

Economic and Social Commission for Western Asia

Overview of Shared Surface Water Resources in Western Asia

Building Capacity for Accessing Disruptive Technologies for Improved Water Resources Management under Climate Change, Beirut, 14-15 January 2020



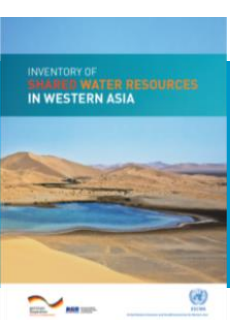
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Shared Prosperity **Dignified Life**



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Inventory of Shared Water Resources in Western Asia

The Inventory is:

the first UN-led effort to take stock of the region's shared surface and groundwater resources in a comprehensive, systematic and standardized manner.

Key Themes:

- hydrology, hydrogeology
- water resources development and use,
- agreements and cross-border management efforts.

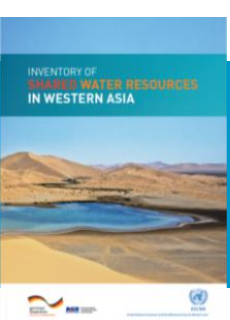
Objectives:

- **Identify**, and document the state of shared water resources and their use
- Improve the **knowledge base** and facilitate information access
- Create awareness and stimulate **informed dialogue** within and between riparian countries
- Support **regional processes** towards improved dialogue and cooperation over shared water resources

Launched in
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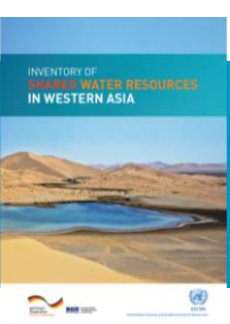
Work Process & Methodology Overview

Compilation of information

- Pre-screening and compilation of the **existing literature**: ESCWA reports, regional literature, scientific publications, country papers, media reports, national statistics, national and regional maps, satellite imagery, etc to document and provide a comprehensive, **descriptive analysis**
- Consultation with regional and international **experts** and **involvement of ESCWA member countries** through focal points for reviews and requests for data

Coverage area

- Focus was placed exclusively on shared resources included in the **Western Asia geographic sub-region** covered by ESCWA, as no comprehensive study of shared drainage basins and aquifer systems in this sub-region and there was a clear mandate to examine water resources management within a regional context.
- Water resources located on the **African continent, as well as in the northern part of Western Asia outside the ESCWA region were excluded**, as extensively covered in other studies
- A river “basin” hydrologically consists of **an area of land in which all surface water drained by the river system is conveyed to the same outlet**; topography is the key element affecting the boundary of the basin.
- Surface water **basin delineation** was made using the topographical database **HydroSHEDS**.



Work Process- Main Challenges

- Data and information available to the public often outdated, obsolete, contradictory or of different nature and scale.
- Some information (especially recent data) classified in national databases and unpublished reports
- Country submissions varied significantly in terms of scope, level of detail and format
- Difficulties in receiving country data in a timely manner, modifications were directly incorporated on layouted version

Where differing or contradictory information was obtained from different sources, the different datasets and arguments were all included to reflect a range of findings and viewpoints

Overview: Shared River Basins in the Inventory

SHARED RIVER		COUNTRIES	MAIN SHARED TRIBUTARIES ^b
MESOPOTAMIA	Euphrates River	Iraq, Jordan, ^a Saudi Arabia, ^a Syria, Turkey	Sajur River Jallab/Balikh River Khabour River
	Euphrates-Tigris- Shatt al Arab	Iran, Iraq, Syria, Turkey	Feesh Khabour River Greater Zab River Lesser Zab River Diyala River
	Shatt al Arab River	Iran, ^c Iraq ^c	Karkheh River Karun River ^d
MASHREK	Jordan River	Israel, Jordan, Lebanon, Palestine, Syria	Hasbani River Banias River ----- Yarmouk River
	Orontes River	Lebanon, Syria, Turkey	Afrin River Karasu River
	Nahr el Kabir	Lebanon, Syria	-
	Qweik River	Syria, Turkey	-

(a) Riparians that contribute surface water only under extreme climatic conditions.

