WASH Cluster
Water Sanitation Hygiene

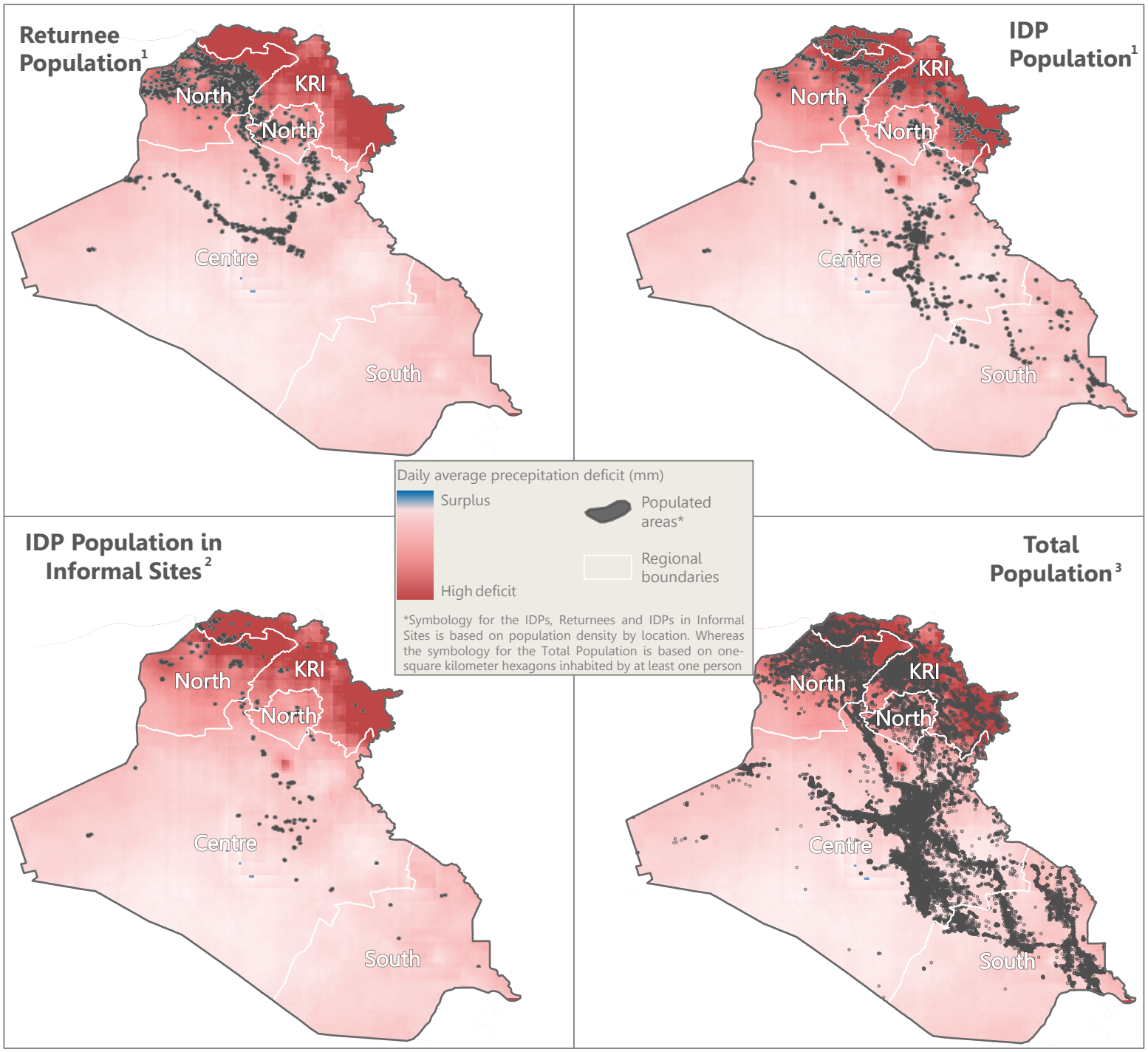
Precipitation and Temperature Change in Iraq - November 2021

Background

In Iraq, climate change is expected to aggravate a set of cross-sectoral challenges, with current and expected implications in the WASH (Water and Sanitation and Hygiene) sector in particular. To support the WASH Cluster with their emergency preparedness, REACH conducted a preliminary analysis of the precipitation and temperature development, as key indicators of climate change.

The four maps below provide information on where precipitation increased, decreased, or remained the same between January and September (2021) compared to the historical average (1984 to 2020). The maps show precipitation deficit overlaid with population data for internally displaced persons (IDPs), returnees, IDPs in informal sites, and the total population of Iraq, in order to determine which areas and population groups might experience greater impacts. The colours represent the degree of deficit, with lighter red areas representing lower precipitation deficit , and darker red areas representing higher deficit.

Figure 1 - Precipitation deficit map overlaid with population density



[1] International Organization for Migration (IOM) Displacement Tracking Matrix (September 2021)
[2] International Organization for Migration (IOM) Displacement Tracking Matrix (September 2021)
[3] WorldPop (2020)

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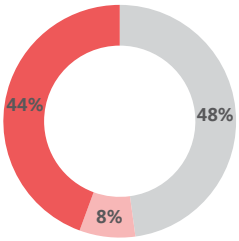
Returnee Population



IDP Population

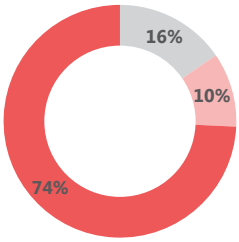
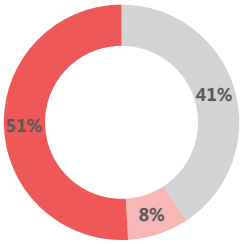


