

# Section 1

## Evolution, state and prospects for water reuse in MENA

### Introduction

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Section 1 summarizes the best available data on water reuse in the Middle East and North Africa region.<sup>1</sup> The chapters of this section review the challenges and opportunities to untap the reuse potential in MENA. It is aimed at a broad audience, including public officers, academics, students and the media.

**Chapter 1** covers the context and drivers of water reuse in MENA. The MENA region is considered the most water-scarce region in the world. The significant population growth, high urbanization rate, migration, irrigation expansion and agricultural intensification have created an increased water demand in the region. On the supply side, available water resources are diminishing due to decreasing precipitation and runoff and increased evapotranspiration because of climate change. The chapter analyzes how these drivers are aggravating the already existing regional water crises. It also shows how water reuse is being adopted formally and informally as part of the solution. It concludes by calling for an accelerated change toward more and safer water reuse.

**Chapter 2** explores the untapped opportunities for wastewater production, treatment and reuse in MENA. The chapter offers a systematic and synthesized review of municipal wastewater generation, composition and fate in MENA countries based on the best available data from hundreds of sources. The chapter provides definitions and key figures to better understand the subsequent chapters of this book. It looks at the dimension of valuable resources embedded in wastewater streams and the extent to which these resources are so far being recovered for beneficial uses. The chapter provides some explanations for situations where the data are weak or scarce.

**Chapter 3** presents case studies from five MENA countries to illustrate the water reuse policy and institutional landscape development in the region. The chapter explores the policy and

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<sup>1</sup>This book has compiled data from 19 Arab countries of the MENA region (namely, Algeria, Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Sudan, Syria, Tunisia, the United Arab Emirates and Yemen). Throughout this book the terms 'the MENA region' and 'MENA' refer only to those 19 countries.

institutional landscape of wastewater treatment and reuse in Egypt, Jordan, Lebanon, Tunisia and Saudi Arabia. It analyzes the key elements that contribute to, or hinder, the development of water reuse policies and institutional arrangements in the selected countries. It does so by observing the different trajectories each country has followed in developing its water and sanitation sector over the years. The chapter analyzes the key policy and institutional milestones as well as the bottlenecks that shaped this development throughout the years. It starts by identifying the most important policies and institutional reforms (milestones) that shaped the current water reuse institutions and arrangements, then analyzes the current interactions and de facto functioning of the different governmental institutions that operate in the sector.

**Chapter 4** explores the cost recovery mechanisms of water reuse in the MENA region. It assesses several wastewater treatment and reuse projects in the MENA region by focusing on indicators such as their costs and cost recovery or revenue generation mechanisms and the associated technologies. The chapter draws on primary and secondary data collected from existing wastewater treatment plants (WWTPs) in the region with varying value propositions to estimate the investment and operational cost of WWTPs per volume of wastewater treated and operational cost recovery from water reuse.

**Chapter 5** examines how water quality standards and regulations for agricultural water reuse in the MENA region evolve from international guidelines to country practices. The chapter analyzes national regulations and guidelines for irrigation water reuse in the MENA region with a focus on five countries: Egypt, Lebanon, Morocco, Jordan and Tunisia. It introduces the main regulatory approaches adopted worldwide with a focus on the WHO and FAO guidelines that proved influential in the region. The second part of the chapter reviews the historical development of countries' regulations within the larger development of water reuse policies. The third part compares the health-based, agronomic and physicochemical standards against different international guidelines and other MENA country regulations, with a particular interest in human-health standards and restrictions imposed on agricultural practices. The fourth part of the chapter questions the adoption (or lack thereof) of the internationally promoted risk management approaches and unpacks some challenges preventing their translation into national policies and practices. The chapter concludes with common trends in designing qualitative regulations for agricultural water reuse in the MENA region and draws recommendations for future policy and research activities.