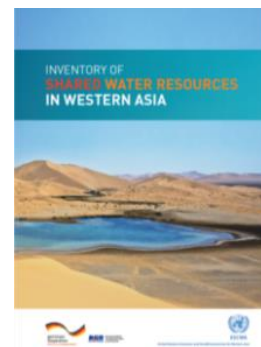
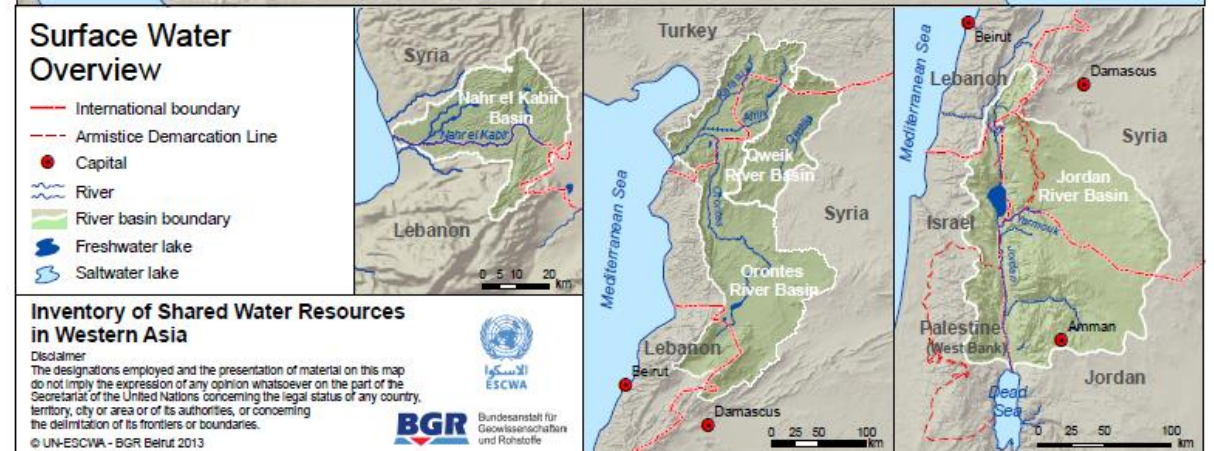
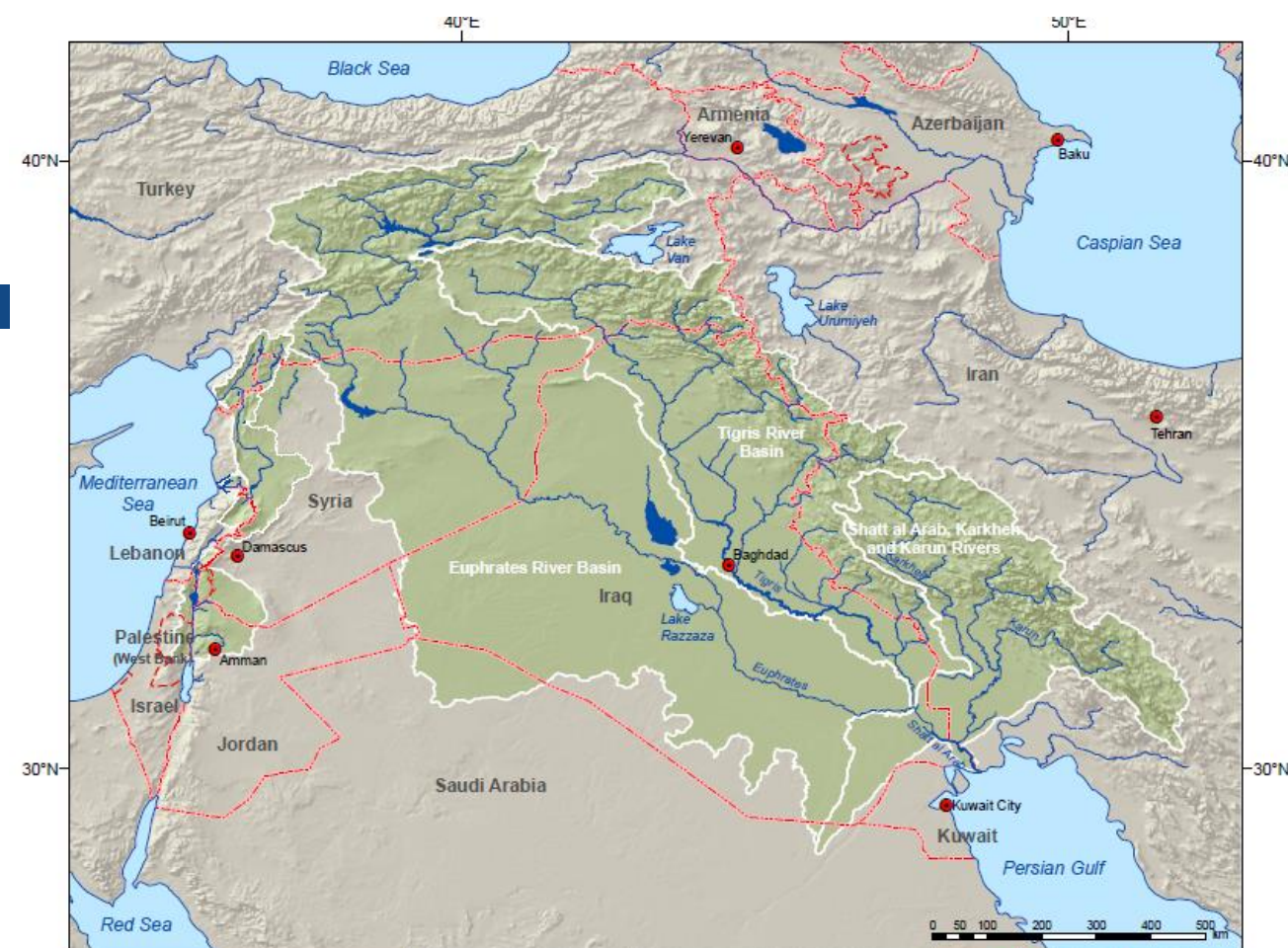
(b) Not all shared tributaries listed are shared by all the displayed countries.

(c) Iran and Iraq are only riparians to the river, however all riparians to the Euphrates and Tigris Rivers are riparians to the Euphrates-Tigris-Shatt al Arab basin. See 'Overview and Methodology: Surface Water' chapter for more information.

