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Water Security in the Middle East

Syria: The impact of the conflict on population displacement, water and agriculture in the Orontes River basin, February 2014

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Foreword

This report presents an assessment of population displacements, drinking water availability, domestic and agricultural water infrastructures, and agriculture in the Orontes River basin in Syria. The assessment was conducted in collaboration with a team of Syrian researchers and engineers with the help of Syrian civil society organizations involved in emergency relief and recovery planning.

The work was undertaken within a research program on water resources and management in the Orontes River basin initiated in 2012 with the support of the Global Program Water Initiatives of the Swiss Agency for Development and Cooperation as part of an overall project on Water Security in the Middle East. The program led by the Graduate Institute of International and Development Studies is conducted in collaboration with hydrogeology Center of the University of Neuchâtel, the Laboratory of Geographic Information Systems of the Federal Institute of Technology, Lausanne, the Faculty of Geosciences and Environment of University of Lausanne, the "Maison de l'Orient et de la Méditerranée", Lyon, and regional research institutions.

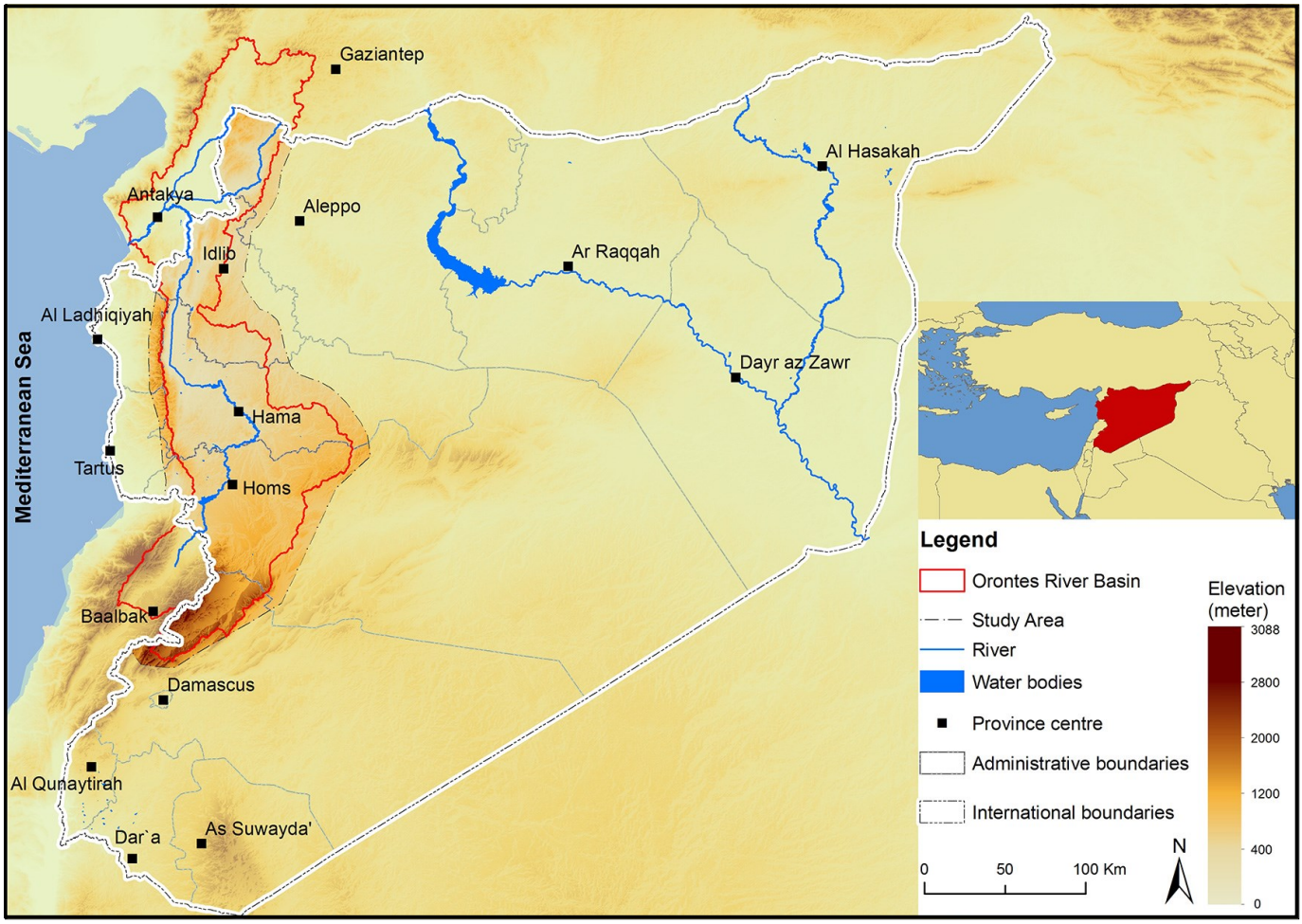
Approaches to assessing water security in the Middle East have primarily focused on transboundary issues. As for all transboundary rivers in the region there is not overall agreement on the sharing of water resources in the Orontes River basin, but there is an agreement on water allocation between Lebanon and Syria and a Memorandum of Understanding between Syria and Turkey for the construction of a joint dam. Concerns in recent years focused more specifically on the increased pressure on water resources and water quality. However, the rampant social and political crisis in the Syrian section of the basin, which is one of the causes of the ongoing conflict, was by and large overshadowed.

