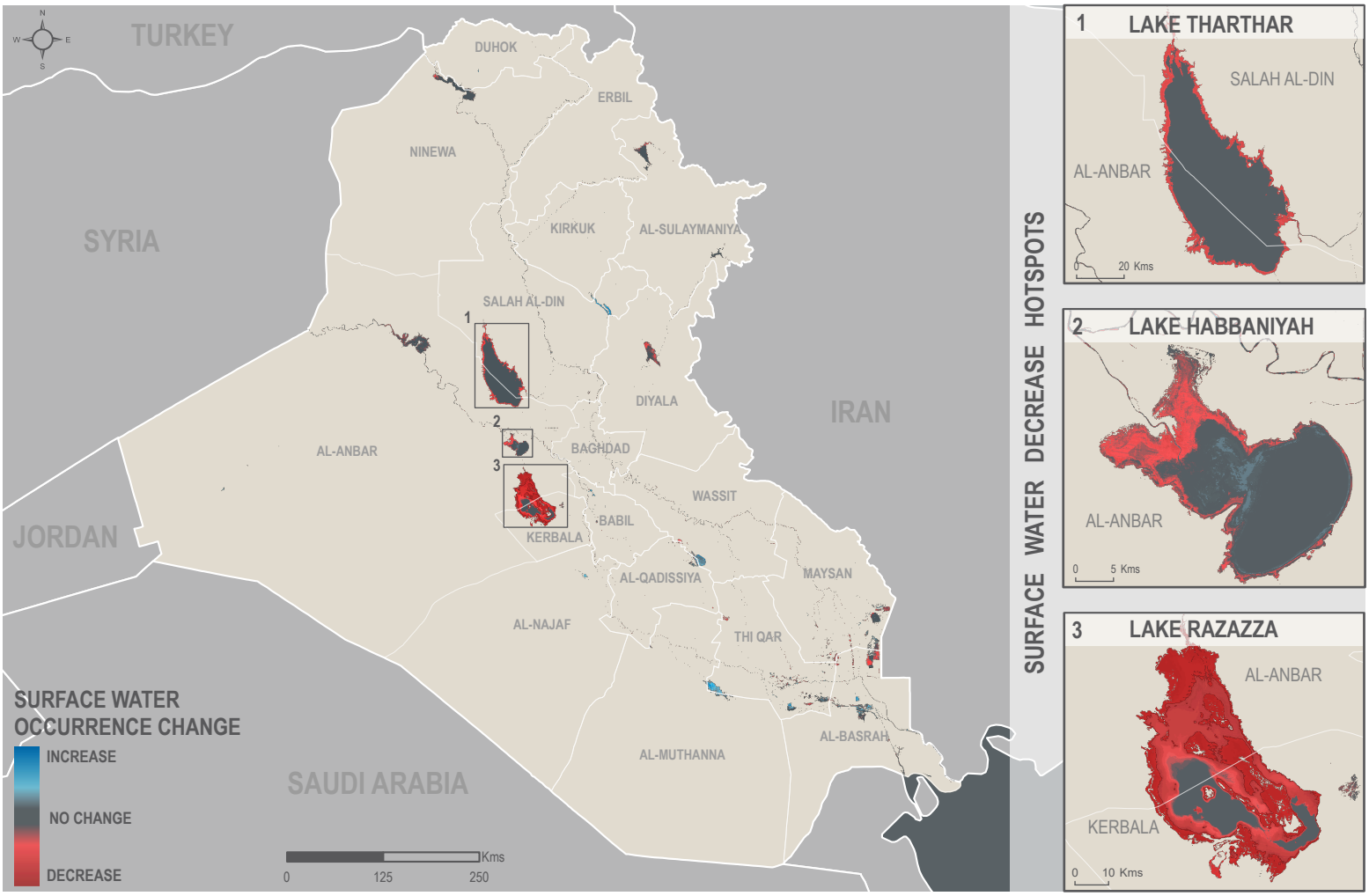
WASH Cluster
Water Sanitation Hygiene

Long-term Surface Water Dynamics in Iraq

May 2020

SURFACE WATER OCCURRENCE CHANGE BETWEEN 1984 - 2018

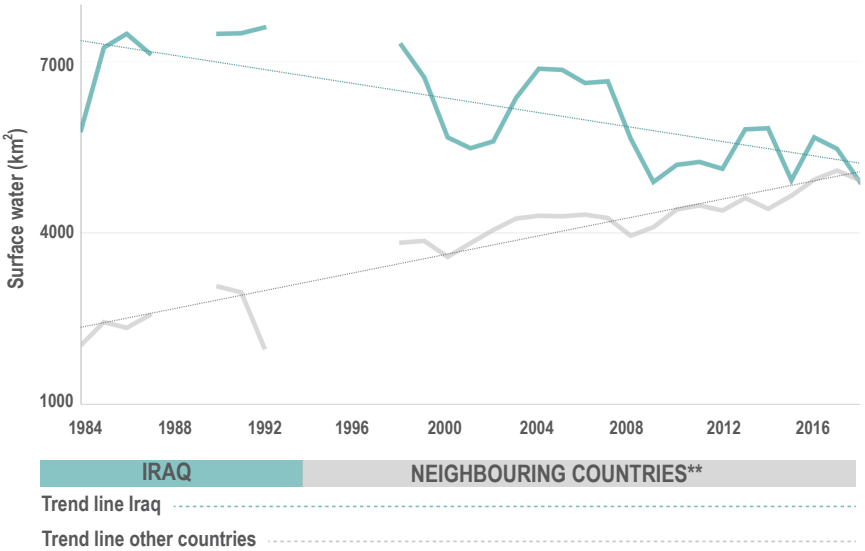


The Water Occurrence Change map provides information on where surface water occurrence increased, decreased or remained the same between the two epochs: 1984-2004 and 2005-2018. The intensity of the color represents the degree of change. For example, dark red areas show greater loss of water than light red areas.

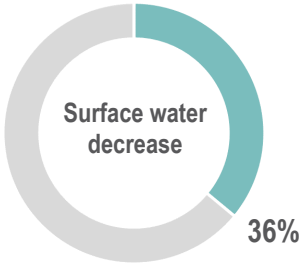
Background

Water availability in Iraq undergoes large annual and inter-annual fluctuations caused by factors such as variations in precipitation and temperature, and upstream and in-country water management.[1] Various long term challenges related to water shortages and flooding have raised a new set of cross-sectoral issues with implications for Water Sanitation and Hygiene (WASH) interventions. However, detailed information on surface water area trends is limited. To inform the WASH Cluster in Iraq on needs for sustainable and preparedness-focused interventions, REACH conducted a comprehensive long term surface water change analysis. In general, the analysis suggests that Iraq's surface water experienced a downward trend during the years 1984-2018, while neighbouring countries experienced a surface water increase during the same timeframe.

