should aim to address specific locally defined problems, taking full account of their particular operating context. Implicit in this approach is the understanding that this step of problem identification and deconstruction is critical to reform success and must precede solution selection. Change is slow and incremental. Once the problems are identified, they can be broken down: this will help in the discovery of the root causes and the identification of possible ways forward.

There is no pre-existing menu of solutions. In fact, at this stage the focus should not be on solutions at all, as they are likely to change over time as conditions change on the ground. Instead, the focus should be on identifying the root causes of problems and creating goals or desired outcomes.

Principle 2: Create an authorising environment for decision making that encourages experimentation and divergent thinking

Given the complex issues that each community faces in terms of water management and operations, it is unlikely that the best solution will present itself without first needing adaptation. Collaboration and local experimentation are encouraged. The idea is to take a gradual approach to water resources management, as this is more likely to result in better, long-term solutions, and is far less expensive than big, externally imposed fixes that may or may not be appropriate or effective. In order for this to be implemented, communities should be given adequate and approved space for trial and error, combined with a focus on problem-oriented solutions that have a greater likelihood of being strong and appropriate.

Principle 3: Engage broad sets of agents to ensure that reforms are viable, legitimate and relevant

Learning is crucial to achieving the best outcomes. Experimentation will allow municipalities to try multiple combinations of actions and continuously make small adjustments to their management systems so that those systems remain operational and functional even while changing. This is different from traditional monitoring and evaluation programmes that focus on compliance with a linear process, where lessons learned are only revealed at the end.

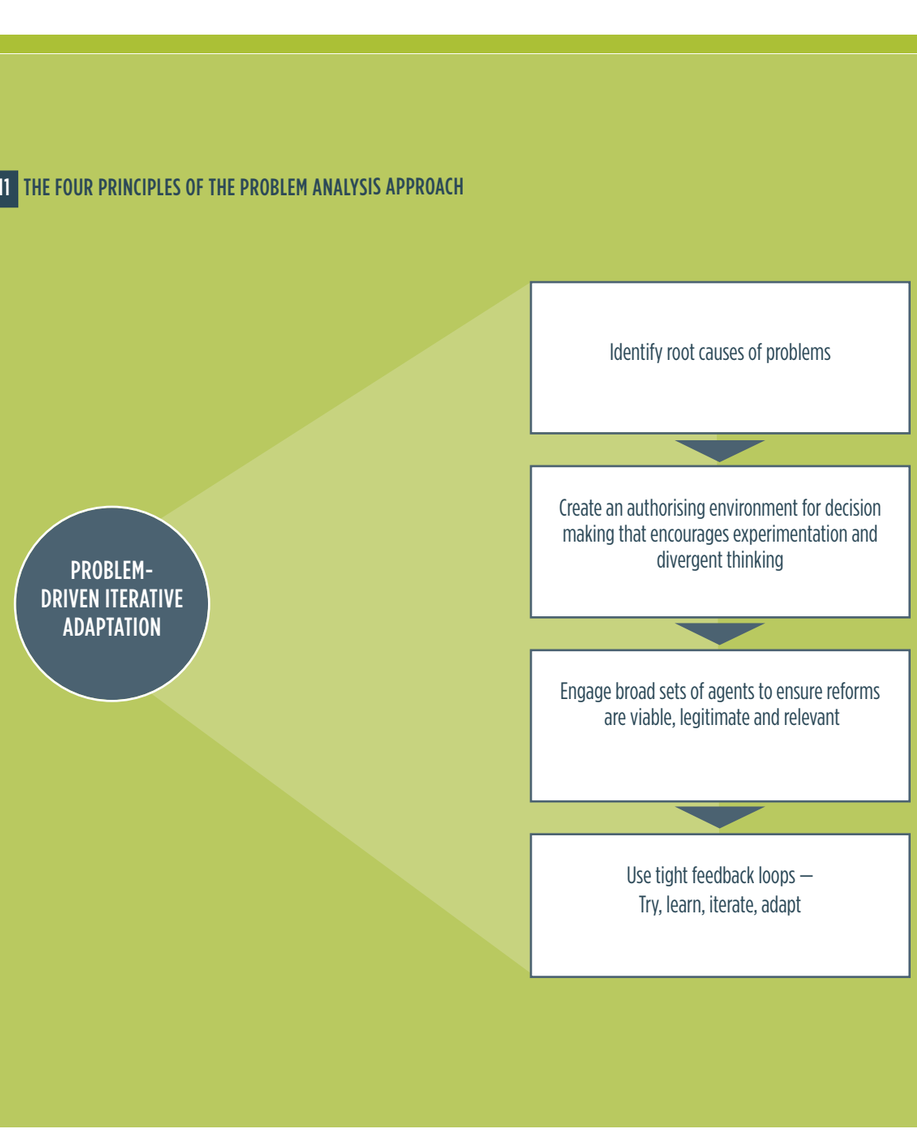
Building a robust support base ensures that the reforms remain in place regardless of changes in management or political regime. That being said, it is also important to note that in many regions, the support of key local leaders is crucial to the legitimacy and success of a project. Identifying and engaging these individuals early on in the process can help develop the broad base of support needed to move the reform process forward.

This approach allows for the reality on the ground to rapidly shape the reforms put into place. There is no universal solution. Hybrid approaches often end up being the most useful, but this cannot be identified or tested without having a period of experimentation and learning in place. Time is needed to determine the best way forward, but also to allow sufficient flexibility for the plan to be adjusted in the middle of implementation.

Principle 4: Use tight feedback loops — Try, learn, iterate, adapt

The final principle embeds this experimentation within active and ongoing feedback loops that facilitate the development of new or revised solutions when necessary, while also building on previous achievements. The importance of learning is crucial to achieving optimal outcomes. It is often necessary to try multiple combinations and routinely make adjustments to the management system in order to ensure that it remains useful during times of change. The approach allows on-the-ground reality to rapidly shape the implemented reforms. Such dynamism is essential when determining the best ways forward, and also provides sufficient flexibility to adjust mid-course. In order to ensure future water security, the mechanisms in place must be able to adapt to changing conditions. By fostering a management environment that embraces ongoing learning and adaptation, leaders at all levels will be able to better respond to future changes and challenges that accompany shifting freshwater resource availability and demand.

FIGURE 11 THE FOUR PRINCIPLES OF THE PROBLEM ANALYSIS APPROACH



STEP 07

Formulation of problem statements

Working groups analyse the manifestations of the problems listed in the assessment report and "deconstruct" them in order to define root causes.

Public opinion assessment and LWS assessment will indicate a number of problems — that is, their manifestations. Once the manifestations of the problems have been identified from the assessment process, those problems must be broken down and problem statements defined. Problem deconstruction should be undertaken by the working groups (once the planning team and working groups have completed the assessment) rather than by external actors. The problem analysis should identify the real problems and their possible root causes.

Investigative techniques, such as the "5-Whys" technique (see box below), can be used to facilitate reflection but are by no means the only way to deconstruct problems and identify root causes.

Be sure to identify the underlying problem and not its symptoms!

- Symptoms are visible signs or events that indicate that a problem exists. Symptoms represent the effects of the problem.
- The causes are the roots or sources of the problem. Problems emerge and develop because of them.
- The search for causes requires answers to the question "Why is this happening?"

DRILLING DOWN TO ROOT CAUSES: THE 5-WHYS TECHNIQUE

Originally developed by Sakichi Toyoda, founder of Toyota Motors, for use in manufacturing, the 5-Whys method is a technique for going beyond the surface to investigate and reveal the root cause(s) of a problem. Trying to fix an institutional failure only by tackling the problem often leaves the underlying cause of failure unaddressed, much like a doctor who only treats the symptoms and not the illness. Participants identify a problem and then ask "Why?". The answer then forms the basis of the next "Why?". The number of iterations can vary, but it typically takes five questions to arrive at the root cause. For example:

Problem: My irrigation water was not delivered to the field today.

Why? – The water leaked out between the canal and the field.

Why? – The conveyance pipe is cracked.

Why? – The pipe was built in 1970 and has not been replaced since.

Why? – The National Water Authority manages all the irrigation pipelines in this valley and employs only three engineers to monitor and maintain its conveyance pipes.

Why? – The National Water Authority focuses on delivering water to the rapidly growing population of urban residents in the nearby capital and cannot spare more of its engineers to maintain ageing rural infrastructure.

STEP 08

Definition of problem statements

Working groups define lists of problem statements.

After problem identification and "rooting", working groups should carefully define the problem statements for each root problem. The following recommendations for problem statements apply:

- The problem today and not tomorrow: The problem shown in its current form and not according to its potential.
- The negative connotations: The problem should be shown in a negative context.
- Short definition: Avoid explanations/stories about the problem.
- Avoid generalities: Problem statements should not imply solutions (e.g. a lack of money).

STEP 09

Prioritisation of problems

The planning team, facilitated by the local coordinator, discusses the lists of problems defined by the working groups and formulates a list of priority problems.

Lists of potential problems may be (and often are) huge, while not every problem from the list will be solved by the LWSAP process. In this step, the planning team discusses and prioritises problems in order to draw up a final list that can be used in the next steps of the planning process. Criteria for prioritisation can also be discussed among the stakeholders, but usually the list of criteria is as follows:

- Is it urgent to find a solution to the problem?
  - The problem is urgent if it requires immediate action to address a crisis.
- How important is it to find a solution to the problem?
  - The problem is important if neglecting it can lead to serious consequences in the future.
- How feasible is it to solve the problem?
  - Some problems cannot be solved with existing levels of technology or organisation.
  - Some problems may require a financial investment that far exceeds the capabilities (of the state or local communities).
- Are the team members and the community at large willing to devote their efforts to solving the problem?

After this priority check, the final list of problems will be used for the next steps in the action planning.

5 Designing the action plan

10 Development of a vision

11 Definition of goals and objectives

12 Identification of actions

13 Specification of actions

14 Prioritisation of actions

15 Formulation of a framework action plan

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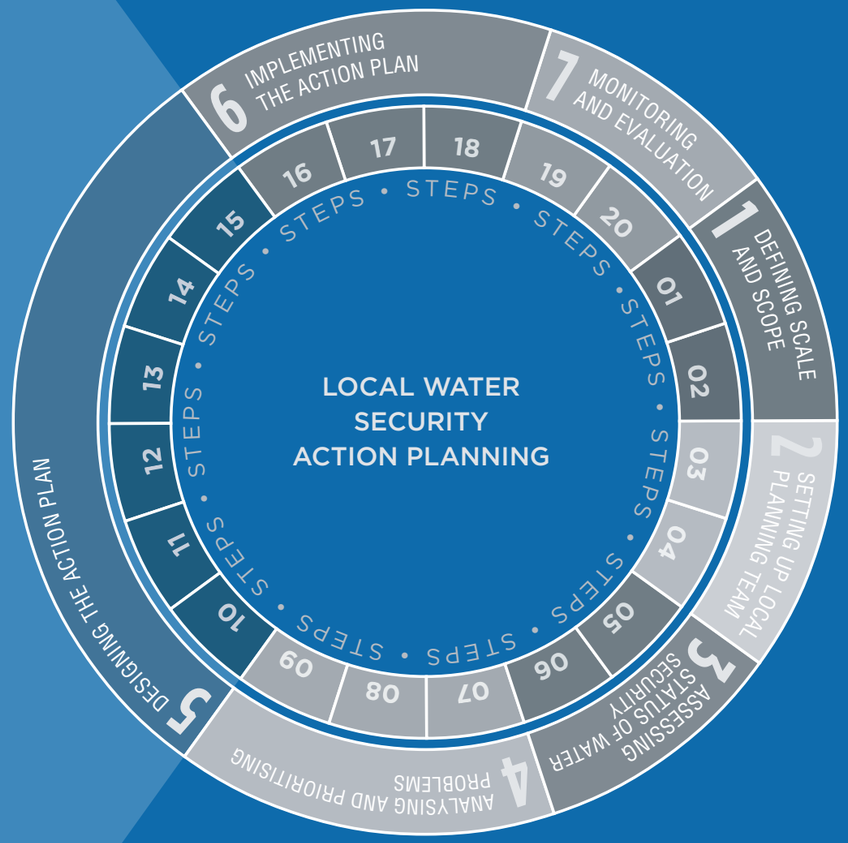
In Activity 5, the collected information and assessment steps are matched with suitable types of actions and activities, resulting in a list of priority actions and activities that will help the community to achieve greater water security. The list includes actions and combinations of measures that will help to mitigate the core problems. Once the current situation has been assessed, topics of substantive interest defined, and problems analysed and formulated, the next phase is to design specific interventions to achieve water security. Goals, objectives and activities together make up the action plan.



STEP 10

Development of a vision

The planning team discusses and decides on the definition of the LSW vision at a planning team meeting or workshop facilitated by the local coordinator.

The process of defining a vision provides an opportunity for the core planning team members to discuss and agree on what the broad purpose of the LWSAP will be. Although this should be a relatively easy task in many planning exercises, it becomes particularly important in multi-stakeholder efforts in which the different partners may have radically different ideas of what they would like to accomplish. A well-crafted vision statement grabs and directs the planning team's attention, sets its agenda, and energises its work. The vision statement becomes the common starting point for discussion about more specific activities and outcomes.

