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THE ROLE OF RESEARCH CENTERS IN WATER SUSTAINABILITY

دور المراكز والجهات البحثيّة في استدامة المياه

Dr. Burhan A. M. Niyazi
Deputy Director of Water Research Center
King Abdulaziz University

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Contents

1. Introduction
2. Water Resources In KSA
3. About WRC at KAU
4. WRC Scientific Contributions
5. The Role of Research Centers in KSA Water Sustainability

Introduction

Introduction

"وَجَعَلْنَا مِنَ الْمَاءِ كُلَّ شَيءٍ حَيٍّ أَفَلاَ يُؤْمِنُونَ" (الأنبياء:30)

Since the beginning of man history on Earth, all civilizations started around water resources. Even these days, no civilization can survive without sustained water resources.

Introduction (continued)

Saudi Arabia in last few decades invested a big portion of its resources to provide water to establish civil, industrial and agricultural developments and modernization (desalination plants, freshwater supply network to cities, urbanized areas and industrial cities).

Introduction (continued)

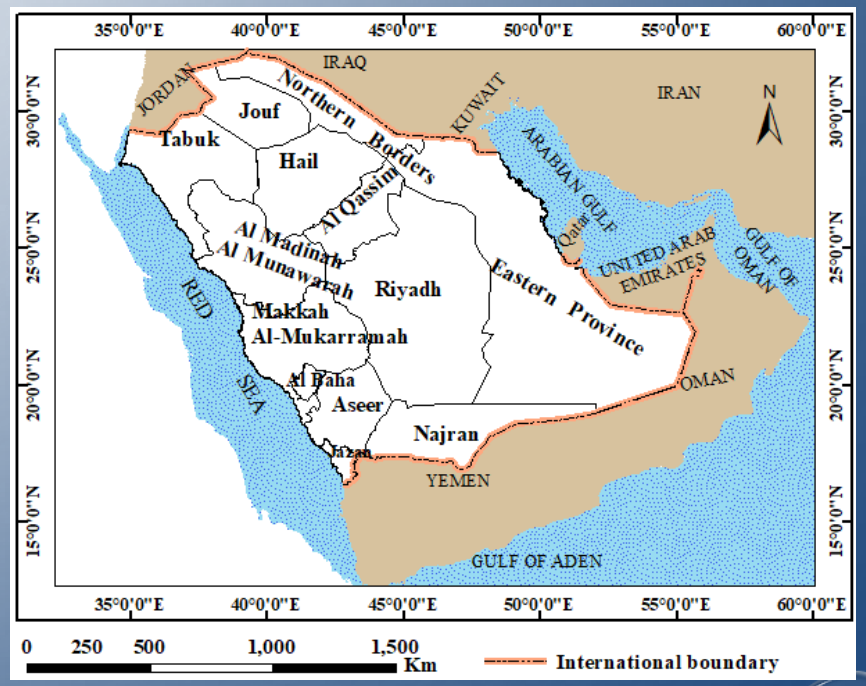
Now, with the new Saudi Vision 2030, the big dreams and mega plans need a sustained and adequate water resources to achieve the national strategic goals.

That's why 5 internal goal within 3 strategic goals of the Vision 2030 concern about sustaining water resources and vital resources security.

Water Resources and KSA

Water Resources in KSA

Saudi Arabia is the largest country located in Arabian Peninsula at the southwest of Asia continent restricted between latitudes 16° 22` 46" and 31° 14` 00" N and longitudes 34° 59` 30" and 55° 40` 00" E with an area of about 2,250,000 km^2.