Change in permanent* surface water (1984 - 2018)



Reduction of permanent surface water (1992 - 2018)***



*Permanent surface water refers to areas which are underwater throughout the year.

**Neighbouring countries refers to areas of the Euphrates-Tigris basin outside of Iraq.

***1992 marks the completion of the marshland drainage works and the inauguration of the Attaturk dam along the Euphrates river.[2]

[1] REACH (February 2020). Long-term Precipitation Pattern in the Euphrates-Tigris Basin

[2] UNEP (2001). The Mesopotamian Marshlands - Demise of an Ecosystem

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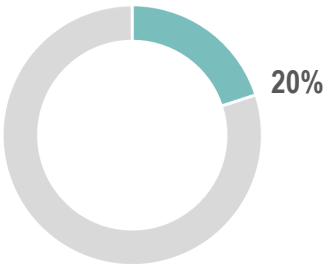
CASE STUDIES OF SURFACE WATER DECREASE

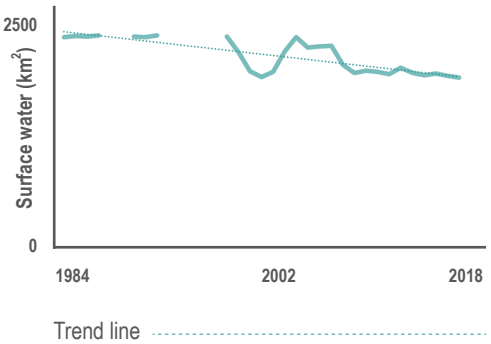
LAKE THARTHAR

Year of construction: 1965[3] **Purpose:** flood protection (Tigris river)[3] **Water loss since 1984:** 495km²

Percentage decrease



Change over time

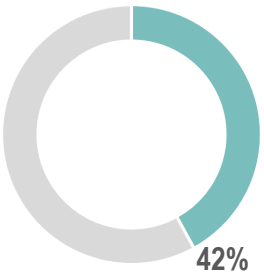


Comparison between 1984 and 2018

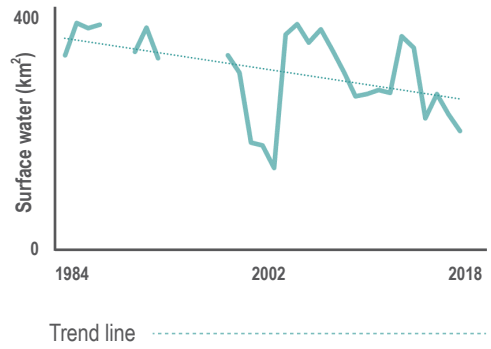
LAKE HABBANIYAH

Year of construction: 1940[4] **Purpose:** flood protection (Euphrates river)[4] **Water loss since 1984:** 139km²