The Orontes River basin is a key region in the conflict and comprises some of the most conflict -affected urban and rural areas in the country. Access to drinking water is a critical issue in large parts of the Orontes River basin. Water for food is also important, crop production shrunk by over 70% largely because of the sharp decline in irrigated land. Beyond the urgent need to strengthen emergency assistance, the planning of the rehabilitation of water infrastructures and the management of water resources are key elements to be considered from a reconciliation perspective where Syrian civil society organizations have an important part to play.

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Map 1: The Orontes River basin and study area in Syria



Methodology

The overall objective of the program within which this study was conducted is to provide a detailed assessment of water resources and usages and water management issues in the Orontes River basin. The data base, developed as part of the program, on water resources and infrastructures, public water networks, irrigation, land use and agricultural production, served as a basis to assess the impact of the conflict in the Syrian section of the Orontes basin. The study area is wider than the hydrographic basin and was defined according to the estimated limits of the hydrogeological basin (Map 1).

The assessment of the impact of the conflict in Syria is based on village level data collected by a large network of informants, based in the country, with the collaboration of Syrian civil society organizations involved in emergency relief and in recovery planning. The data was analyzed in collaboration with a team of civil and agricultural engineers and economists many of whom are former employees of the Ministries of Water Resources and Agriculture and Agrarian Reform and currently contribute to civil society organizations. Remote sensing data was used as a means of verification regarding changes in irrigated areas in 2013.

Sources of secondary data

Infrastructures and water networks:

1:50,000 Topographic Maps, Military Survey Department, Damascus, 1977.
Aerial photographs 1958.

Land use and agriculture:

Landsat scenes: Landsat 8(OLI - TIRS), LC81740352013217LGN00, 05 – 08 – 2013,
Landsat 8, (OLI - TIRS), LC81740362013217LGN00, 05 – 08 – 2013,
Landsat 5 (TM), LT51740362010225MOR00, 13 – 08 – 2010,
Landsat 5 (TM), LT51740352010225MOR00, 13 – 08 - 2010
Agricultural Census 2003 – 2010, National Agricultural Policy Center, Damascus.

Regional DEM:

Global Digital Elevation Model derived from the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER GDEM version 2)

Population:

Central Bureau of Statistic, Syria, Damascus, 2010.

The Orontes basin comprises some of the most conflict-affected areas in Syria today such as the city of Homs and the rural districts of Al Qusayr and Ar Rastan. Two-thirds of the four million inhabitants of the basin have been displaced over the past three years. They have taken refuge in areas relatively unaffected by violence, some of which later became combat areas. Many fled, or were forced into exile mostly in Lebanon and Turkey. While some areas are almost empty, in others, the population has more than tripled. Access to safe drinking water is a critical issue for over 2.5 million people and agricultural production has shrunk by over 70%. There is an immediate need to improve drinking water supply and to support agriculture in areas less affected by the fighting. From a post conflict perspective, rehabilitation of the domestic and agricultural water infrastructure will be a priority to ensure the sustainable return of displaced populations. Beyond emergency relief interventions, the prioritization and allocation of resources for reconstruction will be determinant factors in the reconciliation process.

