

Water Security in a New World

David Devlaeminck  
Zafar Adeel  
Robert Sandford *Editors*



# The Human Face of Water Security

 Springer

# **Water Security in a New World**

## **Series editor**

Zafar Adeel, Pacific Water Research Centre, Simon Fraser University, Burnaby,  
BC, Canada

More information about this series at <http://www.springer.com/series/13406>

David Devlaeminck • Zafar Adeel  
Robert Sandford  
Editors

# The Human Face of Water Security

 Springer

*Editors*

David Devlaeminck  
China International Water Law (CIWL),  
School of Law  
Xiamen University  
Xiamen, Fujian, China

Zafar Adeel  
Pacific Water Research Centre  
Simon Fraser University  
Burnaby, BC, Canada

Robert Sandford  
Hamilton, ON, Canada

ISSN 2367-4008

ISSN 2367-4016 (electronic)

Water Security in a New World

ISBN 978-3-319-50160-4

ISBN 978-3-319-50161-1 (eBook)

DOI 10.1007/978-3-319-50161-1

Library of Congress Control Number: 2017935378

© Springer International Publishing AG 2017

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Printed on acid-free paper

This Springer imprint is published by Springer Nature

The registered company is Springer International Publishing AG

The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

# Contents

<b>1</b>	<b>The Human Face of Water Insecurity</b> . . . . .	<b>1</b>
	Robert Sandford	
<b>2</b>	<b>Water Security as the Centerpiece of the Sustainable Development Agenda</b> . . . . .	<b>25</b>
	Zafar Adeel	
<b>3</b>	<b>Water, Law and Equity</b> . . . . .	<b>45</b>
	Owen McIntyre	
<b>4</b>	<b>Water as a Human Right in the Global South: Ethical, Legal and Sociopolitical Dimensions</b> . . . . .	<b>71</b>
	Patricia Avila-García	
<b>5</b>	<b>Crime, Corruption, Terrorism and Beyond: A Typology of Water Crime</b> . . . . .	<b>95</b>
	Kyungmee Kim and Ashok Swain	
<b>6</b>	<b>Water Security Is Job Security: Water as an Enabler for Livelihoods</b> . . . . .	<b>113</b>
	Sarah Dickin and Luca Di Mario	
<b>7</b>	<b>Water Seekers, Carriers and Keepers: The Global and Gender Divide</b> . . . . .	<b>131</b>
	Alice Bouman-Dentener	
<b>8</b>	<b>Public Health Dimensions of Water Insecurity</b> . . . . .	<b>147</b>
	Susan Watt	

**9 Going to the Well: Water as a Community Builder** ..... 173  
Jennifer Fresque-Baxter and Erin Kelly

**10 Pathways to a Water Secure Community** ..... 197  
Corinne J. Schuster-Wallace and Sarah E. Dickson

**Index** ..... 217

# Contributors

**Zafar Adeel** Pacific Water Research Centre, Simon Fraser University, Burnaby, BC, Canada

**Patricia Avila-Garcia** Research Institute in Ecosystems and Sustainability (UNAM-IIES), National Autonomous University of Mexico, Mexico City, Mexico

**Alice Bouman-Dentener** DiploriA Sustainable Development Solutions, The Hague, The Netherlands

Women for Water Partnership, The Hague, The Netherlands

**Sarah Dickin** Stockholm Environment Institute, Stockholm, Sweden

**Sarah E. Dickson** Department of Civil Engineering, McMaster University, Hamilton, ON, Canada

**Luca Di Mario** Asian Development Bank, Manila, Philippines

**Jennifer Fresque-Baxter** Department of Environment and Natural Resources, Government of the Northwest Territories, Yellowknife, NT, Canada

**Erin Kelly** Department of Environment and Natural Resources, Government of the Northwest Territories, Yellowknife, NT, Canada

**Kyungmee Kim** Department of Peace and Conflict Research, Uppsala University, Uppsala, Sweden

Research School for International Water Cooperation, UNESCO Category II Centre on International Water Cooperation, Uppsala, Sweden

**Owen McIntyre** School of Law, University College Cork, Cork, Ireland

**Robert Sandford** United Nations University – Institute for Water, Environment and Health, Canada, Hamilton, ON, Canada