Percentage decrease



Change over time

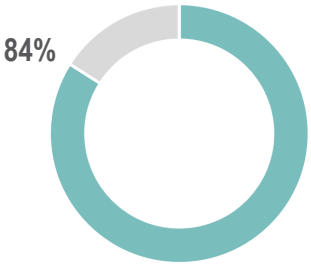


Comparison between 1984 and 2018

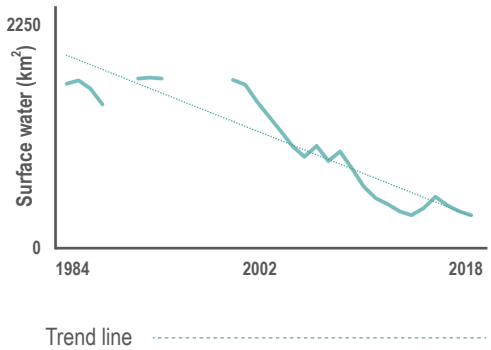
LAKE RAZAZZA

Year of construction: 1969[5] **Purpose:** flood protection (Euphrates river)[5] **Water loss since 1984:** 1362km²

Percentage decrease



Change over time



Comparison between 1984 and 2018

[3] Sissakian (2011). Genesis and Age Estimation of the Tharthar Depression, Central West Iraq

[4] Abdullah et al. (2019). Water Resources Projects in Iraq, Reservoirs in The Natural Depressions

[5] Abdulwahhab et al. (2012). The Study of the surface area change of lake Al-Razzaza using geographic information system (GIS) and using remote sensing