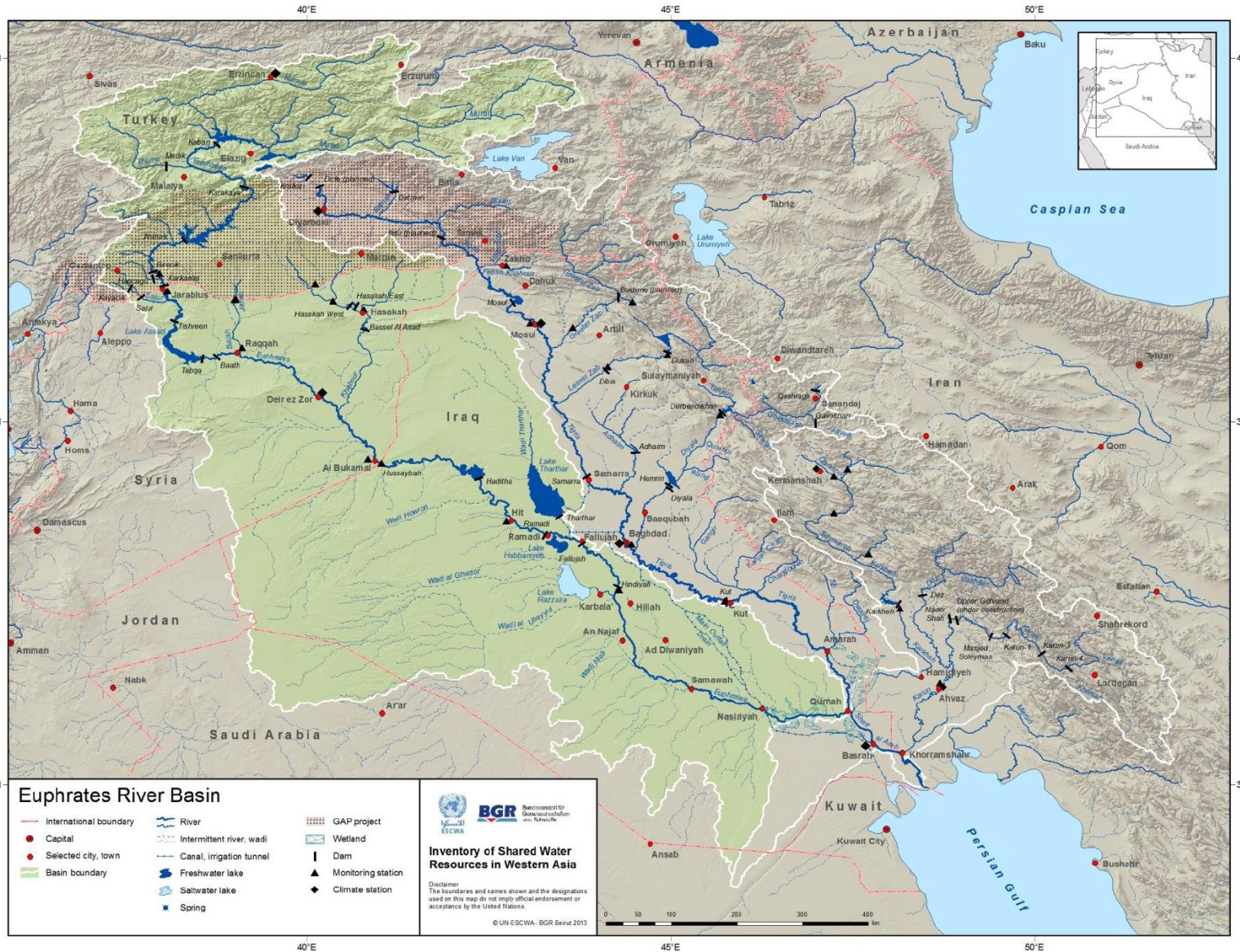
(d) The Iranian Karun River does not cross any political boundary, but provides a significant freshwater contribution to the Shatt al Arab and forms an important part of the transboundary river system; it is thus included in the Inventory as part of the shared basin covered in the chapter related to the Shatt al Arab.

Shared Surface Waters in Western Asia

- Euphrates – Tigris – Shatt Al Arab
- Jordan River
- Orontes River
- Nahr El Kabir River
- Qweik River



Euphrates River Basin



BASIN FACTS

RIPARIAN COUNTRIES	Iraq, Syria, Turkey
RIVER LENGTH	2,786 km
BASIN AREA	440,000 km ²
MEAN ANNUAL FLOW VOLUME	At Jarablus (<i>Syrian-Turkish border</i>): <ul style="list-style-type: none"> • (1930-1973) ~30 BCM • (1974-2010) ~25 BCM

- The river originates in the mountains of eastern Turkey and flows through Syria and Iraq.
- It is joined by three tributaries in Syria (Sajur, Balikh and Khabour rivers).
- With construction of large water engineering structures in the upstream region, the river's flow regime has shifted over the years.

Euphrates River Basin

- Water use in the basin focuses on irrigation, hydropower and drinking water supply, with agriculture consuming the most (>70%).

KEY CONCERNS

- Water use increased sharply in the second half of the 20th century, resulting in a **significant reduction in stream-flows** and **changes to the natural hydrological regime** of the river.
- The **highly variable climate** results in variable water availability. Under the current water management regime, **droughts form a major natural hazard** that affect water supplies in the basin.
- **Water quality**: pollution from agricultural and domestic sources seriously affects water quality and the river suffers from severe salinity that increases along its course.
- Recent **conflicts in the region**

