

Water Security in the Middle East

“A Crisis on Top of a Crisis”

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The Hashemite Kingdom of Jordan**

**May 22, 2014,
Stanford University, USA**



Ministry of Water And Irrigation



Outline

- The pillars of water security in the Middle East
- Situation analysis
 - Main Hydro-Characteristics of the ME
 - Demography and stress on water resources
 - Arab Spring & Water Security
 - Impact of the Syrian Crisis
- Water Supply
 - Transboundary Issues and shared water basins
 - Groundwater Overexploitation & Water Security
 - Challenges of climate change
- Water Demand and Water Deficit
- Needs for the region
 - The Need for Regional Cooperation
 - Water and sanitation – are we on track?
 - MDGs and SDGs Post 2015

The Pillars of Water Security in the ME

- Water Futures: Sustainability and Growth
- Human rights to water and sanitation recognized in the regional water strategy
- National security
- Regional stability

The background of the slide is a solid blue color. In the center, there is a vertical sequence of water droplets falling, with concentric ripples emanating from the point of impact at the bottom. The text 'Situation Analysis' is centered within a white rectangular box that is positioned in the middle of the slide.

Situation Analysis

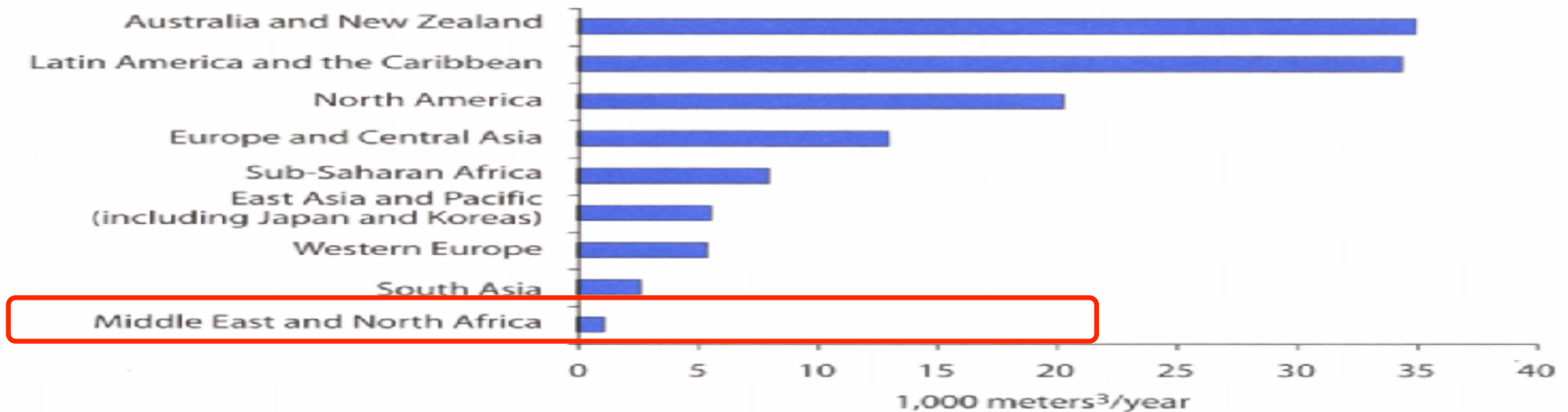
Situation analysis-Main Hydro-Characteristics of the ME

- Political Instability.
- Transboundary Conflict.
- Scarce Water Resources by Nature.
- Waves of Refuges since World War II, 1948, 1967, 1975, 1981, 1990, 2003, 2011
- Climate Change impacts.
- Extremely Rich and Extremely Poor Countries.
- High Population Growth (>3%) and modest Economic Growth Rates (<2%)
- Poor Water Governance

Situation analysis-Main Hydro-Characteristics of the ME

FIGURE A1.1

Actual Renewable Water Resources per Capita, by Region



Source: Table A1.1.

Note: Actual Renewable Water Resources (ARWR) is the sum of internal and external renewable water resources, taking into consideration quantity of flow reserved to upstream and downstream countries through formal or informal agreements or treaties, and reduction of flow to upstream withdrawal; and external surface water inflow, actual or submitted to agreements. ARWR corresponds to the maximum theoretical amount of water actually available for a country at a given moment. The figure may vary with time. The computation refers to a given year and not to an annual average. ARWR does not include supplemental waters (desalinated, or treated and reused). See table A1.1.

TABLE A1.1

Actual Renewable Water Resources per Capita, by Region

Region	ARWR per capita (1,000 m ³ / year)
Australia and New Zealand	35.0
Latin America and the Caribbean	34.5
North America	20.3
Europe and Central Asia	13.0
Sub-Saharan Africa	8.0
East Asia and Pacific (including Japan and Korea)	5.6
Western Europe	5.4
South Asia	2.7
Middle East and North Africa	1.1

Source: FAO AQUASTAT data for 1998–2002.

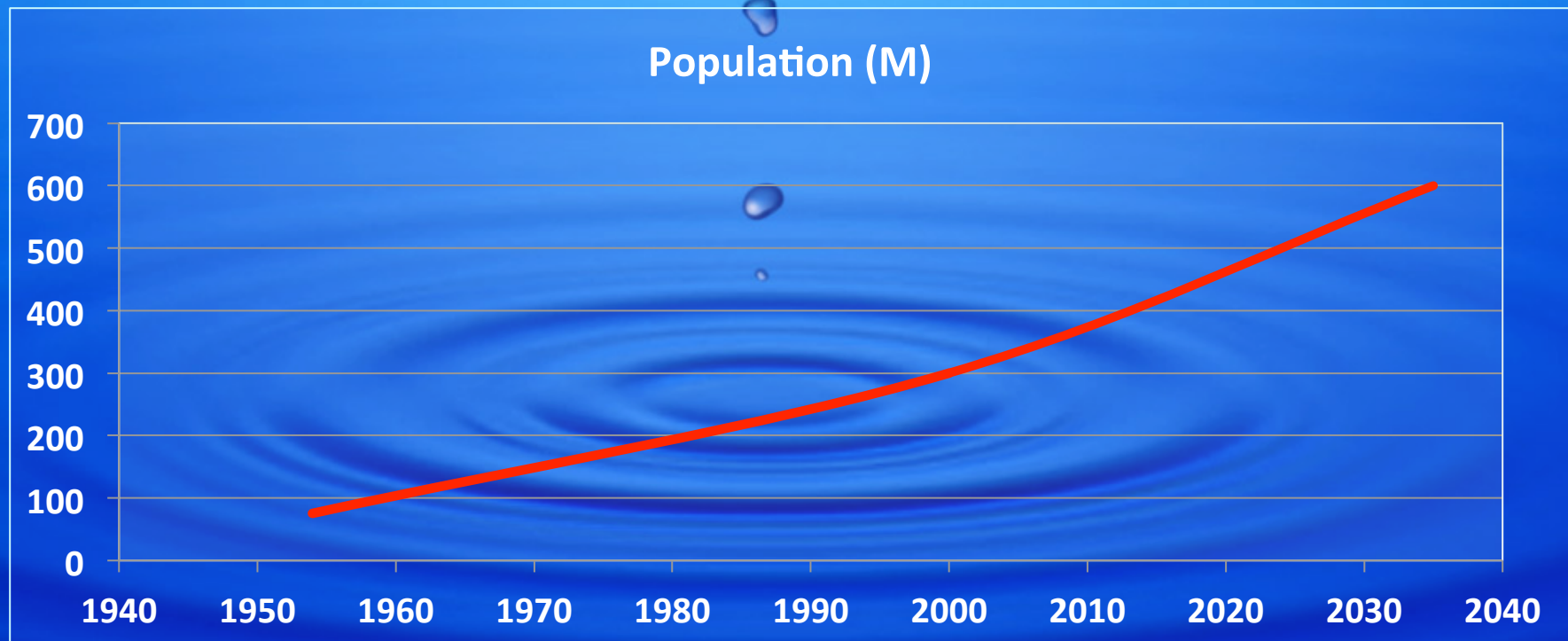
Jordan
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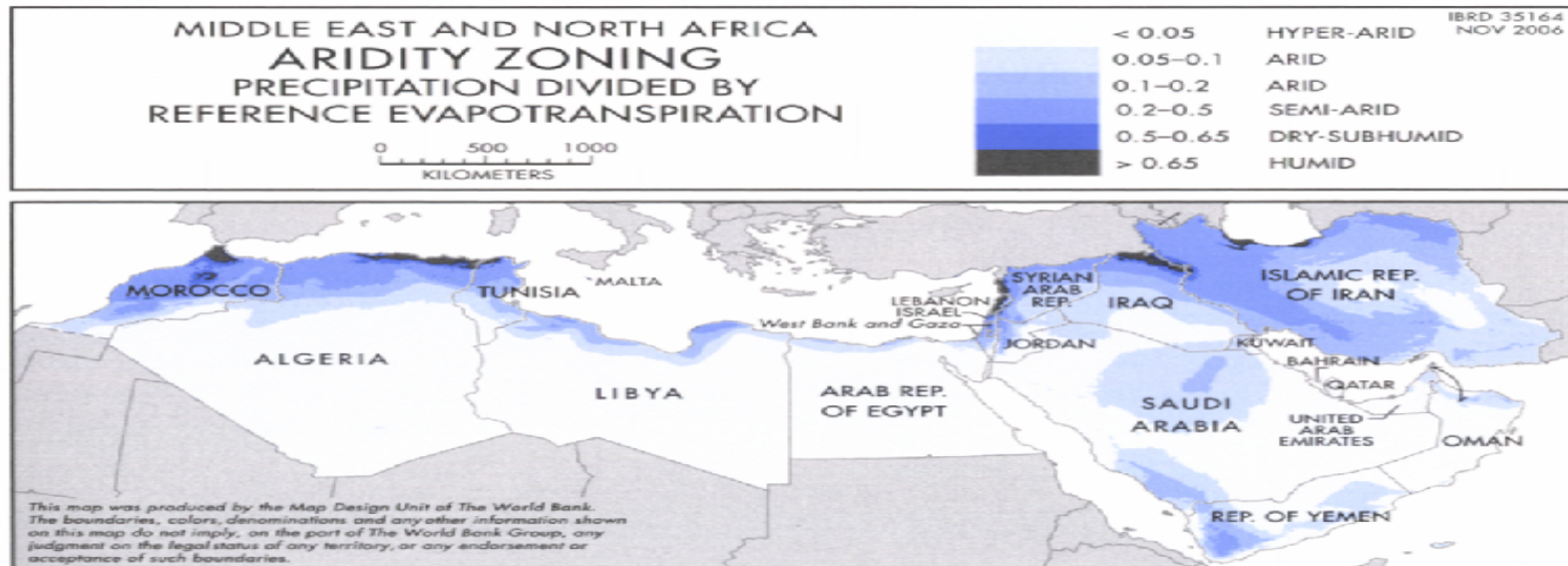
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Situation analysis-Demography and stress on water resources