An LWS vision should be:

- relatively general — broadly defined to encompass all planned activities;
- visionary — inspirational in outlining the desired change in the state of the targets towards which the action plan is working; and
- brief — simple and succinct so that all participants can remember it.

The LWS vision of the local self-government unit should be developed by the planning team at a visioning workshop, facilitated by a local coordinator. The easiest approach is that of a formal brainstorming session, where the planning team discusses and reaches a consensus on the vision statement. However, if some members of the planning team believe that the ultimate vision for the action plan should be other than that harmonised among the majority (e.g. that it should be more conservationist oriented, or more oriented to improving local management), then the crafting of the vision statement becomes a far more difficult exercise, especially if realising different visions ultimately requires adopting different (and potentially conflicting) strategies. In this case, the planning team must go through a far more formal process that includes:

- soliciting unique submissions from the entire group on paper;
- organising the submissions by working groups;
- crafting a draft proposal based on the submissions, attempting to include elements of the main ideas in the working groups;
- reviewing the draft with the planning team;
- redrafting the vision statement by the working groups; and
- obtaining the final approval of the planning team.

The elements of the vision statement are illustrated in the example of the LWSAP for Saskatchewan (Table 5).

The vision is the desired state or ultimate condition that the action plan is working to achieve. It is typically expressed in a vision statement — that is, a clear and brief summary of what the planning team members and their partners would like to achieve.

TABLE 5 SASKATCHEWAN'S 25-YEAR WATER SECURITY PLAN

VISION
Water for continued growth, quality of life and environmental well-being

PRINCIPLES	
Long-term perspective	Today's water management decisions will be undertaken within the context of a long-term strategic plan.
Water for future generations	A sustainable approach to water use will protect the quality and quantity of water now and for the future, benefiting human health and communities and promoting a thriving economy.
Integrated approach to management	Water decisions will integrate the multiple objectives and information pertaining to economic development and the ecological, hydrological and social aspects of water to achieve a balanced outcome.
Partnerships and participation	The provincial government will facilitate collaboration in the development and implementation of water management decisions.
Value of water	Water will be treated as a finite resource and used efficiently and effectively to best reflect its economic, social and environmental importance.
Informed, risk-based management	Water management will incorporate consideration of risk and be supported by research and data.

GOALS	TOPICS OF SUBSTANTIVE FOCUS
Ensure the sustainability of our surface water and groundwater supplies to support opportunities for growth	• Efficient use of water • New water supply infrastructure • Framework for water allocation
Climate change adaptation	
Ensure our drinking water is safe by protecting supplies from the source to the tap	• Public systems • Private systems
Ensure water quality and ecosystem function are sustained	• Water quality • Wetlands • Ecosystem health and biodiversity protection • Local source water protection planning
Ensure infrastructure safely meets water supply and management needs	• Infrastructure safety and maintenance • Infrastructure benefits and sustainable operation
Ensure measures are in place to effectively respond to floods and drought	• Flood damage prevention and emergency response in developed areas • Agricultural drainage and flooding • Drought response
Ensure adequate water information is available to support decision making	• Data collection and management • Communication and information • Research partnerships
Ensure water management and decision-making processes are coordinated, comprehensive and collaborative	• Modern legislation • Provincial and federal coordination • Interjurisdictional water management • Engagement with the public and First Nations and Metis communities

Source: Saskatchewan (2010)

STEP 11

Definition of goals and objectives

The planning team discusses and decides on goals and objectives at a planning team meeting or workshop facilitated by the local coordinator.

Goals should be both ambitious and realistic and should indicate how stakeholders intend to achieve a water security vision for their local self-government.

Goals refer to sectoral or national objectives to which the LWSAP is designed to contribute (e.g. safe drinking water, sustained water quality and ecosystem services). They help to establish the macro-level context within which the action plan fits, and describe the long-term impact that the action plan is expected to contribute towards (but not itself achieve or be solely accountable for).

A **goal** is a formal statement detailing a desired impact of an action plan.

An **objective** is a specific statement detailing a desired accomplishment or outcome of an action plan, such as reducing a critical threat.

A good goal is:

- linked to the topics of substantive interest (directly associated with one or more of the water security topics of substantive interest);
- impact oriented (represents the desired future status of the topics of substantive interest in the long term);
- time bound (achievable within a specific period); and
- specific (clearly defined, so that everyone involved in the project has the same understanding).

Objectives should show how stakeholders intend to solve identified problems in order to meet water security goals. Objectives are the core of the action plan. They indicate a measurable commitment to be realised within a specific timeframe. They focus resources and guide the selection of actions. They are also used to measure progress in action plan implementation and to evaluate the action plan.

A good objective is:

- outcome oriented (represents necessary changes in critical threat and opportunity factors that affect one or more water security goals);
- measurable (definable by numbers, percentage, fractions, or all/nothing states; and measurable in relation to defined targets);
- time bound (achievable within a specific period);
- specific (clearly defined so that everyone involved has the same understanding); and
- practical (achievable and appropriate in the context of the project site and in light of the political, social and financial context).

Objectives are linked to the specific problems, threats and opportunities identified in the problem analysis phase. They specify the desired condition in the short and medium term. In a well-designed action plan, the realisation of objectives should lead to the fulfilment of the goals and, ultimately, of the vision. Goals and objectives together represent what needs to be accomplished: they become the benchmarks against which progress is gauged.

Since objectives imply concrete actions and behavioural change on the part of stakeholders, they need to be the product of negotiation. They more or less clarify a preference that can be traded off ("a little more of this for a little less of that"). The planning team may wish to use the following questions during the negotiation:

- Are the achievements defined by the objectives sufficient to meet immediate, priority needs?
- Are the achievements defined by the objectives sufficient to achieve the ultimate strategic goal?
- Can the objectives be achieved?
- What actions and activities need to be undertaken?
- Are the responsible stakeholders willing to undertake these actions and activities, or are we willing to convince them to do so?
- Are we willing to settle for a lower level of achievement than is set by the objective? What would it be?
- Can performance relative to the objective be objectively measured?

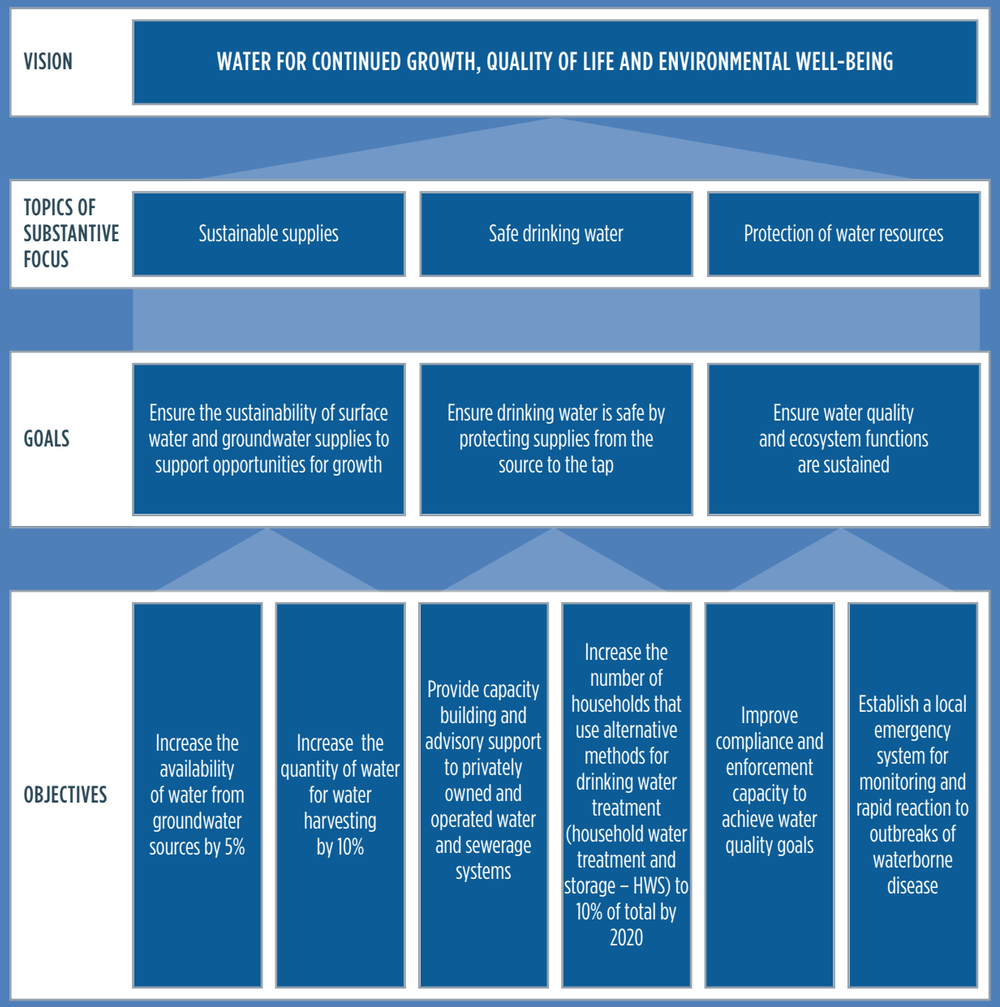
Goals and objectives can be formulated using the REC's "green sheet" on LWS goals and objectives (Table 6).

The hierarchy between vision, topics, goals and objectives is shown in Figure 12. Some goals might cross several topics of substantive focus. Similarly, some objectives might correspond to several goals.

TABLE 6 REC'S "GREEN SHEET" TABLE ON LWS GOALS AND OBJECTIVES

Country			
Name of LSG unit			
LWS vision statement			
Topic of substantive focus 1			
Goal 1.1			
	OBJECTIVE STATEMENT	REFERENCE TO PROBLEM STATEMENT	TARGETS
Objective 1.1.1			
Objective 1.1.2			
…			
Objective 1.1.n			
Goal 1.2			
Objective 1.2.1			
Objective 1.2.2			
…			
Objective 1.2.n			
Topic of substantive focus 2			
Goal 2.1			
	OBJECTIVE STATEMENT	REFERENCE TO PROBLEM STATEMENT	TARGETS
Objective 2.1.1			
Objective 2.1.2			
…			
Objective 2.1.n			
Goal 2.2			
Objective 2.2.1			
…			
Objective 2.2.n			

FIGURE 12 THE VISION/TOPICS/GOALS/OBJECTIVES HIERARCHY



STEP 12

Identification of actions

Working groups identify and formulate appropriate actions for the respective topics of substantive focus. These should be further discussed and decided on by the planning team at a planning team meeting or workshop facilitated by the local coordinator.

Once the planning team has defined the goals and agreed on the ideal level of achievement (defined by objectives), it can initiate the formulation of actions to achieve those goals and objectives. This is typically done by established working groups. The process can be helped by using the REC's "green sheet" on LWS action identification, a completed example of which is provided in Table 7.

Actions indicate what will be done or what change will take place; how much will be done; who is responsible; when the action should be undertaken; and, if applicable, the requirements (cost) in terms of money or other resources.

One or more actions should be identified in order to achieve each objective. Each action includes the following information:

- Title, including a reference to the objective.
- Description, including the list of activities, if relevant.
- Experience of the local self-government to date in relation to this type of action (previous projects; previous planning).
- General suitability for problem solving, including the problem or problems to be addressed when this action takes place, and the effect or effects on problem solving or risk reduction.
- Places and/or locations where the action will take place (if relevant).

When deciding on an action to be implemented in the local administrative unit, several criteria should be kept in mind:

- future climate change impacts; and
- national water-related strategies and legislation:
  - There are different national/regional restrictions and regulations in every country that need to be checked before selecting actions. The choice of an action may be questioned, if, for example, the use of rainwater is regulated restrictively.
  - Local water security implementation also depends on political decisions and funding possibilities, thus it is best to take into account political will and funding options at an early stage of planning.

Actions include specific projects and groups of activities that have to be undertaken in order to achieve objectives and contribute to achieving goals.

Activities refer to the specific tasks undertaken to achieve the required outputs.