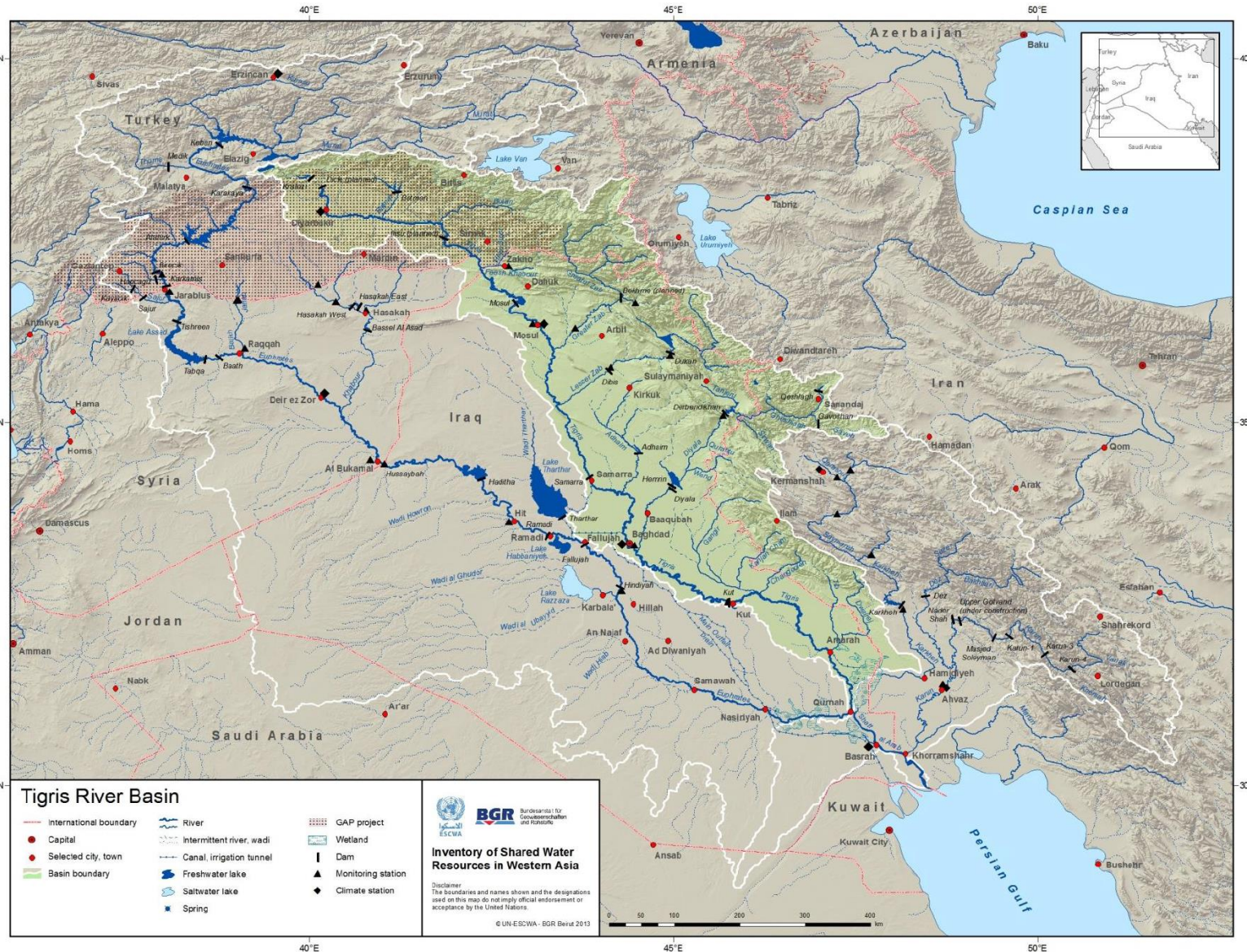
RIPARIAN COOPERATION

- Bilateral agreements and MoUs signed over the years
- No comprehensive or long-term treaty between Turkey, Syria and Iraq



The Euphrates at the Syrian-Turkish border, Syria, 2009. Source: Andreas Renck.

Tigris River Basin



BASIN FACTS

RIPARIAN COUNTRIES

Turkey, Syria, Iraq, Iran

RIVER LENGTH

1,800 km

BASIN AREA

221,000 km²

MEAN ANNUAL FLOW VOLUME

At Kut:

- (1931-1973) ~32 BCM
- (1974-2005) ~16.7 BCM

- The river originates in the Taurus mountains and flows south-east along a stretch of the Syrian-Turkish border before entering Iraq
- A number of tributaries shared by Iraq/Turkey or Iran/Iraq contribute to its flow

Tigris River Basin

KEY CONCERNS

- Water use for irrigation and hydropower production is constantly increasing, with numerous operational and planned projects along the river's main course and its tributaries placing **pressure on flow regimes** in the basin.
- **Periodic droughts** affect water supply and may impact water allocation to different sectors in the future.
- **Water quality**: rising pollution from domestic and industrial sources, salinity are a cause of concern.
- **Ecosystem** concerns (e.g. Ilisu dam and Tigris valley ecosystem, Iraqi Marshlands)