Year	Population of ME (Million)
1954	75
2000	300
2035	600

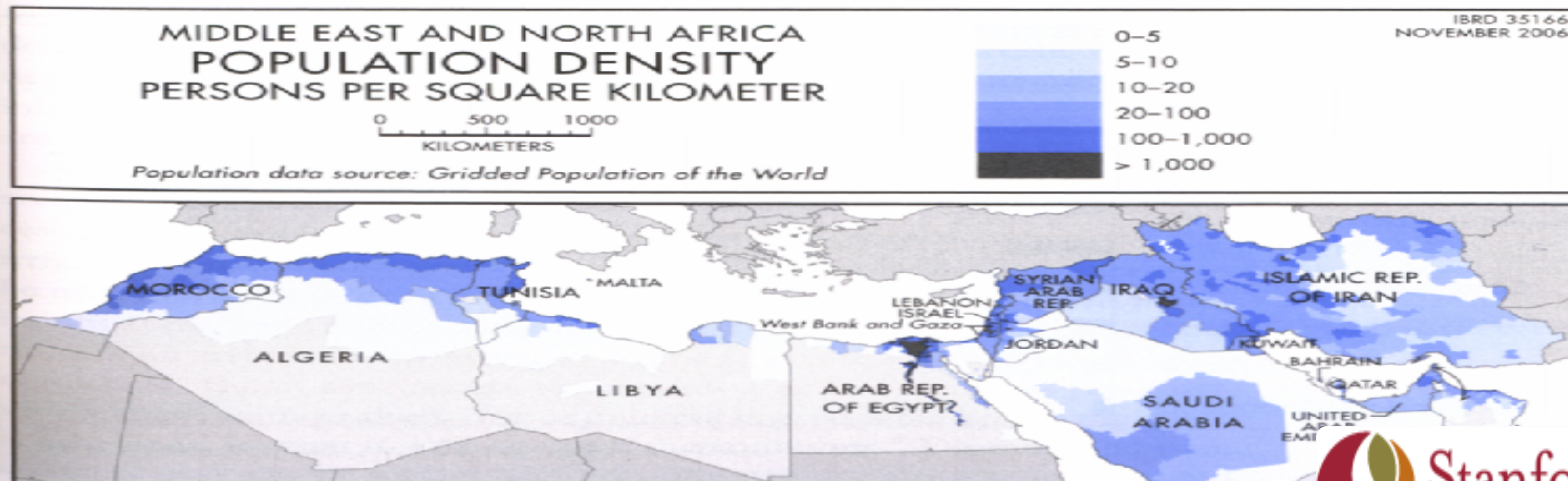


Aridity Zoning and Population Density in MENA



Source: Aridity estimates prepared by the Development Research Group, World Bank, based on: Climatic Research Unit (2005), Global Climate Dataset, University of East Anglia, UK.

MAP 2



Situation analysis-Arab Spring & Water Security

- The population of the ME constitute about 8% of the total population of the world and have less than 1% of the world's water resources
- The population growth rate for the area averaged at about 3.27% While the world's average rate is 1.25%
- Water shortages in the Arab Countries are at the root of the region's instability both locally and regionally
- The challenge therefore, for the region, is to balance declining resources with the increasing consumption that results from rapid population growth

Situation analysis-Arab Spring & Water Security

- Lack of access to basic commodities, are fuelling more organized and systematic uprising against the present system of governance, or status quo*.
- Ineffective governance institutions, lack of transparency and corruption have prevented governments from providing adequate protection against increased water scarcity in most Arab countries.
- Yemen considered one of the world's most water-stressed countries. Sanaa could be the world's first capital to run out of water. Water issues contributed heavily to the national uprising against the political regime.
- It is very clear: When people cannot find water for the basic needs of their children, they will ultimately join whoever promises to change the current dismal situation.

* Source: El-Naser, H. (2012): Arab Spring and Water Governance, ACCUWA, Amman, Jordan

Situation analysis-Arab Spring & Water Security

- The Arab Countries are the largest importers of cereal in the world.
- Ineffective governance has resulted in importing most of the ME food needs at high prices.
- In Mashreq Countries, basic foodstuffs were in short supply and, therefore, local prices rose from 2003 until 2011 beyond the affordability of the poor or even the middle class.
- Wheat is a good example in the case of Egypt where prices in 2011 rose by around 12% despite government subsidies on food and energy that reached 7% of GDP.

Situation analysis-Arab Spring & Water Security

- It is still unclear and indeed, difficult to predict if the political changes and consequences of the Arab Spring will enhance the prevailing water governance among these countries or not.

Situation analysis-Arab Spring & Governance

What needs to be done

- First, Countries and civil societies need to work on enhancing prevailing water governance with all its elements (in the first place transparency, accountability, Coherence & Integration, and the rule of law) and dimensions i.e Social, Economic, Environmental and Political
- Second, a regional and national strategy needs to be put in place to identify a sustainable plan for an equitable provision of water in a region equally hard hit. This needs to include a coordinated regulatory framework. Without proper regional coordination, measures taken that may disadvantage neighboring countries will lead to water conflicts
- Third, proper management of municipal and industrial water supplies requires the introduction of water pricing schemes. Water pricing is likely to be unpopular in the short term, but it will moderate consumption behaviors and lead to a more efficient use of water, and helps protect water supplies from overuse and pollution
- Fourth, increasing investment and providing sources of funding is crucial. The region's formidable accumulation of sovereign wealth funds should pool some resources and launch a regional water investment fund to invest in the huge outlays required for the necessary infrastructure

Situation analysis-Arab Spring & Governance

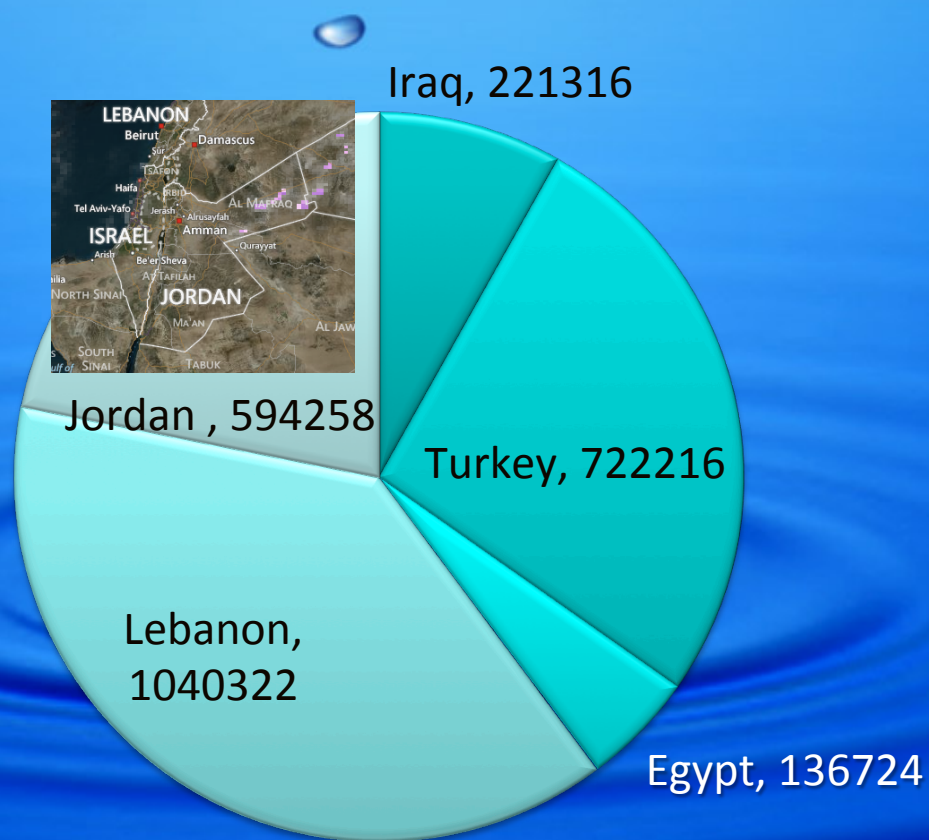
Water Governance

Good Water Governance is a must for achieving water security in the ME

Improving water governance is rather difficult under the prevailing conditions of the Arab Spring which requires political will, reformers and sound water institution including capacity building and effective role of law. A major barrier would be how to coordinate agricultural water and domestic water needs