TABLE 7 REC'S "GREEN SHEET" TABLE ON LWS ACTION IDENTIFICATION: A WORKED EXAMPLE

Country		Republic of Dreamland					
Name of LSG unit		Apple					
LWS vision statement		Water for continued growth, quality of life and environmental well-being					
No.	**Action**	**Description of action (including list of activities)**	**Experience with this type of action to date**		**General suitability for problem solving**		**Relevant location(s) (if applicable)**
			Already being realised	**Already planned**	**Addressed problem(s)**	**Effects on problem(s)/ risk reduction**	
Topic 1		Safe drinking water					
Goal 1.1		Ensure drinking water is safe by protecting supplies from the source to the tap					
Objective 1.1.1		Increase the number of households that use alternative methods for drinking water treatment (household water treatment and storage – HWT) to 10% of total by 2020					
1.1.1.1	Evaluation of HWT in the municipality of Apple	HWT technologies (also known as point-of-use [POU] or point-of-entry [POE] water treatment technologies) are any of a range of devices or methods employed for the purposes of treating water in the home or at point of use in other settings. The municipality will conduct a study on possibilities for the wider introduction of HWT in Apple, including appropriate technological solutions (chemical disinfection; membrane, porous ceramic or composite filters; granular media filters; solar disinfection; UV light technologies using lamps etc.), appropriate locations, cost-benefit analysis, and cost-sharing schemes.	No	No	Water sources in the region are not considered of sufficient quality for potable use.	Currently no systematic efforts to reduce the risks of contaminated potable water for household use in Apple have been recorded. As a consequence, limited data are available. Systematic evaluation will help the introduction of alternative systems and reduce the risks.	N/A
1.1.1.2	Procurement and implementation of 40 HWT systems.	In accordance with the study on HWT in Apple, and following the proposed cost-sharing scheme, the municipality of Apple will allocate funds and participate in the procurement and implementation of 40 HWT systems in neighbourhoods marked as suitable for HWT intervention.	Sporadic efforts to introduce HWT have been noted in the villages of Orange, Lemon and Banana.	No	Water sources in the region are not considered of sufficient quality for potable use.	Options focus on the immediate need to provide safe, high-quality water through point-of-use and/or point-of-entry treatment. Point-of-use and point-of-entry treatment can be employed quickly and do not require large investments in infrastructure.	Although an appropriate location will be determined by conducting a study on possibilities for the wider introduction of HWT in Apple, the Centre, Orange and Strawberry neighbourhoods seem to be most eligible.

STEP 13

Specification of actions

The planning team determines the responsibilities, timeframe, technical and legal issues, resources, possible negative effects and communication issues for each specified action. These should be discussed and decided by the planning team at a planning team meeting or workshop facilitated by the local coordinator.

Once the working groups have identified appropriate actions in terms of goals, objectives and problems, the actions should be further specified. The planning team must answer the following questions:

- Who will carry out (or be ultimately responsible for) the actions?
- By when will they take place? How long will they last?
- Are there any technical or legal issues that will present an obstacle to action implementation?
- Will the action be acceptable to stakeholders?
- What resources (e.g. money, staff) will be needed?
- Are there any negative external impacts related to action implementation?
- Who should know what about the action?

To carry out the specification exercise, working groups should complete the narrative sections of the REC's "green sheet" table on LWS action specification (Table 8). The table should be completed by each working group for the actions corresponding to their respective topics.

TABLE 8 REC'S "GREEN SHEET" TABLE ON LWS ACTION SPECIFICATION: A WORKED EXAMPLE

Country	Republic of Dreamland												
Name of LSG unit	Apple												
No.	**Action**	**Category**				**Main responsible institution**	**Complexity of action**			**Costs**	**Negative external impacts**
		Infrastructure	**Capacity building**	**Policy/governance**	**Good management practices**		**Time aspects of planning and realisation**	**Technical/legal complexity**	**Acceptance by stakeholders**		
1.1.1	Evaluation of HWT in the municipality of Apple		x			Apple Water Supply Company	Short term	The involvement of an advanced external technical team is needed.	There may be significant difficulties with the adoption of HWT technologies without significant subsidies or creative rent-to-own schemes that offset the cost of such technologies through, for example, savings on bottled water expenditures.	USD 70,000	No significant negative external impacts.
1.1.2	Procurement and implementation of 40 HWT systems	x				Municipality of Apple Apple Water Supply Company	Short term	HWT can be effective if applied in strategic locations, providing water to specific populations. This option is unlikely to be feasible in many locations in Apple — especially areas dependent on shallow and contaminated groundwater wells. The costs for treatment for desalination would likely be too high.	The largest challenge with point-of-use systems is long-term maintenance. These units need to be maintained and replaced on a regular basis. Failure to do so can result in the units being ineffective or bypassed altogether. This would require education campaigns and policy continuity for the programme.	USD 40,000	No significant negative external impacts.

STEP 14

Prioritisation of actions

The planning team selects prioritisation criteria and applies them in order to prioritise actions. The planning team carries out the ranking exercise and prioritisation at a planning team meeting or workshop facilitated by the local coordinator.

The list of actions now looks something like a "wish list". In some cases it will be obvious which action makes the most sense. In many other cases, however, the planning team will need to brainstorm in relation to the developed list of actions and select the one that makes the most sense — in other words, it will need to prioritise the actions.

There are many well-known prioritisation techniques. Here, the multiple criteria matrix technique is used.

SELECTION OF PRIORITISATION CRITERIA

The selection of appropriate prioritisation criteria on which to judge the merit of potential actions is important in order to avoid selection based on bias or hidden agendas, and to ensure that everyone is "on the same page". Table 9 shows the criteria to be used in the prioritisation process.

Not all criteria have the same importance for the local self-government unit. Criteria therefore need to be ranked by assigning appropriate weighting factors. The determination of the weighting factor is a very important task and significantly affects the character of the action plan. If, for example, a planning team wants local efforts towards water security to be based on actions that are inexpensive and that the local self-government can carry out independently, the weighting factors for the criteria "cost" and "availability of resources" will be higher. However, if the accent is on short-term interventions that can benefit a wider territory, than the weighting factors for the criteria "urgency" and "coverage" will be higher.

The task of determining the weighting factors is assigned to the planning team.

The sum of all the weighting factors assigned to each criterion should be equal to 1.

RANKING

All actions should be rated against the specified criteria. The first step is to create a matrix (Table 10) in which all actions are listed vertically down the y-axis and all criteria are listed horizontally across the x-axis so that each row represents an action and each column represents a criterion. An additional column should be included for the priority score.

Each action can then be ranked against the specified criteria. The cells of the matrix should be filled in by rating each action against each criterion, which should be established by the team prior to beginning this process. An example of a rating scale includes the following:

3 = criterion met well

2 = criterion met

1 = criterion not met

The ranking of each option is extremely subjective and ranking should typically be done by consensus after consultation among the planning team members.

Once the cells of the matrix have been filled in, the final priority score for each action can be calculated. This is done by calculating the relative importance of each criterion by multiplying the rating in each cell by the weighting factor of the corresponding criterion and adding together all the relative importance values. Actions with the highest priority score receive a ranking of 1.

It is now possible to rank all actions against their priority and to compile a final list of actions. The planning team decides on the lower limit of the overall priority value for actions to be included in the final list of actions.

In the interests of better visibility, it is recommended to group actions by category (infrastructure, capacity building, policy/governance, good management practices, other) (see Table 11).

TABLE 9 PRIORITISATION CRITERIA

CRITERION	DESCRIPTION OF CRITERION	DESIRABILITY
Cost	Refers to the anticipated costs of the action (i.e. action will cost millions of USD; action will cost hundreds of thousands of USD; action will cost tens of thousands of USD; or it is a no-cost action) or to the return on investment.	Actions characterised by lower costs with a higher return on investment will be given a higher grade.
Feasibility	Refers to the availability of the technology and expertise to implement the action (in the case of structural actions), or the level of support from stakeholders in non-structural actions (i.e. technology/expertise is readily available; technology/expertise may be accessed; technology/expertise must be developed; reform is widely supported; some support exists; opposition to reform may exist).	Actions that have a higher level of feasibility will be given a higher grade.
Effectiveness	Refers to the level of impact at which the planned actions affect the fulfilment of the set goal of improving water security, or particular topics of substantive focus (i.e. directly improves water security; contributes to improving water security; multiple steps away from improving water security).	Actions that have a higher level of effectiveness will be given a higher grade.
Availability of resources	Refers to the availability of internal LSG resources (staff, time, money, equipment) to solve water security–related problem(s).	Actions that have a higher level of resource availability will be given a higher grade.
Urgency	Refers to the urgency of intervention to solve LWS-related problem(s) (short, medium or long term).	Actions that should urgently be implemented will be given a higher grade.
Coverage	Refers to the size of the LWS-related problem to be addressed by the action (e.g. number of individuals affected; size of territory served etc.).	Actions that have greater coverage will be given a higher grade.
Acceptance	Refers to the level of social, administrative, political, legal and environmental acceptance of the anticipated action.	If, for example, the action is more unfair to one section of the community than others, the level of social acceptance will be lower. If the action is difficult to implement because of the associated administrative problems, administrative acceptance will be lower. If the action is likely to be politically unacceptable, political acceptance will be lower. If there are any perceived legal problems in action implementation, legal acceptance will be lower.

TABLE 10 RANKING MATRIX

Weighting factor of criterion	CRITERIA							Overall priority
	Costs	Feasibility	Effectiveness	Availability of resources	Urgency	Coverage	Acceptance	
	SUM = 1							
ACTION								

TABLE 11 ACTIONS GROUPED BY CATEGORY

Country						
Name of LSG unit						
No.	Action	Description of action	Timeframe	Responsible institution	Cost	Location(s)
INFRASTRUCTURE						
1						
2						
...						
n						
CAPACITY BUILDING						
1						
2						
...						
n						
POLICY/GOVERNANCE						
1						
2						
...						
n						
GOOD MANAGEMENT PRACTICES						
1						
2						
...						
n						
OTHER						
1						
2						
...						
n						

STEP 15

Formulation of a framework action plan

The planning team, facilitated by the local coordinator, develops a framework action plan.

In the final step (Step 15) of Activity 5, the planning team, facilitated by the local coordinator, develops a framework action plan. The plan should include the following elements:

- an introduction, including the legislative and institutional framework for action plan development and a short description of the methodology employed;
- a description of the current situation in relation to water security, including scope and scale (with the list of topics of substantive focus), and the analysis of priority problems (including the list of problems);
- the statement of the strategic vision of the local self-government and a description of the vision;
- a presentation of the key goals for addressing problems and opportunities;
- a presentation of specific objectives to be achieved;
- a description of priority actions for achieving the goals and objectives;
- an action strategy that describes the key partnerships to be established for implementation, including linkages with existing planning processes; and
- annexes containing all the tables used during the planning process.

6 Implementing the action plan

16 Definition of implementation structure(s)

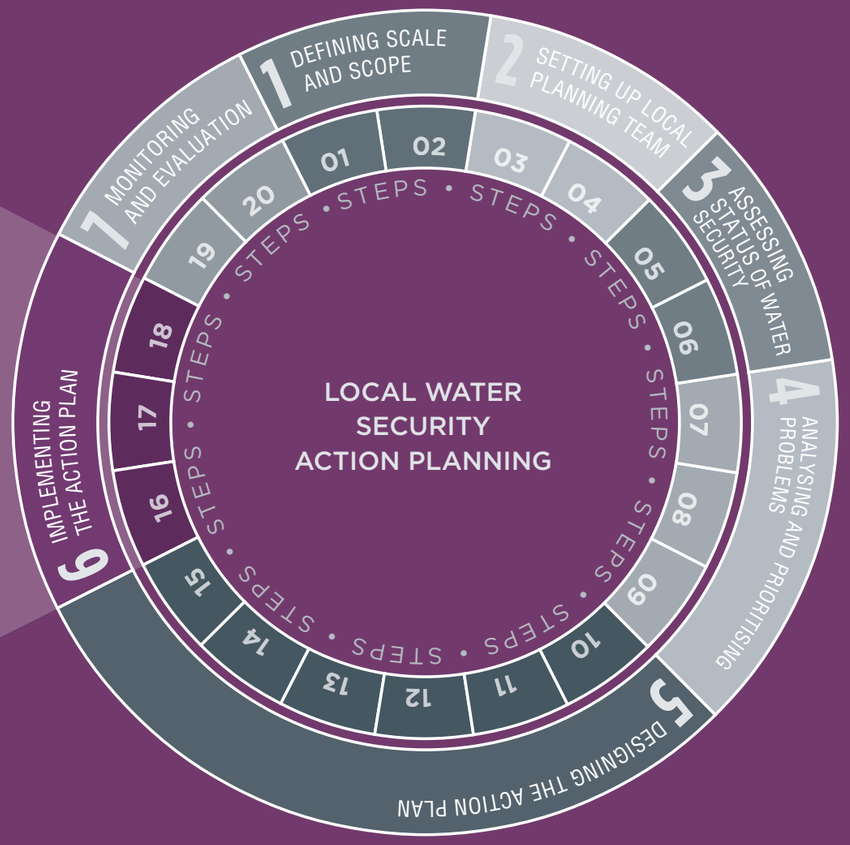
17 Development of an implementation plan

18 Documentation of implementation

Professor Dr. Slobodan MILUTINOVIĆ

Activity 6 of the LWSAP process involves the implementation of the developed action plan. The success of any action plan and the pace of its implementation will depend on the capacity of the organisations and people responsible for its management — that is, on the political and administrative capacity of the institutions involved. An assessment of the institutional setting and existing administrative capacity (plus planning for future capacity development) is therefore an essential aspect of LWSAP preparation.

Activity 6 is divided into three steps: Defining the implementation structure(s) (Step 16), Developing an implementation plan (Step 17), and Documenting implementation (Step 18).



STEP 16

Definition of implementation structure(s)

The planning team, facilitated by the local coordinator, develops a framework for action plan implementation, including the assignment of existing structures and/or recommendations for establishing new ones. This step must be carefully coordinated with all stakeholders and discussed with the local administration and decision makers.

An action plan is only as good as the structures put in place to implement it. The LWSAP should contain a detailed description of how it will be implemented. Specifically, this description will explain the roles and responsibilities of each institution within the action plan operating structure.