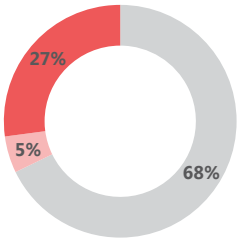
Figure 2 - Estimated percentage of population living in the respective deficit zones, by population group

No deficit / Surplus: ≥ 0 mm
Low deficit: ≥ -0.3 mm to 0 mm
Moderate deficit: ≥ -0.5 mm to -0.3 mm
High deficit: -0.5 mm>

IDP Population in Informal Sites



Total Population



Analysis of findings

The precipitation maps show that the deficit is higher in KRI and northern Iraq, whereas in central and southern Iraq, deficit is comparatively low. Finding suggest that, compared to the other assessed population groups, the IDP population might be the most vulnerable to climate change, with around 74% of IDPs estimated to live in high deficit zones. More than half of the population living in informal sites are in high deficit zones, whereas for returnees, only 44% of the population live in high deficit zones. When considering the entire population of Iraq, the majority of people live in low deficit zones (68%). While almost one-third (27%) of the total population is estimated to live in a high deficit zone, returnee and IDP populations seem substantially more likely to live in a high deficit zone, possibly aggravating pre-existing vulnerabilities related to their (former) displacement status.

Figure 3 shows that temperatures in Iraq are rising, compared to the historical average (2015 - 2020) and temperatures throughout 2020. Temperatures in 2021 from January to September were higher in most months than both the historical average and temperatures measured throughout 2020.

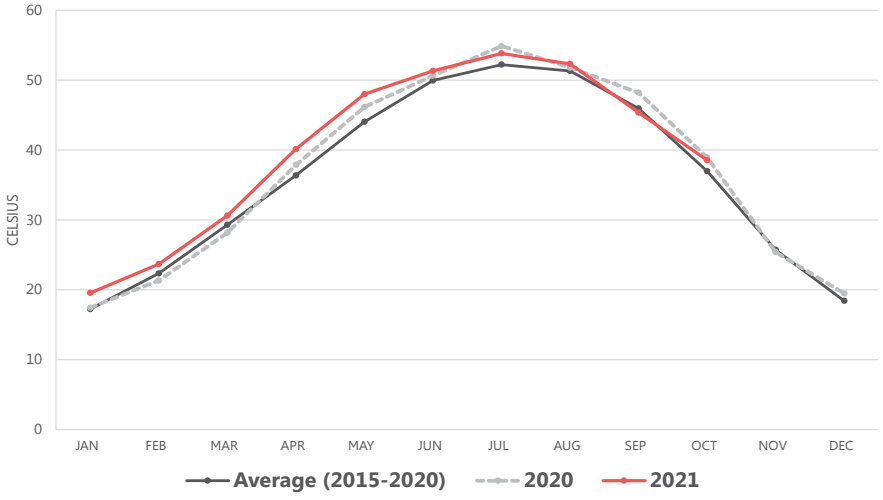
The high deficit in precipitation in some areas of Iraq, in addition to the rising temperature and low water supply from neighbouring countries, will likely have a negative effect on surface water levels.[4] This is expected to limit people's access to water, which will likely force people to increasingly depend on ground water, especially in seasons with on average lower rainfall (i.e. summer and autumn). A higher consumption of groundwater may accelerate a water crisis, especially if ground water reservoirs are not being recharged. This could negatively impact the agricultural sector, reduce access to livelihoods, and increase food insecurity.[5]

Table 1 - Estimated number of people living in the low, moderate and high deficit zones, by region and by population group.*

Deficit type	Population Group	KRI	North	Centre	South
Low	IDP Population	0	0	170,198	11,712
	Returnee Population	0	0	2,362,830	0
	IDP Population in Informal Sites	0	0	41,709	222
	Total Population	0	20,532	19,804,117	7,400,933
Moderate	IDP Population	17,799	65,658	39,475	0
	Returnee Population	1,116	176,070	206,220	0
	IDP Population in Informal Sites	90	7,852	726	0
	Total Population	187,242	1,327,014	533,494	2,636
High	IDP Population	602,179	280,958	192	0
	Returnee Population	59,316	2,097,102	35,448	0
	IDP Population in Informal Sites	20,514	31,652	240	0
	Total Population	6,586,671	4,227,537	65,542	0

* KRI: Duhok, Erbil, Al Sulaymaniyah
North: Ninewa & Kirkuk
Centre: Salah Al-din, Diyala, Baghdad, Al Anbar, Kerbala, Babil, Wassit, Al Qadissiya, Al Najaf
South: Al Basra, Al Muthanna, Thi Qar, Missan

Figure 3 - Comparison of the average monthly temperature between the average of 2015 - 2020; average of 2020; and January-October 2021.



Methodology

The precipitation data was collected for the period between 1981-2021 using the satellite precipitation dataset Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS), processed in Google Earth Engine.[6] To calculate the precipitation deficit, the historical average 1981 to 2021 and current 2021 average were calculated. The 2021 average was then subtracted from the historical average. While calculating the average precipitation, only January to September data was considered to make the historical and current year average precipitation comparable, considering the absence of data after September 2021.[7] Moderate Resolution Imaging Spectroradiometer (MODIS) temperature data from 2015 until 2021 was used to calculate the monthly temperature average.[8] This data was equally processed in Google Earth Engine.

[4] MEI - Water scarcity could lead to the next major conflict between Iran and Iraq (2021) & Climate Diplomacy - Turkey, Syria and Iraq: Conflict over the Euphrates-Tigris.
[5] Government of Netherlands - Climate Change Profile: Iraq (2019)
[6] Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS)
[7] Google Earth Engine analysis code available on demand, email: iraq@reach-initiative.org
[8] Moderate Resolution Imaging Spectroradiometer (MODIS)