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HDC Organisation

Water crises and its repercussions

A general report showing the situation of Food and water security in north and east Syria.

This report clarifies the impact of reduced water on food and societal security as it threatens the lives of the people of NES and will lead to the first instances of migration due to climate change in addition to migration because of the current conflict and war.
Main Data Source: General Administration Of The Euphrates Dams With Energy And Communication Office Of AANES.

INTRODUCTION

Water affects various aspects of life, as it is the basis for the balance of partial ecosystems and the protection of their vital interacting elements. It constitutes the main engine of regional and local economies and occupies the equivalent of half of the workforce worldwide.

The per capita share of water is estimated at 1,000 cubic meters annually and below it, is considered below the water poverty line. During the past two decades, because of climatic factors, the gap between water resources and the demand for it has increased, and with the increase in demand and the mismanagement of resources and the impact on that of political conflicts in the region that led to a decrease in The per capita share is significantly as happened in Syria.

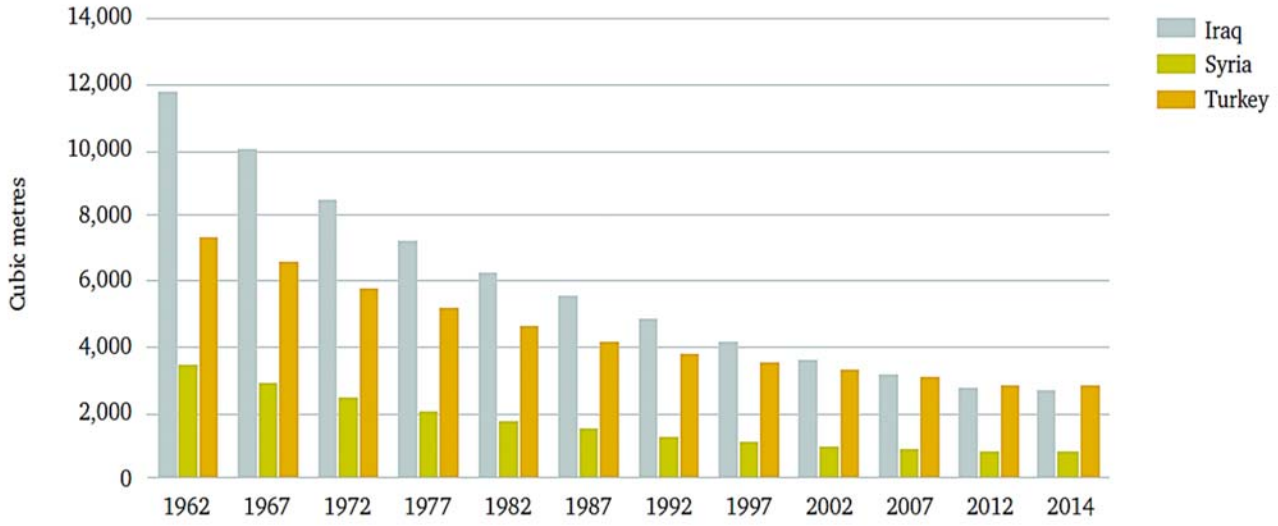
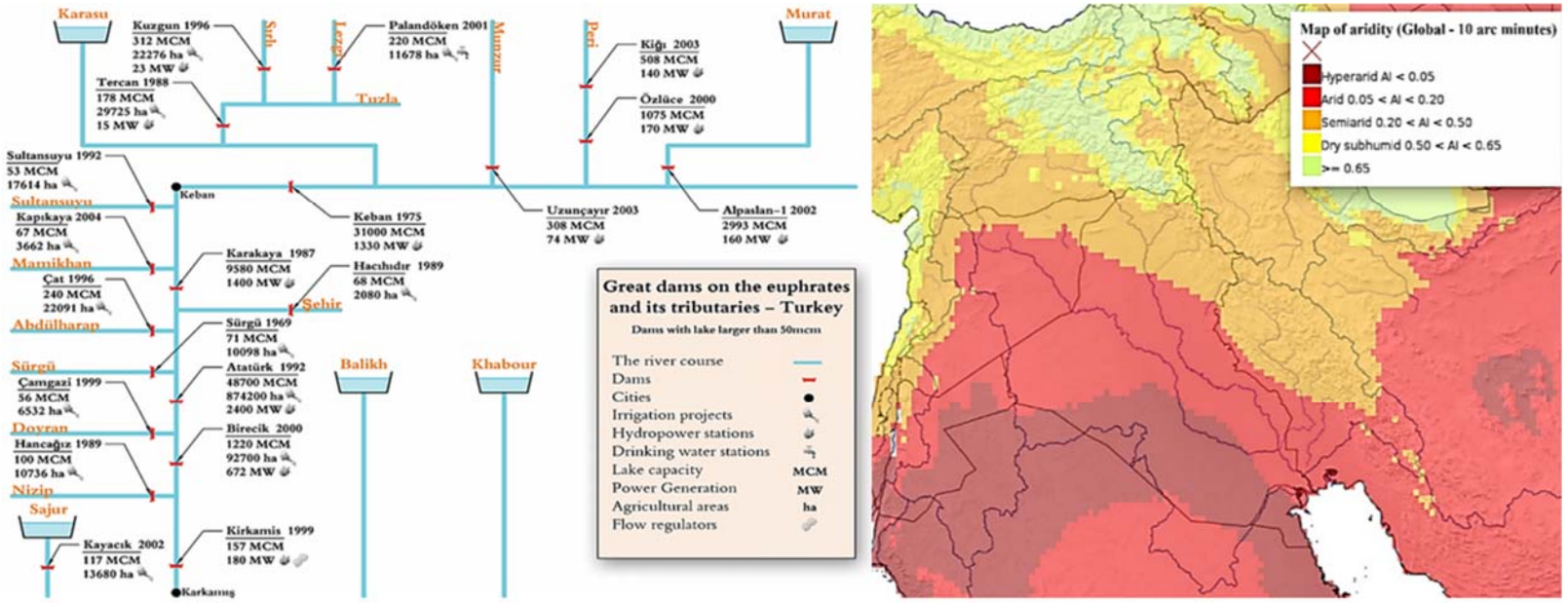


Chart 1: Decreased per capita share of water

Syria is one of the countries that rely heavily on water sources originating outside the country, the most important of which is the Euphrates River, which is shared internationally. Thus, Syria has a high-water dependency ratio of 72.36% compared to Turkey 1.52% and Iraq 60.83%. This indicates that any control of the amount of water received from abroad It will lead to destabilization and the deterioration of ecosystems as we are currently witnessing.

THE EUPHRATES:

The Euphrates Basin constitutes 98% of the area of NES, most of the lands of the Euphrates basin are located in the arid region, in which the aridity index is less than 0.5, as shown in the map, while the southern lands of it are located in the extremely arid region, with an aridity index less than 0.2. The United Nations Environment Program defines drylands according to the aridity index, as the ratio between annual precipitation and potential evapotranspiration. The Euphrates River alone irrigated up to 295 thousand hectares out of 640 thousand hectares planned for irrigation, and it was producing more than 400 megawatts of hydroelectric power, But the current water crisis, which emerged as a result of a series of phenomena related to the repercussions of climate change at the global level, which in general reduced the natural resources of the Euphrates River, this crisis deepened a lot and took a catastrophic turn for the population of the middle and lower Euphrates basin (those estimate more than 16 million people in Syria and Iraq). after the remarkable acceleration in the rates of completion of the Southeastern Anatolia GAP project in addition to the use of water as a pressure card on the riparian countries on the Euphrates and the Tigris as a source country.