**Corinne J. Schuster-Wallace** Independent Water-Health Expert, McMaster University, Hamilton, ON, Canada

**Ashok Swain** Department of Peace and Conflict Research, Uppsala University, Uppsala, Sweden

Research School for International Water Cooperation, UNESCO Category II Centre on International Water Cooperation, Uppsala, Sweden

**Susan Watt** School of Social Work, McMaster University, Hamilton, ON, Canada  
United Nations University Institute for Water, Environment and Health, Hamilton, ON, Canada

# List of Abbreviations

AAROM	Aboriginal Aquatic Resources and Oceans Management
ASC	Aboriginal Steering Committee
BOT	Build-operate-transfer
BOOT	Build-own-operate-transfer
BLT	Build-lease-transfer
BWMA	Bilateral Water Management Agreement
CASA 1000	1000 Electricity Transmission and Trade Project for Central and South Asia
CBD	Convention on Biological Diversity
CBM	Community-Based Water Quality Monitoring Program
CESCR	Committee on Economic, Social and Cultural Rights
CPEC	China-Pakistan Economic Corridor
DALYs	Disability-adjusted life years
EIA	Environmental Impact Assessment
ENGO	Environmental nongovernmental organization
ENR-GNWT	Department of Environment and Natural Resources–Government of the Northwest Territories
FAO	Food and Agriculture Organization
FDI	Foreign direct investment
FSDS	Federal Sustainable Development Strategy
GDP	Gross domestic product
GLAAS	Global Analysis and Assessment of Sanitation and Drinking Water
GNI	Gross national income
GNWT	Government of the Northwest Territories
GWP	Global Water Partnership
HIA	Health impact assessment
HIC	High-income country
ICCPR	International Covenant on Civil and Political Rights
ICESCR	International Covenant on Economic, Social and Cultural Rights
ICJ	International Court of Justice
IDP	Internally displaced persons

IFAD	International Fund for Agricultural Development
ILC	International Law Commission
IPCC	Intergovernmental Panel on Climate Change
ISIS	Islamic State in Iraq and Syria
IWRM	Integrated water resources management
KAP	Knowledge, attitudes, and practices
KWDT	Katosi Women Development Trust
LHWP	Lesotho Highland Water Project
LMIC	Low- and middle-income countries
MDG	Millennium Development Goals
MRB	Mackenzie River Basin
MRBB	Mackenzie River Basin Board
NDC	Nationally determined contributions
NGO	Non-governmental organization
NWT	Northwest Territories (Canada)
ODA	Official development aid
OECD	Organisation for Economic Co-operation and Development
OECD-DAC	Organisation for Economic Co-operation and Development– Development Assistance Committee
PCIJ	Permanent Court of International Justice
RADWQ	Rapid assessment of drinking water-quality
RBA	Human rights-based approach
RBO	River Basin Organisation
RRM	Rural, remote, and marginalized communities
RWH	Rainwater harvesting
SDG	Sustainable Development Goal
SIA	Social impact assessment
SRDP	Slave River and Delta Partnership
SWAT	Self-Water Assessment Tool
SWEEP	Slave Watershed Environmental Effects Program
TAPI	Turkmenistan-Afghanistan-Pakistan-India Pipeline
TWG	Tegemeo Women Group
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNCESCR	United Nations Committee on Economic, Social and Cultural Rights
UNCLOS	United Nations Convention on the Law of the Sea
UNECE	United Nations Economic Commission of Europe
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change

UNU-INWEH	United Nations University Institute for Water, Environment and Health
UNWC	United Nations Watercourses Convention
UPA	Urban and peri-urban agriculture
USAID	United States Agency for International Development
UWASNET	Uganda Water and Sanitation Network
VIP	Ventilated improved pit latrine
WaSH	Water, sanitation and hygiene
WHO	World Health Organization
WSP	Water safety plan
WOFAN	Women Farmers Advancement Network of Nigeria