The Orontes River basin is a key region in the ongoing conflict and will remain so during the post-conflict transition period. Massive population displacements and the widespread destruction are linked to the highly strategic nature of the basin due to the confessional diversity of the population, the borders areas with Lebanon and Turkey, the access to the coastal areas and the Damascus – Aleppo highway. Furthermore, the region has large water and agricultural resources. As on February 2014, pro-government forces and opposition forces each control about 40% of the Orontes basin. About half of the remaining 20% are combat areas in the center and south of the basin. In the areas to the east, control is undefined or shifting from one side to another. Theses areas with low population density are not a major strategic stake, barring the Salamiyah district and the communication lines in the region. Northern areas extending over the provinces of Idlib and Afrin were the first to escape the control of the regular forces, followed by the regions of Qalamoun, Ar Rastan and Al Qusayr. The latter was retaken by pro-regime forces in June 2013.

Territorial control and combat zones are related in part to the confessional distribution of the population. In the middle reach of the Orontes basin, the population is predominantly Alawite to the west of the river and is Sunni to the east; both sides have Christian, Shia, Ismaili, and Circassian enclaves. In the north, the Afrin district population is predominantly Kurdish.

From the standpoint of the pro-regime forces, the location of combat areas can be interpreted as a strategy to partition the country. Indeed, since 2013, the fighting has been concentrated in the center, and since January 2014, to the south of the basin. At the center of the basin, areas besieged and subject to heavy bombardment, correspond to large irrigation schemes along the Orontes River with high economic stakes. This is also the case of the Al Qusayr district. The offensive led by these forces in the Yabrud district to control the access to the Qalamoun region, aims to ensure territorial continuity between the areas controlled by the regime and the northern Bekaa valley. Further, the Qalamoun is an area of refuge for people expelled from Al Qusayr. Springs, wells and water networks are strategic for territorial control and have been deliberately targeted to interrupt water supply in certain sectors.

Prior to the conflict, the Orontes basin provided a quarter of the agricultural production and accounted for a third of industrial production of the country. The distribution of population, agricultural and industrial activities are largely related to the availability and access to water resources. The oldest water infrastructure dates back to the Bronze Age. Those in the upper reach of the basin could be older. These installations were extended in the Hellenistic, Roman and Byzantine periods and restored from the 1920s. The Al Ghab Irrigation Development Plan initiated in the late 1950s was the first agricultural achievement of the Ba'ath Party after it took power in 1963. Farmers cultivating irrigated lands in the Orontes basin were among the main beneficiaries of the agrarian reforms and the centralized agricultural policy until the second half of the 1970s. Then the Euphrates river basin program became the national priority for irrigation projects.

The Orontes basin became one of the first industrialized regions of Syria with the establishment in Homs of state plants such as the sugar factory in 1948 and oil refinery in 1957. Industrialization accelerated in the 1990s with the establishment of private factories in particular chemical and pharmaceutical plants. The agricultural and industrial development in the region, led to a strong growth in the population of the basin reflecting the large ethnic and confessional diversity of the country.

The city of Hama is sadly notorious for having suffered a 27-day siege to crush the insurgency led by the Muslim Brotherhood in February 1982. The massive offensive that resulted in a death toll of 10,000 to 40,000 put an end to the Islamist opposition that first became active in the 1970s. At this time, the urban and rural population of the Orontes basin was, however, largely supportive of the regime. Following the progressive deterioration of economic and social conditions, the rural basis of the regime steadily eroded.