The first step in implementing the LWSAP should therefore be to consider the following questions:

- What mechanisms for inter-jurisdictional cooperation are required to implement the new actions and enforce the proposed policies?
- What structures must be put in place to ensure that the responsible LSG staff from different departments can coordinate their activities with one another?
- What structures must be put in place to ensure the continued participation of stakeholders in the implementation of the action plan?
- What new institutions, established outside the municipal corporation, are necessary to implement the proposed actions?

STEP 17

Development of an implementation plan

The planning team develops an implementation plan.

The LWSAP implementation plan describes the modalities by which each measure (and possibly each operation) will be implemented. This is not only a description of the rationale of the measures: it also implies the detailed designation of beneficiaries and recipients and the identification of monitoring indicators and the types of actions through which measures will be implemented.

The implementation plan follows a typical project cycle management logical framework model, providing a structure that makes it possible to move from a broad goal to intermediate accomplishments or outcomes and then to very concrete strategies and action steps. Because different models/tools use different languages, Figure 13 illustrates the links between the language used in the implementation plan and that used in a logical framework approach (LFA).

An implementation plan should have an intervention logic that is in line with the LFA that is used as a "golden standard" in the majority of donor-assisted programmes and projects.

The logical framework approach (LFA) is an analytical process and set of tools used to support objective-oriented project planning and management. It offers a set of interlocking concepts that are used as part of an iterative process to aid the structured and systematic analysis of a project or programme idea.

The objectives should then contain:

- a rationale section, where the coherence between the vision and the goals is briefly explained;
- a description of the way in which the objectives will be achieved;
- the operations involved in achieving the objectives;
- a needs assessment that duly justifies the budget for the objectives and related actions;
- a brief description of beneficiaries and recipients, including bodies that directly receive the outputs of the action and the segment of the population towards whom the activities are addressed; and
- relevant monitoring indicators (objectively verifiable and including units, baseline data, targets and data sources).

The objectives can be synthesised in table format (Table 12).

Once the objectives are described, an implementation plan should be developed. A completed example of an implementation plan is provided in Table 13.

FIGURE 13 A COMPARISON OF THE IMPLEMENTATION PLAN AND THE LOGICAL FRAMEWORK APPROACH

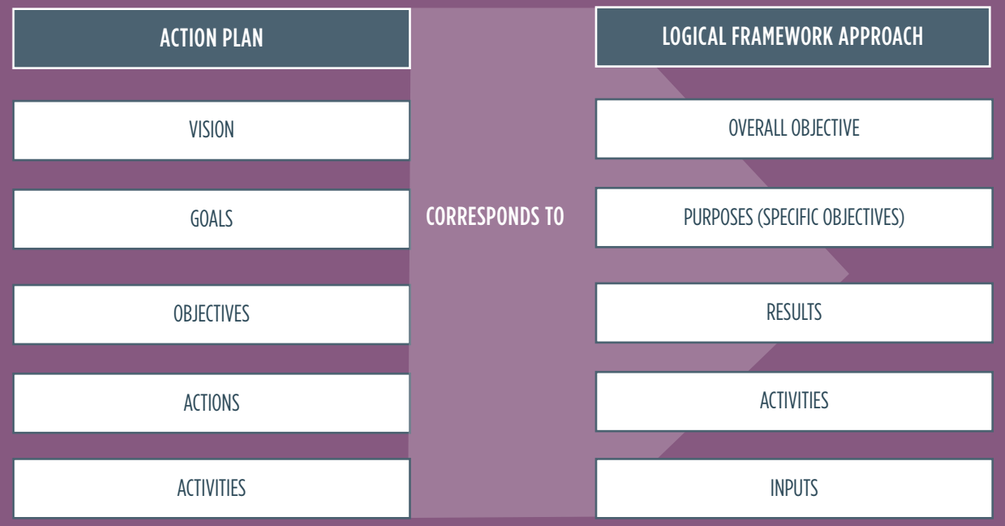


TABLE 12 SYNTHESIS OF OBJECTIVES

OBJECTIVE				
DESCRIPTION AND RATIONALE				
ENVISAGED ACTIONS				
BENEFICIARIES AND RECIPIENTS				
INDICATOR	UNIT	BASELINE	TARGET	DATA SOURCE

TABLE 13 COMPLETED EXAMPLE OF AN IMPLEMENTATION PLAN (adapted from ICLEI & IDRC 1996)

OBJECTIVE	1.1.1	Eliminate untreated sewage and industrial discharges into river X by 2020		RELATED TRIGGERS	If external finance for new treatment facilities is not obtained by August 2016, industrial discharge fees will be levied and commercial/residential sewerage fees will be increased.			
Actions		Strategy	Responsibility	Timeframe	Progress check	Required resources	Monitoring documentation record	Performance evaluation (indicators)
1	Construct new treatment station.	Begin design work in next budget year.	Public Works Department of LSG administration	Obtain financing by June 30, 2016. Complete construction by December 2019.	Monthly progress meetings until end of 2015, with quarterly meetings thereafter.	USD _____	Progress reports, including on volume of discharges treated and untreated, written and filed by Public Works Department	Volume of untreated discharges (per month) from: a) city sewerage system; and b) industrial plants and facilities.
2	Require industries to pretreat discharges.	Provide technical assistance. Institute regular discharge monitoring.	Chamber of Industry; Health Department	Begin monitoring in 2015, technical assistance in 2016.	On same schedule, submit written reports to Directorate of Public Works.	2 industrial engineering volunteers. 2 water quality monitoring staff. Student volunteers. USD_____		
3	Where possible, disconnect roof-top storm drains from roadside storm drains.	Provide water bill rebate to households that install rainwater collection barrels.	State Water Company; Public Works Department	Announce rebate in third-quarter billing. Provide barrels at beginning of 2017.		Programme paid by Water Company.	Evaluation reports on partnership programmes (for 2 and 4) prepared by City Health Council	
4	Reduce household wastewater generation through conservation and reuse.	Provide water-saving toilets and faucet equipment to all households. Educate residents on water use.	Water Users Association in partnership with local business groups	Begin three-year programme in 2016.		USD _____		

STEP 18

Documentation of implementation

The planning team develops procedures for documenting the implementation of the plan.

A final but often overlooked aspect of effective implementation is the establishment of capacities and procedures for documenting plan implementation. A documentation programme can be used to make the reporting required under an internal management system more consistent and reliable. Since a great deal of information is gathered during the implementation of projects, a documentation programme can ensure that this information is available for future issue analysis, assessment and planning exercises.

7 Monitoring and evaluation

19 Performance monitoring

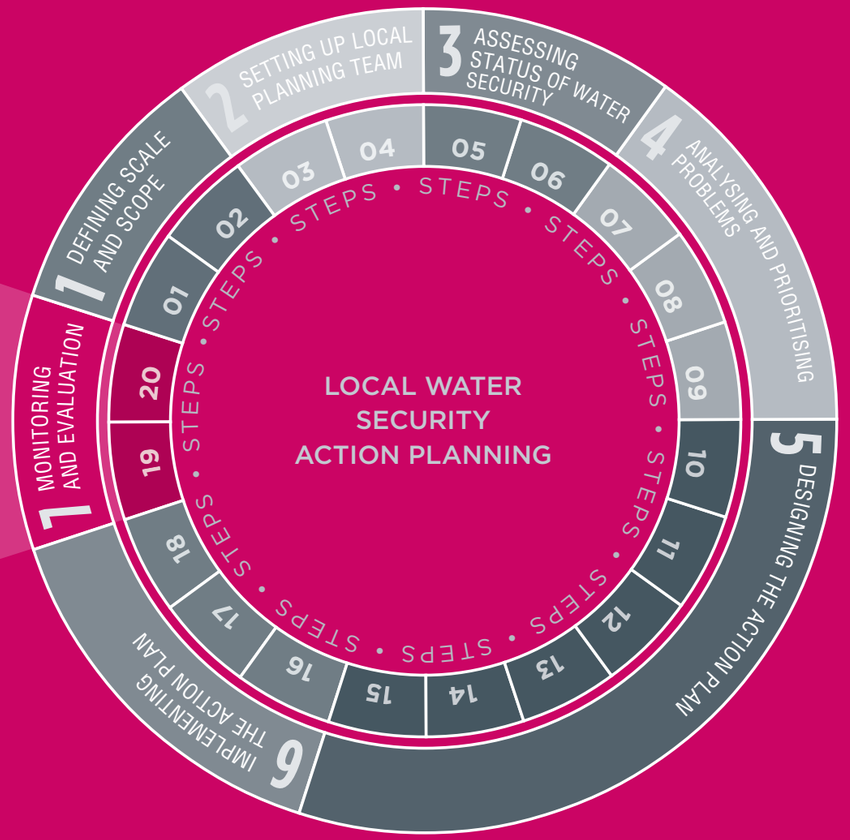
20 Evaluation and impact assessment

Professor Dr. Slobodan MILUTINOVIĆ

The planning team should prepare a monitoring and evaluation plan or system, which will be the basis of the progress reports for the whole action plan and which should be shared regularly with all development partners and key stakeholders. In addition, each individual component within the action plan implementation framework will have appropriate monitoring and evaluation systems, as described under Activity 6.

The monitoring and evaluation plan should include:

- key indicators for the identified outcomes and different interventions, with targets to be achieved at specific points in time;
- the means of verification, sources of information or measurement methodologies for the indicators;
- a schedule with information about the specific monitoring and evaluation systems used for the interventions included in the action plan; and
- a schedule for the evaluation of the action plan as a whole, including joint evaluations and evaluations at different levels.



STEP 19

Performance monitoring

The planning team develops a monitoring plan.

Performance monitoring is the process of measuring progress towards achieving sector policy objectives/targets by means of indicators (numerical variables) that provide information on implementation at four points in the intervention hierarchy — inputs, outputs, results and objectives.

The identification of indicators is a crucial element in drafting the LWSAP. Following LFA principles, objectively verifiable indicators should be set at all levels of the intervention logic.

Objectively verifiable indicators represent the baseline for measuring programme performance, monitoring programme operations, and eventually evaluating the overall effectiveness of programme implementation.

The action plan should define three levels of indicators:

- impact indicators, to be set at the level of action plan vision and topics of substantive interest;
- result indicators, to be set at the level of objectives; and
- output indicators, to be identified at the level of actions.

At the level of action plan vision and topics of substantive interest, impacts consist of all the consequences that affect, in the short or medium term, people or organisations that are not direct beneficiaries. For example, objectively verifiable indicators for impacts may be:

- total water availability;
- the amount of renewable freshwater available per person;
- water runoff ratio for surface water; and
- annual water consumption per capita.

Impact indicators at the level of goals represent the consequences of the action plan beyond its direct and immediate interaction with the beneficiaries. In this sense, impacts group together the action plan consequences for direct beneficiaries, which appear in or last into the medium term. An example is:

- the groundwater supply vulnerability ratio.

Result indicators at the level of objectives represent the immediate advantages of the action plan for its direct beneficiaries. An advantage is immediate if it appears while the beneficiary is directly in contact with the actions drafted in the action plan. Result indicators provide information on changes that occur for direct beneficiaries, for example:

- the number of households that use advanced alternative methods for drinking water treatment;
- the proportion of households connected to a sewerage network; and
- the length of the drinking water supply network.

Output indicators represent the product of the actions drafted in the action plan. More precisely, an output is considered to be everything that is obtained in exchange for public expenditure. Examples of output indicators include:

- the number of HWT systems installed and in operation; and
- the capacity of wastewater treatment plants built.

Impacts — Measure the wider benefits beyond direct beneficiaries

Results — Measure the direct benefits produced for beneficiaries

Outputs — Measure the consequences of resource utilisation (activities carried out and their products)

Inputs — Measure financial and human resources provided

STEP 20

Evaluation and impact assessment

The planning team develops an evaluation plan.

If a sound performance monitoring system is created, then evaluation (i.e. the assessment of the LWSAP impact) becomes easier. In the context of LWSAP, the concept "impact" should be understood as the effects of a range of different interventions on the lives of local inhabitants and on the general policy, normative, sociocultural and economic environment.

There are many possible approaches to evaluation. Many of them are technically complex and expensive, requiring specific expertise. More information on these techniques can be found in the relevant literature. The general steps for organising and carrying out an impact assessment exercise in the LWS context are as follows:

- Plan for impact through the articulation of the "logic model" developed by the action plan framework.
- Identify key questions and information needs through a participatory process among all stakeholders involved in achieving the impacts.
- Design the impact assessment process by identifying the approach and methodologies to be used at different levels.
- Assess the impact of the LWSAP by considering attribution and the contribution of individual components and factors.
- Follow up and use the impact assessment information to identify actions and generate knowledge about which type of interventions work.

The LWSAP should also include an evaluation plan. Evaluation can be done either during implementation or at the end, and should cover:

- the relevance of the project's objectives in relation to the identified needs and the overall LWS strategy;
- the effectiveness of the project in producing the desired outcomes, and the efficiency of project implementation; and
- the sustainability of project results and the unexpected effects that might have been produced.

Project evaluation will be an input for the impact assessment process.