# Boxes, Figures, and Tables

## Boxes

Box 2.1	Description of SDG 6 on Water Security .....	29
Box 4.1	General Comment No. 15. Normative Content Right to Water .....	81
Box 4.2	Violation of the Human Right to Water and Sanitation in Latin America .....	91
Box 5.1	The Lesotho Highland Water Project .....	104
Box 5.2	Water and Terrorism .....	107
Box 7.1	Salamatu Garba, Director of Women Farmers Advancement Network of Nigeria (WOFAN).....	134
Box 7.2	Voices of Katosi Women Development Trust (KWDT) .....	136
Box 7.3	The Dublin Principles.....	138
Box 7.4	Voices of Women in Mweteni Village, Tanzania .....	139
Box 8.1	Ten Essential Public Health Services .....	153
Box 8.2	Public Health Foci on Water Insecurity .....	155
Box 8.3	Facts About Worldwide Malnutrition .....	158
Box 9.1	Transboundary Water Management Agreement Negotiations.....	181
Box 9.2	Slave River and Delta Partnership .....	183
Box 9.3	Aquatic Monitoring in the Dehcho Territory.....	184
Box 9.4	NWT-Wide Community-Based Water Quality Monitoring Program .....	186
Box 9.5	The Significance of the Water Strategy to Achieving Water Security in the NWT.....	187
Box 9.6	Lessons from the Water Strategy to Support Water Security Nationally .....	193
Box 9.7	The Water Strategy in an International Context .....	193

**Figures**

Fig. 6.1 The benefits of wastewater for urban and peri-urban farmers ..... 119

Fig. 6.2 Direct and indirect benefits of wastewater ..... 121

Fig. 8.1 The role of public health ..... 148

Fig. 8.2 The cycle of public health intervention..... 151

Fig. 8.3 The cycle of water security ..... 152

Fig. 10.1 A framework for RRM community water security ..... 201

Fig. 10.2 Elements for achieving community water security ..... 211

Fig. 10.3 Pathway for sustainable community change ..... 212

**Tables**

Table 6.1 Revenue generated in different farming systems in 2002 ..... 120

Table 9.1 Categories of Keys to Success ..... 178

# Chapter 1

## The Human Face of Water Insecurity

Robert Sandford

**Abstract** The timely availability of fresh water has for decades been recognized as a global concern. In addition to matters of availability and quality we now recognize that the world will soon be redefined by changing precipitation patterns associated with an increase in the mean temperature of our planet's atmosphere. This will result in droughts in some places becoming deeper and more persistent making human presence in some parts of the world impossible to sustain. While it did not receive the same attention in the media, the announcement of UN's 2030 *Transforming Our World* global sustainable development agenda was at least as important as the climate negotiations held in Paris 2 months later if only because it deals with damage we are doing to other elements of the Earth system that are exacerbating and being exacerbated by climate change. The goals in the agenda of improving the management of water globally and acting on climate change need to be elevated to special importance because success cannot be achieved in addressing other critical global sustainable development challenges, which include huge challenges such as eliminating poverty and hunger and bringing about peace and stability, unless we manage water more effectively, a goal that can only be achieved by stabilizing the composition of the Earth's atmosphere. This chapter argues that if we do not make water security and water-related climate stability a global imperative at the national and sub-national level, the result will be greater regional tension, conflict and involuntary migration related in large measure to water insecurity.

**Keywords** Water security • Climate stability • Conflict • Migration

### 1.1 Water Security and Insecurity

In general, water security is usually taken to mean having and being able to reliably provide adequate water of the right quality where and when you need it for all purposes especially agriculture but also for purposes related to sustainable natural

---

R. Sandford (✉)  
United Nations University – Institute for Water, Environment and Health,  
Hamilton, ON, Canada  
e-mail: [sandford@telusplanet.net](mailto:sandford@telusplanet.net); [robert.w.sandford@gmail.com](mailto:robert.w.sandford@gmail.com)

bio-diversity-based Earth system function. It also means ensuring that your use and management of water in the region in which you live does not significantly affect the water security of regions up or downstream from you now or in the future.

Over the last decade water security has also come to mean being able to achieve these goals not just in the face of growing populations but also in the face of new circumstances created by the acceleration of the global hydrological cycle.

Water security now means managing not just the water you once thought was reliably available to you; but also managing water in ever greater extremes of abundance and scarcity than we have experienced in the past.