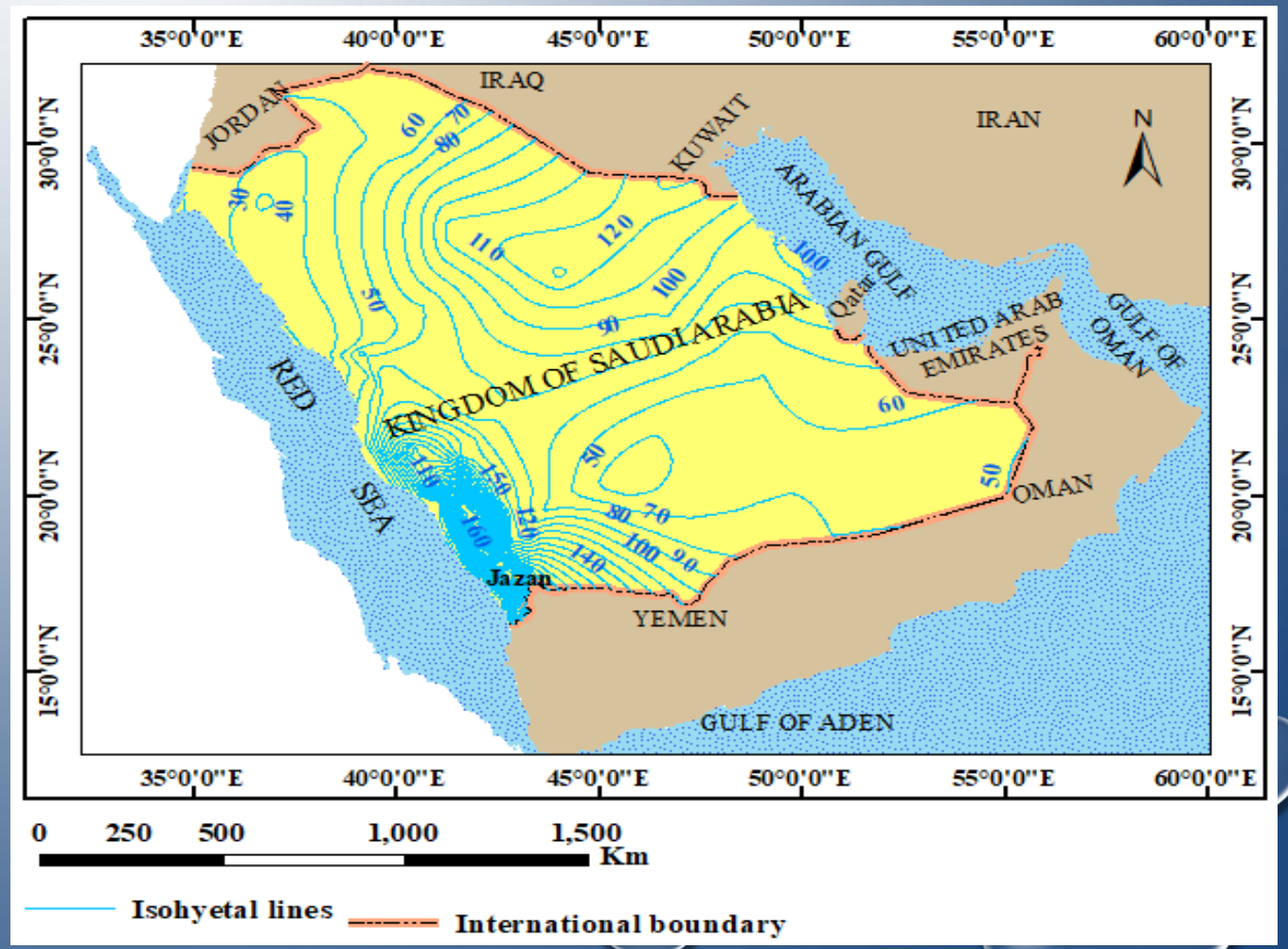


Water Resources in KSA (continued)

- Most of the country follows the pattern of the desert climate (extremely arid), with the exception of the southwest, which is characterized by a semi-arid climate
- Climate of Saudi Arabia is characterized by high temperatures during summer and moderate in the winter
- Rainfall in KSA is very limited and low magnitude usually fall during the period from November to April

Water Resources in KSA (continued)

Average Annual Rainfall over KSA



Water Resources in KSA (continued)

- The main source of water used in KSA is the Unrenewable groundwater that is stored in the aquifers millions of years ago
- The limited renewable water resources that replenish depleted water is the most critical challenge, that faces KSA in regards of water resources
- The low replenishment is due to naturally low rainfall and climate change
- The high depletion due to vast expansion of population and development

Water Research Center
KAU

Who Are We?

Water Research Center (WRC) is founded in 1997 (1418 H) according to the decision made by the Presidency of the Ministers Council.

The center aims to apply modern scientific methods in the planning and implementation of research projects related to water resources in order to preserve these resources and to optimize their utilization, which help creating a prosperous present and a bright future for KSA.

Who Are We?