Map 1: GAP projects and Aridity index on the Euphrates

The overall goal of the mega development project is to localize 8800 megawatts of electric capacity, and to double the irrigated agricultural land in Turkey to 3.1 million hectares, So far, capacities of up to 6564 megawatts have been localized on the Euphrates River only, with an electrical completion rate of 74.6%, and the areas of land invested within the project have reached 1.16 million hectares in the Euphrates Basin, which is estimated at 64.4%, an agricultural achievement rate within the continuous development project for the southeast Anatolia.

The amount of surface flow entering Syria from abroad is estimated at 28.52 km^3/year, of which the Euphrates River constitutes 15,768 km^3/year when Turkey commits to pass an annual average flow of 500 m3/sec (55.28% of the surface flow coming from outside the country of which up to 58%, or 290 m^3 /s) , must be passed to Iraq, according to the 1990 agreement between Syria and Iraq.

TIGRIS AND KHABOUR

The Tigris River forms the boundary between Syria on the one hand and Turkey and Iraq on the other hand, and the length of its shared course with Turkey is about 39.2 km, while the length of its shared course with Iraq is about 5.2 km. Its annual total flow upon entering the Syrian border is 18.3 billion m^3/year before 2011, with an average of 580 m3/s.

The Khabur River is 320 km long. It originates in southern Turkey near the Syrian border, then crosses the border south to Syria from Ras al-Ain and merges into the Jaqjaq River, then drains into the Euphrates near the city of al-Mayadin, which belongs to Deir ez-Zor regions, where the average flow of the Khabur River was 45 m^3/s. It originates from a group of springs located in the Ras Al-Ain region.

Tigris River Project:

The Tigris River project was launched in March 2011, but it was not implemented due to the start of the crisis in Syria. The goal was to benefit from Syria's share of the river. It was estimated, according to a bilateral agreement with the Iraqi side in 2002, at 1250 million m^3/year, representing an annual average flow of 39.6 m^3/s After its implementation, it was supposed to irrigate an area of 210 thousand hectares in the second, third and fourth agricultural stability areas.

DROUGHT OF AL-KHABOUR RIVER:

It was expected to take advantage of the natural resources of the Khabour River to irrigate 150,000 hectares from Ras Al-Ain to Al-Sour within the Khabour River project, but all projects stopped investing due to drought. That can define by the average flow income, which was in 1998/99 (9.82 m3/sec) and become (5.93 m3/sec) in 1999/2000 then drought totally at 13/4/2001 converting to seasonal river flow not exceed 3 m^3/sec.

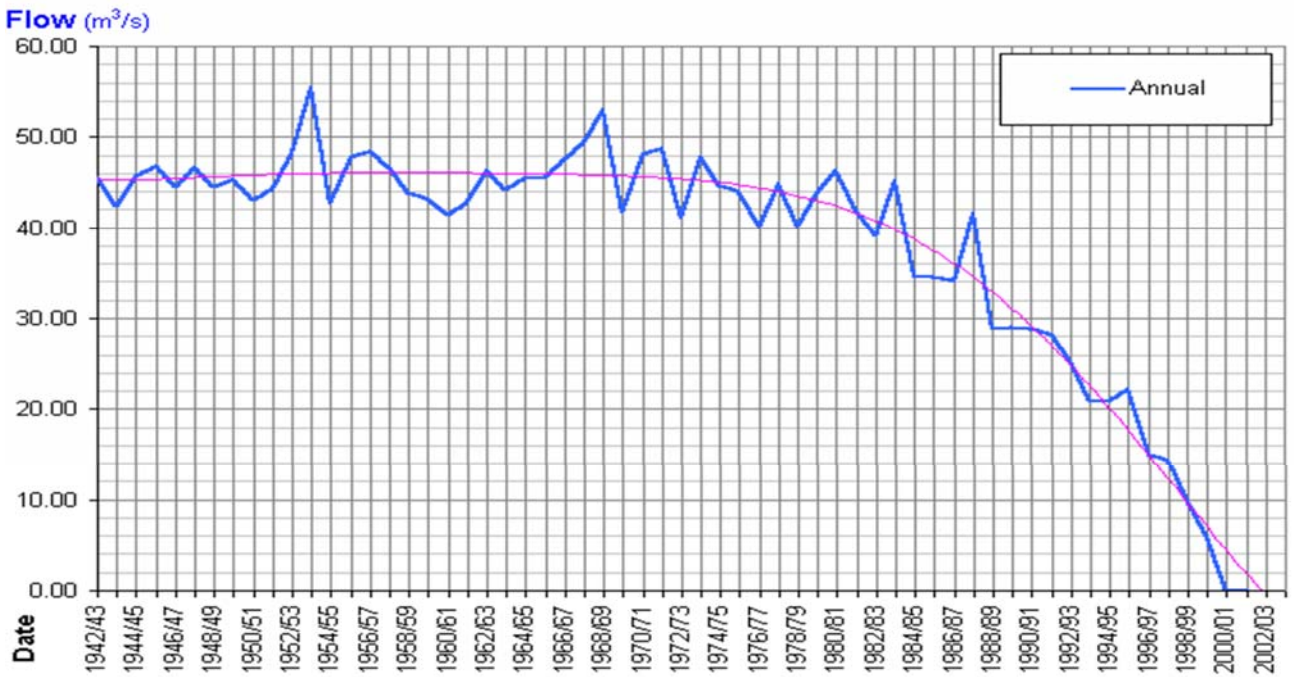
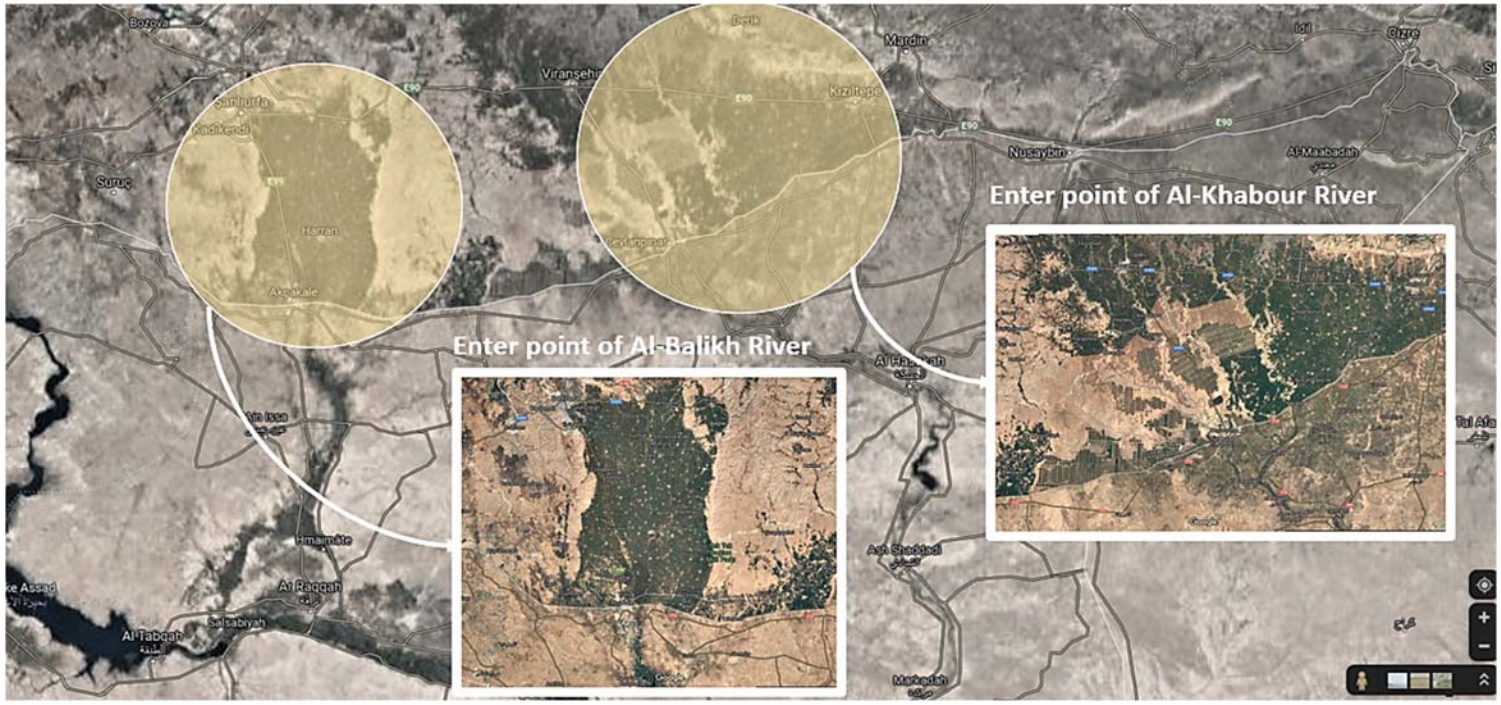


