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SANITATION, WASTEWATER MANAGEMENT AND SUSTAINABILITY

FROM WASTE DISPOSAL TO RESOURCE RECOVERY

GPA Global Programme of Action for the Protection of the Marine Environment from Land-based Activities

SEI STOCKHOLM ENVIRONMENT INSTITUTE

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UN Environment Programme Global Programme of Action for the Protection of the Marine Environment from Land Based Activities and Stockholm Environment Institute

CONTENTS

1. INTRODUCTION

1.1 Sanitation, wastewater and sustainability

Few areas of investment today have as much to offer the global shift towards sustainable development as sanitation and wastewater management.[1] Gaps in access to decent, functioning sanitation are clear markers of inequality and disadvantage. Unsafe management of excreta and wastewater expose populations to disease, and degrade ecosystems and the services they provide.

At the same time, there is growing recognition that societies can no longer afford to squander the water, nutrients, organic matter and energy contained in sanitation and other wastewater and organic waste streams. These resources can, and should, be safely recovered and productively reused. In fact, the vision of resource-efficient, circular economies is unachievable without radical change in how we manage wastewater, excreta and other biomass waste.

This book discusses how this radical change might take shape. It distils some of the latest thinking and experiences on how to make sanitation and wastewater management more sustainable; and on how they can contribute to broader societal sustainability. In particular, it focuses on the idea of sanitation and wastewater management as resource management functions: as ways of keeping valuable resources available for productive uses that support human well-being and broader sustainability.

To put the scale of the opportunity into perspective, globally we produce an estimated 9.5 million m³ of human excreta[2] and 900 million m³ of municipal wastewater every day (Mateo-Sagasta et al. 2015). This waste contains enough nutrients to replace 25 per cent of the nitrogen currently used to fertilize agricultural land in the form of synthetic fertilizers, and 15 per cent of the phosphorus, along with enough water to irrigate 15 per cent of all the currently irrigated farmland in the world (some 40 million hectares; Mateo-Sagasta et al. 2015). At the city scale, the wastewater (including excreta) from a city of 10 million people contains enough recoverable plant nutrients to fertilize about 500,000 hectares of farmland – which in turn could produce about 1.5 million tons of crops.[3]

[1] Although sanitation waste is often considered part of wastewater, this report refers to it separately to reflect the fact that many sanitation systems are "dry" – i.e. they do not involve flushing with water, and keep faeces and urine separate from other wastewater streams. Such source separation of excreta, as discussed in Chapter 4, is often a desired function within sustainable sanitation systems.

[2] Based on 1.3 litres of excreta per person and a world population of 7.3 billion people.

[3] Based on one person producing roughly 5 kg of nutrient equivalents per year, at a fertilization rate of 100 kg/hectare of farmland producing 3 tonnes of grain per ha.

The opportunities become even more apparent when we consider where the biggest gaps in provision are found. As the maps in Figure 1.1 show, these gaps are largely found in sub-Saharan Africa and South Asia. These regions are badly affected by some of the key development challenges that could be alleviated through sustainable sanitation and wastewater management: food insecurity and associated under-nutrition, water scarcity and soil degradation (see Box 1.1). They are also expected to

FIGURE 1.1 **Sanitation the solution? Mapping some key global challenges sustainable sanitation could help to address**

FIGURE 1.1A **Sanitation gaps: Percentage of population with access to improved sanitation, 2015**