Situation analysis-Impact of the Syrian Crisis

The Syrian refugees registered in the region total 2,734,533
ref UNHCR on 15 May 2014



Situation analysis-Impact of the Syrian Crisis

Number of Syrians In Jordan

	Number	%
Total Active Registered Syrians ARS	597,974	100%
Total ARS at Hosting Community	491,063	82.1%
Total ASR at Camps	106,911	17.9%

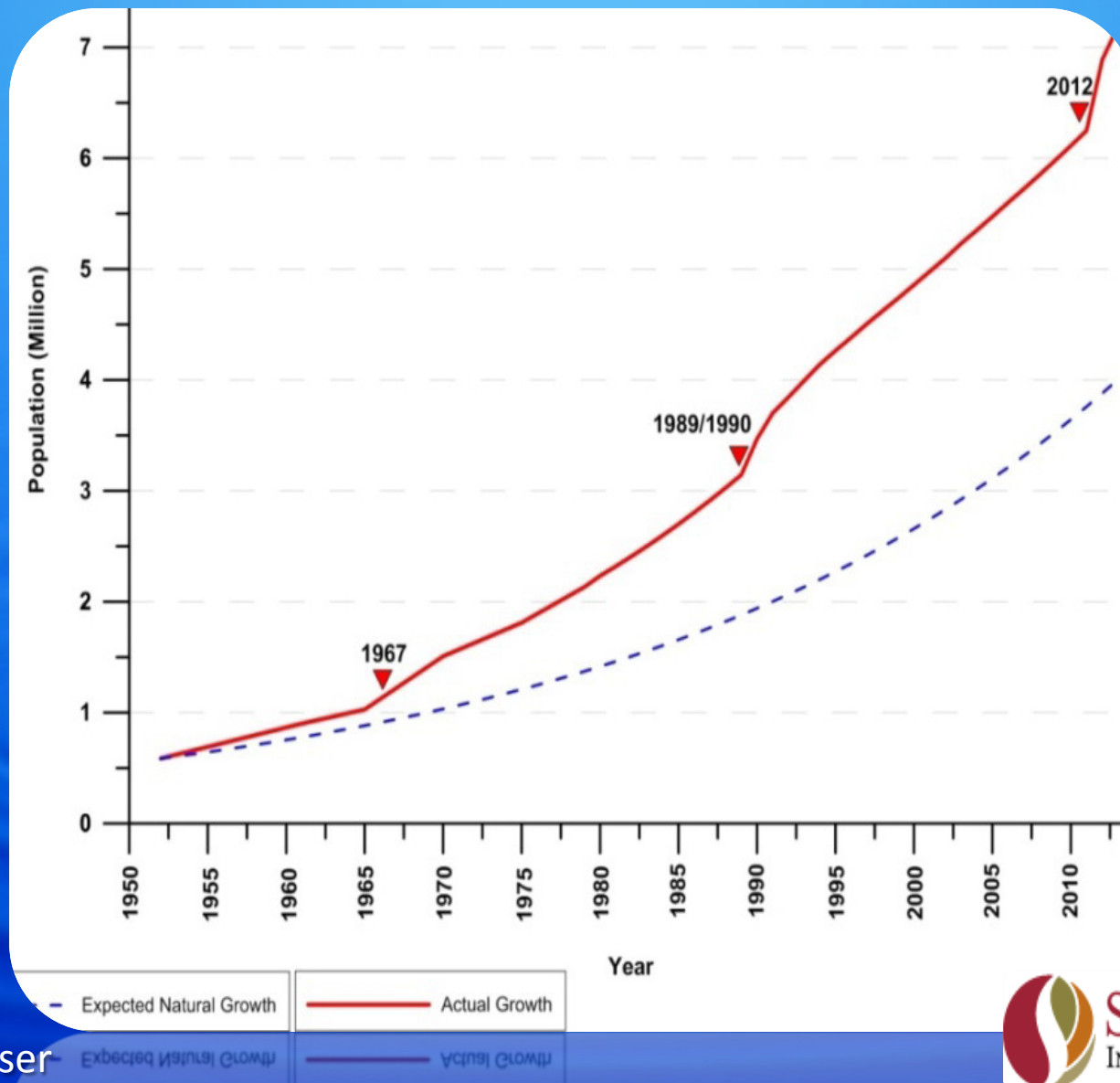
Number of Syrian refugees at hosting community	491, 036	A
Number of Syrian refugees at camps	106, 911	B
Number of Syrian <u>people</u> before crises (<i>March 2011</i>)	750, 000	C
Total number of Syrian <u>people</u> at hosting community (<i>refugees and non-refugees</i>)	1.241 million	A+C
Total number of Syrian people at hosting community and camps (<i>refugees at hosting community and camps and non-refuges</i>)	1.348 million	A+B+C

Situation analysis-Impact of the Syrian Crisis

- In Jordan the domestic demand has increased due population growth of 2.2% and to the stepped increase in population resulting from waves of refugees since 1948
- Syrians fleeing their homeland putting Jordan as the third country hosting the largest number of refugees
- Thirteen camps for Palestinians and five for Syrians have been established creating new demand centers for water and sanitation services

Situation analysis-Impact of the Syrian Crisis

Natural Growth vs Actual Growth Rate of Residents in Jordan



Situation analysis-Impact of the Syrian Crisis

Key Figures Syrian Crisis in Water Supply

Description	2013	2014 expected
Syrian refugees	>600,000	>800,000
Total no. of Syrians living in Jordan	1,200,000	1,400,000
Daily water consumption @ 70 l/cd	84,000 m ³ /d	98,000 m ³ /d
Annual water consumption	30.7 MCM/a	35.8 MCM/a

Situation analysis-Impact of the Syrian Crisis

Cost of Syrian Refugee Crisis

Current estimates 2013	430 JOD/Refg/Yr
Direct costs	208 JOD/Refg/Yr
Indirect costs	220 JOD/Refg/Yr
Annual Costs for 2013	516 million JOD
Expect Costs for 2014	602 million JOD

Situation analysis-Impact of the Syrian Crisis

National Resilience Plan (NRP)

Three year programme of high priority investments by the Government of Jordan in response to the impact of the Syrian crisis on Jordanian host communities and the Jordanian economy

Planning period	3 years (2014 – 2016)
Investment volume WASH Projects	750 million USD

Situation analysis-Impact of the Syrian Crisis

National Resilience Plan (NRP)

- Donors have to provide not only funding to capital investment projects, but as well adequate resources to manage and control fast implementation of projects.
- Fast track, un-bureaucratic methods to be introduced and approved to shorten project implementation.



8th May 2014

The background of the slide is a vibrant blue gradient. In the center, a water droplet is shown in mid-fall, with several concentric ripples emanating from its point of impact on the surface below. The droplet and ripples are rendered with realistic lighting and shadows, giving them a three-dimensional appearance.

Water Supply

Water Supply-Transboundary Issues and Shared Water Basins



TIGRIS - EUPHRATES BASIN

- TIGRIS – EUPHRATES RIVERS ORIGINATING IN TURKEY
- SEPARATELY MERGE AS A UNIQUE RIVER IN IRAQ
- BEFORE DISCHARGING TO PERSIAN GULF