RIPARIAN COOPERATION

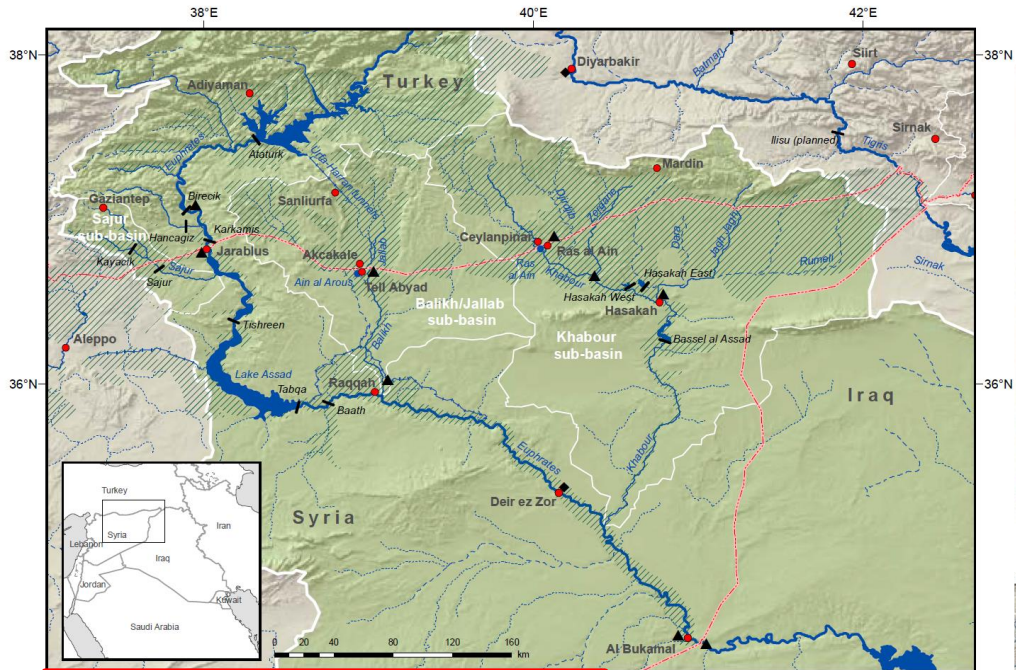
- Bilateral agreements Iraq/Syria, Syria/Turkey
- No basin-wide agreement between all riparians



The Tigris River at Baghdad, Iraq, 2006. Source: James Gordan.



The Tigris at Diyarbakir, Turkey, 2007. Source: Raki Man.



The Shatt al Arab, Iraq, 1992. Source: Ed Kashi/VII.



Shared Tributaries of the Tigris River

- International boundary
- Selected city, town
- Basin boundary
- Main shared sub-basin boundary
- ▨ Zone of agricultural development
- River
- ⋯ Intermittent river, wadi
- Canal, irrigation tunnel
- Freshwater lake
- Saltwater lake
- Spring
- | Dam
- ▲ Monitoring station
- ◆ Climate station

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ESWA Inventory of Shared Water Resources in Western Asia
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Shared Tributaries of the Euphrates River

- International boundary
- Selected city, town
- Basin boundary
- Main shared sub-basin boundary
- ▨ Zone of agricultural development
- River
- ⋯ Intermittent river, wadi
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The Sajur River in Syria, 2009. Source: Andreas Renick.



Shatt al Arab, Karkheh & Karun Rivers

- International boundary
- Selected city, town
- Basin boundary
- Main shared sub-basin boundary
- ▨ Zone of agricultural development
- River
- ⋯ Intermittent river, wadi
- Canal, irrigation tunnel
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The Lesser Zab in Bekhme, Iraq, 2005. Source: Ed Kashi/VII.

Jordan River Basin

BASIN FACTS

RIPARIAN COUNTRIES

Lebanon, Palestine, Syria, Jordan, Israel

RIVER LENGTH

223 km

BASIN AREA

18,285 km² (excluding the Dead Sea)

MEAN ANNUAL FLOW VOLUME

At the outlet (Dead Sea):

- 1,300 MCM (1950s)
- 20-200 MCM (more recent estimates)

- The Jordan River originates in the Anti-Lebanon and Jabal el Sheikh mountain ranges and flows to the point of discharge into the Dead Sea.
- Tributaries of the river include the Hasbani, the Liddan, and Banias rivers, which converge and flow into Lake Tiberias.
- As the flow leaves Lake Tiberias, it receives the waters of the Yarmouk River (longest tributary in the basin)
- The river is further joined by the Zarqa River in Jordan as well as several eastern and western side wadis in its lower course.



Jordan River Basin

— International boundary	— River	Dam
- - - Armistice Demarcation Line	- - - Intermittent river, wadi	▲ Monitoring station
● Capital	— Canal, irrigation tunnel	
● Selected city, town	— Freshwater lake	
— Basin boundary	● Spring	
— Main shared sub-basin boundary	x Mountain	
/// Zone of agricultural development		

Inventory of Shared Water Resources in Western Asia

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Jordan River Basin

KEY CONCERNS

- Ensuring **adequate quantities of water** for all riparians is a key challenge in the basin given the relatively small volume of water available and the large population.
- **River flow has been greatly reduced** over the years as a result of increased exploitation of water resources in the basin.
- The **rapid decline of the Dead Sea** is an indicator that the region's ecosystem is at risk.
- Water quality rapidly deteriorates along the course of the Jordan River displaying **extremely high salinity and pollution rates**.

*Since the early 20th century, numerous attempts to foster cooperation between basin riparians have been hampered by the regional political conflict which continues to stand in the way of any basin-wide agreement on water. **Basin-level approach would require engagement of all riparians in all aspects of the negotiations***