What we now realize is that water security and climate security are inseparable; one is implicit in the other. It could even be said they are the same thing. It is widely held that water and climate security are critical elements of sustainability. Without stable water and climate regimes sustainability will forever remain a moving target.

Flood and drought resilience are very much elements of the larger water security ideal in that they are tied to human health and well-being as well as social, economic and political stability especially in parts of the world that are simultaneously experiencing rapid population growth and changes in hydro-meteorological regimes. The failure to assure flood and drought resilience is increasingly seen as contributing to national and regional water in-security that can have devastating local effects which spill out of and affect surrounding regions and may even affect the rest of the world. This is a relatively new development in the politics of hydro-climatic change which is now, because of social media, assuming a very human face.

On Wednesday, September, 2nd, 2015, the body of a 3-year old boy, a Syrian refugee named Aylan Kurdi, later identified Alan Kurdi, washed up on a beach in Turkey. While the boy's face was only partially exposed in the now famous photographs taken of him, and though he drowned in water, Alan Kurdi put a child's face on the global threat of water insecurity. Here was a little boy dressed in a red shirt; blue pants and running shoes – a child that could have been anyone's child anywhere – alone and face down in the incoming waves. The images, posted by the Turkish photographer Nilüfer Demir and British photo-journalist Andy Worthington, were instantly communicated around the world through social media causing immediate international outrage over the world's failure to understand the serious nature of what was happening in Syria and to act upon its humanitarian responsibility toward refugees. While some disagreed that Alan Kurdi could be characterized as a true "climate refugee" in that the conflict in Syria could have broken out at any time irrespective of drought, the fact remains that deep and persistent drought did play a role in intensifying the Syrian refugee crisis.

In the 5 years between 2006 and 2011, over half of Syria was engulfed in the worst drought in recorded history. It was held by many climate scientists that the drought was deeper and more persistent than could be explained by established patterns of regional natural climate variability. As the drought worsened, nearly 85% of livestock died and crops upon which locals relied for food and for export withered away in the dry fields. When the government of President Bashar al-Assad responded by granting groundwater well rights along political and ideological lines,



many farmers were forced to drill their own illegal wells. As the drought intensified there were demonstrations demanding government action. Protesters were soon being arrested and tortured.

As the drought lingered on, nearly a million farmers were forced to abandon their farms and move to already crowded cities like Daraa, exacerbating already extreme water shortages in those cities. In these cities there were few jobs for those who crowded in from the countryside. Even though most international analysts had deemed Syria immune to what became known around the world as the Arab Spring, angry Syrians were emboldened by what they saw happen on television in Tunis and Cairo. A movement emerged with the stated purpose of toppling the Syrian political regime. The protesters, however, underestimated Bashar al-Assad's ruthlessness. Further arrests and torture followed. The revolution became violent. Soon other nations and regional extremist movements, each with its own regional interests became involved exacerbating the conflict. At the time of this writing the conflict had yet to be resolved. In the meantime, the surrounding regions, including Europe, are facing the largest forced migration of people since World War II.

Can it be legitimately stated that climate change impacts on water security played a role in the Syrian conflict? There can be no questioning the fact that loss of livelihood by 1.5 million people due to drought put a great deal of stress on Syria's social and economic fabric. Nor is there any question that massive population displacement from rural areas into Syrian cities contributed to social unrest and fueled the revolutionary movement that intensified the war. While it is true as international water expert Peter Gleick noted in his paper "Water, Drought, Climate and Change in Syria" that the civil war that began in March of 2011 was sparked by the complex interaction of a number of social and political factors both nationally and regionally, there has clearly been an increase in incidents of water-related violence at sub-national levels around the world. Syria is one of these places. Many of these conflicts are attributable to the role water security plays in maintaining national and regional economic, social and political stability.

## 1.2 The World Had Been Warned

The world has been warned many times that the impacts of water insecurity could radiate outward from the water-scarce regions of the Middle East and North Africa in ways that would have impacts on Europe and the rest of the world.