The main objectives of the Water Research Center are:

- Conduct research related to water resources exploration, management, and utilization
- Propose scientific solutions to water issues and problems in the Kingdom
- Provide scientific consultations related to water to the government and private sectors
- Exchange scientific information with concerned agencies via scientific seminars, workshops, courses, and conferences

Scientific Units

The Water Research Center has the following units:

- Water Resources Unit
- Remote Sensing and GIS Unit
- Environment and Costal Areas Unit
- Wastewater Treatment and Reuse Unit
- Integrated Water Resources Management Unit

Scientific Staff

Director: Prof. Iqbal M.I. Ismail

Deputy Director: Dr. Burhan A. Niyazi

Researchers:

Prof. Mohamed A. Rashed

Dr. Milad Z. Masoud

Dr. Rajmohan P. Natarajan

Dr. Majed M. El-Osta

Lec. Sayid F. Zaidi

In addition, WRC has technicians and administration assistants.

Our Research Group

The Water Research Center also hosts the Water Resources Research Group (WRRG) that includes a group of distinguished national and international researchers in water resources.

Burhan A. M. Niyazi	Water Research Center, KAU
Jalal Mohammed Albadry Basahi	Water Research Center, KAU
Mohamed Mohamed Rashed	Water Research Center, KAU
Milad Halim Zaki Maosud	Water Research Center, KAU
Syed Muhammad Faisal Zaidi	Water Research Center, KAU
Amro Mohammed El-Feki	Faculty of Meteorology, Environment and Arid Land Agriculture, KAU
Khaled S. Balkhair	Faculty of Meteorology, Environment and Arid Land Agriculture, KAU
Nassir Soliman Al Amri	The General Authority of Meteorology and Environmental Protection