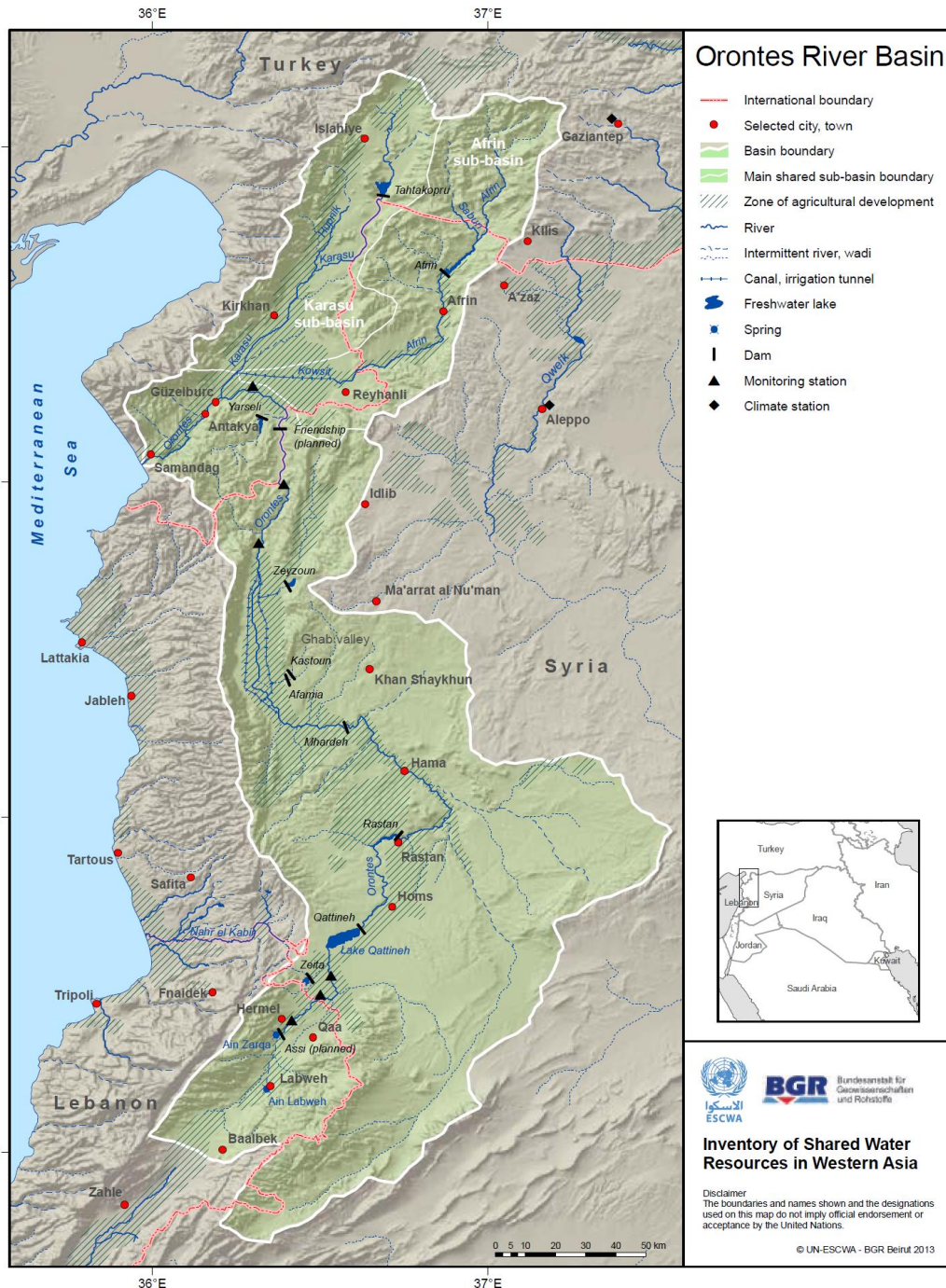
MAIN CHALLENGE: GEOPOLITICAL SITUATION

- Bilateral conflicts are regional in this basin
 - ❖ Arab/Non-Arab Conflicts
 - ❖ Arab/Arab Confrontations and tensions
- Current context affects all riparians: e.g in West Bank climate-induced stress on water resources compounded by the occupation; in Jordan additional water stress due to the influx of refugees, etc..



The Jordan River at one of its narrowest points, Jordan, 1992. Source: Ed Kashi/VII.

Orontes River Basin



BASIN FACTS

RIPARIAN COUNTRIES

Lebanon, Syria, Turkey

RIVER LENGTH

404 km

BASIN AREA

26,530 km²

MEAN ANNUAL FLOW VOLUME

- Hermel, Lebanon 0.4 BCM (1931-2011)
- Al Omeiry, Syria 0.2 BCM (1974-2011)
- Darkosh, Syria/Turkey border 0.9-1.4 BCM (1964-2011)

- “Assi” River, flowing north from Lebanon to Syria and Turkey and draining west into the Mediterranean Sea.
- Sources in Lebanon are **karstic springs** (Al-Labweh, Ain Zarka and Daffash) at an altitude of 690 m in the Bekaa Valley.
- River **mainly fed by groundwater**, groundwater recharge depends on the **snow cover** in Mount Lebanon and the Anti-Lebanon Mountains.
- Flows contributed in Syria (small streams and springs, Ghab Valley) and from Afrin and Karasu tributaries contribute to flow in Turkey

Orontes River Basin

KEY CONCERNS

- **Water quantity:** intensification of water use in the basin by all riparians mainly for agriculture, and projected developments raises the question of long-term water sustainability.
- **Water quality:** heavily polluted with untreated effluents discharged into the river.