Established in 1983, the InterAction Council is an independent international organization that aims to mobilize the experience, energy and international contacts of a group of statesmen who have held the highest political office in their own countries. Its members jointly develop recommendations on — and practical solutions for — political, economic and social problems confronting all of humanity. The council is unique in bringing together on a regular basis more than 30 former heads of state or government who work together to foster international co-operation in three principal areas — peace and security, revitalization of the world economy and

the nexus between development, population and environment and universal ethics. The members of the InterAction Council select specific issues from within these broad areas and then develop proposals for action. They then communicate these proposals directly to government leaders and other national decision-makers, heads of international organizations and influential individuals throughout the world. If there could be said to be a global senate then this might be it.

The final communiqué of the 30th Annual Plenary Meeting of the Interaction Council held in China in 2012 reported (InterAction Council 2012) that, as a result of humanity's over-exploitation and pollution of water resources, there is now a growing global water crisis. If left unaddressed, the Council noted, water scarcity, and the deteriorating water environment will undermine human health, hinder economic development and in some places will even affect national and regional stability.

The demand for water continues to grow in tandem with rapidly increasing human populations and accompanying economic and social development. It must be realized that, despite this growth, the world cannot continue to divert water indefinitely for consumptive purposes. Enough water must remain in the environment to sustain biodiversity-based planetary life-support system functions. Aquatic ecosystems must be protected to safeguard natural processes of water purification, prevent floods, and moderate the effects of drought.

While the 30th Annual Plenary was held in China, which has its own serious water problems, it was noted at that meeting that the challenges associated with water security were particularly serious in the Middle East and North Africa. The flows of the Jordan River, for example, have diminished by 95% due to dams and diversions affecting not only Jordan but all the countries that rely upon its waters. The political tensions and distrust that have characterized the region in the past must be resolved before cooperation can lead to more efficient water management. But no solution to the water scarcity problems in the Middle East and North Africa, the InterAction Council noted, will be possible without on-going dialogue between decision-makers and water experts.

The InterAction Council also recommended that conflict over water can be avoided by adopting the principles of basin-scale management and cooperation. In conclusion, the InterAction Council recommended enhanced public education campaigns aimed at making the global public more aware of water issues. A further examination of water scarcity issues in the Middle East and North Africa has confirmed the validity and urgency of these recommendations.

The Middle East and North Africa region faces serious food security issues and some of the most daunting climate change challenges of any region in the world. Because of the besieged circumstances of many governments and the social and political instability of the past several decades, water and water-related food and energy security issues in the region are being addressed in a short-sighted manner that will inevitably lead to conflict as populations grow out of proportion to local food supply and changing climatic conditions reduce available water supplies.

A clear-sighted, long term view of the water scarcity problem is required now not just to lessen the potential for tension between states over water supply and quality issues but to prevent outright collapse of some nations in the Middle East and North Africa region in the near future. That longer view can be provided in part by science.

Food security is a serious concern in many countries in the Middle East and North Africa. The food crisis that began in 2008 has worsened. In 2012 alone, international wheat prices rose by 19%. With each rise in the food price index millions around the world are pushed into poverty. High food prices hit the poor hardest which results in greater unrest. If the state is unable to make up the difference in prices through subsidies; or if food staples of the quantity and quality required are not available in the international market; then unrest grows. When this happens the issue of food security becomes or is absorbed into larger issues of state and regional security.

The Middle East and North Africa have the largest food deficit of any region in the world. Relative food security exists only in the oil-rich countries of the Arabian Peninsula which together constitute only 10% of the region's population. At moderate risk are Iran, Libya and Tunisia. Jordan already faces a serious food security situation, and extremely alarming food security situations exist now in Yemen and Sudan.

Despite already serious water scarcity and a clear understanding of the huge threats to water security in the region, water continues to be badly misused in agriculture. Farmers in many areas are still permitted to abstract water unsustainably and to draw down aquifers in excess of recharge depleting centuries-old aquifers. This kind of mismanagement accelerates environmental degradation through soil erosion, soil and water salination and through water-logging. These are of course global problems but ones that are particularly serious in dry areas like the Middle East and North Africa.

While the outlook for food security in the region is not good, research demonstrates that well-run trans-national research institutions can assist all the nations in the Middle East and North Africa region to simultaneously improve agricultural productivity and practices while at the same time put into relief policy directions that will close the food security gap.