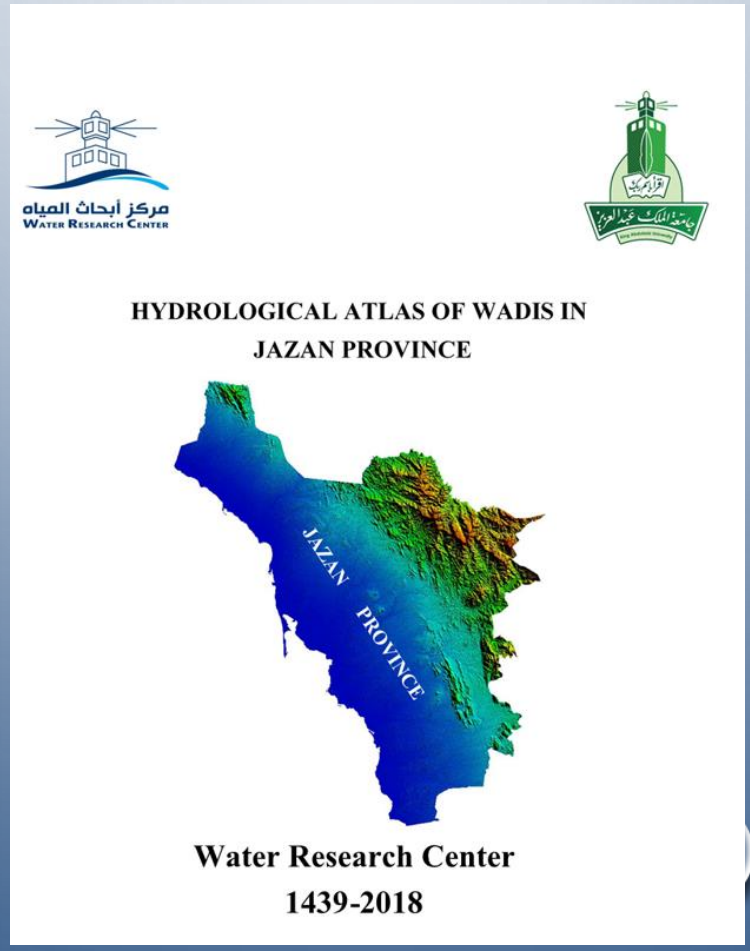
Our Research Group

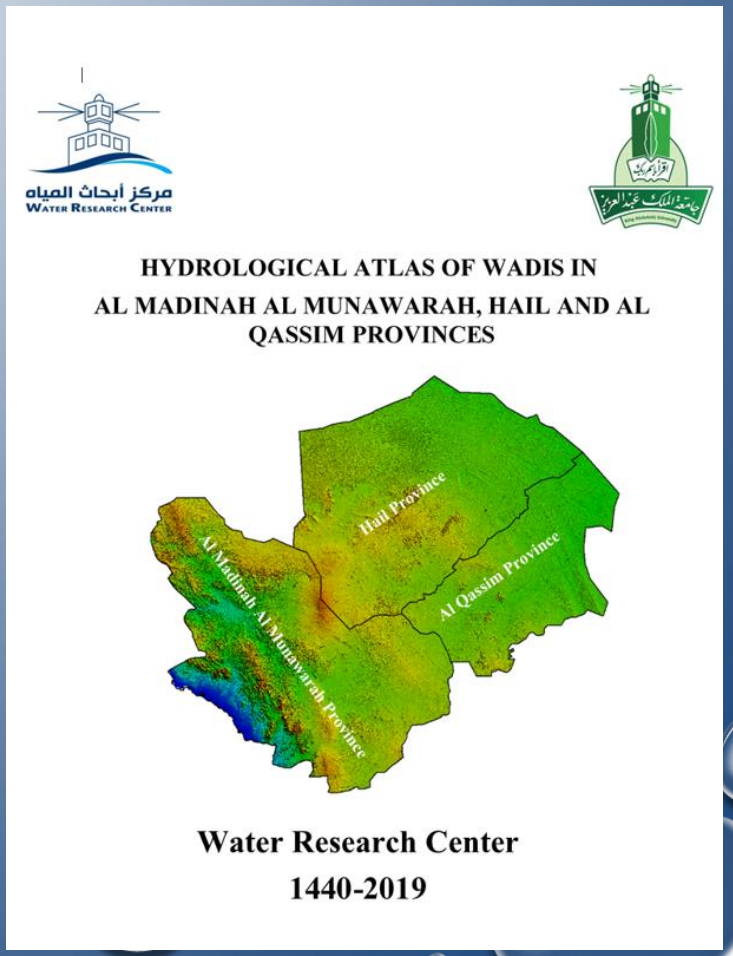
Hatem Abdalrahman	Faculty of Meteorology, Environment and Arid Land Agriculture, KAU
Jarbou Abdullah Bahrawi	Faculty of Meteorology, Environment and Arid Land Agriculture, KAU
Ali Subyani	Faculty of Earth Science, KAU
Ahmed S. Al Hames	Saudi Geological Survey
Majed Al-Osta	Water Research Center, KAU
Khalid Ahmad Bankher	Saudi Geological Survey
Fahd Salem Al Ahmadi	Ministry of Environment, Water and Agriculture, Al-Madinah Branch
Mohammed Jamil Abdulrazzak	Taiba University
Zakai Cen	Technical University of Istanbul, Turkey
Tanju Karanfil	Department of Environmental Engineering and Earth Science, Clemson University, USA
Abdul A. Khan	Glenn Department of Civil Engineering, Clemson University, USA
Mohamed Elsayed Ahmad	Civil Engineering, Texas A&M University, Corpus Christi, USA

WRC Scientific Contributions

WRC Scientific Contributions

Hydrological Atlas Series





Hydrological Atlas Series

- The Hydrological Atlas is a digital map reference for all watersheds within the hydrological boundaries of each province in KSA (digital database)
- It contains all hydro-morphological parameters of the wadis (watersheds) generated to identify, inventory and evaluate the hydrological characteristics of the wadis in KSA.
- It is produced by the integration analysis between morphometric parameters, DEM, topographic maps (1:250,000), geological maps (1:250,000), and hydrological models (WMS, HEC1 and HEC HMS)