Ain Zarqa Spring, the source of the Orontes, Lebanon, 2009. Source: Andreas Re

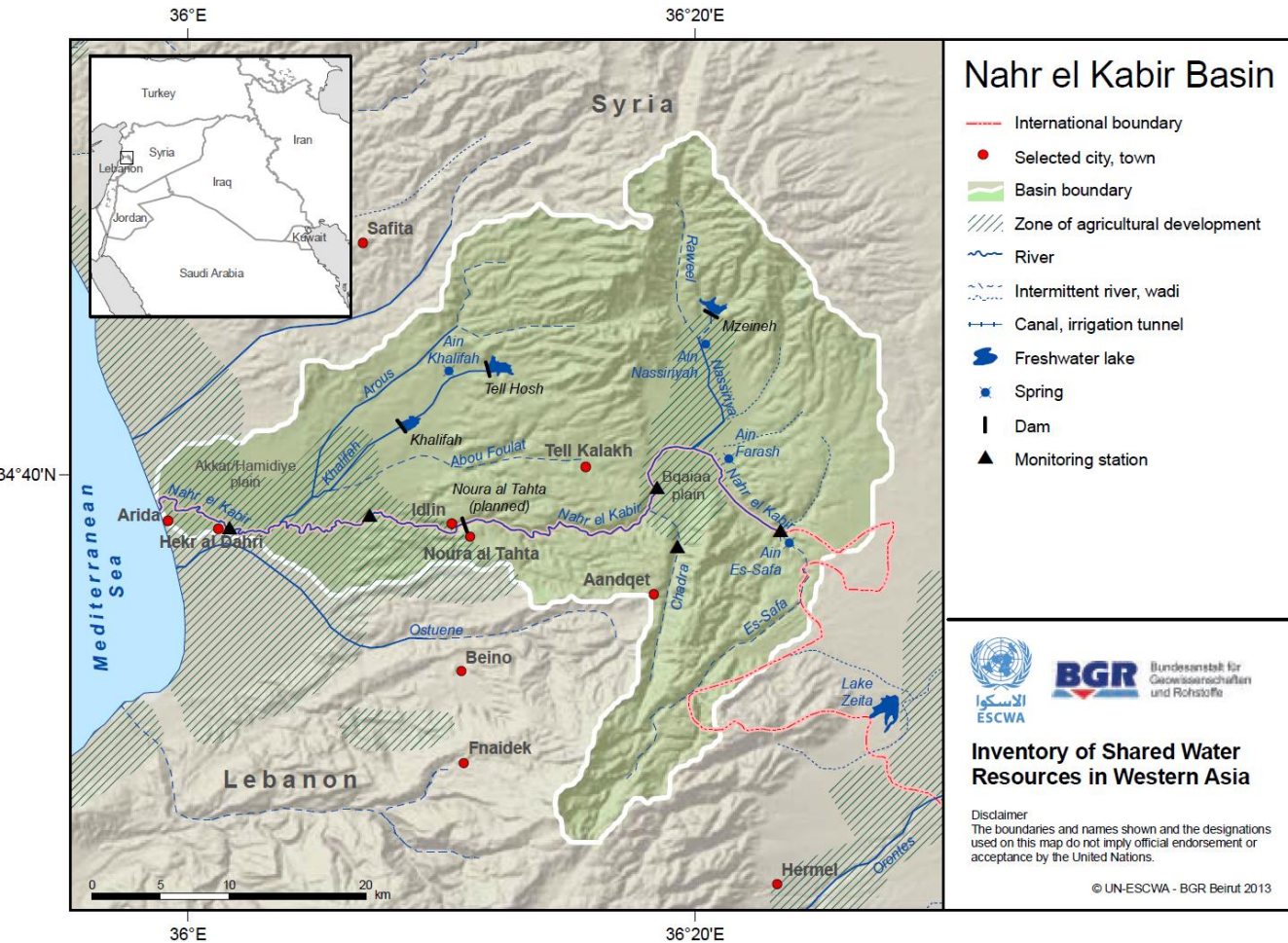
RIPARIAN COOPERATION

- A number of **bilateral water agreements** involving Turkey, Syria or Lebanon on issues such as water allocation (Lebanon-Syria) and the joint construction of infrastructure (Syria-Turkey).
- **No agreement involving all three riparians** to date.



The Orontes in Hama, Syria, 2009. Source: Adel Samara.

Nahr el Kabir Basin



BASIN FACTS

RIPARIAN COUNTRIES	Lebanon, Syria
RIVER LENGTH	78 km
BASIN AREA	954 km ²
MEAN ANNUAL FLOW VOLUME	Hekr el dahri (outlet) 337 MCM (1969-2011)

- “Nahr el Kabir al Janoubi” River, forms the north-south border between Lebanon and Syria.
- Rises from numerous karstic springs and wadis in the northern part of the Lebanon Mountain range
- 3 dams in Syria, planned construction of Noura al Tahta/Idlin Dam to mainly support irrigation in both riparians through Joint Lebanese-Syrian Project

Nahr el Kabir Basin

RIPARIAN COOPERATION

- **2002 agreement** between Lebanon and Syria to share the water of the Nahr el Kabir and build a joint dam on the river course
- **Lebanese-Syrian joint committee** for the river management (infrastructure and water quality) regularly meet

KEY CONCERNS

- Recurrent **flash floods** causing losses and damage in both riparians
- Water quality: Spread of the **invasive Water Hyacinth** 'Zahret el Nil', clogging waterways throughout the river course over a long distance.
- **Continuous joint efforts** ongoing to manage and control the invasive plant.