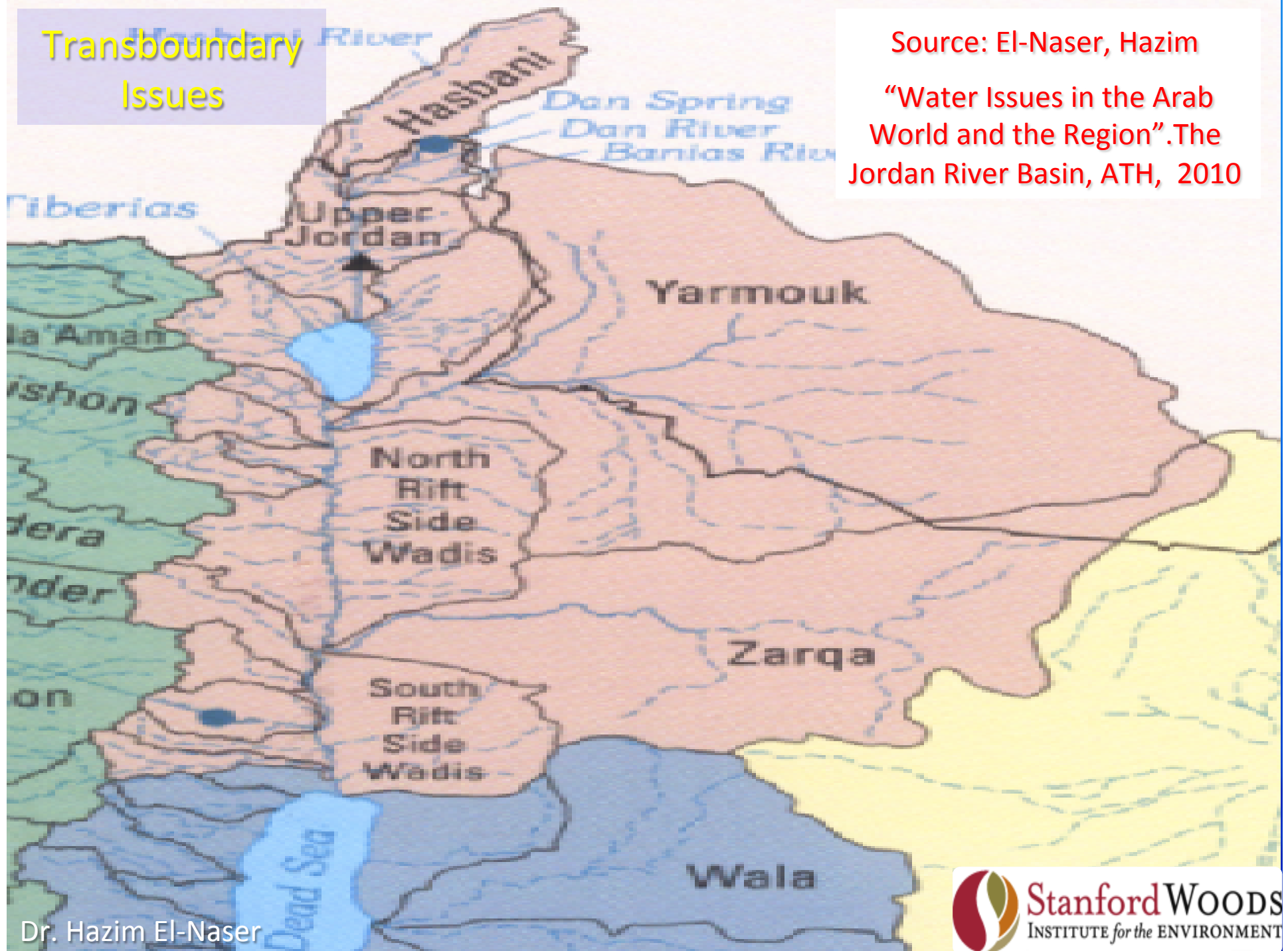
Source: Akif ÖZKALDI

“Water Issues in the Arab World and the Region”. ATH, 2010

Transboundary Issues

Source: El-Naser, Hazim

“Water Issues in the Arab
World and the Region”. The
Jordan River Basin, ATH, 2010

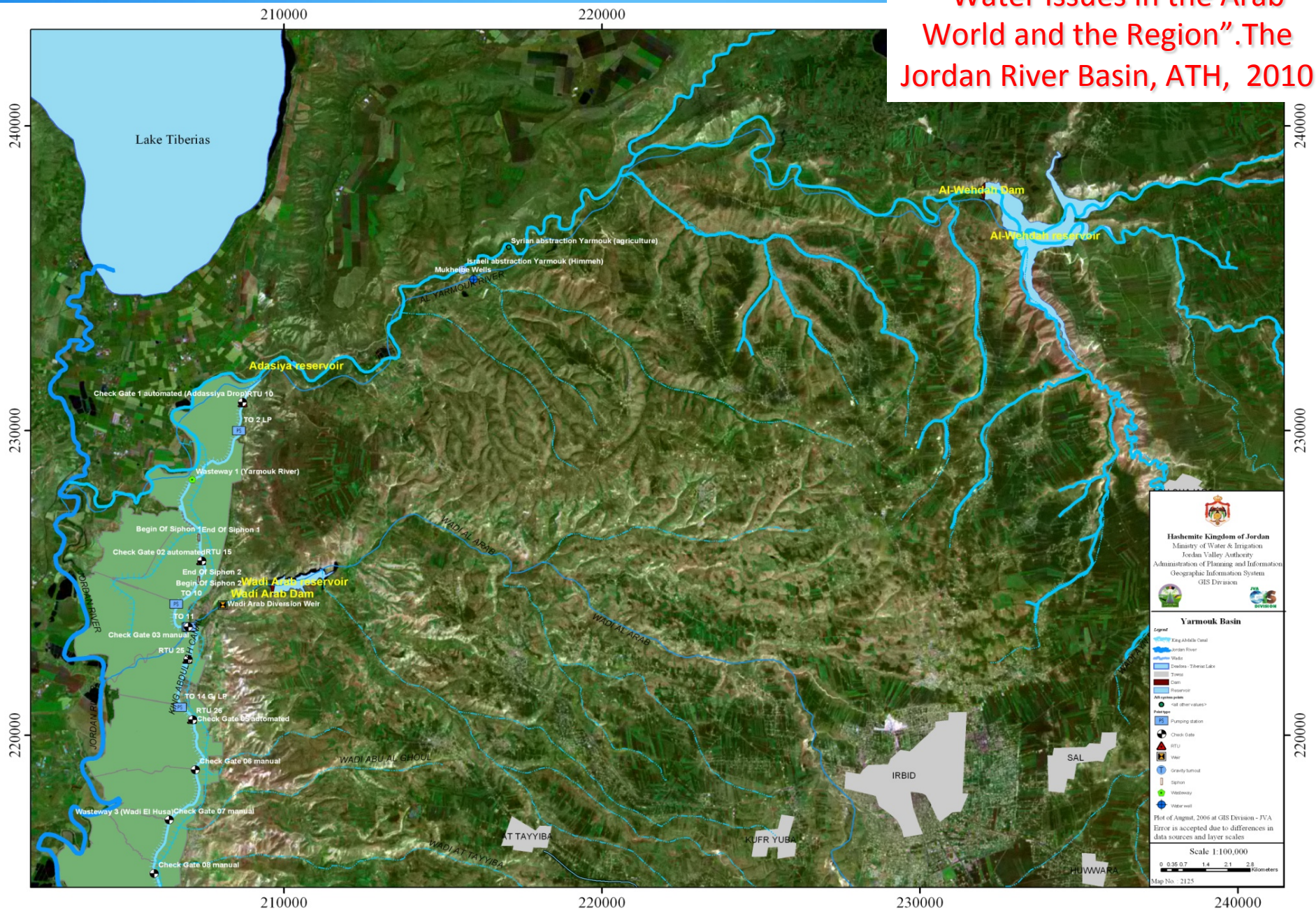


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Trans-boundary Issues

Source: El-Naser, Hazim

“Water Issues in the Arab World and the Region”. The Jordan River Basin, ATH, 2010



Water Supply- Groundwater Overexploitation & Water Security

Groundwater Overexploitation is a Major Threat to Water Security

Currently, renewable and non-renewable groundwater resources in most Arab countries, specifically in the Arabian Peninsula, are heavily utilised to meet increasing water demand and crisis management as it is the case in Jordan

Water Supply- Groundwater Overexploitation & Water Security

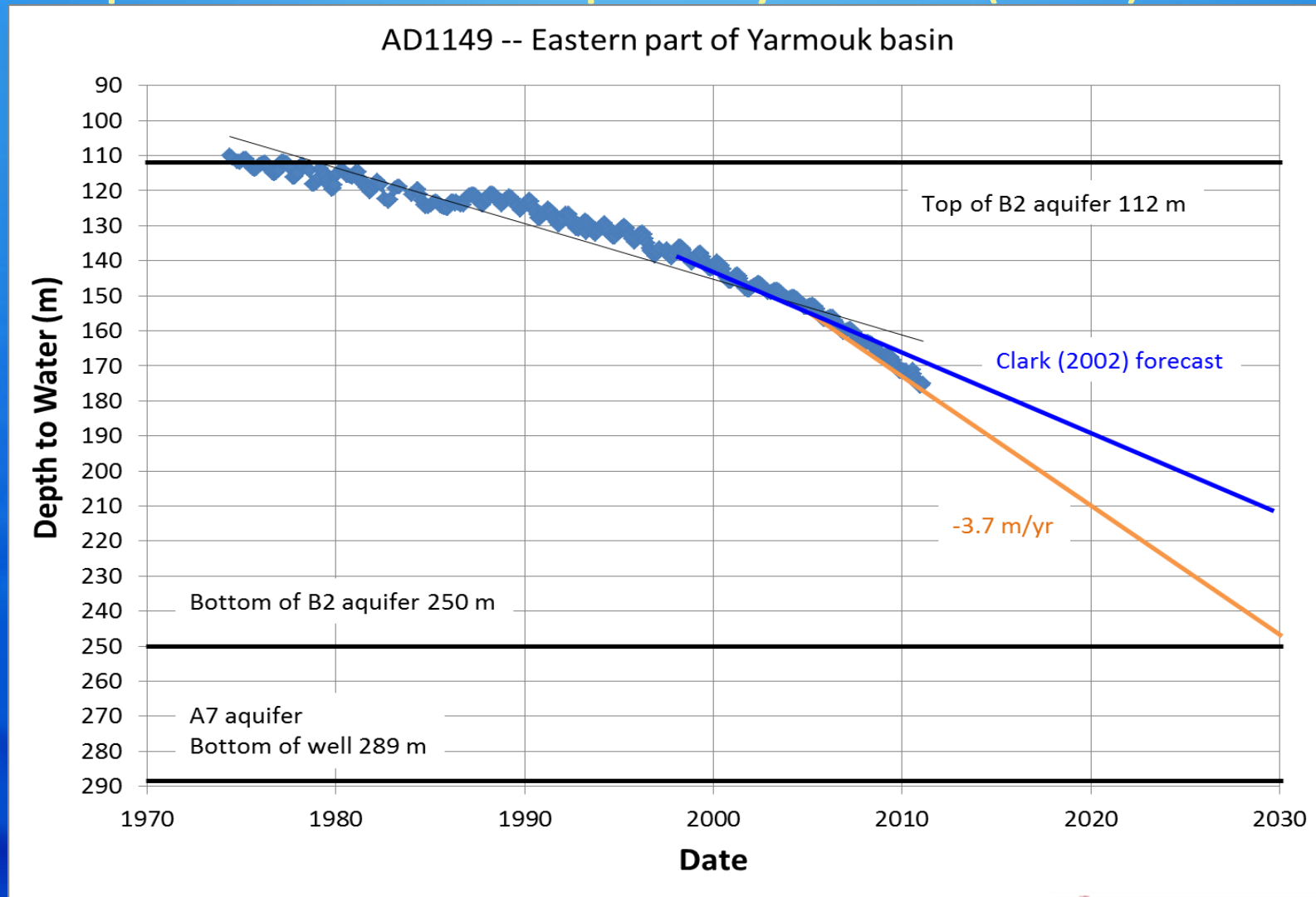
Precious Groundwater Resources are Drying Up

- Groundwater-The Default Option.
- Depleting aquifer storage reduces Jordan's ability to manage drought years (and eventual impacts of climate change).
- Groundwater levels continue to decline about -1 m/yr in Jordan's major basins.
- In most cases, rates of decline are constant or increasing (faster decline).
- If these rates continue, average aquifer saturated thickness will have declined by 30 - 40 % in 2030 which all associated cost and security concerns.