Chart 2: incoming flow of Al-Khabur river

Pumping water from the water carriers in the Ras al-Ain area to support the course of the Khabour River:

116 wells were drilled, 30 wells of them which invested by electric submersible pumps on the course to feed the Allouk station for purify and pump drinking water. As for the remaining 86 wells, they were invested on the bed of the Khabur River, with an average flow of 6 m3/s, feeding the river bed and the main traction channel to provide water for irrigation of Al-Hassaka and the villages located on both sides of the river.

Agricultural land in the Tigris and Khabur basin declined by 71% in 2018 (according to the Ministry of Water Resources in Syria), due to several combined factors, the most important of which are the low levels of rainfall and the dryness of the Khabour stream and its transformation into seasonal due to the expansion of land reclamation projects within the GAP projects.



Map 2: the expansion of land reclamation projects within the GAP projects

IMPACT ON AGRECULTURE AND LIVESTOCKS:

Agriculture is one of the most influential sources of local income in the internal economy of northern and eastern Syria. The percentage of dependence on agriculture has continued to exceed all dependence rates in other economic sectors before and after the crisis, as it decreased in Al-Hasakah region by 35% and still declining due to drought and control of water resources especially those entered from Turkey.

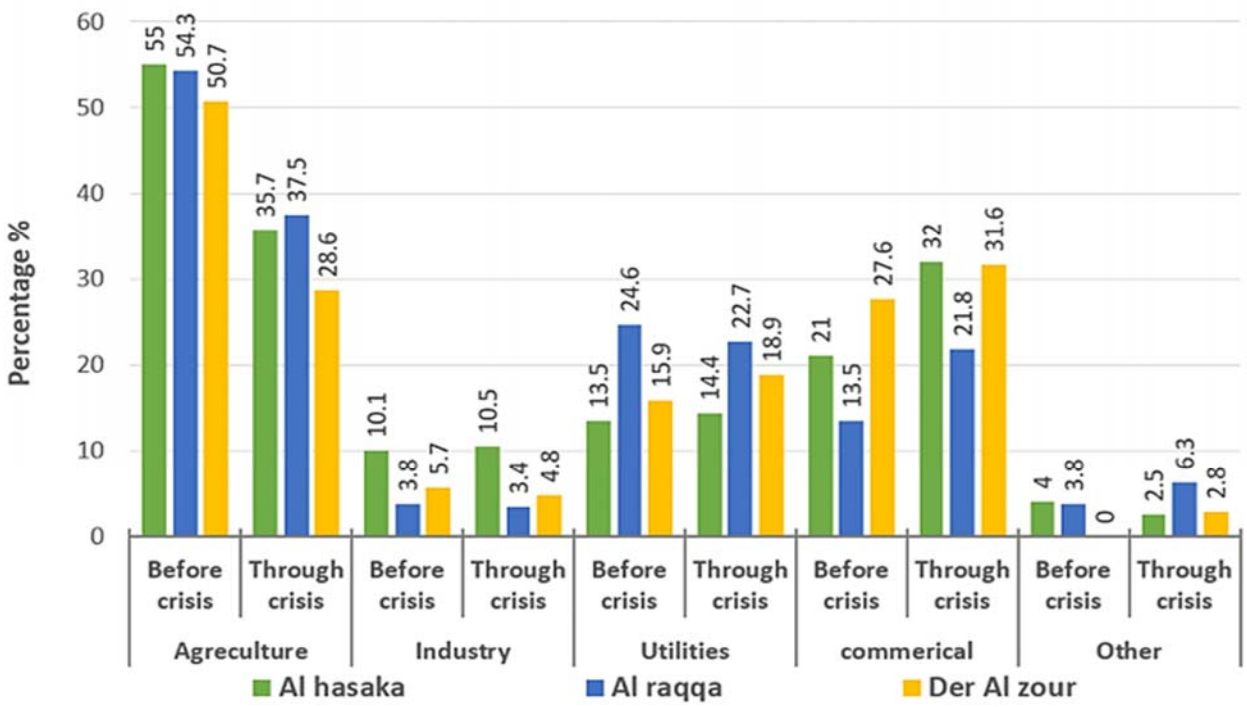
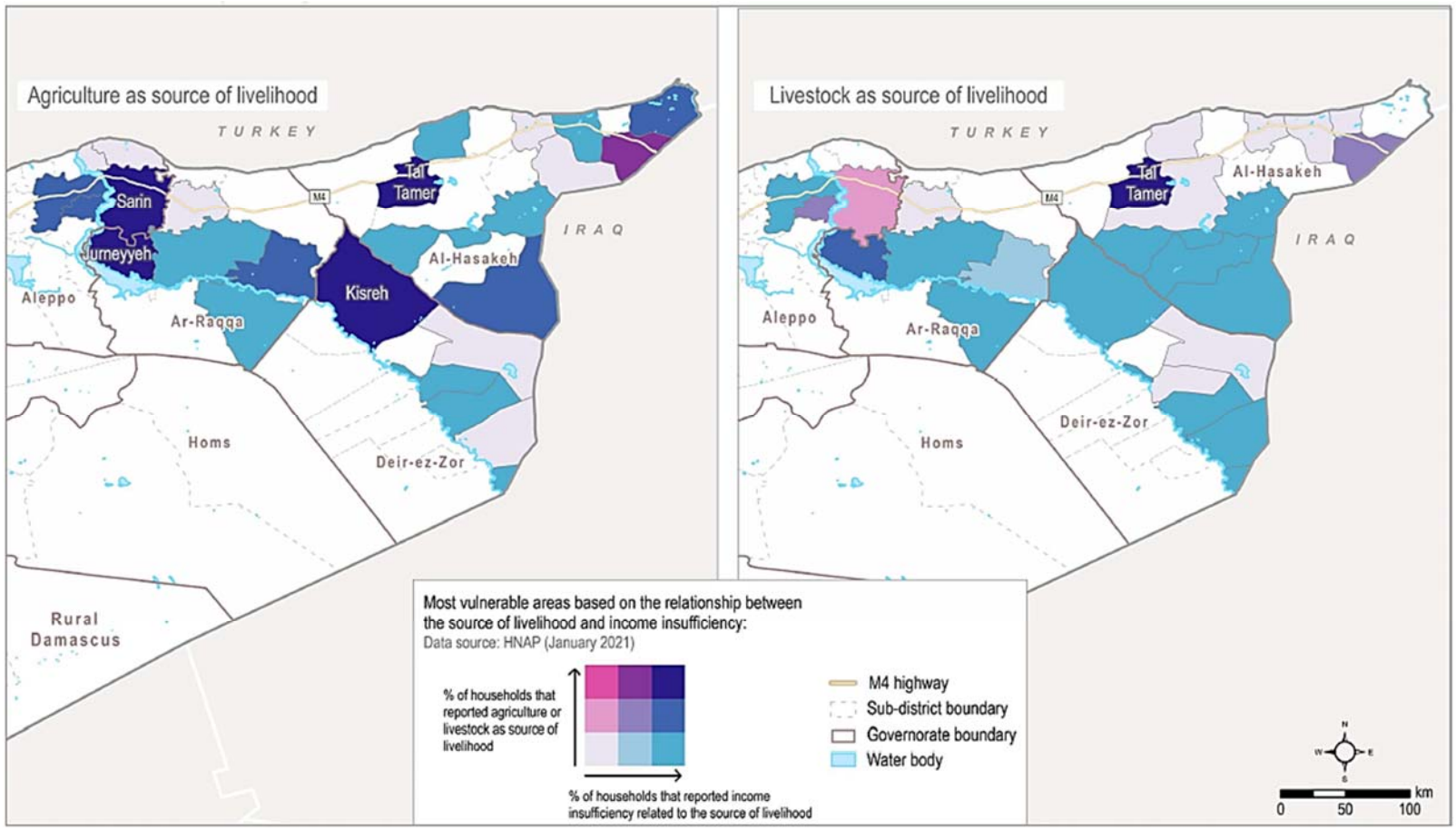