Annexes

Annex 1: **Template and worked example of initial LWS assessment report**

Annex 2: **Calculation of indicators for LWS assessment**

Annex 3: **Draft version of the proposed public opinion assessment questionnaire**

Annex 4: **Sample public opinion assessment**

Annex 1: Template and worked example of initial LWS assessment report

Template for the initial LWS assessment

1. Country and regional context

1.1 Political, economic and social context (half a page)

- Description of country, main economic indicators (GDP etc.), income status, employment/unemployment rates.
- Number of inhabitants, area etc.
- What are the most important economic activities, by sector?

1.2 Constraints facing the water sector at national and regional level (half to one page)

Please present relevant data and statistics related to water consumption at national level, for example:

- Annual/daily per capita water share, trends in the last five to 10 years (if available).
- Annual water consumption, estimation and trends (if available).
- Water consumption according to the different sectors.
- National framework for water management (strategies, action plans).
- Water availability and main water sources, and trends.
- Access to sanitation.
- Wastewater and wastewater treatment.
- Institutional set-up for water management, main stakeholders and the role of local self-governments.

1.3 Main national and local-level initiatives and ongoing processes related to water security (half a page)

Please list the most important strategies, policies and documents (sectoral and cross-sectoral) related to water usage and management, as well as the relevant legislative framework. Please highlight any recent reform processes and changes.

- National strategies.
- Government policies in the water sector.
- Main documents developed by government ministries.
- Follow-up to international processes (MDGs, multilateral agreements and conventions etc.).

2. Local context

2.1 Overview of water management challenges

Brief profile of local administrative area (half to one page)

Please present brief background information on your municipality/delegation, with the following details:

- Geographical position, elevation.
- Demographic structure.
- Climate, rainfall.
- Geology, dominant vegetation.
- Socioeconomic characteristics, main income-generating activities, big industries etc.

Please add any other relevant information.

Water-related drivers and challenges

- Water production per capita.
- Water supply: What are the main sources of fresh water? What is their capacity and condition?
- Water supply system: What is its condition? What are the main related problems?
- Water demand and the ratio of supply and demand.
- Sewerage network and wastewater treatment facilities.
- Water quality (surface waters, groundwater), pollution, hazards.
- Effects of climate change and extreme events (floods, extreme drought etc.).

Please add any other relevant information.

2.2. The "governing" dimension of water security

Institutions and actors involved

a. Initial list of stakeholders (bullet points only)

b. Public participation and stakeholder involvement issues (a third to half a page)

- Please describe main initiatives and mechanisms for public participation in water-related issues.
- Are there any active NGOs or community organisations in the area?
- Is there viable cooperation with regional and national authorities, or other relevant institutions?
- How do you ensure communication with citizens?

Please add any other relevant information.

c. Efforts and local initiatives in water-related issues (past and on-going) (up to half a page)

- Initial problem analysis (half to one page)

Please describe the most important problems related to water use/management and try to identify the root of the problems.

- Initial list of problems (bullet points only)

3. Proposed topics of substantive focus

Please refer to the manual for classification and details:

- Sustainable supplies
- Safe drinking water
- Protection of water resources
- Drought damage reduction
- Effective governance and management

Initial LWS assessment report for Al Karak, Jordan

1. Country and regional context

1.1 Political, economic and social context

Jordan is classified as an upper middle–income country, with a per capita GDP of USD 4,912 and with an economy that is constrained by limited arable land and scarce water resources. However, post-2000 Jordan is often classified as an emerging market. The rapid privatisation of previously state-controlled industries and the liberalisation of the economy resulted in a boom that continued through 2009. Jordan's economy is dominated by services, which account for over 70 percent of GDP and more than 75 percent of jobs. Agriculture provides an income for about 20 percent of the population and employs about 7 percent. Although the sector is small in relation to the overall economy, agriculture contributes an estimated 28 percent of GDP. The 2010 Human Development Index classified the country as "high human development". However, despite Jordan's upper middle–income status, 14.4 percent of Jordanians were living below the official poverty line in 2010. There is chronically high unemployment particularly affecting young people and women.

1.2 Constraints facing the water sector at national and regional level

The annual per capita water share in Jordan (129 m^3/inhabitant/year) is well below the generally accepted per capita water poverty line. According to the Ministry of Water and Irrigation of Jordan and the World Bank, per capita available water is projected to decline from the current low level to only 90 m^3/inhabitant/year by 2025.

Current annual water consumption in Jordan is estimated to be 940 million m^3. Demand for water exceeds Jordan's available water resources. The industrial and municipal sectors, including the tourism sector, together consume 28 percent of Jordan's water supply, while agriculture/irrigation consumes 72 percent (Jordan's Water Strategy 2008–2022). Total municipal and tourist water use has increased significantly in the past decades, from approximately 116 million m^3 in 1985 to 249 million m^3 in 2002. Increased income and changes in lifestyle have contributed to this increased water consumption, especially in the urban areas of Greater Amman, Irbid and Aqaba. Currently, the rate of water abstraction from aquifers far exceeds the natural recharge rate, which has led to a noticeable lowering of Jordan's water tables and a major accompanying decline in water quality. These problems have resulted in an increase in tensions and disputes over water access within and outside Jordan. There is consequently a gap between demand and supply, and evidence suggests that this gap has been widening rapidly in recent years. Water scarcity in Jordan is exacerbated by the Syrian refugee crisis.

The overall decline in fresh surface water resources observed in recent years may have significant implications for the quality of surface water. However, evidence suggests a simultaneous trend of lowering groundwater tables and increasing salinity in most aquifers. Moreover, the salinity of many groundwater resources is rapidly approaching the limits for drinking water supply.

Access to sanitation is relatively high (with some exceptions in rural areas, for example only 20 percent in Karak), and the quantity of municipal wastewater collected and treated has been steadily increasing. However, the quality of treated wastewater is deteriorating: about 50 percent of the total treated wastewater does not appear to meet national quality norms for pollutants. The number of people who have gained access to public wastewater services in the recent past has generally been lower than the increase in the total population. Poorly managed cesspools are the most common alternative for wastewater disposal. Only 28 percent of industrial wastewater is treated. The disposal of wastewater by tankers is a widespread practice and is virtually unmonitored in terms of effluent quality.

The institutional setting in Jordan's water sector is largely centralised, with the Ministry of Water and Irrigation (MWI) being the official body responsible for overall water supply and wastewater systems, planning and management, the formulation of national water strategies and policies, research and development, information systems and the procurement of financial resources (Law 18/1988). Since the water sector in Jordan is highly centralised, governorates and municipalities have little or no role in project planning and development, or in the delivery of water services. However, Jordan has a high capacity for organisation in the water sector, demonstrated through a high level of policy and legal improvements, as well as the inclusion of all relevant government organisations, encompassing not only those in the water sector, but also those in the closely related sectors of agriculture and the environment.

Numerous NGOs (societies, cooperatives and associations) play a role in local development. Legal and institutional preconditions favour public participation, although the functioning of the Water Users Association is still in an initial phase, with a different experience. The main obstacles include financial dependence on state funds and an inability to collect fees, as well as low organisational and technical skills.

1.3 Main national and local initiatives and ongoing processes related to water security

Jordan's Water Strategy 2008–2022 envisaged a number of reforms in the Jordanian water sector, including:

- efficient and effective institutional reform;
- a drastic reduction in the exploitation of groundwater;
- the efficient use of water resources;
- the implementation of the Disi Water Conveyance Project and the Red Sea–Dead Sea Conveyance Project;
- the capping and regulation of irrigated agriculture in the highlands and the reinforcement of by-laws; and
- the introduction of appropriate water tariffs and incentives in order to promote water efficiency in irrigation and higher economic returns for irrigated agricultural products.

Government policies in the water sector are set out in four policy papers: the Water Utility Policy, the Irrigation Water Policy, the Ground Water Management Policy and the Wastewater Management Policy.

In 2014, the Ministry of Water and Irrigation developed the document "Establishing the post-2015 Development Agenda: Sustainable Development Goals (SDG) towards Water Security — The Jordanian Perspective", which reinforces the following strategic objectives in the water sector:

- the provision of safe, uninterrupted, reliable and affordable access to domestic water for all;
- the provision of an adequate quantity of water for economic activities, including industry;
- greater understanding and more effective management of groundwater and surface water;
- healthy aquatic ecosystems;
- the sustainable use of water resources;
- fair, affordable and cost-reflective water charges in place;
- the implementation of measures to mitigate the effects of higher population growth and economic development across all sectors that impact water resources and their users;
- preparation for and adaptation to challenges triggered by climate change;
- the optimisation of efficient water use in irrigation; and
- an increase in wastewater coverage kingdom wide.

2. Local context

2.1 Overview of water management challenges

Brief regional overview (geography, climate, hydrology and hydrogeology, socioeconomic characteristics)

Al Karak is situated on a hilltop about 939 m above sea level, 140 km to the south of Amman, and covers an area of 3,495 km^2. It is the capital of the Governorate of Karak (total population estimated to be 350,000 in 2015). The population of Al Karak municipality is nearly 68,810 (20,000 in the city of Al Karak). Most of the population of the city are Muslims (75 percent), and there is also a significant Christian population (the largest in Jordan, at 25 percent).

Al Karak has a semi-arid climate with temperate, cold and warm seasons. August is the warmest month, with an average temperature of 31.5°C at noon. January is the coldest month, with an average temperature of 3.1°C at night. Rainfall varies in the range of 100 to 300 mm per year and has no distinct peak month. The landscape is mostly covered by sparse vegetation. The soil in the area is high in calcisols, cambisols and luvisols, or is dominated by calcium carbonate as powdery lime or concretions.

Al Karak municipality is located in Wadi Al-Karak basin, one of the most important basins in Jordan. With a total area of 190.7 km^2, it represents the transitional area between the humid and semi-arid areas in the west into the drought highlands in the east.

Despite the fact that the area is home to some companies such as the Arab potassium company and Dead Sea chlorides–related companies, income in Al Karak constitutes only about 46.8 percent of the Jordanian average per capita income, while the poverty rate (40 percent) and unemployment rate (15 percent) are relatively high. Income distribution inequality is greater than average in Jordan. The main economic activity is agriculture, and some inhabitants are employed in administration.

Water-related drivers and challenges (water use and demand; vulnerability to extreme hydrological events and climate change; land and water quality degradation)

The Governorate of Karak produces a total of 20 million m^3 of water per year. The per capita share of water is 172 litres per day, which is slightly above the national average (144 litres per day). Water supply is provided from natural springs and groundwater. The governorate's 46 springs produce 18 million m^3 per year in total (springs with the highest capacity are Ein Sara at 62,300 m^3 per month and Mahtah Ghuwair at 242,500 m^3 per month) and are important sources of water in Wadi Al-Karak basin, whether for domestic or agricultural exploitation. Irrigation is primarily provided from springs.

The water supply network is old and in chronic need of better maintenance. As network pipelines are made of iron they frequently break due to rust, causing the flooding of basements. The proportion of households connected to piped water is very high (99 percent). However, water pressure is low in the summer.

Water pollution is an important issue in Al Karak. According to monitoring results, one of the two biggest springs, Ein Sara, is polluted mainly due to lack of planning and control by the authorities. Water sources are not effectively protected.

As in other parts of Jordan, competition for water is also present in Al Karak. Besides competition between domestic and agricultural uses, Al Karak also faces competition among livestock farms and farmers. Livestock breeders use drinking water to fill the pools for sterilisation of their livestock, causing a reduction in the amount of water delivered to farmers.

The total length of the existing sewerage network in Al Karak is about 37 km. Sewerage networks cover less than one-third of the whole of the territory of Al Karak and the proportion of households connected to the sewerage network is around 20 percent. Therefore, a parallel system is in place based on household-level septic tanks, which are emptied by wastewater trucks that supposedly discharge to existing wastewater treatment plants (WWTPs).

Al Karak WWTP, which uses trickling filters, has been in operation since 1988. It was designed for a hydraulic capacity of 875 m^3 per day. The average influent flow rate received in 2012 was about 1,850 m^3 per day, which means that the plant is overloaded hydraulically. The new Adnaneyeh WWTP was built in 2013 with a capacity of 7,060 m^3 per day to serve the residents of Al Mazar, Mutah and Adnaneyeh as well as several villages in Karak.

2.2 The "governing" dimension of water security

Institutions and actors involved

Initial stakeholders:

- Ministry of Water and Irrigation
- Karak Governorate
- Municipality of Al Karak
- Ministry of Municipal Affairs
- National NGOs
- Local community–based organisations (CBOs) (such as Wadi Al Karak Water Users Association)
- Elected area legislators
- Advisory board
- Donors

Public participation and stakeholder involvement issues

Al Karak municipality is a good example of public participation in water planning, despite the fact that municipalities in Jordan have only a marginal role in water planning and management. The municipality created an advisory board as a good platform to deal with all services-related issues, including water-related problems. This institutionalised multi-stakeholder platform has a positive impact on the legitimisation of the public's demands and on dialogue with central government. Through extensive consultation between the municipal authorities and local community–based organisations and NGOs, members of the community have been able to express their needs.