Water Supply- Groundwater Overexploitation & Water Security

Precious Groundwater Resources are Drying Up in Jordan

Aquifers forecast to be depleted by 2030 at 6 (of 117) wells

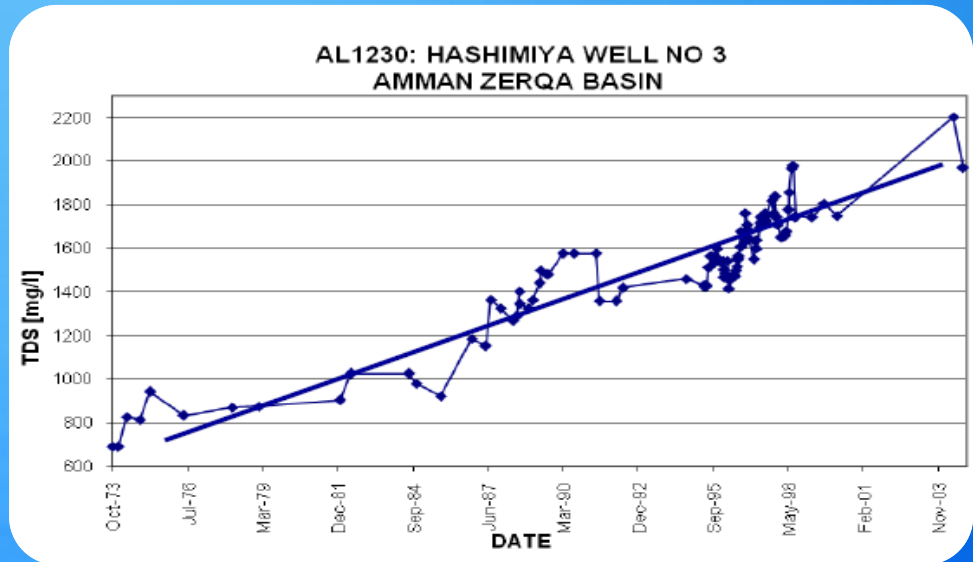


Water Supply- Groundwater Overexploitation & Water Security

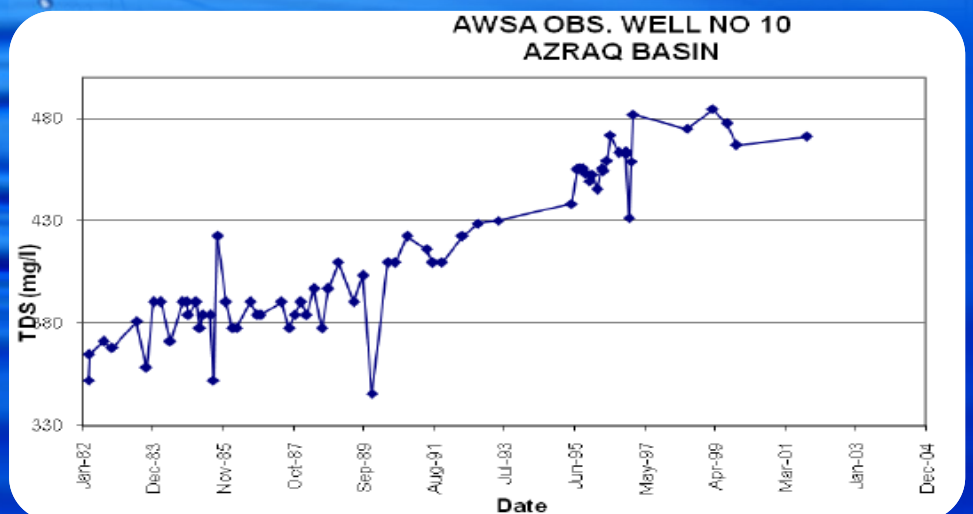
Precious Groundwater Resources are Drying Up in Jordan

Context – Salinity

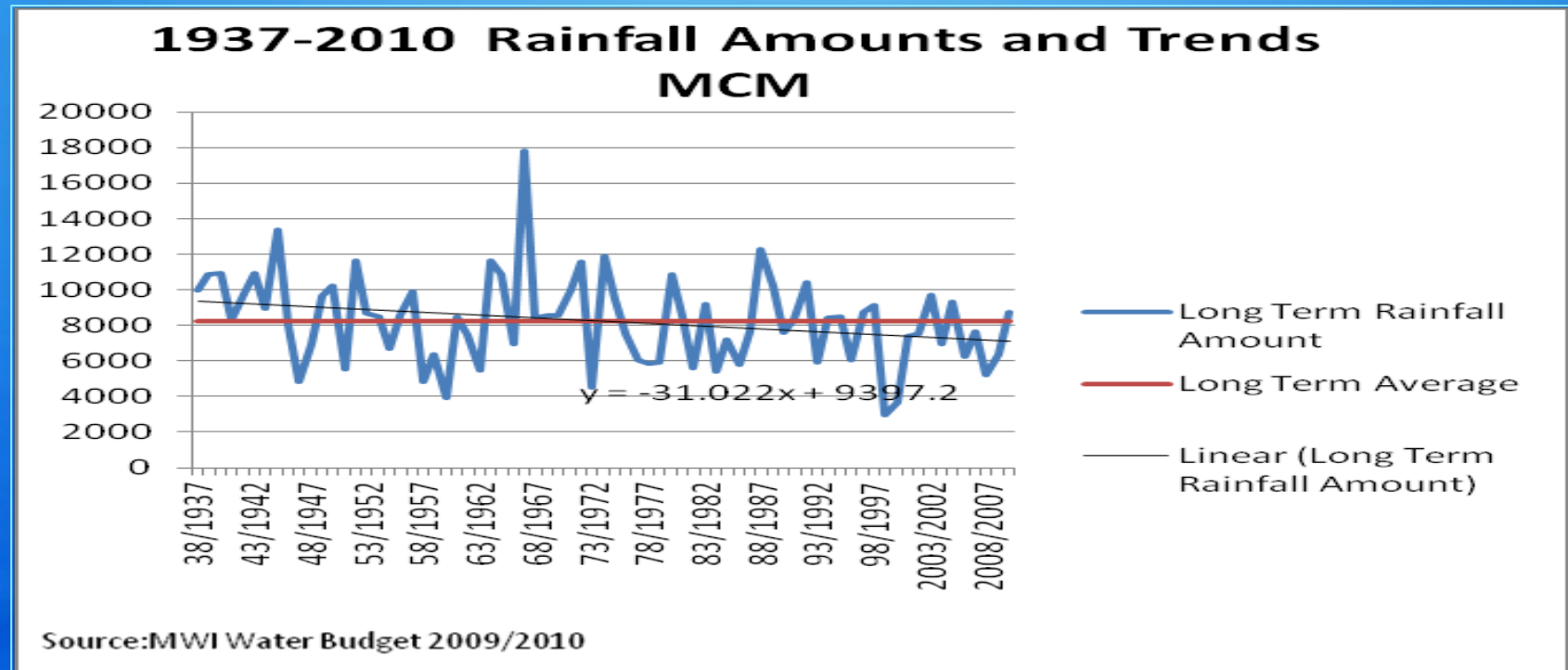
- Wells show increasing salinity (as Total Dissolved Solids, or Electrical Conductivity, $TDS \approx 0.7 * EC$)
- Salinity may force blending or treatment before use, or crop changes
- Wells have been abandoned or 'rested' due to salinity



Ministry of Water and Irrigation, 2010



Water Supply- Challenges of climate change



- Adaptation to variability and climate change must become an integral part of water resources management and water services delivery

The background of the slide is a deep blue gradient. In the center, a single water droplet is shown in mid-fall, with several smaller droplets trailing behind it. Below the falling droplet, a series of concentric ripples spread out across the surface of the water, creating a sense of depth and movement.

Water Demand and Water Deficit

Dr. Hazim El-Naser

Water Demand and Water Deficit

- The region's water deficit projected to triple to 130 billion cubic meters by 2030.
- 66 per cent of Arab states water resources originate from outside the region.
- The expected deficit will necessitate projects estimated to cost Arab states \$200 billion by 2030, which will place further burdens on the region in terms of raising necessary funds and retrieving the project costs.