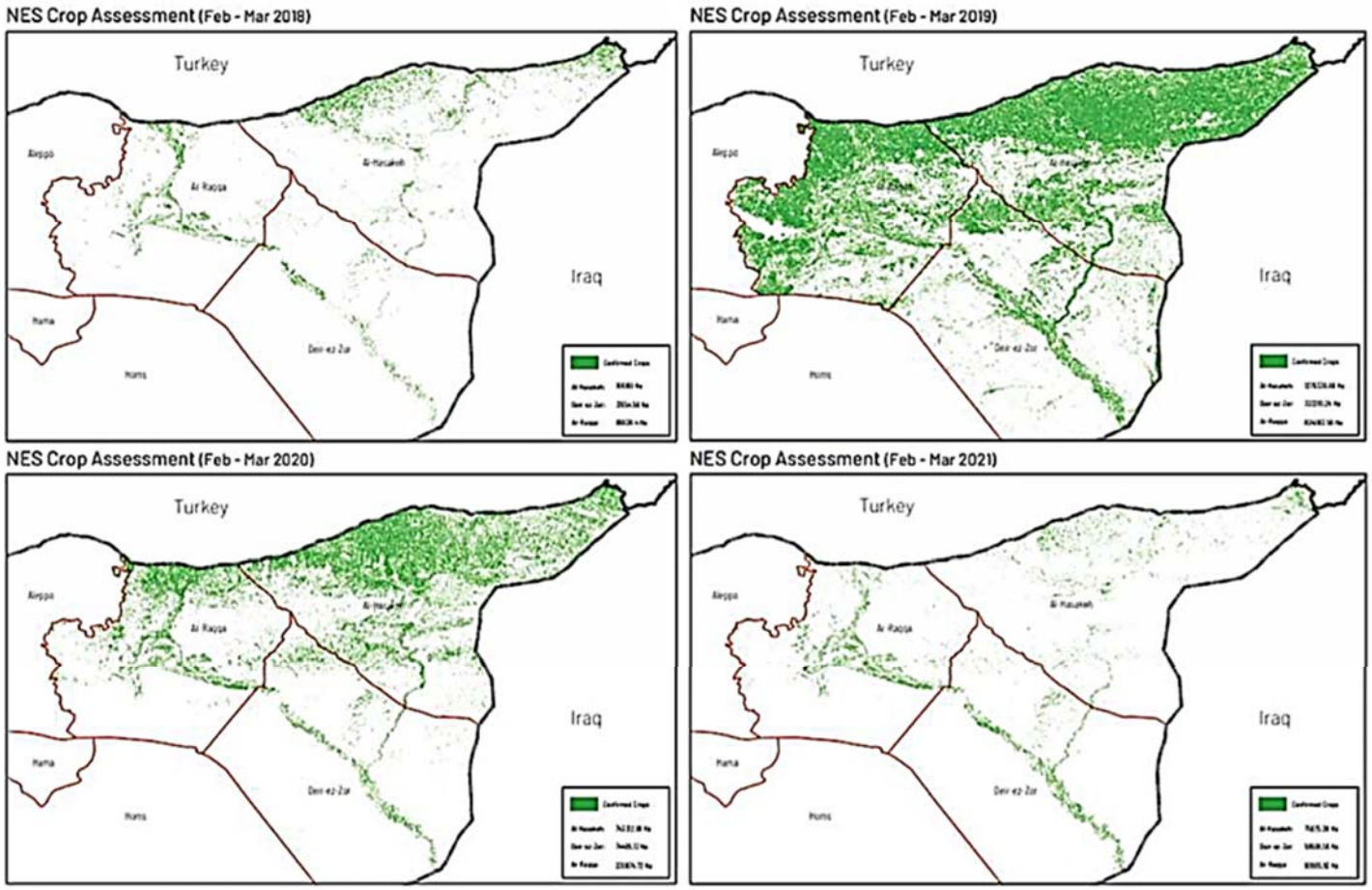
Chart 3: Social dependency ratio on economic Sectors before and through crisis

Drought conditions destroyed large areas of rainfed crops resulting in significant loss of income for farmers in addition to the impact of barley crops on the availability of animal feed which led to high livestock mortality rates already in 14% of the communities assessed in May 2021.



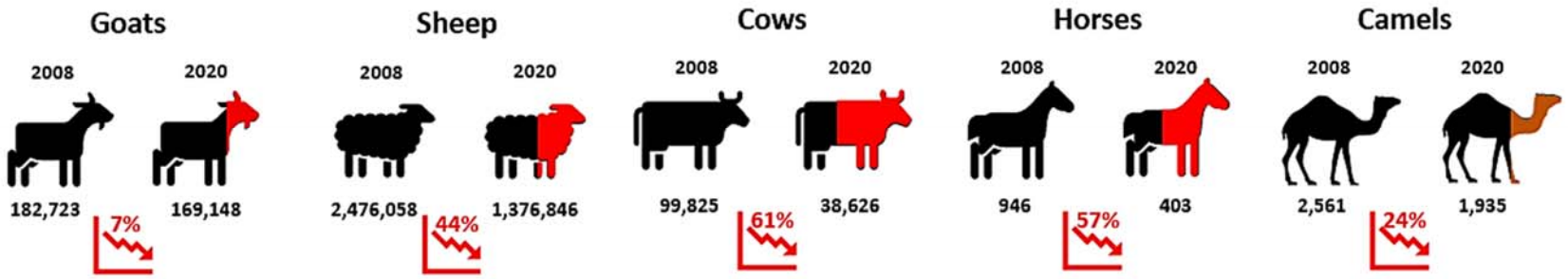
Map 3: Economic vulnerability from agriculture and livestock, Source: Reach with NES forum

As shown in the attached maps, the growth of vegetation cover for crops for the past four years, showing the distribution of cover and its difference depending on rainfall, which has become difficult to predict and severe drought years have become more abnormal than before.



Map 4: NES Crop assessment from 2018 to 2021, Source: PAX organization

The shapes below show the sharp decrease in the number of livestock because of climatic conditions and the state of war, compared to the years 2008 - 2020 in the Al-Jazirah region, as well as the percentage of decline in each type.



IMPACT ON ENERGY PRODUCTION:

On the Euphrates there are three water dams equipped with power plants (Tishreen Dam, Euphrates Dam and Al-bath Dam) with a nominal capacity of (630 - 880 - 75.6) megawatts, respectively, and a total of 1.5 gigawatts.

The generated capability in the three stations changes with the amount of water flow received from Turkey and over the previous years, the incoming flow decreased and therefore the power generation as is noted as in the graph below. So, if the Turkish GAP projects completed, will consume the flow of the Euphrates River by more than 50% and then the Euphrates incoming flow to Syria will not pass 500 m^3/sec at all. It is worth noting that there is a loss of data from 2012 to 2014 due to ISIS control of the dams.