Yield gap has been defined as the amount that actual yields from either irrigated or rain-fed areas fall short of potential yields under optimal management. It is generally held that agricultural productivity gains can be most effectively achieved by reducing the yield gap and increasing relative land availability. Unfortunately, very little capacity exists to increase relative land availability in the Middle East and North Africa region which means that in order to enhance food security, the focus has to be on reducing the yield gap.

Yield gap analysis conducted by researchers in Morocco and Syria demonstrate that the gap between actual and simulated potential yields in research facilities was as high as 82% which suggests a huge potential for increasing wheat production in many parts of the Middle East and North Africa region.

These analyses demonstrate that even without climate change, business as usual is not an option in the Middle East or North Africa. Even with improved agricultural productivity, population growth will put food security even further beyond reach for many countries in the region. Questions remain, however, about whether gains of this order can be achieved at the farm level and if they can be sustained under new climate regimes that drastically reduce water supplies.

Climate change effects are already measureable. The relative change in mean annual temperature and precipitation is higher in the Middle East and North Africa region than anywhere in the world. Temperatures and evaporation rates are expected to rise and precipitation to fall putting even greater pressure on limited water supplies.

It is presently anticipated that the Middle East and North Africa as a region will likely have up to one-quarter less water just as temperatures rise and the population doubles. This situation is projected to be even worse in Jordan and in surrounding countries. It has been predicted that the average water yield in Jordan will decrease by 45–60% due to a 10% decrease in precipitation combined with the evaporative effect of a 2 °C temperature increase. Unfortunately, however, the mean temperature increase is expected to be as high as 4.5 °C by the end of the century with a decrease in precipitation of as much as 25% with combined effects leading to a decrease in water availability of 23% in the upper Jordan catchment. Jordan is not alone in facing this magnitude of hydro-climatic change. It is anticipated that per capita water availability will drop by 35% in Iraq; 38% in Morocco; and 40% in Yemen by 2025. The implications of these changes are far reaching to say the least.

Countries with high reliance on dryland agriculture will be increasingly vulnerable to seasonal changes in climatic patterns. The rural poor will be disproportionately impacted by climate disruption because of their greater dependence on agriculture and their limited capacity to adapt to such changes. The InterAction Council warned that issues of food security could impact political stability in ways that could further threaten the fragile stability of the region. This realization makes building a more effective bridge between science and public policy even more urgent.

Given the current low level of cooperation at the nexus of water, energy and food in the Middle East, the very survival of some countries in the region is threatened by an uncoordinated response to accelerating climate effects on precipitation and evaporation. Unless we are successful in building a more effective bridge between science and public policy not just on a national basis but regionally, some countries may cease to exist at least as we know them today.

Presently the Middle East and North Africa are too absorbed with tensions and uncertainty in their own region to look far into the future. Unfortunately, however, the future as projected presently by science is one that threatens to devastate the region. If current trends persist, growing regional tensions related to water could destabilize the Middle East with impacts that will be felt throughout the rest of the world. Only the international community can prevent that from happening.

### 1.3 Water in the World We Want

The timely availability of fresh water has for decades been recognized as a global concern. There is not enough water to support our constantly growing numbers and to sustain all the uses to which we want to put this precious resource. In addition to matters of availability and quality we now recognize that the world will soon be redefined by changing precipitation patterns associated with an increase in the mean temperature of our planet's atmosphere. There are going to be winners and losers – places that will remain habitable and places that will not. The geography of human presence on the planet is about to change. Change in that geography is unlikely to occur without conflict. While there are precedents to suggest that outright warfare specifically over water can be avoided, solving the problem of inequitable water supply and reducing the tensions persistent water shortages create will not be easy nor will it be cheap.

Among the many reports published by the UN in the lead-up to the Paris climate conference in 2015, was one published by the United Nations University Institute for Water, Environment and Health which warned that without large new water-related investments many societies worldwide will soon confront rising desperation and conflicts over life's most essential resource. Presenting their report which was entitled *Water in the World We Want: Catalysing National Water-Related Sustainable Development* (Schuster-Wallace and Sandford 2015), at UN Headquarters in New York, officials of UN University and the UN Office for Sustainable Development said unmet water goals threaten many regions of the world and form a barrier to key universally-shared ambitions including stable political systems, greater wealth, and better health for all.