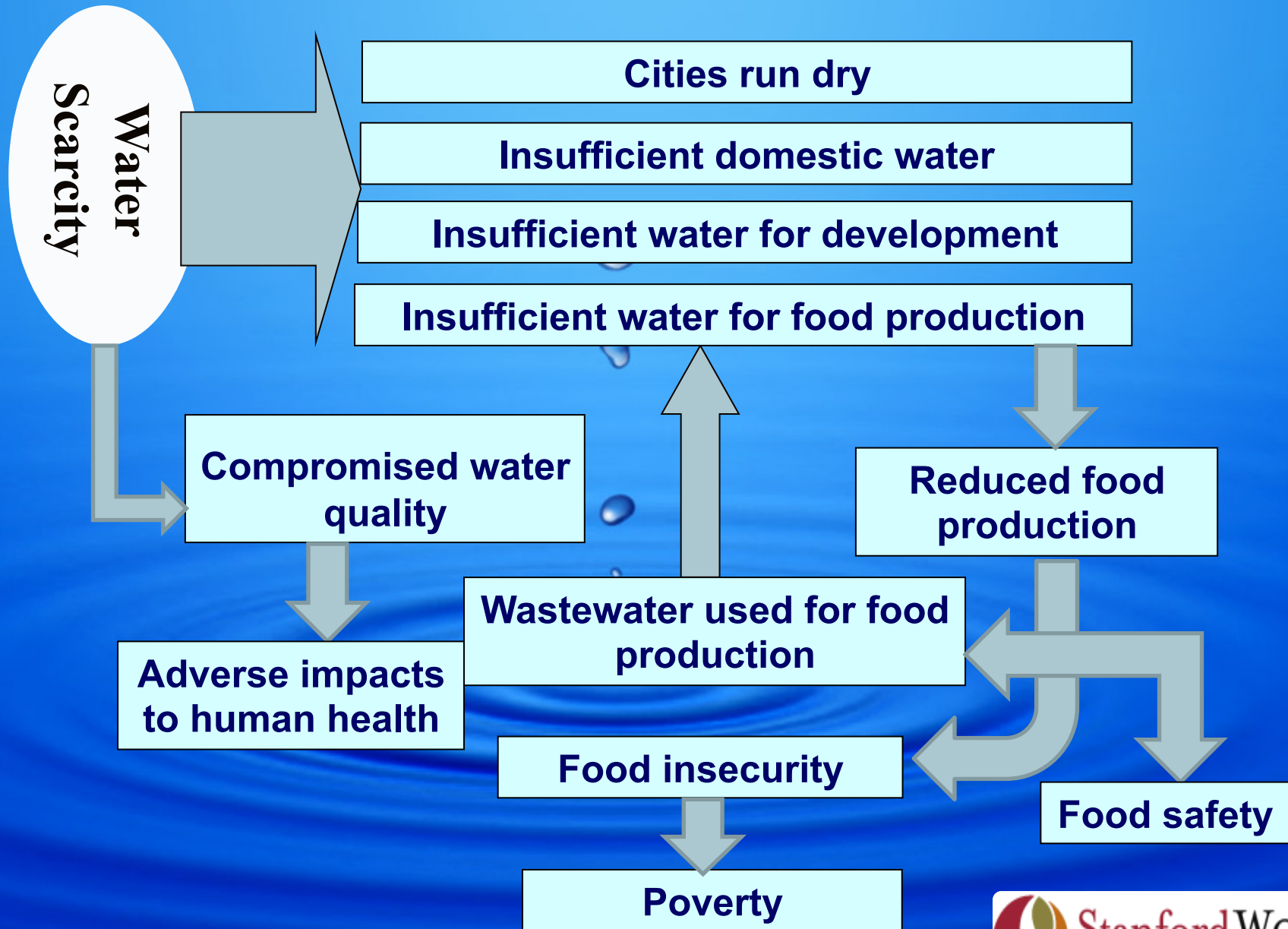
A blue background featuring a water droplet falling from the top, creating concentric ripples that spread outwards. The text 'Needs for the region' is centered within a white rectangular box.

Needs for the region

Needs for the Region – Regional Vision

- Water Governance
- Negotiate water conflicts and regional cooperation.
- Water- Food security towards poverty alleviation and national security.
- Water –Energy towards economic sustainability and national security.
- Recognize regional solutions as a human right.
- Water and Sanitation for all (human dignity, and a human right for improved likelihood).

Needs for the Region – Intensified Water Scarcity and Consequences



Needs for the Region – Regional Schemes

- All proposed regional large-scale water transfer schemes (Euphrates, Manavgat of Turkey, etc) are no more feasible for the following reasons:
- Political Constrains, regional conflict, riparian rights of other countries.
- Desalination technology and cost breakthrough makes such options no more feasible in term of cost per m3.
- Desalination seems to be more cost effective in terms of CAPEX and OPEX and without regional and political constrains

Needs for the Region – The need for Regional Cooperation

- Regional transboundary “Mega Projects (red-dead or conveyance water projects) are Human rights.
- Nursing an environment for water governance as a prerequisite for integrated water resources management and for equitable and sustainable development.
- National and regional resilience plans are put into action.
- Climate change impacts on water security are addressed and indicators for no regret actions are determined.
- Cost Recovery and creating revenue for sustainability: including tariff structures for the agricultural and domestic sectors in a way that recovers costs, while protecting the poor.

Needs for the Region – The need for Regional Cooperation

“Red – Dead Conveyance Project”



Why?

Needs for the Region – The need for Regional Cooperation

“Red – Dead Conveyance Project”



Why Jordan needs Red Sea - Dead Sea (RSDS) Project

1. Establish a Secure and Affordable Water Supply for Jordan while Saving the Dead Sea from Extinction
2. Support Widespread Economic Growth in Jordan
3. Provide for Potential Regional Water Sharing
4. Facilitate Private and Public Partnership through a (BOT) project

The shrinking of the Dead Sea

1960



- 390 m

~1020 km²

2006



- 420 m

~ 635 km²

2050



- 550 m

~ 520 km²

Red Sea – Dead Sea

Water Conveyance Study Program

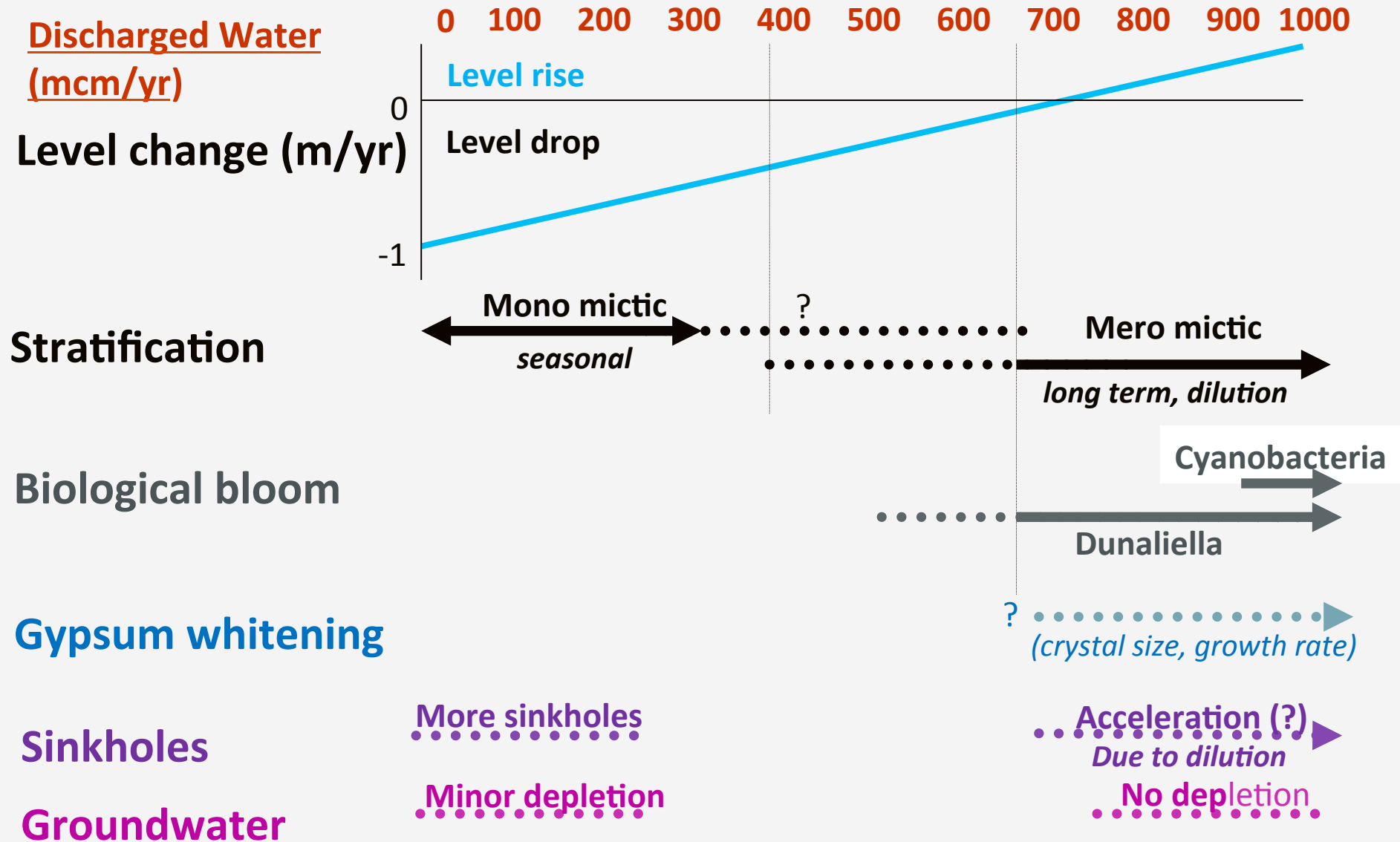
WB Study

Multi-Stakeholder Consultations

Completed Studies

- | | |
|--|------------------------------------|
| 1. Feasibility Study | Coyne et Bellier |
| 2. Environmental and Social Assessment | ERM |
| 3. Study of Alternatives | Professors Allan, Tsur and Malkawi |
| 4. Red Sea Modeling Study | Thetis |
| 5. Dead Sea Modeling Study | Tahal |

Expected Impact on the Dead Sea (WB)



Proposed Project- RSDS- Phase I

As A follow-up on the WB Study

The Regional Countries are in agreement to start the implementation of an initial phase to fulfil the concept of:

- ✓ **Rapid initiation of RSDS Regional Project with Initial Phase I, and it will serve as a pilot phase.**
- ✓ **Initiating the infrastructure elements of all subsequent project phases**