The decline in the consumed electric energy of the total available generation sources, including diesel generators, in 2021 to a value of 209 MW, is mainly caused by the decrease in the generation of hydroelectric dams, against the background of the water crisis and its effects on energy and the availability of the water source (the income Flow and the appropriate water Head), this can be summarized The electrical crisis at all hydroelectric station, as in the graph below, which was producing approximately 415 megawatts in 2020, compared to 140 megawatts in 2021.

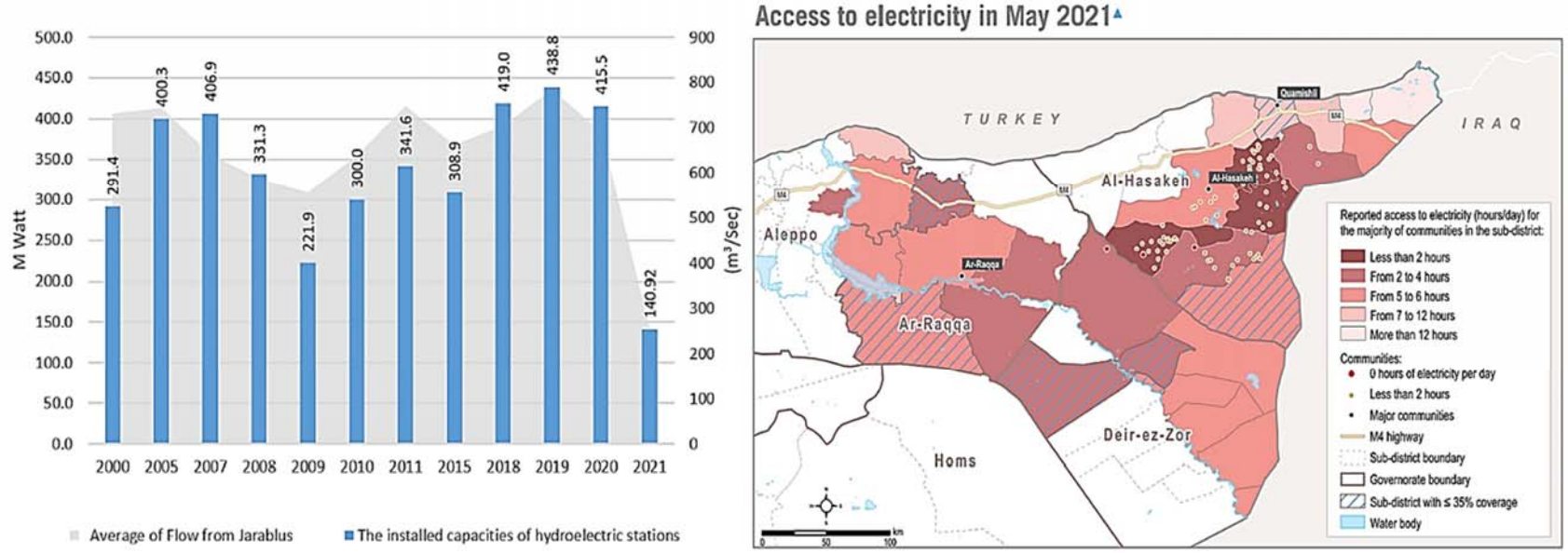


Chart 4: Average flow and power generation from Euphrates dams

The hydroelectric stations of the three dams since 2017 have received the largest burden in generating electric power in NES and contribute a large percentage of more than 86% compared to thermal stations, where this contribution decreased as a result of the decrease in the flow of the Euphrates River from Turkey in 2021 and reached 63%, So, the deficit in the electrical power supply to all regions of NES, especially the communities surrounding the dams site, deepened, and amounted to the estimated minimum demand, 460 Mw in 2021, while it was 205 Mw in 2020.

The current situation of the current energy component is characterized by limited and inefficiency in investing the available resource, and shortness and inability to cover the current loads, as it depends on two natural resources mainly, namely gas and water, which supply the public network with electric power of almost 210 megawatts, which do not cover the minimum energy demands in all NES areas those estimated 667.2 megawatts.