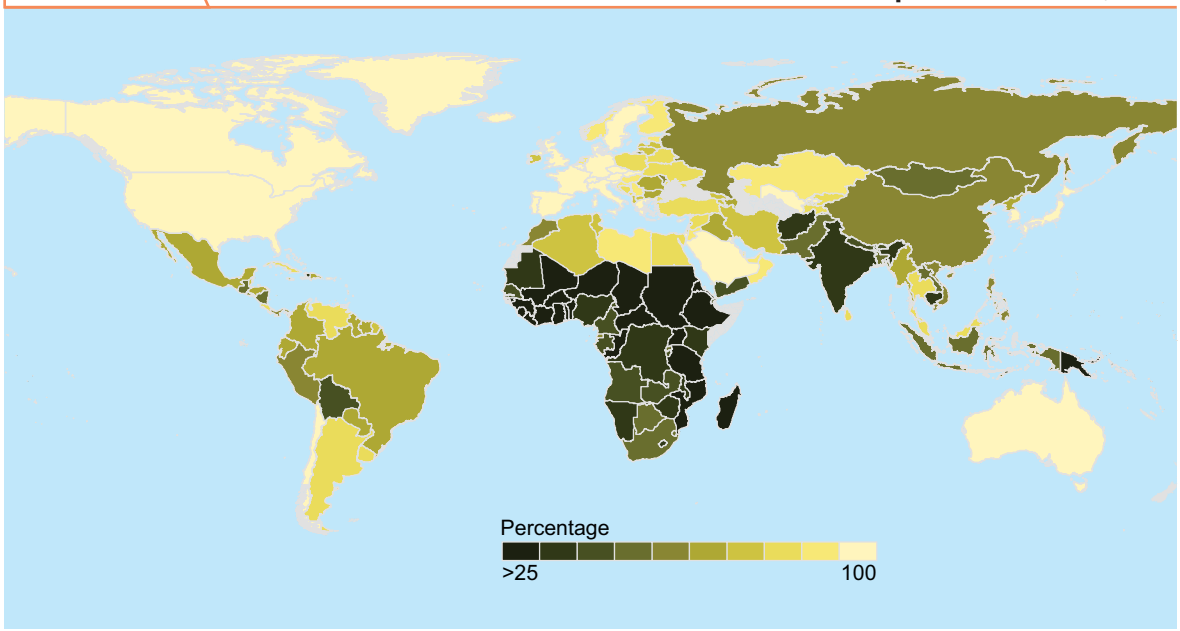

Figure: Based on Joint Monitoring Programme for Water Supply and Sanitation data (www.wssinfo.org/data-estimates/maps)

FIGURE 1.1B **Disease: Percentage of total deaths that are from communicable diseases or maternal, prenatal or nutrition conditions, 2014**