Agreed Project to be Implemented RSDS-Phase I

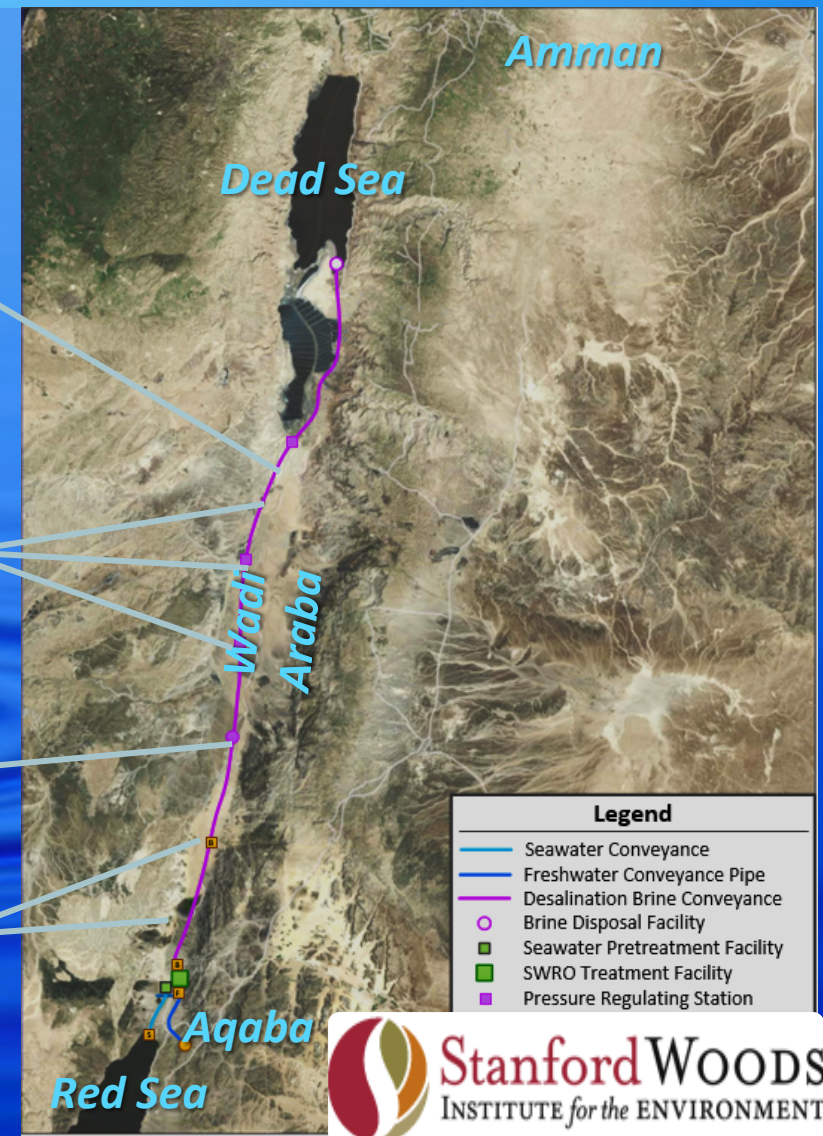
- Memorandum of Understanding (MoU) has been signed on Dec 9, 2013 between Jordan, the Palestinian Authority, and Israel at the World Bank in Washington DC, in which all parties agreed to start the implementation of the first phase of the RSDS project on BoT basis
- Following up on this MoU, bi-lateral agreements will be signed between Jordan and Israel and Palestinian Authority and Israel soon
- This project RSDS-Phase I (Red Sea Desalination Project at Aqaba) is a result of a joint initiative to promote regional cooperation among Israel, Jordan and the Palestinian Authority (the Beneficiary Parties)

Proposed Components

1. Construction of the intake facility with a capacity to abstract about (700) mcm/year of the Red Sea water at the Northern site of Aqaba Gulf.
2. Construction of an intake pumping station, one 3.7 meter diameter 2 km in length through Ayla, and 2.2m diameter, 22 km's in length pipelines to transfer the Red Sea water to the desalination plant.
3. Construction of a treatment and a desalination plant with a capacity of (80-100) mcm/year north of Aqaba airport.
4. Construction of about 20 km's of 900mm freshwater pipeline from desalination plant to Aqaba terminal reservoir, and 4 km of 1.2 m diameter pipeline to deliver the freshwater to Isreal.
5. Construction of two pumping stations to pump the resulting brine to a reservoir at the highest point in Wadi Araba near Risheh area.
6. Construction of a (1.4-1.8)m diameter, (65) km length pipe line to convey the brine from the desalination plant to the storage reservoir in Risheh, and a (1.4-1.8)m diameter, (140) km length pipe line to convey the brine from the reservoir to the Dead Sea, and the construction of the facility to discharge the brine in the Dead Sea.
7. Electrical Instruments, Chlorination, Connection from the National Electrical Grid to the project facilities, and a SCADA System.

The Plan for Phase I of RSDS: Desalinate Red Sea Water

- Desalination Brine Conveyance
(200 km of 1.4 to 1.8m Pipeline)
- Desalination Brine Pressure Regulation
(3-Pressure Reducing Stations;
With the potential to be replaced by
Hydropower Generation Stations)
- 1- (Reservoir) at high point
- Two desalination Brine Booster Pump
Station



Summary of Water Allocation to RSDS- Phase I Beneficial Parties

Water Supplies	Recipient Beneficial Parties		
	Government of Jordan (mcm/yr)	Government of Israel (mcm/yr)	Palestinian Authority (mcm/yr)
1 <i>Red Sea Desalination Water</i> (80-100 mcm/yr) <i>Delivered by Phase I - RSDS Project</i>	30-50	50	-
2 <i>Lake Tiberias Transfer Water</i> (50 mcm/yr) <i>Delivered by Beit Zera - KAC Pipeline</i>	50	-	-
3 <i>Med. Sea Desalination Water</i> (20-30 mcm/yr) <i>Delivered through Israel's National Carrier</i>	-	-	20-30
Potential Total Annual Water Supply	80-100	50	20-30

Benefits of Phase I to Beneficial Parties

- The Gulf of Aqaba is Protected, no Environmental effects
- Infrastructure is Designed to be Expanded
- No Infrastructure is Abandoned in Future Phases
- The Phase I Desalination Facility at Aqaba Provides Flexibility in Delivering Freshwater to Current Consumers
- Project Financing is Feasible through a Combination of Acceptable Water Rates and Financial Grants
- The Project Initiates the Process to Save the Dead Sea

Next Step

Preparation of RFP for the Selection and Assignment of a Specialized Engineering Firms to prepare Preliminary Design, Legal and Financial Terms, and Tender Documents based on BOT and PPP participation. DRAFT RFP is AVAILABLE

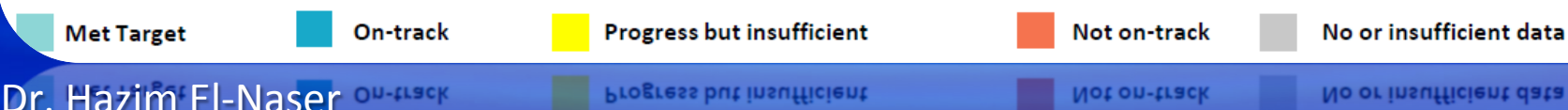
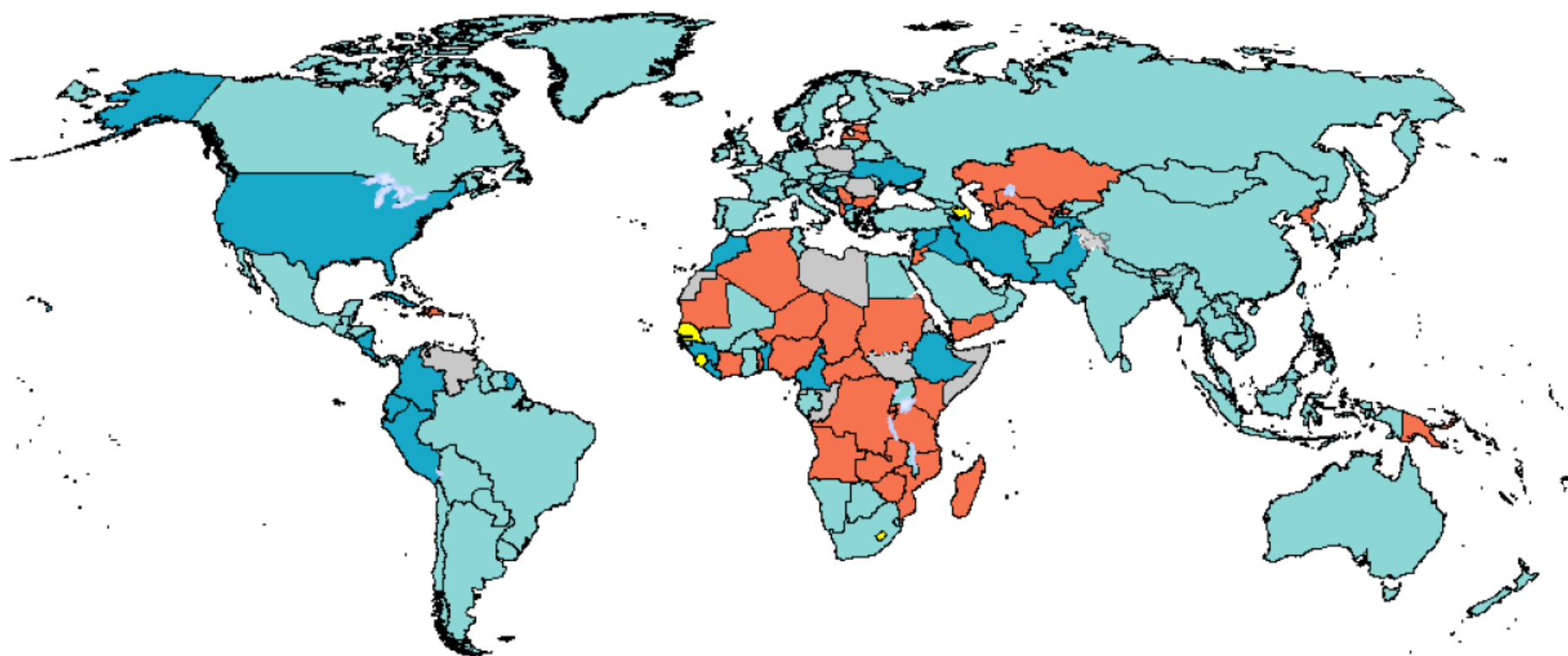
Implementation Schedule

Component	Date
Announce expression of interest	August 2014
Select prequalified bidders	Feb 2015
Distribute RfP	March 2015
Collect technical and financial offers	August 2015
Evaluate Proposal and announce preferred bidder	Oct 2015
Negotiation and financial close	May 2016
Commencing Implementation	May 2016
Commercial operation	2018

Need for the Region- MDGs and SDGs - Are we on Track?