From the 1980s, new developments such as small and medium capacity dams induced a growing asymmetry that favored the western sectors of the basin. Furthermore, parallel to the centralized planning of agricultural production, the regime adopted a clientelist strategy permitting, among others, the drilling of unauthorized wells and smuggling of subsidized diesel and fertilizers. In the late 2000s, the proportion of illegal wells in the districts of the Orontes basin located in the provinces of Hama and Homs were respectively 56% and 59%. Uncontrolled groundwater extraction led to a decline in the flow of springs feeding irrigation schemes and other domestic and industrial water supply networks. Industrial expansion and urban growth generated a growing water pollution problem. The two water treatment plants, with limited efficiency, could only provide a partial solution to the pollution problem. The erosion of the rural basis of the regime accelerated in the 2000s with the economic crisis affecting the planned agricultural sector. The center of the Orontes basin, once a stronghold of the Ba'ath party, became a protest hotspot. The state-controlled prices of strategic agricultural commodities such as wheat, cotton and sugar beet remained unchanged from 1996 to 2007. This induced a marked decrease in farm income because of the rise in the cost of labor, equipment and unsubsidized inputs. In the course of the 2000s, the clientelist redistribution did not disappear, instead benefited a much smaller group to the detriment of a large number of former beneficiaries including farmers, traders and government employees. The crisis was exacerbated by two dry years in 2007 and 2008. This increased the need for irrigation. In 2007, the removal of subsidies on diesel and the year after on fertilizers was a drastic shock. Farmers were meant to be compensated by the rise in the prices of strategic commodities and with direct payments to offset increasing production costs. In reality, the removal of subsidies further impoverished a large number of farmers. In 2010, the poverty rate reached 30% - three times more than the average in rural areas of the country - in the Al Ghab plain that was once a flagship project of the centralized agricultural policy.

Map 2: The Orontes River basin , Overview



Population displacements

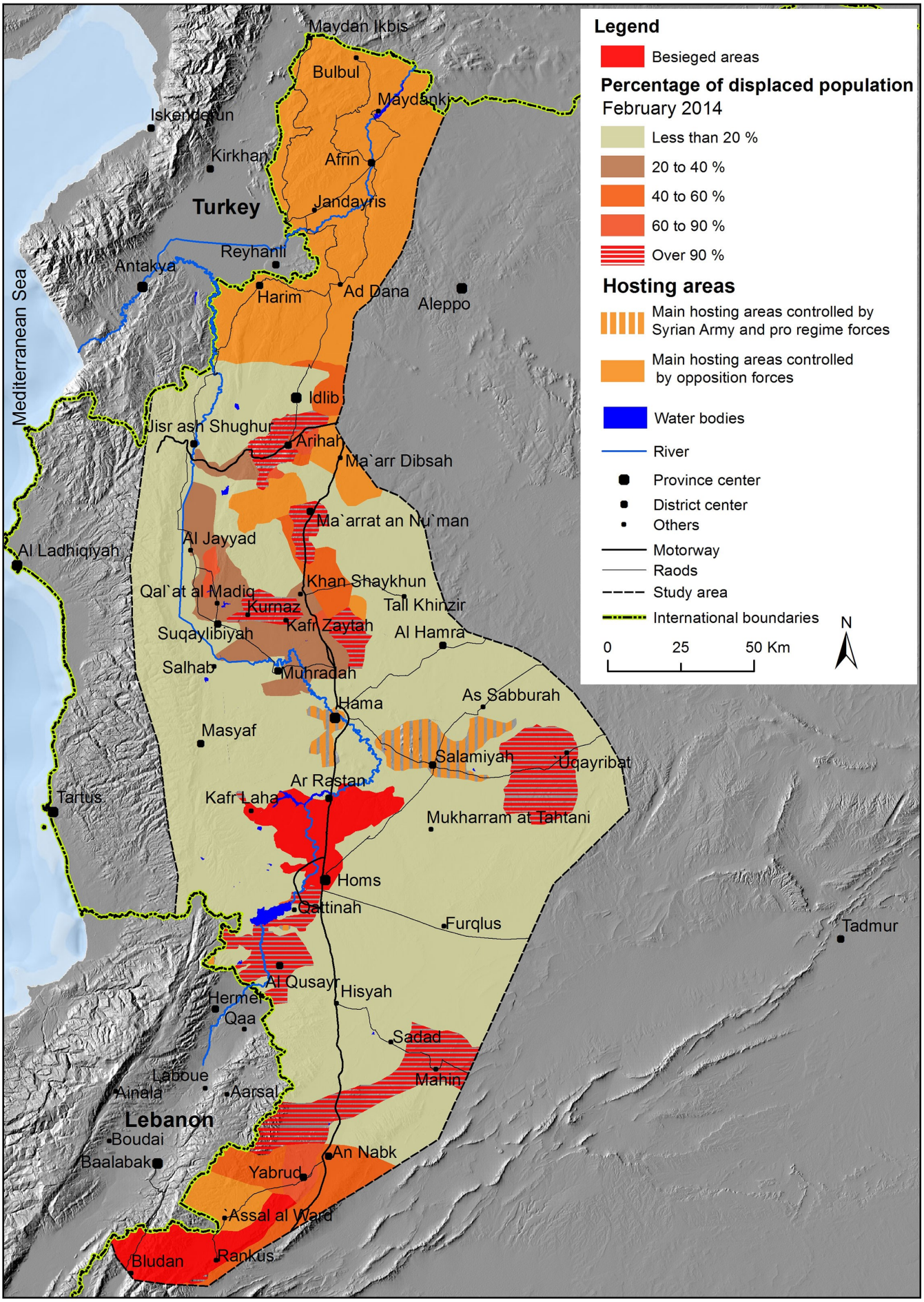
Conflict has led to a mass exodus from one of the most densely populated regions of the country. Three quarters of the four million inhabitants of the Orontes basin have been displaced during the past three years. Some of these displaced populations have returned to their areas of residence after hostilities ended. Some have been forced to shift, according to the changing locations of clashes or have moved due to the depletion of their resources. In some cases, such as the Al Qusayr district, inhabitants fled to the Qalamoun region. But moving combat zones have led to a second - and sometimes third - exodus, within a few months, with no possibility of returning to their home villages.