The municipality of Al Karak is a good example of how local authorities in the Jordanian context can rely on the community to engage all its representatives in planning. The municipality uses community participation as a tool for local planning, and as an instrument for lobbying and advocacy. With some additional capacity-building efforts, these mechanisms can prove that water planning at the local level in a highly centralised country like Jordan can be efficient and sustainable.

Efforts and local initiatives in water-related issues (past and ongoing)

Al Karak municipality has launched numerous local initiatives in cooperation with local NGOs, such as joint activities with Wadi Al Karak Water Users Association focusing on rehabilitation after the 2015 storm and floods. The municipality has regular activities with organisations of young people and women.

2.3 Initial problem analysis

- The low rate of connection to the sewerage network, particularly in rural areas. Alternative wastewater disposal systems, based on septic tanks, lead to the spread of insects, rodents and odours, especially in summer.
- Lack of drinking water and the intermittency of piped water. Despite extensive network coverage, members of the public continue to rely overwhelmingly on non-public water to meet their drinking water needs. Fewer than half of households with access to the piped system (i.e. connected households) use public water as their primary drinking water source, with no significant difference between the proportions of rural and urban connected households. The remaining households mainly depend on bottled water.
- Frequent droughts as a result of the lack of precipitation and climate variability.
- An increase in the consumption of livestock water, especially in the summer. This results in livestock breeders being forced to buy water at high prices and causes a drop in the physical yield of livestock.
- Lack of quality services provided by the municipality.

Initial problems include:

- over-pumping from groundwater wells;
- neglected and poorly protected springs;
- poor water and wastewater infrastructure;
- institutional fragmentation; and
- increasing water demand.

3. Proposed topics of substantive focus

- Sustainable supplies
- Safe drinking water
- Protection of water resources
- Drought damage reduction
- Effective governance and management

Annex 2: Calculation of indicators for LWS assessment

Resources (availability, supply, demand)

The Resource component is calculated at river basin scale and assesses the amount of freshwater naturally available, and whether that amount can reliably meet the needs of the community. The component is calculated on the basis of three indicators:

- **availability**, which measures the amount of renewable freshwater available per person;
- **supply**, which determines the variability of the freshwater supply; and
- **demand**, which measures the current level of demand for the resource.

Both surface water and groundwater can be considered, depending on what the municipality uses (or might use) to meet its needs.

Availability

The availability indicator calculates the amount of renewable freshwater available per person (m^3 per capita per year). This is calculated using the Falkenmark water stress indicator. According to this indicator, 1,700 m^3 per capita per year can meet a municipality's requirements. Anything less than this can cause problems in terms of reliability, economic development and the meeting of basic human needs.

>1,700 — Water shortages occur only irregularly or locally

1,000–1,700 — Water stress appears regularly

500–1,000 — Water scarcity is a limitation to economic development and human health and well-being

< 500 — Water availability is a main constraint to life

The score for the availability indicator will be 100 for any value over 1,700 m^3 per capita per year and 0 for any value below 500 m^3 per capita per year. The score is calculated using the following equation:

$$R_A = \frac{(T_{cap} - 500)}{(1{,}700 - 500)} \times 100$$

Where: T_{cap} is the total renewable water resources per capita (m^3/capita/year)

If $T_{cap} > 1{,}700$, then $R_A = 100$

If $T_{cap} < 500$, then $R_A = 0$

To determine T_{cap}, use the average annual streamflow, the sustainable groundwater yield, or both, depending on the river basin's water resources.

EXAMPLE: If your community relies on surface water as a water source, and the average annual streamflow is 5,000,000 m^3 per year, and the community served has a population of 5,000 people, T_{cap} = 5,000,000/5,000 = 1,000.

Since T_{cap} falls between 500 and 1,700, we must use the formula to calculate R_A:

$$R_A = \frac{(1{,}000 - 500)}{(1{,}700 - 500)} \times 100$$

$$= 500/1{,}200 \times 100 = 41.7.$$

Supply

The supply indicator score represents the variability of the community's freshwater supply.

For surface water supplies, first the water runoff ratio is calculated by dividing the runoff that is exceeded 5 percent of the year by the runoff that is exceeded 95 percent of the year (Gleick 1990). Lower-ratio numbers indicate less surface flow variability. According to Gleick, a value greater than 3 indicates vulnerability. To evaluate surface flow variability (R_{ss}), a runoff ratio (x) of 1 is equal to a score of 100; 3 is equal to a score of 50; and 5 is equal to a score of 0. The community's score is calculated using this equation:

$$R_{ss} = \left(1 - \frac{(x-1)}{(5-1)}\right) \times 100$$

Where: x is the run-off ratio

If $x < 1$, then $R_{ss} = 100$

If $x > 5$, then $R_{ss} = 0$

If $5 > x > 1$, then calculate R_{ss} using the above methods.

If runoff data are not available, streamflow data can be used as a surrogate — using streamflow numbers that are exceeded 95 percent of the year and 5 percent of the year.

EXAMPLE: Take the runoff that is exceeded 5 percent of the year (300,000,000 litres/day) and divide that by the runoff exceeded 95 percent of the year (125,000,000 litres/day).

The runoff ratio, x, would then equal 300,000,000/125,000,000 = 2.4. Then take that value and use the R_{ss} formula:

$$R_{ss} = \left(1 - \frac{(2.4-1)}{(5-1)}\right) \times 100$$

$$= (1 - 1.4/4) \times 100 = 65$$

For groundwater supplies, groundwater supply vulnerability (R_{SG}) is based on general trends observed in community wells. To calculate a score, factors of 0, 0.5 and 1 are assigned to declining, no change, and rising observations respectively. Use the following equation, keeping in mind that the equation should consider the overall trend over a period of a year or longer:

$R_{SG} = (r + 0.5n) \times 100$

Where: r = % of wells with rising water levels

n = % of wells with no change in water level

EXAMPLE: If your community relies on 8 wells, where 2 wells have had falling water levels over a period of a year, 4 wells have had no general change in water levels, and 2 wells have had rising levels, r would equal 0.25, and n would equal 0.5. Therefore:

$R_{SG} = (0.25 + 0.5\ (0.5)) \times 100$

$= 50$

Whether each (or either) equation is used depends on the water sources for the municipality. If both sources of water are important, a weighted average is used to calculate the final score based on the percentage of supply from surface water or groundwater source.

EXAMPLE: If 70 percent of the community's water supply is surface water and the remainder is from groundwater, the supply score (R_S) can be calculated using this equation:

$R_S = 0.7R_{SS} + 0.3R_{SG}$

Using the R_{SS} and R_{SG} values from our previous calculations, we calculate R_S:

$R_S = 0.7(65) + 0.3(50)$

$= 60.5$

Demand

The demand indicator assesses water demand in a river basin by examining the amount of water allocated through water licences or permits. The amount of allocated water is the maximum amount of water that can be used. However, this does not necessarily reflect the actual amount of water use.

The demand on the resource (R_D) is evaluated by calculating the amount of water annually allocated relative to the total amount of renewable freshwater (T), where 0 percent allocation is equal to a score of 100, and 100 percent allocation is equal to a score of 0. The following equation is used:

$$R_D = \left(1 - \frac{a}{T}\right) \times 100$$

Where: a = amount of water allocated (m³/year)

T = total renewable water resources (m³/year)

If T consists of both surface water and groundwater, then allocations of both surface water and groundwater are considered. If information is available for only one source (surface water or groundwater), then T should consider only surface water (or only groundwater).

EXAMPLE: If the amount of water annually allocated in your community is 65,000,000 m³/year and the total renewable water resources are 100,000,000 m³/year, then R_D is:

$$R_D = \left(1 - \frac{65{,}000{,}000}{100{,}000{,}000}\right) \times 100$$

$= 35$

To calculate the Resource component

We take the scores of the three Resource indicators — availability, supply and demand — and find the average. Using the numbers calculated from our examples:

$R = (R_A + R_S + R_D) / 3 = (41.7 + 65 + 35) / 3 = 47.2$

Ecosystem health (quality, stress)

Like the Resource component, the Ecosystem Health component is evaluated at river basin scale and examines the health of the river basin's aquatic ecosystems. The three indicators for this component are:

- **stress,** which measures pressures imposed on the ecosystem;
- **quality,** which measures current conditions for the protection of aquatic life; and
- **fish,** which measures the resulting impacts (if any) on fish species that are economically and/or culturally important to the community.

Stress

The stress indicator is scored by assessing the annual amount of water consumed relative to the total annual renewable surface flows. According to the Organisation for Economic Co-operation and Development (OECD 2004), 60 percent of renewable water flows is required to maintain a healthy, functioning ecosystem. Therefore, to score the ecosystem stress indicator (ES), a rate of consumption greater than or equal to 40 percent is assigned a score of 0.

$$E_S = \frac{0.4 - c/T_{sur}}{0.4} \times 100$$

Where: c = annual amount of water consumed (m³/year)

T_{sur} = total annual renewable surface flow (m³/year)

If $c/T_{sur} > 0.4$, then $E_S = 0$

If $c/T_{sur} = 0$, then $E_S = 100$

If $0.4 > c/T_{sur} > 0$, then use the above equation to solve for E_S.

EXAMPLE: If the annual amount of water consumed (c) equals 40,000,000 m³/year, and the total annual renewable surface flow (T_{sur}) equals 200,000,000 m³/year, then:

$$E_S = \frac{0.4 - 40{,}000{,}000/200{,}000{,}000}{0.4} \times 100$$

$= 50$

Water quality

The Water Quality Index (WQI) is used to calculate the water quality indicator. The WQI assesses surface water quality based on the scope, frequency and amplitude of water quality observations relative to guidelines for protecting aquatic life. The index incorporates quality guidelines for a range of nutrients, metals, physical characteristics, ions and organic compounds. A score of 0 indicates poor quality, while a score of 100 indicates excellent quality.

If your community has accurate water quality data, you may use this link to calculate your community's WQI score: http://www.water-research.net/index.php/water-treatment/water-monitoring/monitoring-the-quality-of-surfacewaters

Fish

The score for the fish indicator (E_F) is calculated by assigning factors of 1, 0.5 or 0 to the percentage of economic and/or culturally significant species whose populations are believed to be increasing, stable or declining respectively. Exact population numbers are not required for this indicator: anecdotal observations are sufficient.

$E_F = (i + 0.5s) \times 100$

Where: i = % of culturally or economically significant fish populations that are increasing

s = % of culturally or economically significant fish populations that are stable

EXAMPLE: Note, this can rely on anecdotal observations. If approximately 35 percent of fish populations are increasing and 20 percent of fish populations are stable, E_F is:

$E_F = (0.35 + 0.5(0.2)) \times 100$

$= 45$

To calculate the Ecosystem Stress component:

We take the average of the scores of the three Ecosystem Stress indicators: stress, water quality and fish:

$E = (E_S + WQI + E_F)/3$

Using the above examples and assigning a WQI score of 30, E is:

$E = (50 + 30 + 45)/3$

$= 41.7$

Infrastructure (demand, condition, treatment)

The Infrastructure component incorporates the state of water and wastewater infrastructure in the community. The three indicators are:

- **demand,** which measures the community's ability to meet future demand;
- **condition** of the infrastructure; and
- **treatment,** measuring the level of treatment that the infrastructure provides.

Demand

The demand indicator assesses the ability of the community's water infrastructure to meet future demand by measuring the number of years before 100 percent system capacity is reached (t_{100}). To solve for t_{100}, we use the following equation:

$$t_{100} = \frac{logFV - logPV}{\log(1+r)}$$

Where: FV = number of people that can be served at 100 percent capacity of existing system*

PV = number of people currently being served by existing system

r = annual rate of population growth

*A constant per capita water use is assumed. However, significant known trends can be factored in.

EXAMPLE: If 5,000 people can be served by the water system at 100 percent capacity, but 3,500 people are currently being served, with an annual population growth rate of 1.0 percent, then:

$$t_{100} = \frac{\log(5{,}000) - \log(3{,}500)}{\log(1 + 0.01)}$$

$= (3.70 - 3.54)/0.004 = 37.0$ years

If 6,000 people can be served by the wastewater system at 100 percent capacity, but 3,500 people are currently being served, with an annual population growth rate of 1.0 percent, then:

$$t_{100} = \frac{\log(6{,}000) - \log(3{,}500)}{\log(1 + 0.01)}$$

= 54.2 years

The value of t_{100} is calculated for both the water and the wastewater systems. If population growth is negative, the score for infrastructure demand (I_D) is 100, as the system demand will decrease. When population growth is positive, any community that has a value of t_{100} equal or greater to 50 (in that there are 50 or more years before 100 percent capacity is reached) has a score of 100, and a community with a t_{100} of 0 (where the system is already operating at 100 percent capacity) receives a score of 0. We use the following equation to calculate I_D:

$$I_D = \frac{t_{100}}{50} \times 100$$

If $t_{100} \geq 50$, then $I_D = 100$

If $t_{100} = 0$, then $I_D = 0$

If $50 > t_{100} > 0$, then calculate I_D using the above equation

Calculate I_D for both the water and wastewater systems and use the lowest score.

EXAMPLE: Above, we calculated t_{100} for both the water and wastewater systems. We must now calculate the score for infrastructure demand (I_D) for both systems.