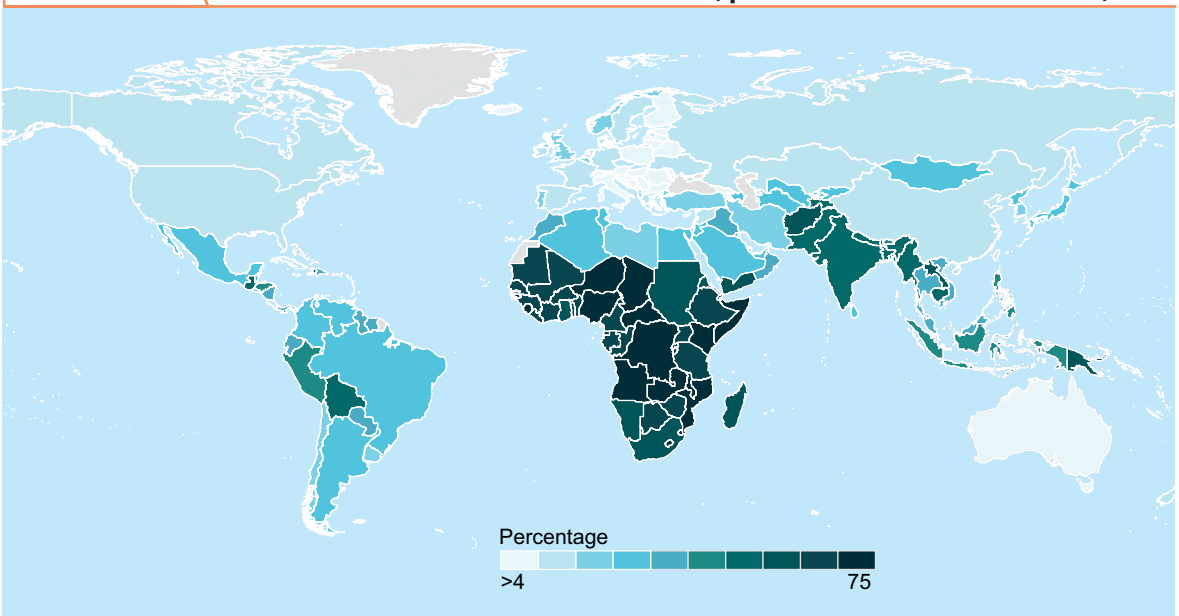

Figure: Based on World Bank data (http://data.worldbank.org/indicator/SH.DTH.COMM.ZS).

experience the greatest population growth by 2030, according to current projections (2030 Water Resources Group 2009). A large proportion of this future population is likely to live in fast-growing cities, where risks from inadequate sanitation and wastewater management, as well as opportunities to mitigate these risks are concentrated.

To realize these opportunities, massive investment in sanitation and wastewater management systems will be needed; to address existing gaps in provision and make the transition to more sustainable systems. What form those investments and systems take has major implications for global sustainable development.

FIGURE 1.1C **Water scarcity: Areas of physical and economic water scarcity, 2007**

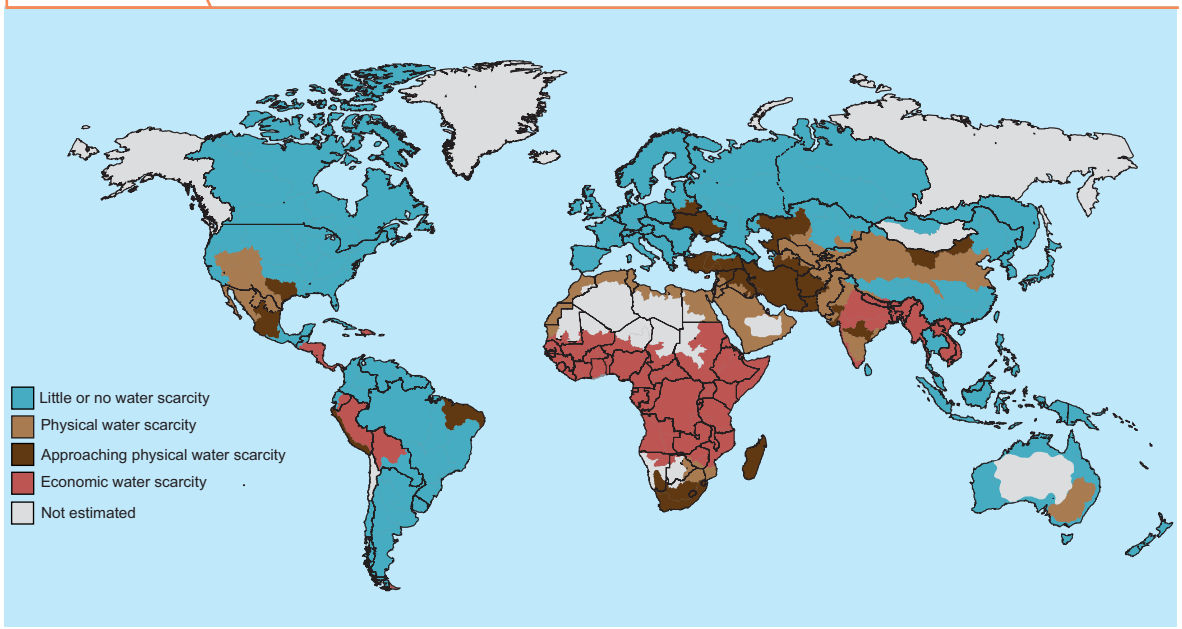

Figure: Based on International Assessment of Agricultural Science and Technology for Development data (www.grida.no/graphicslib/detail/areas-of-physical-and-economic-water-scarcity_1570).

FIGURE 1.1D **Malnutrition: Percentage of children under 5 with stunting, 2015**