The map shows a zoning of the basin based on proportion of displaced people and the main hosting areas. In February 2014, about 1.6 million people from the Orontes basin are displaced and have found refuge in Syria, or in neighboring countries - mainly in Lebanon and Turkey. The most affected areas were emptied of almost all their population on account of fighting or bombing, or because they were expelled from districts declared as military zone to prevent the return of the population. The two main military zones were established in strategic sectors of the Qatinah and Al Qusayr districts, comprising a large irrigation scheme and located close to the Lebanese border, and to the north of An Nabk.

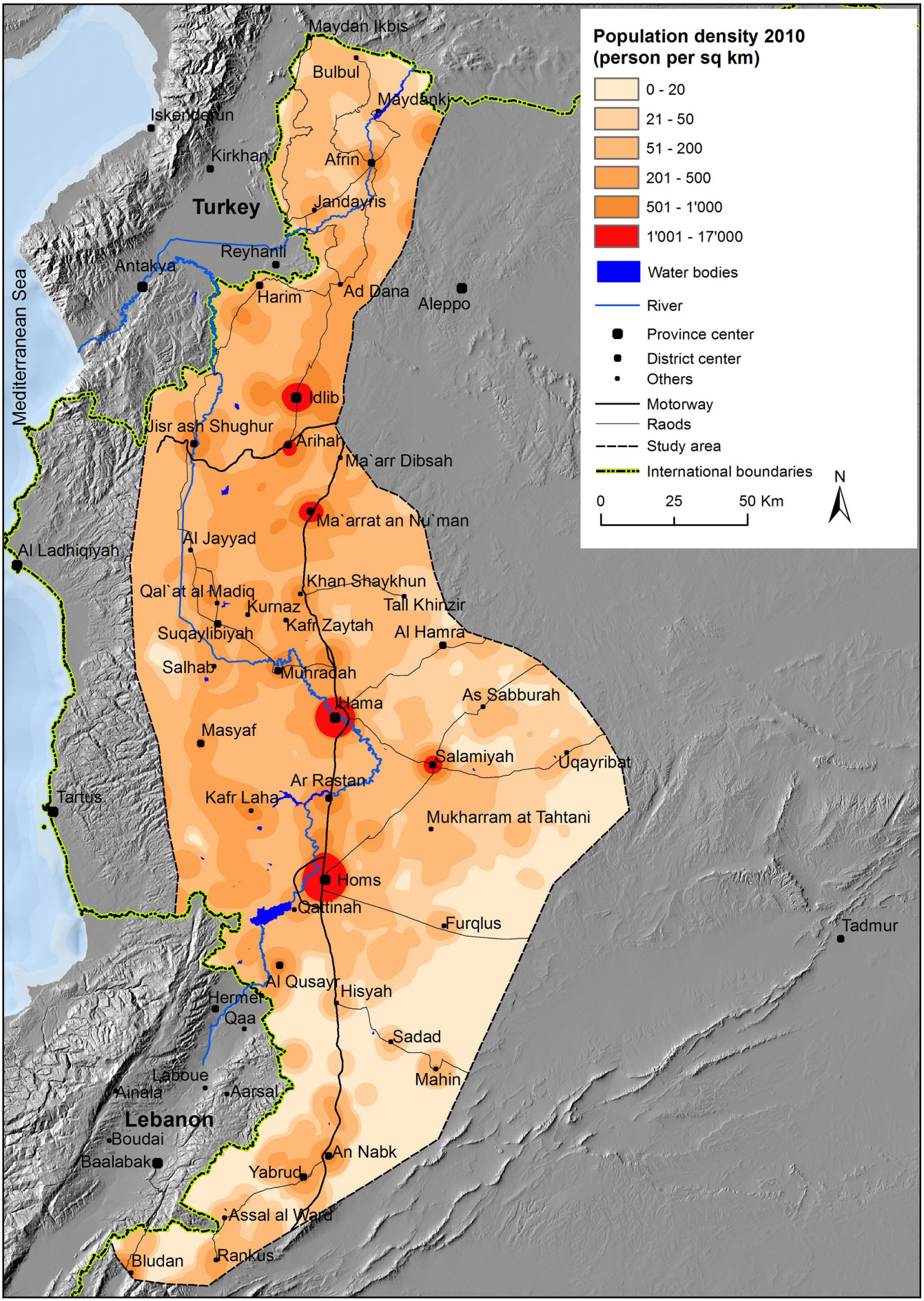
The main hosting areas under control of opposition forces are located in the north, in the districts of Afrin, Harim, Kafr Takharim, Salqin, Ad Dana al Atarib, and Dar Ta`Izzah**,** hosting areas are also found in the districts of Ma'arr Dibsah and Ahsim, north of Ma'arrat an Nu'man, where refugees mainly come from the Orontes basin, and south in the Assal al Ward district. The latter area is currently threatened by the ongoing offensive of pro-government forces on the city of Yabruk. The two main hosting areas controlled by the regime are the Salamiyah district and the outskirts of the city of Hama. The villages of Akkum and Daminah al Gharbiyah, located on either side of the military zone of Al Qusayr, host, displaced populations from neighboring villages whose population has been expelled.

Population displacements have profoundly altered the geographical distribution of the population by draining high density areas located in the center of the basin while greatly increasing the population in the peripheral areas ill-equipped to handle large flows of refugees.