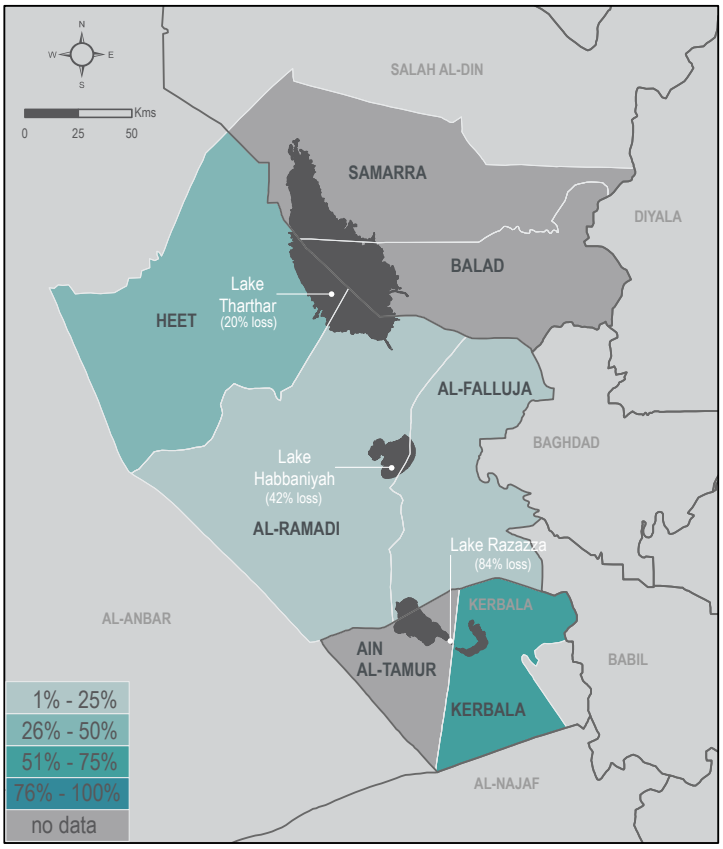
POTENTIAL IMPACTS ON DRINKING WATER

Integrated analysis of household-level indicator and surface water data

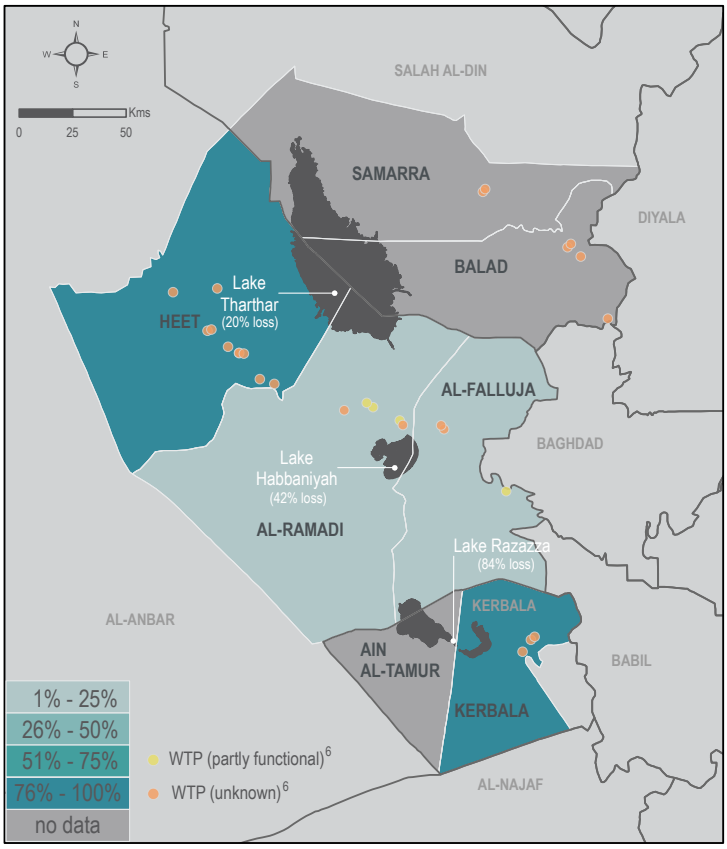
Findings indicate that high levels of turbidity in drinking water may correlate with the previously discussed decreases in surface water. In districts surrounding the three reservoirs, a relatively large proportion of households reported their drinking water being turbid or unclear (59%) compared to households in other areas (47%). Such reports were particularly high in Kerbala district, on the southeastern shore of Lake Razazza, where 100% of households reported their drinking water being turbid or unclear. The reason for this localised turbidity may be that, as the shoreline recedes and reservoir water becomes more concentrated, silt and other particulates may become more prevalent, thus increasing water turbidity.

Therefore, it is not surprising then to see that the majority of households in the area reported bottled water as their main drinking water source (74% in Kerbala district). High turbidity increases the need for water treatment, while simultaneously reducing the effectiveness of water treatment plants (WTPs)[6], even disabling them when the turbidity levels are too high. With all documented WTPs in the vicinity of the three reservoirs only at partial or unknown functionality[6], this highlights the urgent need for further investigation.

% of household reported using bottled water as primary source of drinking water



% of household reported turbidity as reason for water treatment



Surface water extent of 2018 is shown on the maps

Methodology

Change in water occurrence between two epochs (1984-2004 and 2005-2018) was calculated by exploiting the Yearly Water Classification History (v1.1) of the Global Surface Water dataset from the Joint Research Center (JRC) of the European Commission.[7] The dataset represents the spatial and temporal variability of global surface water and its long-term changes and was created by using the entire multi-temporal orthorectified Landsat 5, 7 and 8 archive spanning the last 32 years. For this study, the data was accessed and computed using Google Earth Engine. In order to map the change in surface water occurrence, two similar periods of time had to be identified to enable accurate comparison of data. The timeframes for each epoch were chosen under consideration of having an equal amount (n= 14) of valid observations (VO) per epoch.* First, surface water occurrence (SWO) layers, capturing intra-annual variability, were computed for each selected timeframe. To compute the SWO, the water detection per pixel for all VO was determined ranging from 0%-100%. Pixels with 50% SWO indicate water detection for 7 VO for the respective pixel. Second, by computing the difference between the SWO layers the change in water occurrence was retrieved, indicating the direction and magnitude of change in %. Pixels with -50% surface water occurrence change would indicate a decrease of water occurrence by 50% compared to the previous epoch.

To provide evidence on the potential impact of surface water trends on households' WASH needs, SWO data was complemented with household-level data derived from a recent REACH assessment, which sought to provide information on the WASH needs, gaps, and priorities for out-of-camp households residing in Iraq.[8] In total, 90,090 households were surveyed across the country between 22 September and 31 December 2019. Findings are statistically representative with a 90% confidence level and 10% margin of error for each population group at district level.[8]

[6] WASHapp - Iraq Water Treatment Plant Monitoring System (https://reach-info.org/irq/wash2020/)
[7] Pekel et al. (2016). High-resolution mapping of global surface water and its long-term changes
[8] REACH (2019). Iraq Out-of-Camp WASH Needs

*No VO for the years 1988-1989 and 1993-1997 were available