Since the score for the wastewater system is above 50, then $I_D = 100$. For the water system:

$$I_D = \frac{37}{50} \times 100$$

= 74

We would then use 74 for the score, as it is the lower of the two scores calculated.

Condition

The condition indicator is calculated by examining the percentage of system losses in the water and/or wastewater mains. The indicator is designed to provide a measure of system efficiencies, the level of repair needed, and, in the case of wastewater leaks, the extent to which untreated wastewater is released into the environment.

We use the following equation to calculate a score for the infrastructure condition indicator (I_C). A 25 percent system loss or greater receives a score of 0, and a 0 percent system loss receives a score of 100.

$$I_C = 100 - \left(\frac{L}{25} \times 100\right)$$

Where: L = % system losses

If $L \geq 25$, then $I_C = 0$

If $L = 0$, then $I_C = 100$

Determine system losses (L) for both water mains and sewers. The system with the highest loss percentage is used to calculate I_C.

EXAMPLE: If the water main system loss percentage is 15 percent, then I_C is:

$$I_C = 100 - \left(\frac{15}{25} \times 100\right)$$

= 40

If the sewerage system loss percentage is 10 percent, then I_C is:

$$I_C = 100 - \left(\frac{10}{25} \times 100\right)$$

= 60

We use the system with the higher loss percentage, so the score is 40.

Treatment

The treatment indicator is designed to focus on water treatment plants. To determine a score for the infrastructure treatment indicator (I_T), the population connected to municipal sewers is assessed depending on the level of wastewater treatment it receives. Wastewater treatment consists of three levels: primary, secondary and tertiary. Primary treatment removes only insoluble matter. Secondary treatment removes both insoluble matter and biological impurities. Tertiary treatment is the highest level of treatment where nutrients and chemical contaminants are removed after secondary treatment. The percentage of the population that is served by sewers without treatment, or with primary treatment, secondary treatment or tertiary treatment, is multiplied by the following factors:

None	0
Primary	1/3
Secondary*	2/3
Tertiary	1

*Secondary treatment includes waste stabilisation ponds and sewage lagoons.

This equation is used to calculate the community's I_T score:

$$I_T = (1/3P + 2/3S + T) \times 100$$

It is important to note that people who use septic tanks or who are otherwise not served by municipal sewers are not accounted for in this measure.

EXAMPLE: If 10 percent are served by sewers without treatment, 15 percent are served by sewers with primary treatment, 55 percent are served by sewers with secondary treatment, and 20 percent are served with tertiary treatment, then the community's I_T score is:

$I_T = (1/3(0.15) + 2/3(0.55) + 0.2) \times 100$

$= (0.05 + 0.37 + 0.2) \times 100 = 62$

To calculate the Infrastructure component: Calculate the average of the demand, condition of the infrastructure and access indicators. Using the examples above, the component is $(74 + 40 + 62)/3 = 59$.

Human health (access, reliability, impact)

The Human Health component comprises the following three indicators:

- **access**, which measures the amount of potable water available per person;
- **reliability**, which measures how reliable the water supply is; and
- **impact**, which measures the extent to which people's health is compromised by poor drinking water quality.

Access

The access indicator examines how much potable water is normally available per capita, with the exception of service disruptions, as a measure of whether basic domestic needs are being met. Water supplied by municipal infrastructure, water trucks and domestic wells can be included.

To calculate the access indicator (H_A), the amount of accessible potable water available for domestic use is compared to the benchmark of at least 150 litres per capita per day. Communities meeting this benchmark will receive a score of 100, where, at the low end, anything equal to or below 50 litres per capita per day receives a score of 0. The following equation is used:

$$H_A = 100 - \left(\frac{150 - y}{150 - 50} \times 100\right)$$

Where: y = amount of accessible potable water available per person per day (litres/capita/day)

If $y \geq 150$, then $H_A = 100$

If $y \leq 50$, then $H_A = 0$

If $150 > y > 50$, then calculate H_A using the above equation.

EXAMPLE: If your community of 5,000 people has 375,000 litres of potable water per day, then $y = 75$. Solving for H_A:

$$H_A = 100 - \left(\frac{150 - 75}{150 - 50} \times 100\right)$$

= 25

Reliability

The reliability indicator is designed to reflect water supply reliability in a community by looking at the number of days on which water service is interrupted by a loss of service, a boil water advisory, or other form of drinking water ban or warning. The score for this indicator is determined by the number of service disruption days per capita per year. The total number of service disruption days per capita is calculated using the following equation, with a maximum value of 365 (meaning that every person in the community is subject to a service disruption for the entire year).

$$SDD = \frac{\sum_{i=1}^{N}(p_i \times d_i)}{pop}$$

Where: SDD = service disruption days measured per capita

N = number of service disruptions experienced in a year

p_i = the number of people affected by the service disruption

d_i = the duration of the service disruption in days

pop = total population

EXAMPLE: Your community of 5,000 people has two disruptions in a year. The first disruption affects 400 people for 6 days. The second disruption affects 750 people for 30 days. Then:

$$SDD = \frac{(400 \times 6)}{5{,}000} + \frac{(750 \times 30)}{5{,}000}$$

$= 0.48 + 4.5 = 4.98$

The score for the reliability indicator (H_R) is calculated using the following equation:

$$H_R = \left(1 - \frac{SDD}{365}\right)^3 \times 100$$

Although 365 is the maximum value for SDD, 50 service disruption days is still considered to be very significant.

EXAMPLE: Using our above ***SDD*** value, we can calculate H_R:

$$H_R = \left(1 - \frac{4.98}{365}\right)^3 \times 100$$

= 96

Impacts

The impacts indicator assesses health impacts associated with insufficient water quality and/or quality. To evaluate the Human Health Impact indicator (H_I), the number of reported cases of waterborne diseases and illnesses (***w***) is used.

The H_I score is determined by the number of water-related disease and illness incidents per 1,000 people using the following equation, where a score of 0 corresponds to 1 or more incidents per 1,000 people, and a score of 100 indicates 0 incidents.

$H_I = (1 - w) \times 100$

Where: ***w*** = number of reported cases of waterborne disease and illness per 1,000 people per year.

If $w = 0$, then $H_I = 100$

If $w > 1$, then $H_I = 0$

EXAMPLE: If three cases of waterborne disease and illness were recorded in a community of 5,000 people in the last year, then $w = 0.6$. Therefore, H_I is:

$H_I = (1 - 0.6) \times 100$

= 40

To calculate the Human Health component: Calculate the average of the access, reliability and impact indicators.

(25 + 96 + 40)/3 = 54

Capacities (financial, education, training)

The Capacity component measures the capacity of the community to manage their water resources in a safe and effective manner by examining the following indicators:

- financial capacity;
- education; and
- training (i.e. the number of trained operators working in water and wastewater treatment plants).

Financial capacity

The financial capacity of the community is examined by compiling the local government's per capita surplus or excess of revenues over expenditures, and then assessed relative to minimum and maximum levels across the country. This will be dependent on the subnational jurisdiction level at which your country compiles these data — that is, at the provincial/territorial level, or otherwise. The maximum and minimum values of the subnational jurisdictions are used as benchmarks to calculate a score for the community's financial indicator (C_F). The following equation can be used:

$$C_F = 100 - \left(\frac{\max - s}{\max - min} \times 100\right)$$

Where: **max** = maximum provincial/territorial average for local government per capita surplus

min = minimum provincial/territorial average for local government per capita surplus

s = community's per capita surplus

EXAMPLE: In Canada, local governments in the province of Saskatchewan averaged the highest per capita surplus of CAD 863 per person (+863) in 2002. Local governments in Quebec averaged the greatest debt of CAD 2,177 per person (-2,177). These maximum and minimum values are used as benchmarks to calculate C_F, where a value greater or equal to +863 will have a score of 100, and a value of less than or equal to -2,177 will have a score equal to 0. If the value falls between those benchmarks, then the equation above is used.

Education

The education indicator (C_E) examines the level of education in the community. It provides an indication of the human capacity available to manage water resources independently and sustainably. It is calculated by measuring the percentage of the population aged 20 to 64 with a high-school education or higher.

Benchmarks can be established for maximum and minimum values depending on the highest and lowest graduation rates for subnational jurisdictions.

$$C_E = 100 - \left(\frac{\max - e}{\max - min}\right) \times 100$$

Where: **max** = maximum provincial/territorial percentage of population aged 20 to 64 with a high-school education or higher

min = minimum provincial/territorial percentage of population aged 20 to 64 with a high school-education or higher

e = community's percentage of population aged 20 to 64 with a high-school education or higher

If $e \geq \max$, then $C_E = 100$

If $e < min$, then $C_E = 0$

If $\max > C_E > min$, then calculate C_E using the above equation.

EXAMPLE: Again returning to Canada, in 2001 the highest provincial or territorial value was recorded in Yukon Territory, where 83.5 percent of people aged 20 to 64 had obtained a high-school certificate or higher. The lowest value was recorded in Nunavut, where 59 percent of people had a high-school certificate or higher. Those maximum and minimum values were used as benchmarks for C_E scores, where a value greater or equal to 83.5 percent has a score of 100 and a value less than or equal to 59 percent has a score of 0.

Training

The training indicator addresses the community's capacity to operate water and wastewater treatment plants by measuring the level of training that the water and wastewater plant operators have received. This is evaluated by recording the percentage of operators with the forms of training listed below for each plant. The percentage of operators in each training category is then multiplied by the corresponding factors listed below.

Industry certified	1
Other training	0.5
No training	0

Then, to determine an operator training value (***OTV***):

$OTV = (C + 0.5t) \times 100$

Where: ***C*** = % of operators per plant that are industry certified

t = % of operators per plant that have some other form of training

EXAMPLE: If there are five operators for one plant in your community, and three are industry certified and two have some other form of training, your ***OTV*** score would be:

$OTV = (0.6 + 0.5(0.4) \times 100$

= 80

To calculate the final score for the community (C_o), the results from the various water and wastewater treatment plants (if there are more than one) are aggregated using the following equation:

$$C_o = \frac{\sum_{i=1}^{N} w_i \, OTV_i}{\sum_{i=1}^{N} w_i} = \frac{0.6\,(70) + 0.4\,(50)}{0.6 + 0.4}$$

Where: OTV_i refers to the operator training value for water or wastewater plant ***i***

w_i = the weight applied to each plant based on the percentage of the population the plant serves

Note: Calculate this separately for water and wastewater plants, assigning the lowest score calculated for the indicator.

EXAMPLE: After calculating the ***OTV*** for each plant, weights are then assigned. If there are three plants in the community with one water plant and two wastewater plants:

Water plant: ***OTV*** value of 80 serving 100 percent of the population

Wastewater plant 1: ***OTV*** value of 70 serving 60 percent of the population

Wastewater plant 2: ***OTV*** value of 50 serving 40 percent of the population

Then:

= 62

Since the wastewater plant has a score of 62 and the water plant has a score of 80, the score for this indicator would be 62.

To calculate the Capacity component: Average the scores of the financial capacity, education and training indicators.

Annex 3: Draft version of the proposed public opinion assessment questionnaire

Section 1: Introduction

INTERVIEW DATA	
Name of interviewer	
LOCATION AND TIME OF INTERVIEW	
Name of interviewer	
Town/village	
Street	
District	
Country	
Date and time	

IS THE INTERVIEWEE AT LEAST 18 YEARS OLD?	
	Yes
	No (Thank you for your time. We are unable to proceed with the interview, as interviewees must be at least 18 years old.)

CONSENT

We are carrying out a survey to explore how water issues affect you and your family. We are interested in how water is managed in your area, how you hear about water projects and how you think water provision can be improved for you.

1A. WOULD YOU LIKE TO TAKE PART?	
	Yes
	No (Thank you for your time. Please have a look through this information, which explains the purpose of the project.)

IF YES: INFORMED CONSENT

Thank you! All the information you provide will be stored and processed anonymously, and it will not be possible to trace any of your answers to you. Before we start, we would like to make sure that you are aware of a few things:

- There are no right or wrong answers: we are purely interested in your views.
- You can omit any questions that you do not want to answer, and you can withdraw from the survey at any point if you wish.
- The information you provide will be used in our project reports and shared with other scientists in the form of papers and presentations.
- The survey is completely anonymous. Nothing you tell us can be traced back to you as an individual.

1B. DO YOU GIVE YOUR CONSENT, AND WOULD YOU LIKE TO CONTINUE?	
	Yes (Thank you! Please have a look through this information, which explains the purpose of the project.)
	No (Thank you for your time. Please have a look through this information, which explains the purpose of the project.)

Section 2: Questions related to project objectives

Please tick only one answer that is relevant to you!