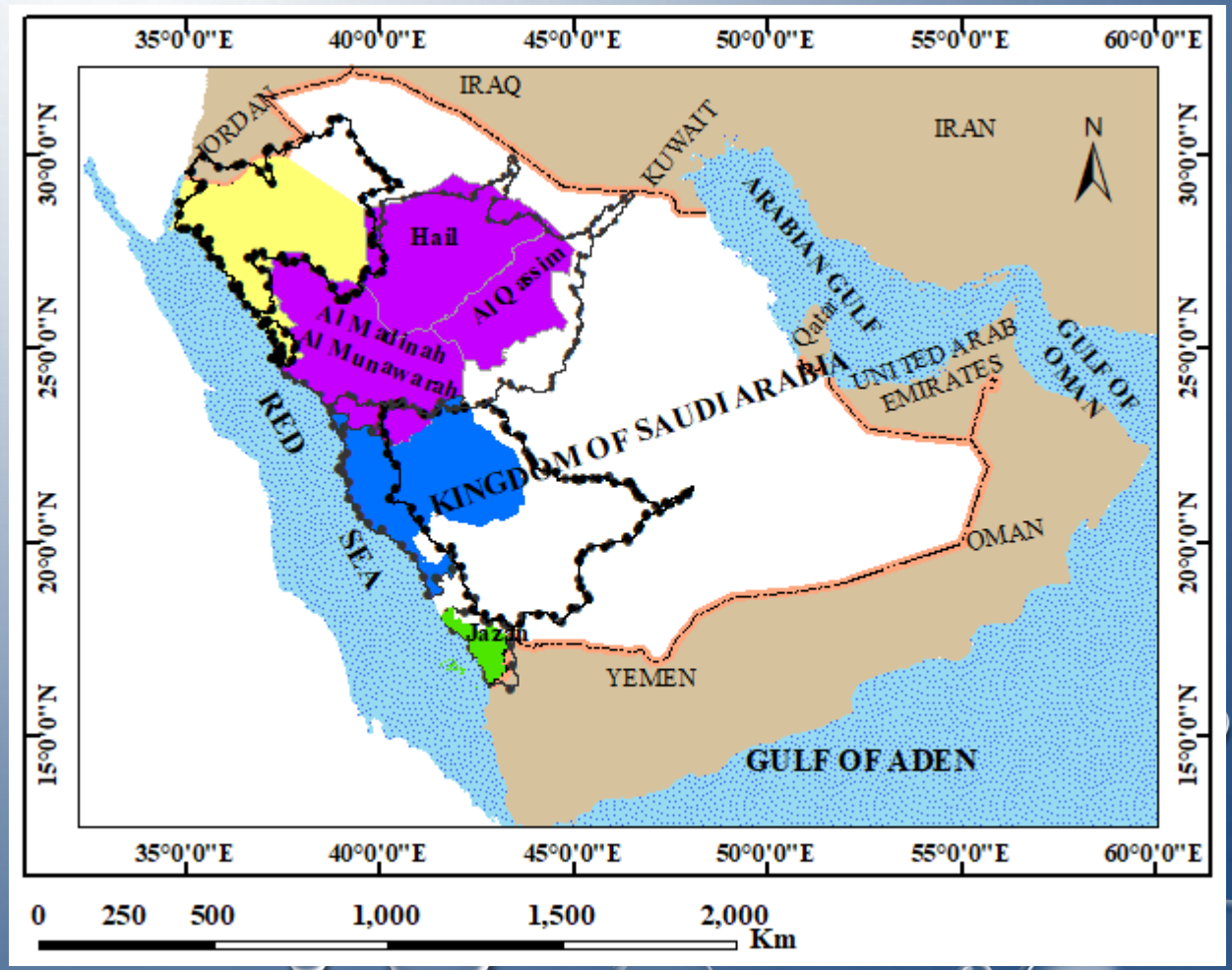
Hydrological Atlas Series

For each wadi, a number of thematic maps, frequency diagrams, figures and tables are created, including:

- Digital elevation models,
- Hillshades,
- Geological outcrops,
- Faults and lineaments structure and their rose diagrams,
- Slope and its frequency diagram,
- Flow direction and its frequency diagram,
- Stream network order,
- Rainfall distribution maps and curves,
- Area elevation curves and volume elevation curves,
- Land use and soil maps, and
- Hydrographs (Rainfall-Runoff relationship)