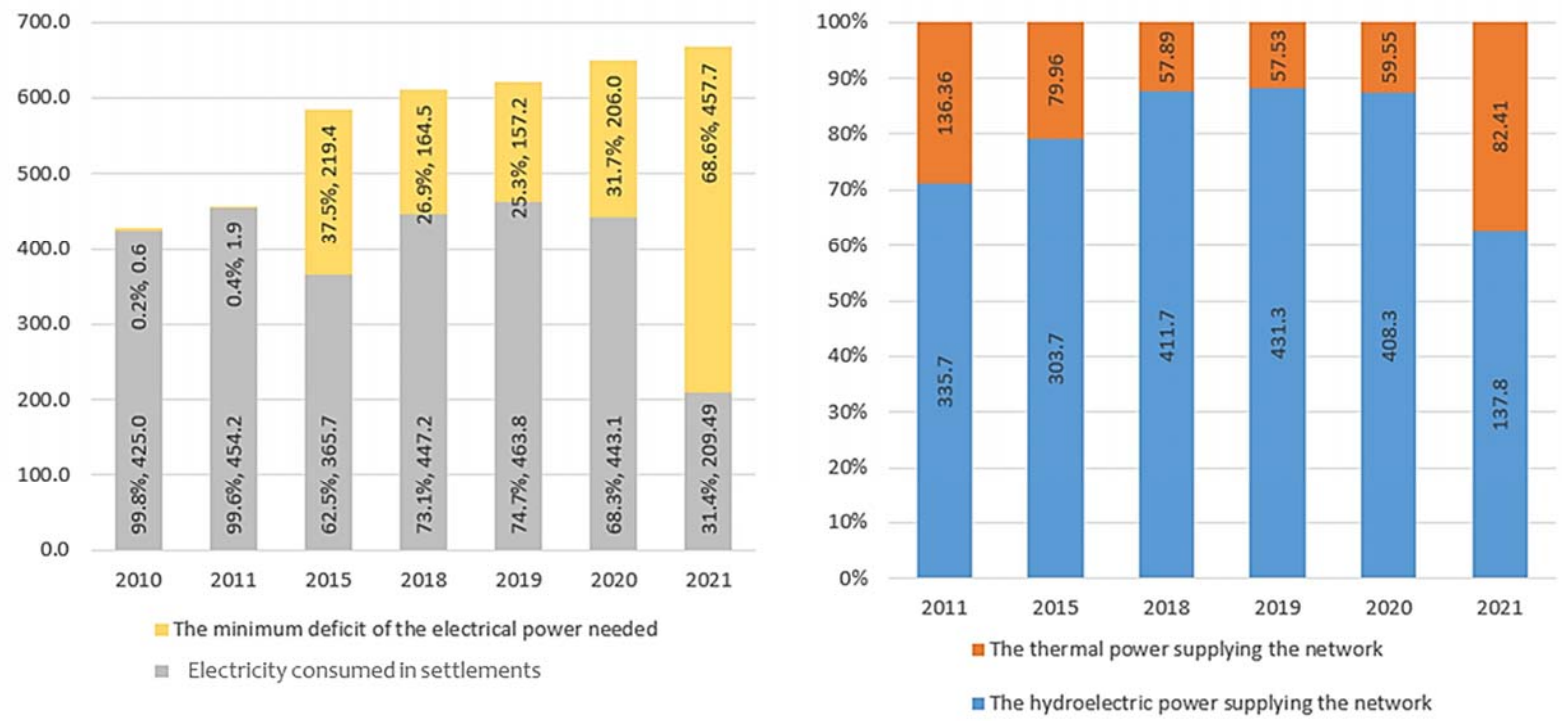


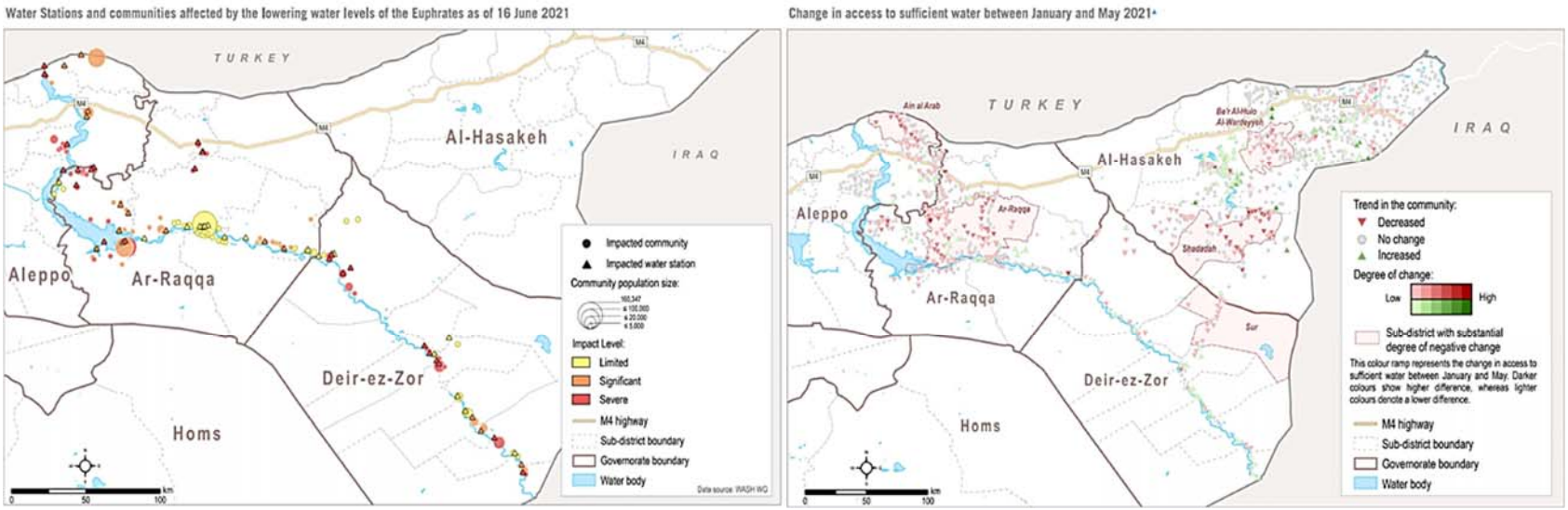
Chart 5: the total power generation and its deficit in all NES areas

WATER RESOURCES CONTROL:

Historically, and since the beginning of the mid-nineties of the last century, the annual average of the flow from Turkey to Syria ranged in the range of 1000 ± 50 m³/sec, which is estimated at 30 ± 3 billion m³/year, but those income flows have been decreased to 250 ± 50 m³/sec in the year 2020, one of the results was that, the lake of Tabqa Dam (Euphrates) has lost a water volume estimated at 4285.7 million m^3, and the Tishreen Dam Lake (Rojava) has lost mor than 560.28 million m^3.

As previously discussed, controlling the amount of Euphrates water and reducing the flow negatively affected the energy production of the three dam stations as well as drinking water. The length of the Euphrates River and related bodies of water, mostly through piped water networks. As of June 15, 2021, a total of 57 water stations in the NES were affected by the low water level in the river and related canals, of which 11 have already been completely closed.

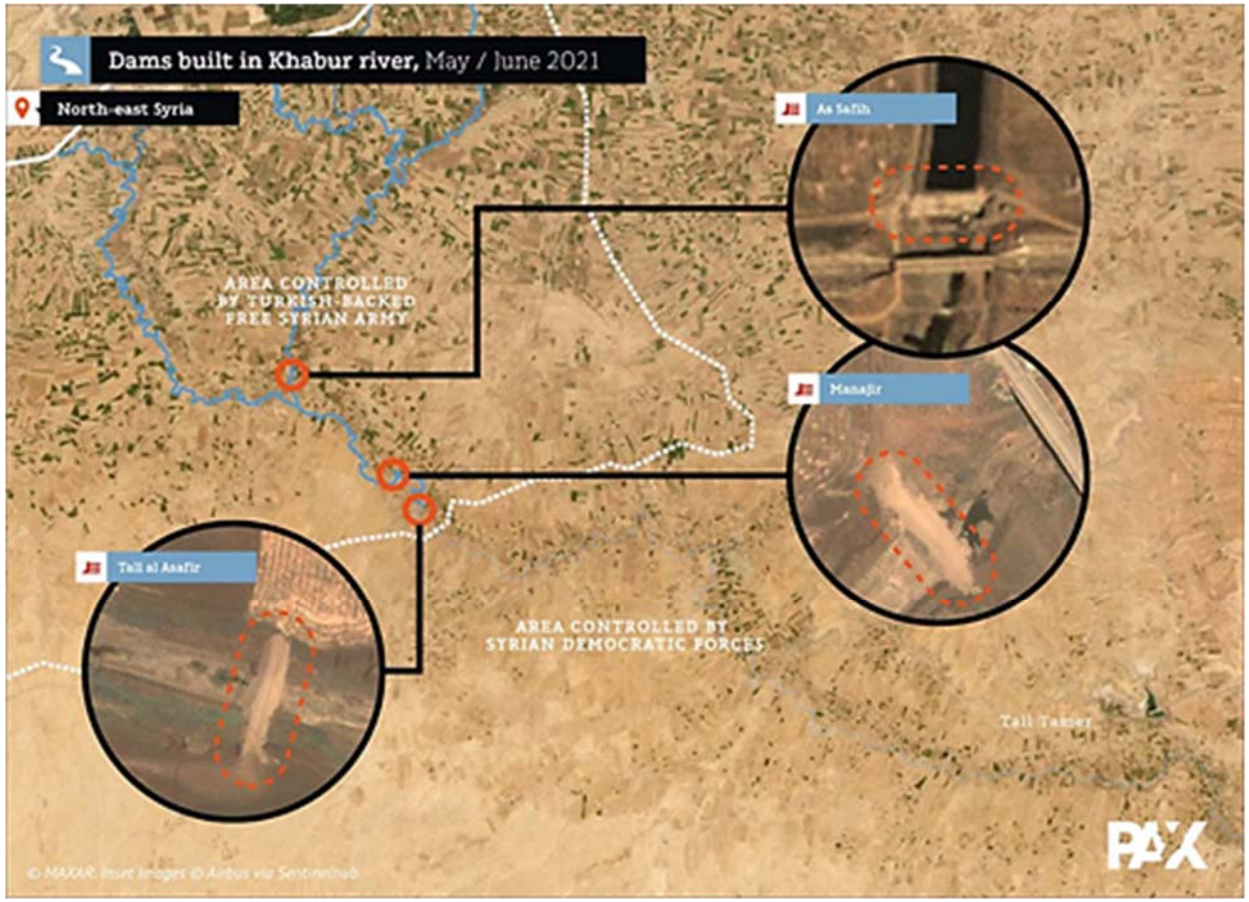
Chart 6: decrease water level in the three dam's lakes



Map 5: Access to sufficient water resources, Source: Reach with NES forum

With reduced rainfall and reduced water flow, all agricultural areas along the Khabur have faced water shortages as the use of Khabur water has shifted seasonally along the stream and the 2 km wide flood plain since 2001.

The situation has worsened with the Turkish-backed armed groups establishing dams on the course of the Khabour River to store it and prevent the Khabur water from reaching to AANES areas. The construction of the third dam a few hundred meters north of the first dam in the town of Al-Manajir on the first of June.