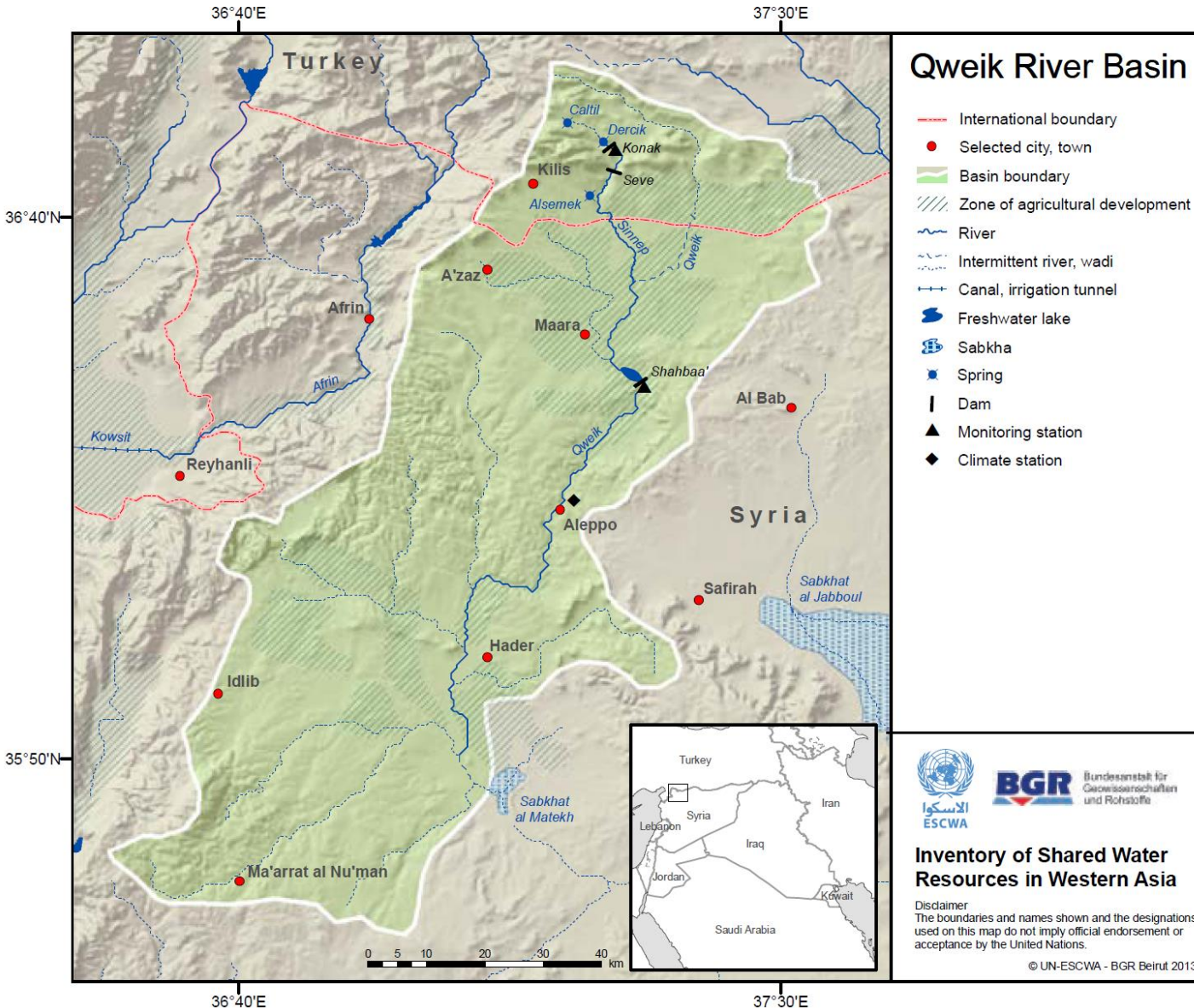


The Nahr el Kabir near the river mouth at Arida, Lebanon, 2010. Source: Andreas Renck.



The invasive water hyacinth, which is clogging water channels in the basin, 2009. Source: Ministry of Energy and Water in Lebanon.

Qweik River Basin



BASIN FACTS

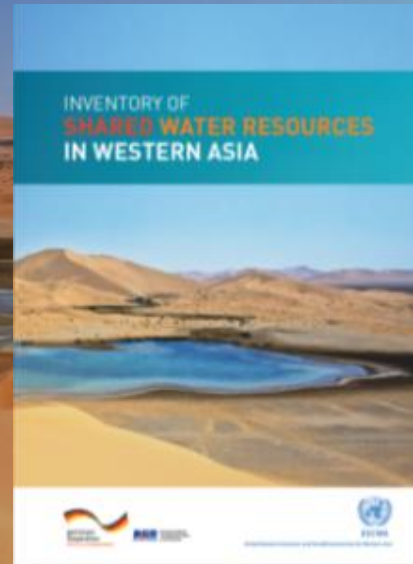
RIPARIAN COUNTRIES	Syria, Turkey
RIVER LENGTH	167 km
BASIN AREA	6,941 km ²

- Rises in Turkey and discharges in Syria, “closed drainage basin”
- Main source of freshwater to Aleppo before the 1950s, currently flows intermittently due to rising demand and river exploitation
- Severe pollution with direct wastewater and industrial waste discharges into to river, risk to contaminate groundwater
- No recent cooperation agreement, latest one in 1921 “The Franklin-Bouillon Agreement” with mention to meet Aleppo’s water needs.

Pressures and Concerns for Sustainable Development of Shared Water resources

- ❖ Climate Change & Extreme Events
- ❖ Population Growth
- ❖ Unemployment
- ❖ Food Security
- ❖ Rural to Urban Migration
- ❖ Conflict, crisis, occupation and insecurity
- ❖ Water Security
- ❖ Freshwater Scarcity
- ❖ Water Quality and Ecosystems
- ❖ Groundwater linkages
- ❖ Water resource use & efficiency for sustainable resource management
- ❖ Despite assessment, more joint monitoring & management needed
- ❖ Different considerations for renewable & non-renewable resources when considering over-extraction of non-renewable groundwater resources
- ❖ Water is shared between countries and communities.

Water-stress and growing socio-economic development and environmental pressures makes progress towards sustainable development a greater challenge.



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