Ref: WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation(JMP) 2014 update

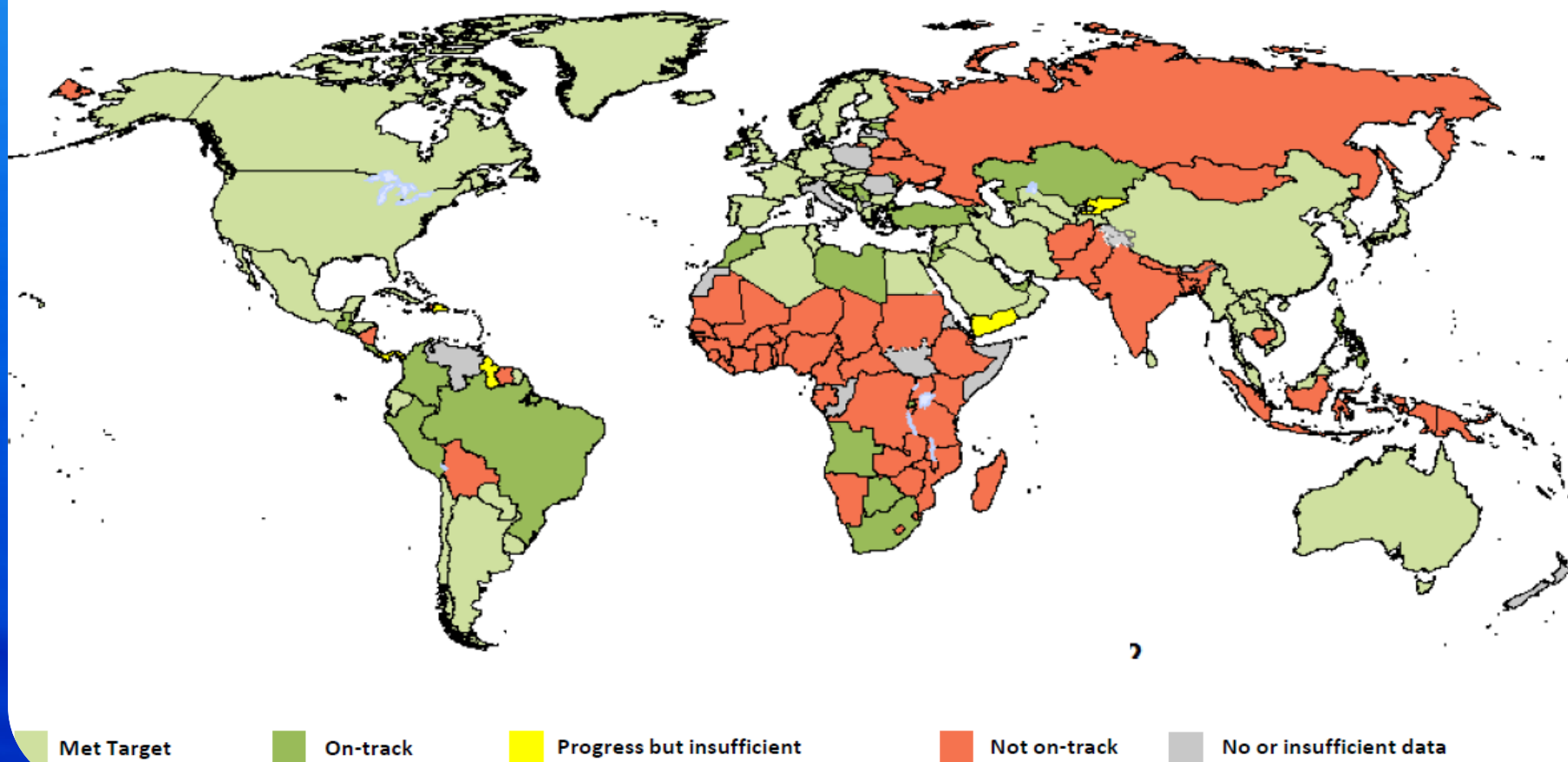
116 countries have already met the MDG drinking water target, 31 are on track and, 45 are not on-track



Need for the region- MDGs and SDGs - Are we on Track?

Ref: WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation(JMP) 2014 update

77 countries have already met the MDG sanitation target, 29 are on track and, 79 are not on-track



Location Map



Needs for the Region - Jordan's Progress in Achieving the MGDs

- The proportion of population with sustainable access to improved water resources exceeds 99%.
- The water quality compliance to microbiological parameters exceeds 99.3% in the whole kingdom.
- Acknowledging that safe sanitation is vital for improved human health, disease and pollution prevention, Jordan is keen to apply the world best practices especially in wastewater treatment, management and re-use especially now with the overwhelming pressure on water and sanitation as a result of hosting 600,000 Syrian Refugees and another 600,000 Residents.
- The proportion of population with safe sanitation exceeds 98% (according to the UNICEF Joint Monitoring Programme).
- Population connected to public sewer systems are 63% which is below the MDG target for 2015.
- Jordan is re-using 98% of its treated wastewater in agriculture to reallocate fresh water for domestic purposes.

MDGs and SDGs Post 2015 Development Framework: Different Regions, Different Needs

- MDGs addressed mainly poor countries and SDGs addressed all countries, regions and nations without proper consideration of regional needs, characterizations and specific challenges and the order of MDGs
- Globalization of objectives is not necessarily fair and justice. In some regions, for example, access to water and sanitation in an arid and harsh environment supersedes other MDGs. In other cases, peace and security are preconditions for human development within the MDGs and SDGs

* Source: Establishing the Post-2015 Development Agenda: Sustainable Development Goals (SDG) towards Water Security The Jordania

MDGs and SDGs Post 2015 Development Framework: Different Regions, Different Needs

- To avoid universality of the Development Goals which might not be applicable to so many countries and regions, a “mainstreaming” approach shall be adopted. For example, MENA countries shall have a standalone goal that deals with hunger including water and sanitation, peace and security. In addition to this specific regional goal, other universal development goals within the context of MDGs, SDGs and Post 2015 Development goals shall be also applicable to the same region with all needed interlinks and integration for better progress and results.

* Source: Establishing the Post-2015 Development Agenda: Sustainable Development Goals (SDG) towards Water Security The Jordanian Perspective

Water Scarcity and R&D

- R&D is a major factor for solving regional water issues, unfortunately very little amount of resources being mobilized to achieve this goal
- The Arab States have a low ranking in research development and technological innovation. The overall spending in R&D is about 0.15 per cent of the gross domestic product (GDP), compared with an average of 1.4 per cent in the world, and 2.5 per cent in Europe. This spending is provided by the public sector to a very large extent (97 per cent)

* Source: UNESCO Forum, on Higher Education, Research and Knowledge entitled "Research and Development in the Arab States: the Impact of Globalization, Facts and Perspectives" by A. Sasson May

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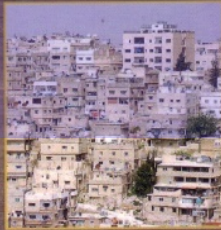
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H.K. El-Naser

Management of Scarce Water Resources

A Middle Eastern Experience

Thank you



 **WIT**PRESS

Dr. Hazim El-Naser

Management of Scarce Water Resources A Middle Eastern Experience



Hazim K. El-Naser, PhD
Currently a member of
Jordan's House of Representatives
Former Minister of Water and Irrigation
Minister of Agriculture Hashemite Kingdom of Jordan

Arid and semi-arid countries have historically suffered from a plethora of complex water concerns due to its climatic limitations. Research in these regions has long supported the necessity of delivering life sustaining access and

availability to water while being inherently linked to several inter-related factors, including technical and economic issues, human resources, health and private sector participation. Regional conflicts and controversial political agendas have also exercised a profound impact on the viability of co-operative water resource and management perspectives.

Dr Hazim El-Naser has applied his experiences as a water expert and ministerial position in Jordan by looking at a wide variety of water related topics that explore the problems the MENA countries face in respect to water resource management. This book focuses on his experiences to highlight the complexity of these problems and advocate practical solutions, and uses recent case studies to provide a framework to assist the practitioner in resolving these problems.

Titles of related interest
Water Resource Management
Editors: C. BREBBIA and V. PO
WIT Transactions on Ecology and the Environment, Vol 125
ISBN: 978-1-84564-116-0 2008 400pp

Sustainable Irrigation Management,
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Editors: Y. VILLACAMPA, C.A. BREBBIA
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