The *Water in the World We Want* report argued that continued stalling, coupled with population growth, economic instability, disrupted climate patterns and other variables, could reverse hard-earned development gains and preclude meaningful levels of development that can be sustained into the future. The report underlined that all current water management challenges will be compounded one way or another by hydro-climatic change, and by increasingly unpredictable weather. The report noted that historical predictability, known as relative hydrological stationarity provided the certainty needed to build houses to withstand winds of a certain speed, snow of a certain weight, and rainfalls of certain intensity and duration, when to plant crops, and to what size to build storm sewers. Because of warming generated by changes in the composition of the Earth's atmosphere, however, the relative stability of the global hydrological cycle has been lost. The consequence is that the management of water in all its forms in the future will involve a great deal more uncertainty than it has in the past.

In a more or less stable hydro-climatic regime, the report observed, you are playing poker with a deck that you know and can bet on risk accordingly. The loss of stationarity is playing poker with a deck in which new cards you have never seen before keep appearing more and more often, ultimately disrupting your hand to such an extent that the game no longer has coherence or meaning. People, unfortunately, do not have the luxury of living without water and when faced with a life or death

decision, people tend to do whatever they must to survive. Changes in fundamental hydrology, the report noted, “are likely to cause new kinds of conflict, and it can be expected that both water scarcity and flooding will become major trans-boundary water issues.”

The report noted that within 10 years, researchers predict 48 countries — 25% of all nations on Earth with an expected combined population of 2.9 billion — will be classified “water-scarce” (1000–1700 cubic meters of water per capita per year) or “water-stressed” (1000 cubic meters or less). By 2030, overall global demand for freshwater could exceed supply by 40%, with the most acute problems in warmer, low-resource nations with young, fast-growing populations, according to the report.

An estimated 25% of the world’s major river basins run dry for part of each year, the report noted, and new conflicts are likely to emerge as more of the world’s rivers become further heavily abstracted so that they no longer make it to the sea. Meanwhile, the magnitude of floods in Pakistan and Australia in 2010, and on the Great Plains of North America in 2011 and 2014, “suggests that the destruction of upstream flood protection and the failure to provide adequate downstream flood warning will enter into global conflict formulae in the future.” The report cited the rising cost of world flood-related damages: US\$53 billion in 2013 and more than US\$312 billion since 2004.

Published in the run-up to the UN Member State adoption of universal post-2015 Sustainable Development Goals, the report provided an in-depth analysis of 10 countries to show how ensuring reliable water supply and providing universal sanitation services offers a rapid, cost effective way to achieve sustainable development. The countries included in the study cover the full range of economic and development spectrum: Bangladesh, Bolivia, Canada, Indonesia, Republic of Korea, Pakistan, Singapore, Uganda, Vietnam, and Zambia. Based on the national case studies, the report prescribes country level steps for achieving the global water targets.

The report also noted that the success of global efforts to achieve sustainable development goals with respect to water on the scale required rests in large part on a crackdown on widespread corruption in the water sector, particularly in developing countries. The report noted that in many places corruption is resulting in the hemorrhaging of precious financial resources, siphoning an estimated 30% of funds earmarked for water and sanitation-related improvements.

The *Water in the World We Want* report also noted that the world’s water and wastewater infrastructure maintenance and replacement deficit is building at a rate of \$200 million per year, with \$1 trillion now required in the USA alone. To finance its recommendations, the report says that in addition to plugging the leakage of funds to corruption, \$1.9 trillion in subsidies to petroleum, coal and gas industries should be redirected by degrees. The estimated global cost to achieve post-2015 sustainable development goals in water and sanitation development, maintenance and replacement is US \$1.25–\$2.25 trillion per year for 20 years, a doubling or tripling of current spending translating into 1.8–2.5% of global GDP. The resulting benefits would be commensurately large, however — a minimum of \$3.11 trillion

per year, not counting health care savings and valuable ecosystem service enhancements.

The report recommended that national governments must make sustainable advancements in water, wastewater, and sanitation management, supported by a dedicated and independent arm's length water agency, a high level policy priority. The report also observed that decisions for managing water at all scales must be evidence informed, accounting for the multiple roles, uses, and demands on water and disposal of human waste and wastewater, as well as the way in which the distribution of water resources is changing, and expected to continue to change over time and space.