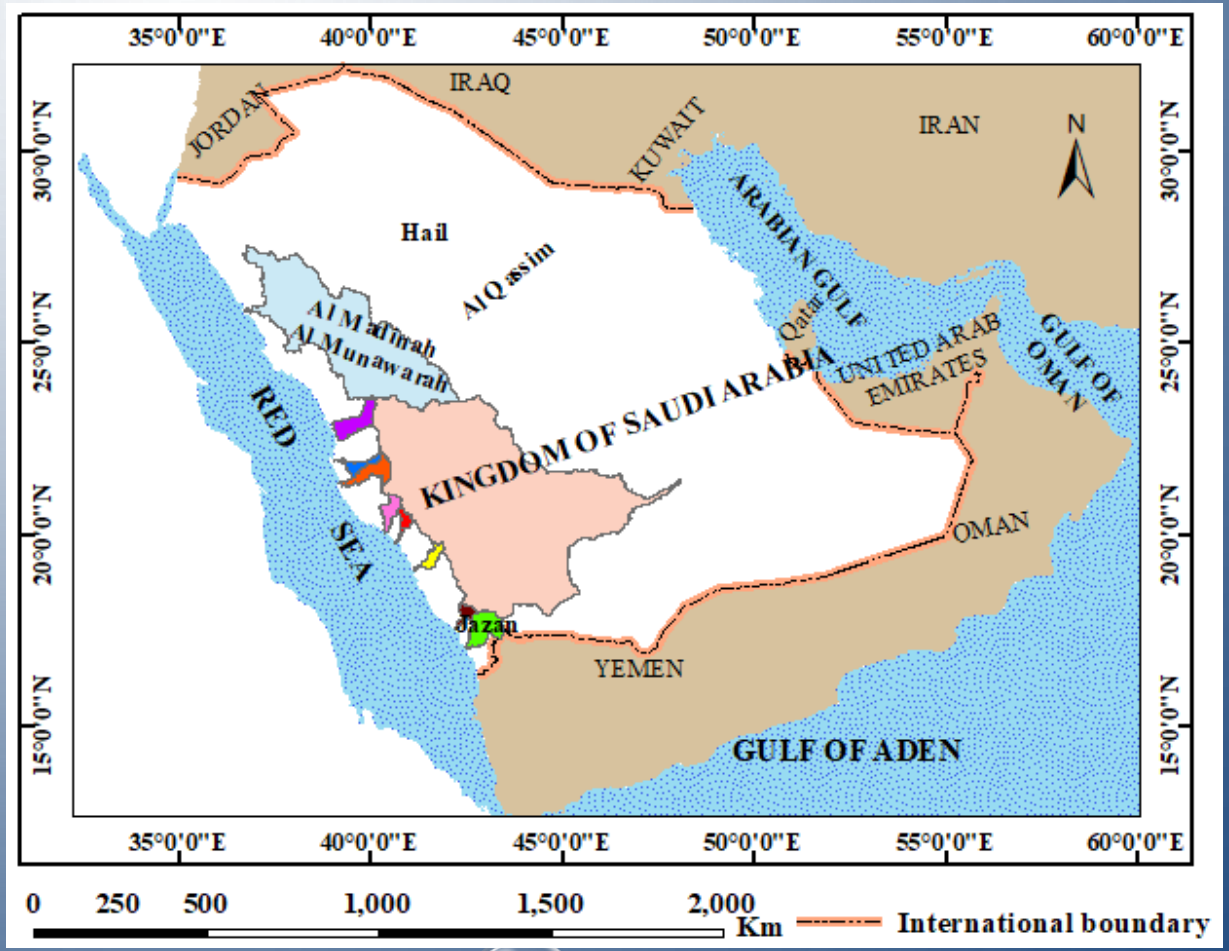
WRC Scientific Contributions

Hydrological Atlas Series



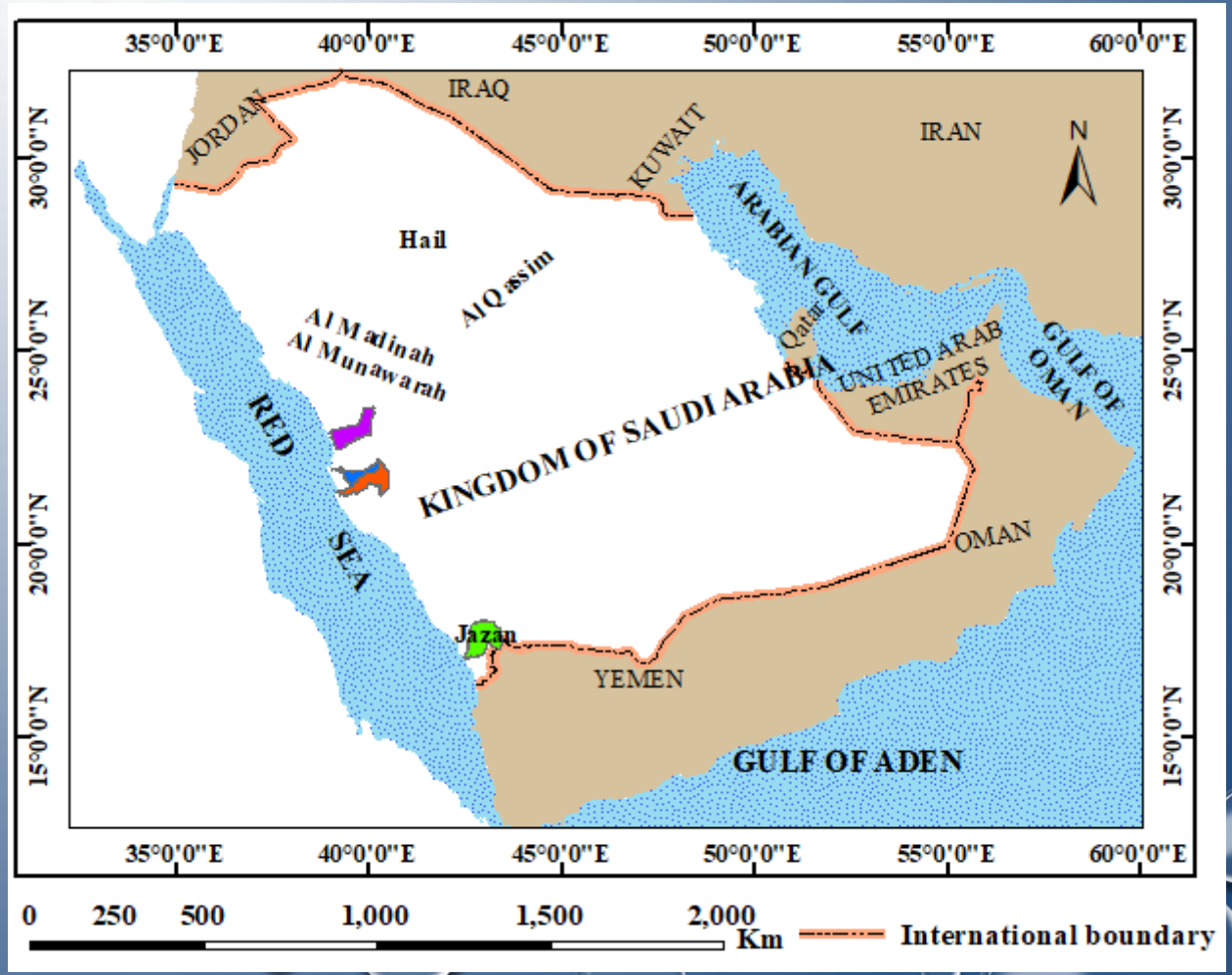
WRC Scientific Contributions

Surface Water Research



WRC Scientific Contributions

Groundwater and Groundwater Quality Research



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- El Feki A., Masoud M.H. and Niyazi B. **2017** Integrated rainfall–runoff and flood inundation modeling for flash flood risk assessment under data scarcity in arid regions: Wadi Fatimah basin case study, Saudi Arabia. Natural Hazards, 85 (1), pp 87–109.

- Rashed, M. and Rashed, E. **2017**. Double-sided sliding-paraboloid: a step towards real-time GPR imaging. Computers & Geosciences, 102, 12-21. DOI: 10.1016/j.cageo.2017.02.005.

The Role of Research Centers in KSA Water Sustainability

The Role of Research Centers in KSA Water Sustainability

The main problems that threatens water sustainability in the country include:

- Lack of (shared and complete) hydrological databases
- Absence of integrated water management plans
- Missing of communication among research centers, academia, private sector and water authorities
- Low awareness of water conservation in local community

The Role of Research Centers in KSA Water Sustainability

- Research centers (RCs) can serve as the scientific partner for the water resources authorities and agencies to work together for water sustainability plans in the country
- With effective communication between RCs and water authorities (Was), database gaps can be filled and water problems can be identified and solved efficiently
- The integrated cooperation between WAs and RCs is the key for Was in KSA to get the best out of RCs for water sustainability

The Role of Research Centers in KSA Water Sustainability

- To tackle the water sustainability problem, I would suggest the following:
- Create an effective communication channels with related RCs
- Establish an effective partnerships with related RCs
- Establish scientific chairs in universities and RCs to solve specific problems related to water sustainability
- Arrange workshops, meetings and conferences with RCs and experts within KSA to identify water resources problems and solutions

THANKS


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