Map 6: New dams built in Khabour river

During a period considered the driest in the history of Syria, and the siege imposed on the flow of the waters of the Khabour River by the Turkish-backed groups, with the limited flow of the Euphrates River, agricultural lands declined and with the suspension of pumping water from the Allouk station for several consecutive times, more than 22 times. This led the affected population to switch to other drinking water sources such as tanks by 93%, and to surface water by 16%, which increases the incidence of diseases due to the lack of sterilization of the water.

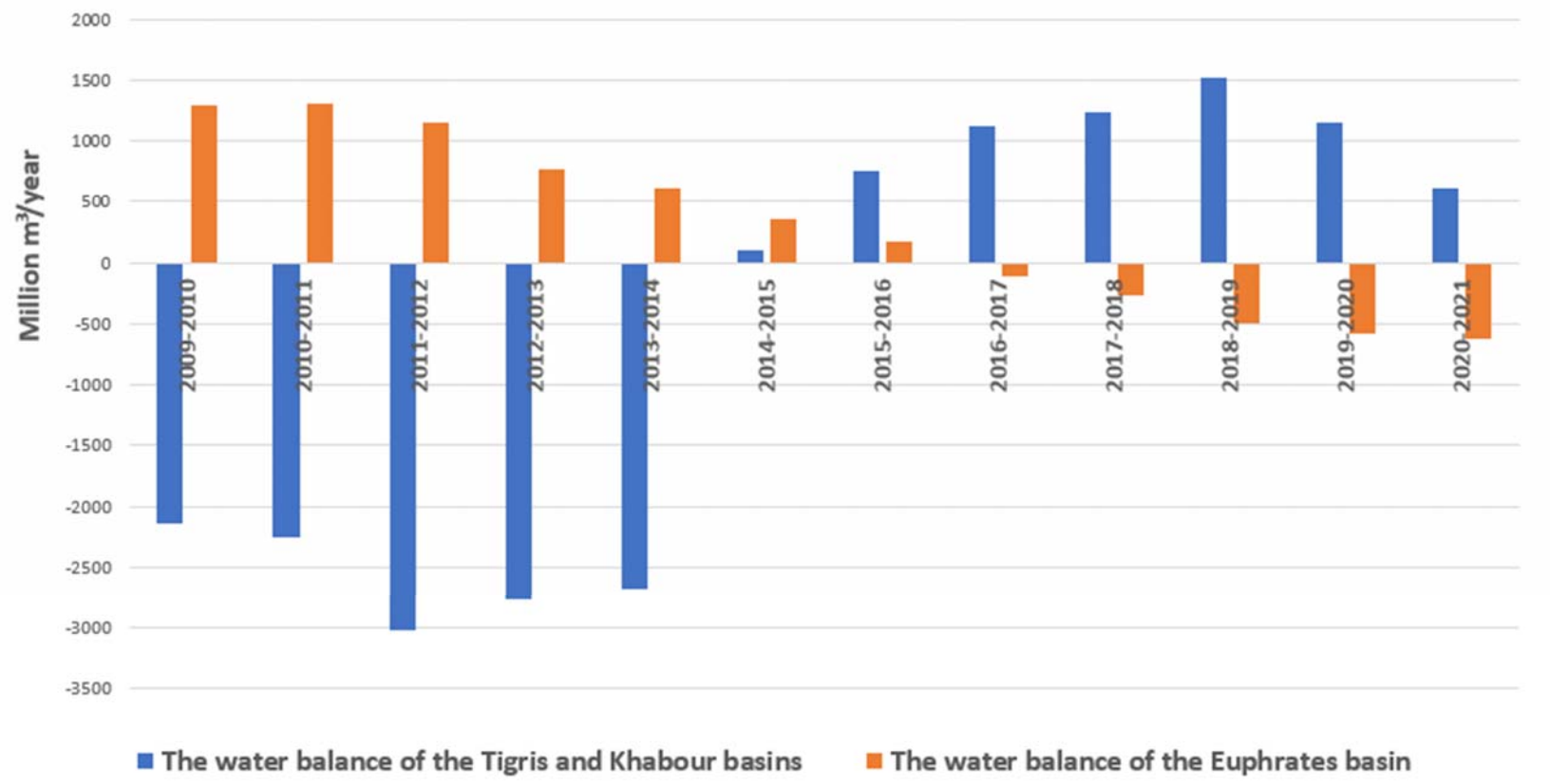
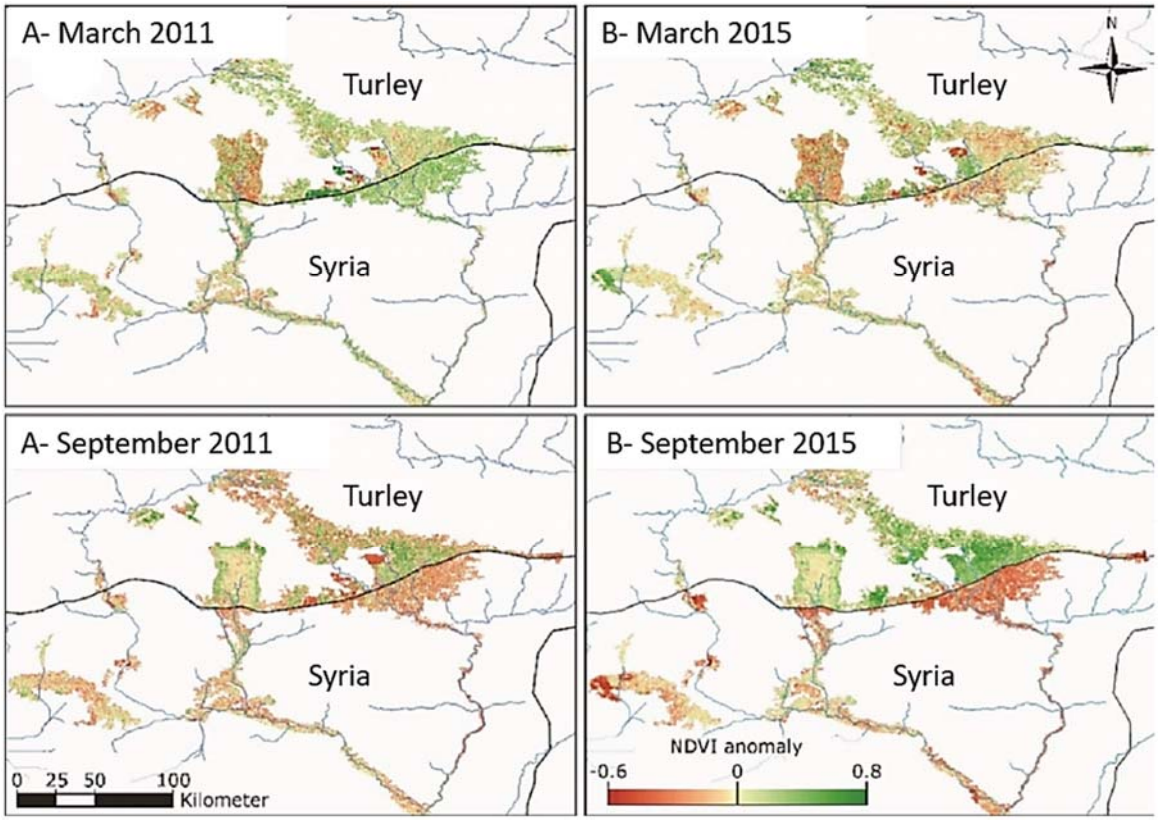


Chart 7: Comparing the water balance of the Tigris and Euphrates basins

Finally, and by comparing the water balance of the Tigris and Euphrates basins, we note that **the Tigris Basin** was suffering from a deep deficit in the availability of water resources necessary to cover the total needs of its economic and social activities, but, this deficit began to disappear with the beginning of 2015 and the reason behind this is the significant decline in the areas of irrigated agricultural lands as a results of drought of Khabour river and non-implementing of the Tigris river project, As for **the Euphrates basin**, it was abundant with water until the same year, but its resources deteriorated after that due to a group of factors, the most important of which is the emergence of the results of the acceleration in the implementation of the GAP projects, in addition to the military actions and the destruction of the infrastructure witnessed by them.