OBJECTIVE 1. IMPROVE INFORMATION FLOW BETWEEN LOCAL AUTHORITIES AND LOCAL PEOPLE

1. HOW DO YOU FIND OUT ABOUT WATER QUALITY?

Newspapers	Television	Radio	Village meetings	Internet	I do not receive this information
○	○	○	○	○	○

Other (please specify)	

2. HOW DO YOU FIND OUT ABOUT GOVERNMENT PLANS FOR IMPROVING WATER QUALITY, TACKLING WATER SCARCITY ETC.?

Newspapers	Television	Radio	Village meetings	Internet	I do not receive this information
○	○	○	○	○	○

Other (please specify)	

3. HOW OFTEN DO THE LOCAL AUTHORITIES PROVIDE YOU WITH INFORMATION RELATED TO WATER QUALITY IN YOUR VILLAGE?

Never	Once a year	Once every six months	Once a month	Once a week	Once a day
○	○	○	○	○	○

4. HOW OFTEN WOULD YOU LIKE TO RECEIVE INFORMATION ABOUT WATER QUALITY FROM THE LOCAL AUTHORITIES?

Never	Once a year	Once every six months	Once a month	Once a week	Once a day
○	○	○	○	○	○

5. HOW OFTEN DO THE LOCAL AUTHORITIES PROVIDE INFORMATION RELATED TO WATER PLANS AND PROGRAMMES IN YOUR VILLAGE?

Never	Once a year	Once every six months	Once a month	Once a week	Once a day
○	○	○	○	○	○

6. HOW OFTEN DO YOU REQUEST INFORMATION ABOUT WATER FROM THE LOCAL AUTHORITIES?

Never	Once a year	Once every six months	Once a month	Once a week	Once a day
○	○	○	○	○	○

7. HOW OFTEN DO YOU EXPRESS AN OPINION ABOUT WATER-RELATED PROBLEMS TO THE LOCAL AUTHORITIES?

Never	Once a year	Once every six months	Once a month	Once a week	Once a day
○	○	○	○	○	○

OBJECTIVE 2. BRING ABOUT CHANGE IN WATER GOVERNANCE PATTERNS IN TARGET MUNICIPALITIES (INITIATE A BOTTOM-UP APPROACH TO WATER MANAGEMENT PLANNING)

1. HOW OFTEN ARE YOU INVITED TO PARTICIPATE AT MEETINGS (EVENTS) RELATED TO WATER MANAGEMENT PLANNING WITHIN YOUR MUNICIPALITY?

Never	Once a year	Once every six months	Once a month	Once a week	Once a day
○	○	○	○	○	○

2. IS YOUR CONTRIBUTION TO THE WATER MANAGEMENT PLANNING PROCESS ACCEPTED BY LEADERS OF THE PROCESS?

Yes	No
○	○

OBJECTIVE 3. BRING ABOUT BEHAVIOURAL CHANGE IN RELATION TO WATER UTILISATION PATTERNS IN TARGET MUNICIPALITIES

1. HOW OFTEN WOULD YOU LIKE TO RECEIVE INFORMATION ABOUT WATER-SAVING RULES AT HOME?

Never	Once a year	Once every six months	Once a month	Once a week	Once a day
○	○	○	○	○	○

2. ARE YOU TRYING TO SAVE WATER AT HOME?

Yes	No
○	○

IF YES, HOW?

3. DO YOU USE TAP WATER TO WASH YOUR CAR/WATER YOUR GARDEN ETC.?

Yes	No
○	○

4. ARE YOU HARVESTING RAINWATER?

Yes	No
○	○

OBJECTIVE 4. IMPROVE PUBLIC AWARENESS ABOUT THE IMPACT OF WATER SCARCITY ON BIODIVERSITY, THE ENVIRONMENT AND LOCAL SOCIOECONOMIC DEVELOPMENT

1. PLEASE RATE THE IMPORTANCE (CURRENT AND FUTURE) OF WATER QUALITY FOR THE ABUNDANCE OF PLANT AND ANIMAL SPECIES IN YOUR VILLAGE

Not important at all	Not very important	Neutral	Important	Vital for plants and animals	I do not know
○	○	○	○	○	○

2. DO YOU THINK THAT YOU COULD EARN MORE MONEY IF YOU HAD SECURE ACCESS TO WATER?

No, I do not	Yes	I do not know
○	○	○

OBJECTIVE 5. REDUCE WATER-RELATED TENSIONS OR CONFLICTS IN TARGET MUNICIPALITIES

1. HOW OFTEN DO YOU HAVE CONFLICTS OVER THE USE OF WATER WITH OTHER WATER USERS?

Never	Once every few years	Once a year	Once a year	Once a month	Once a week
○	○	○	○	○	○

2. IN YOUR OPINION, WHAT IS THE BEST SOLUTION FOR REDUCING CONFLICTS?

Sufficient water for all sectors	○
Equal participation of all consumers in water management planning	○
Improved access to water	○
Reduced water pollution	○
Other (please specify)	

Section 3: Information about water availability, use and quality

1. WHAT IS THE MAIN PURPOSE FOR WHICH YOU USE WATER?	
Domestic	○
Gardening	○
Farming	○
Other (please specify)	

2. IS SUFFICIENT WATER AVAILABLE TO YOU FOR YOUR MAIN USE?	
Yes	○
Never	○
Most days	○
Other (please specify)	

3. IS THE WATER OF AN APPROPRIATE QUALITY FOR YOUR MAIN USE?		
Yes	No	I do not know
○	○	○

4. IS THE WATER PROVIDED AT A PRICE THAT YOU CAN AFFORD?	
Yes	○
No	○

Section 4: Information about the respondent (please tick only one answer relevant to you under each heading)

GENDER	
a) Male	○
b) Female	○

AGE	
a) 18–29	○
b) 30–49	○
c) 50–69	○
d) Over 70	○

EDUCATION	
a) No formal education	○
b) Primary school	○
c) Secondary school	○
d) University	○

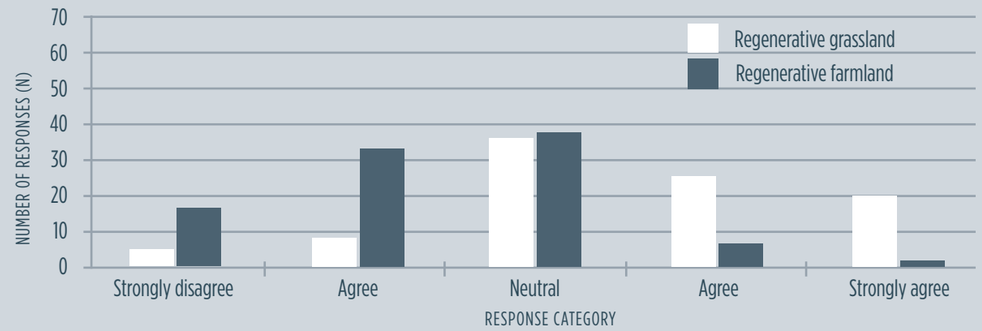
PLACE OF RESIDENCE	
a) Rural area	○
b) Urban area	○

Section 5: Indicators of socioeconomic status

WHAT IS THE MAIN SOURCE OF WATER FOR MEMBERS OF YOUR HOUSEHOLD?	
Piped water into the dwelling	○
Piped water to the yard/plot	○
Public tap/standpipe	○
Tubewell/borehole	○
Protected dug well	○
Unprotected dug well	○
Protected spring	○
Unprotected spring	○
Rainwater collection	○
Bottled water	○
Cart with small tank/drum	○
Tanker truck	○
Surface water (river, dam, lake, pond, stream, canal, irrigation channel)	○
Other (please specify)	

Annex 4: Sample public opinion assessment

ANNEX FIGURE 1 RESULTS FROM A PUBLIC SURVEY IN THE FORM OF A HISTOGRAM: WESSEX-BESS PROJECT, UK



ANNEX TABLE 1 PART OF A PUBLIC SURVEY IN TABLE FORM: WESSEX-BESS PROJECT, UK

WHAT ARE THE MOST IMPORTANT FEATURES OF THIS PLACE?	ARABLE AND HORTICULTURE	BROADLEAVED, MIXED AND YEW WOODLAND	BUILT-UP AREAS AND GARDENS	CALCAREOUS GRASSLAND	CONIFEROUS WOODLAND	FRESHWATER	IMPROVED GRASSLAND	ROUGH LOW-PRODUCTIVITY GRASSLAND
Sports facilities	1							
Footpaths/bridleways	3	1					2	
Historic monuments	3	5		2			1	1
Farms and fields	4	2	1	1			7	1
Ancient grassland	3	1		4			6	1
Sacred sites							1	
Woods and trees	8	11	5	1	3	1	11	
Wildlife	16	10	5	5	3	2	17	2
Open space	13	5	1	4		1	17	2
Facilities for young children	1	1					1	
Water features	5	1			1	2	4	
Amenities (e.g. car park, toilets, café)		1					3	
Hills and contours	9	1		3			9	1
Total	66	39	13	20	7	6	79	8

The table shows results aggregating the number of times that respondents stated that a particular feature of a place is important to them.

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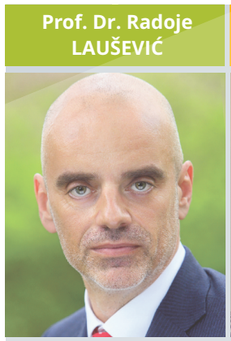

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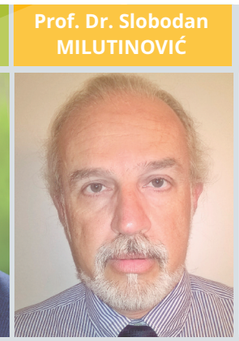

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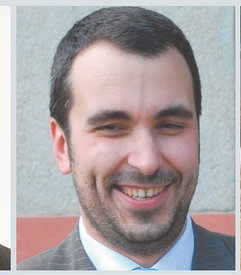

Srdjan SUŠIĆ

Ana POPOVIĆ

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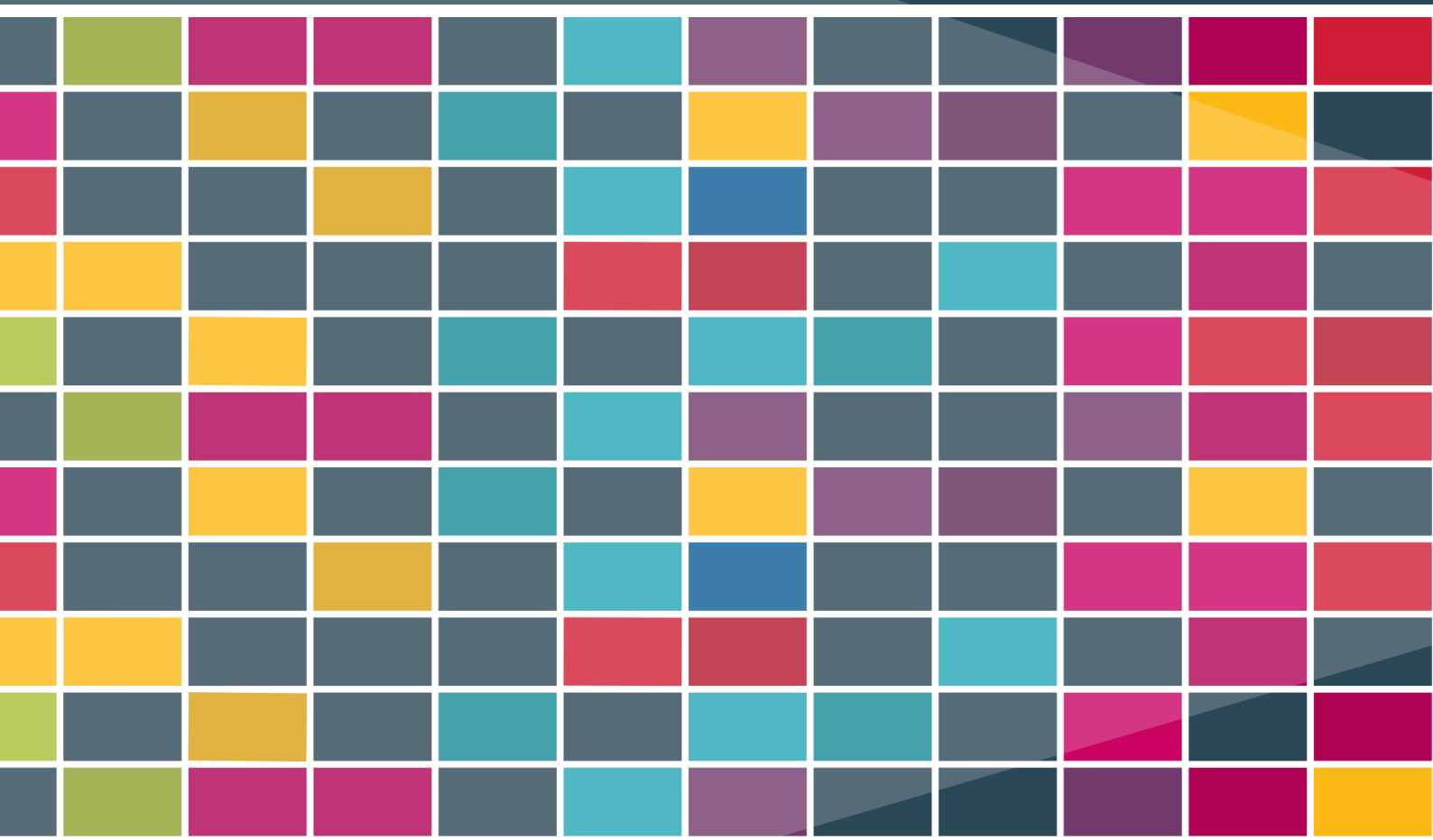
Central European University, Budapest, Hungary



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