Governments and all economic sectors, the report clearly stated, must eradicate corruption through the establishment and implementation of clear and defined anti-corruption protocols, with meaningful consequences when the protocols are breached. Capacity development must be nested within, and form a pillar of institutional reform at all scales within a country, with an emphasis on transferable skills that can be used for sustainable development across all areas and goals. The report also recommended that governments, supported by relevant stakeholders, must commit to timely and transparent monitoring and reporting on sustainable development indicators to monitor progress and hold the global community mutually accountable. There must also be a national commitment to universal access to water and sanitation, linked to waste treatment and management, delivered through nationally coordinated and monitored multi-stakeholder response. The report also noted that the world can no longer ignore the water nature needs for planetary biodiversity based Earth system function and charged national governments with committing to ensuring continued viability and level of provisioning and regulating natural ecosystem functions.

The report recommended that national water governance and management include a requirement to balance supply and demand at the at the sub-basin level for sustainability and disaster risk reduction, while recognizing and protecting downstream users. These targets must permit the tailoring of actions to national realities.

The report argued that agriculture sector must be held more accountable for water use efficiencies and other system efficiencies which limit water demand while maintaining or increasing productivity, ensuring that women and small scale farmers are provided with the knowledge and technology to be able to play their part, thereby increasing income above poverty thresholds. The energy sector must also be held accountable for water efficiencies in energy and a transition to clean energy, including hydropower, which does not compromise water quality, environmental integrity, community access, or disaster mitigation.

The report was also very clear about the importance of involving the private sector in the global effort to achieve sustainable development goals with respect to water. Water-dependent companies have a key role to play, the report noted, in financing and implementing sound water, sanitation and wastewater management strategies and must step up to the plate or risk significant losses. This is no longer simply corporate social responsibility but sound economic strategy. National gov-

ernments, multi-national corporations, and international institutions must work together to identify and implement strategies to equitably free up available existing resources. Current expenditures must be more efficient, freeing up and increasing returns on existing resources through integration of inter- and intra-sectoral activities that take advantage of economies of scope and scale. Subject to rigorous due diligence, national governments must identify, explore, and utilize new and emerging financial sources.

Dr. Zafar Adeel, Director of the United Nations University Institute of Water, Environment and Health and Jong Soo Yoon, Head of the UN Office for Sustainable Development, stated that the report filled a critical gap in understanding the complexities associated with water resources and their management, but also provided substantive options that enabled the world to move forward with the global dialogue on the relationship to water and sustainability.

## 1.4 The 2030 UN Transforming Our World Sustainable Development Agenda

Such reports make it clear that it is not unreasonable to say that water in-security has a very human face. As a global society we face some very substantial and very complex immediate threats to the sustainable presence of the global social order as it exists today. Threats that we have brought on ourselves. But within these challenges resides opportunity. The opportunity before us is humanity's big chance to get it right for future generations. In responding to the urgency and the opportunity of finally getting sustainable development right, the United Nations announced its long anticipated new framework for global action. Launched in New York in the September of 2015, the 2030 *Transforming Our World* agenda (UN 2015b) promises to be the most comprehensive and inclusive effort to positively change the world in all of human history. It was heralded at the time of its release as nothing less than a charter for people and the planet for the twenty-first century. While it remains to be seen if it meets these high expectations, there is no question that the 2030 *Transforming Our World* agenda raises the ceiling on sustainability globally. While it did not receive the same attention in the media, the announcement of 2030 *Transforming Our World* agenda was at least as important as the later climate negotiations in Paris if only because it deals with damage we are doing to other elements of the Earth system that are exacerbating and being exacerbated by climate change. The *Transforming Our World* agenda recognizes that unless we address the problems that form the backdrop to the climate threat, it will not be possible to prevent runaway changes in Earth system function that could bring the conditions that make life possible on this planet as we know it today to an end.

The 2030 *Transforming Our World* agenda is constructed around five themes: people, planet, prosperity, peace and partnership. It is also important to note that this agenda applies equally to the developed world as it does to developing nations. In