As inclusion the farmers and its farms faced a hard situation imposed on them and harshly affected its economic activities, not only socio-economic sector has damaged, all ecological component has been deteriorated from this water crises, air, soil, human, livestock, and vegetations, as we see blow the NDVI (Normalized Difference Vegetation Index) was near 0 value in March 2015 but become worse in September reaching to -0.6 value.



In April 2021 the Global Drought Observatory (GDO) issued a drought warning for eastern Syria as the latest FAO report on rainfall analysis in Syria predicted that the lack of rainfall associated with the climate crisis will have severe consequences, setting the country on a path to becoming a security hotspot. climatic. Future droughts will increase and intensify, creating more problems for agriculture and communities as water levels dropped down, both in rivers and groundwater sources.

The blockade is an extreme measure that has deprived the civilian population of its power. Under international humanitarian law, included in Additional Protocol I to the Geneva Conventions (Protection of Victims of International Armed Conflicts), attacks on “objects indispensable to the survival of the civilian population” (including water infrastructure) are prohibited.

RECOMMENDATIONS:

LONG – TERM RECOMMENDATIONS:

I-To mitigate the consequences of the GAP projects and the effect of climate change phenomena on available water resources, it is recommended to:

1. Reducing pressure on the currently available water sources.

1.1. Adopting agricultural cycles that take into account food security along with water security and the need to allocate the water ration for plants and reduce their general needs in various possible ways.

1.2. Updating the existing infrastructure facilities such as irrigation and drinking networks and others and maintaining them in order to reduce the large water losses.

1.3. Controlling water consumption patterns in all uses and directing them in various possible ways towards rationalization and effective use, and setting regulatory controls related to the extraction of groundwater.

1.4. Investing the surplus after Al –Bath Dam to reclaim uninvested lands, and improve the currently invested lands after correct diagnosis of their condition.

2. Increasing the degree and efficiency of organization of the basin.

2.1. Improving the organizational and administrative structures of water infrastructure facilities and increasing their efficiency.

2.2. Establish monitoring and measurement centers to control operations and prepare future plans and budgets.

2.3. Developing methods of water harvesting to secure the request for some types of agricultural crops[1].

2.4. Distributed investment of unconventional water quantities by establishing decentralized treatment plants that provide the feeder with sufficient water to meet the necessary quantitative and qualitative needs.

3. Reclamation of partial ecosystems in the basin.

3.1. Increasing green spaces around and inside urban areas, and planting more than one row of roadside precincts.

3.2. Preserving biodiversity, especially within nature reserves.

3.3. Develop a plan to invest uninvested agricultural lands with economically and socially feasible crops that have a positive impact on development factors and are consistent with water and food security standards.

4. Searching for alternative renewable or non-renewable energy sources to bridge the deep gap in electrical demand.

4.1. investing in promising potential of renewable solar energy for all regions of northern and eastern Syria to remove part of the electrical load from the grid.

4.2. Drafting studies specialized in investing wind energy and supplying it to the public network.

4.3. Investing the natural gas and gas associated with the oil wells as a feasible investment by construction a combined cycle thermal plant to cover the base load of electrical power.

4.4. Developing studies for the purpose of establishing a savings station attached to Tishreen Dam or built at the sites of Halabiya and Zalbeya .

II- Develop a new approach to water policies to improve the current situation:

1. Using methods to motivate regional partners to cooperate, participate and invest, and seek to link regional value chains by adopting the experiences gained during the last administration period.

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[1] *Such as reactivating the role of agricultural airports in northern and eastern Syria through programs to motivate farmers and stakeholders and train them to fertilize their crops, and to invest unconventional water through the use of rainmaking methods.*

1.1. Encouraging the parties to accept the use of Syria's share of the Tigris waters to irrigate the tributaries and banks of the Jaqjaq and Khabour, and to supply the Euphrates with an additional flow that covers its current deficit as a basin[2]

1.2. Coordination and cooperation to enter into negotiations leading to securing a fair and reasonable share of the Euphrates waters for Syria.

1.3. Attracting investors with an investment law that stimulates partnerships with local investors and giving attractive privileges through modern contracting method that will develop a number of development projects in the region.

2. Forming a planning vision to organize the spatial imbalance in the distribution and concentration of the population and to remove the developmental disparities between them.

2.1. Develop planning studies based on correct and integrated field statistics, through which it is possible to ward off the danger of population concentration in cities and their random expansion harmful to facilities, which are followed by unbearable pressure on infrastructure and dramatic depletion of their natural resources.

2.2. Bringing the standard of living in rural communities closer to urban in order to remove developmental disparities between them and to restore balance to the demographic map of the population in the regions of northeastern Syria.

3. Adopting a new approach to managing water resources based on solutions derived from nature and suited to specificity of natural assets (climate, topography, soil, water ……) and in line with the evolution of organizational structures.

3.1. Building complex and integrated capacities to confront the coming drought. Hydrologically, distributed water harvesting projects should be intensified depending on precipitation and topography, agriculturally using the contour plowing method parallel to the settlement lines of the natural land, in addition to developing seeds that can withstand dry climates.

3.2. Expanding afforestation projects and increasing the vegetation cover for plants those are low on water gluttony and contributed to maintaining the relative humidity of the soil, and irrigating it based on non- traditional water sources rich in fertilizers in quality and sufficient in quantity.

4. Orientation towards the production of export commodities with the least virtual water content and towards the supply of commodities with the most virtual water content.

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[2] The deficit in the Syria Euphrates basin is estimated at 497 million cubic meters, which represents 15.76 m^3\s, which can be covered and more when investing the project of extracting Syria's share from the Tigris which estimated 39.6 m^3/sec and following the practices of organized consumption and others.

SHORT – TERM RECOMMENDATION:

1-Involving of international community, the United Nations and international and local organizations in the process of finding a way out of the water resource crises imposed by the Turkish side, based on the outcomes of the 1997 United Convention on the Use of International Watercourses for Non –Navigational Purposes.

2 –Giving priority to preserving the current water resources and avoiding their depletion, in addition to rehabilitating its infrastructures on the basis of the future.

3- Regulating activities related to forms of water use (surface, underground, urban, rural, etc.) and patterns of electric energy consumption (domestic, industrial, commercial, agricultural, and others).

4- Developing and integrating statistics water, agricultural and climate measurement mechanisms by adopting a guide of statistical indicators, based on the law and approved, which develops to organize big data and direct it from a sufficient and necessary knowledge to support the decision and its makers.

5- Update the agricultural investment plan periodically by deducting the investment share in the field studies for each province, which support the decentralized, integrated approach in production and consumption.

6- Building and consolidating relations with the regional neighbors to exchange knowledge and concerted efforts aimed at getting the region out of its crises threatening its water and food security.

7- Updating the traditional irrigation systems with aim of reducing the large quantities of leakage and evaporation and to irrigate them by following the most appropriate methods based on the cultivated crops.

8- Improving the efficiency and quality of service provision through partnership between the public and private sectors in the field of urban water utilities management, through modern forms of contracting, including performance and management or concession contract, and in the most appropriate manner BOT, BOOT, BTO, etc.

9- Separating the electricity network for critical infrastructures (security, transportation, water) from public grid inside domestic settlements and providing it with a permanent source of energy that covers the load, in order to remove the problem of the impact of emergency security cases on the dam operation program that simultaneous with flow and water head.