Map 3: Population displacements, February 2014



Map 4: Population density, 2010



Access to drinking water

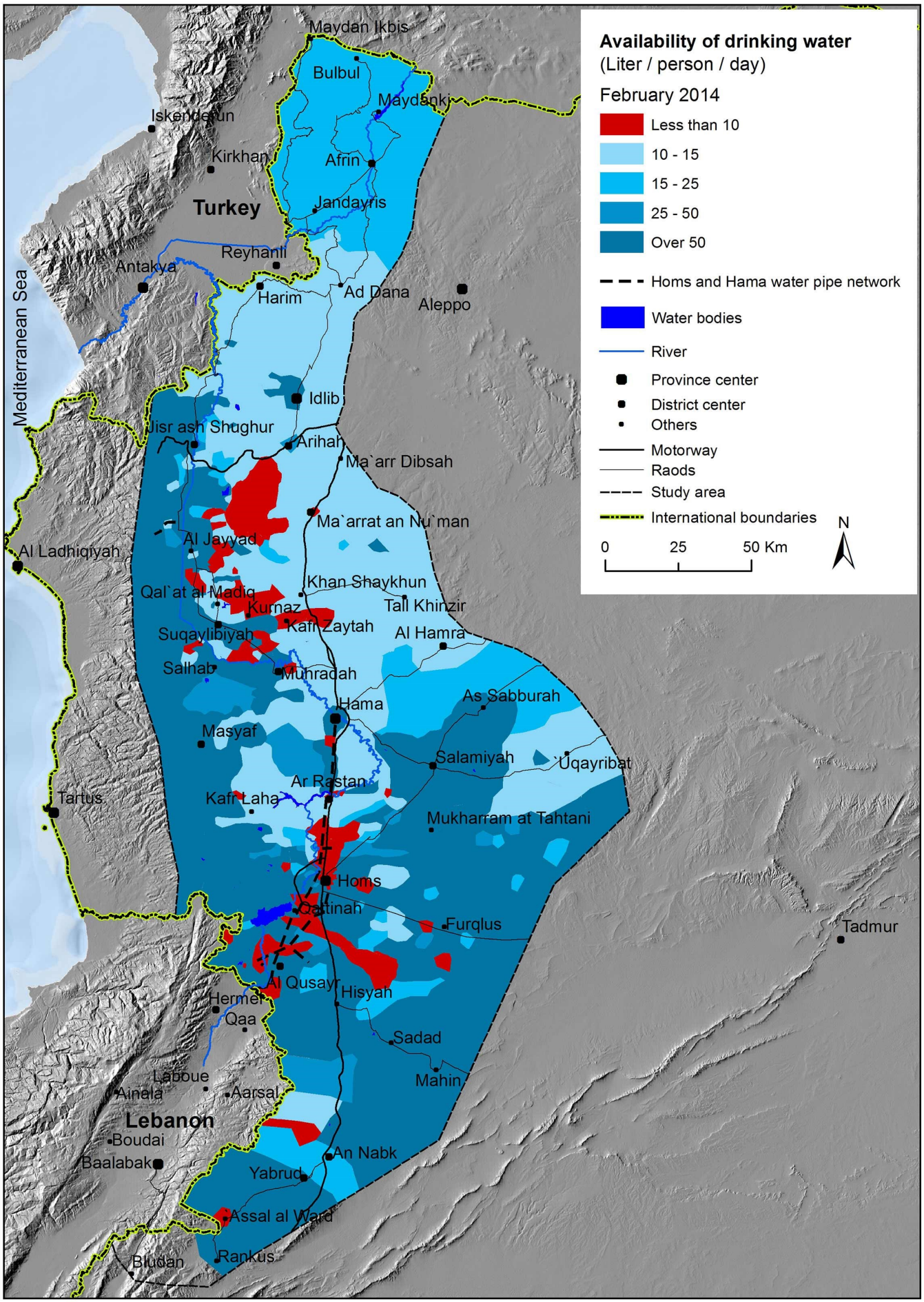
Prior to the conflict, 95% and 89% of urban and rural households respectively were connected to the public water supply system. This did not however prevent from shortages nor assure access to safe water. According to data from the Ministry of water resources, in 2010 the availability of drinking water per capita in most rural areas in the Orontes basin ranged from 50 to 75 liter per day (l/d). The quality of drinking water was poorly reported. Data from the Ministry of Public Heath, for the country as a whole, indicate that in 2006, out of 8610 samples 6% were contaminated with coliforms. The rate of contamination was probably higher in the Orontes basin because of the lack of treatment plants and the high level of pollution.

The public water supply system in the Orontes basin comprises about 1500 wells equipped with electric pumps and two main pipe networks supplying the main cities. Groundwater is the main source of drinking water. Wells are used to feed small rural networks generally at the village level - one exception being the Al luji network which supplies 39 villages from one main pumping station. The Homs pipe network is fed by the Ain Altanour and Alsamak springs located on the west bank of the Orontes River close to the Lebanese border. The Hama-Salamiyah pipe network supplies the two cities plus Al Qusayr, Qatinah, Ar Rastan and to 65 villages along the network. The latter is fed from an intake on the Orontes River close to Umeiry. Water is treated in a purification plant 11 km south of Al Qusayr.

Access to safe drinking water is currently critical in large parts of the Orontes basin which has led to a sharp increase in waterborne diseases. For over 50% of the population living in the basin, safe water supply per capita is less than the 20 l/d defined by the World Health Organization as the short term survival requirement in emergencies[1]. Power cuts and damage to pumping stations are the main causes of drinking water shortages. Public water networks in rural areas are dependent on power supply which is severely affected by the conflict. Areas under the control of pro-regime forces are however generally better served than those under the control of opposition forces.

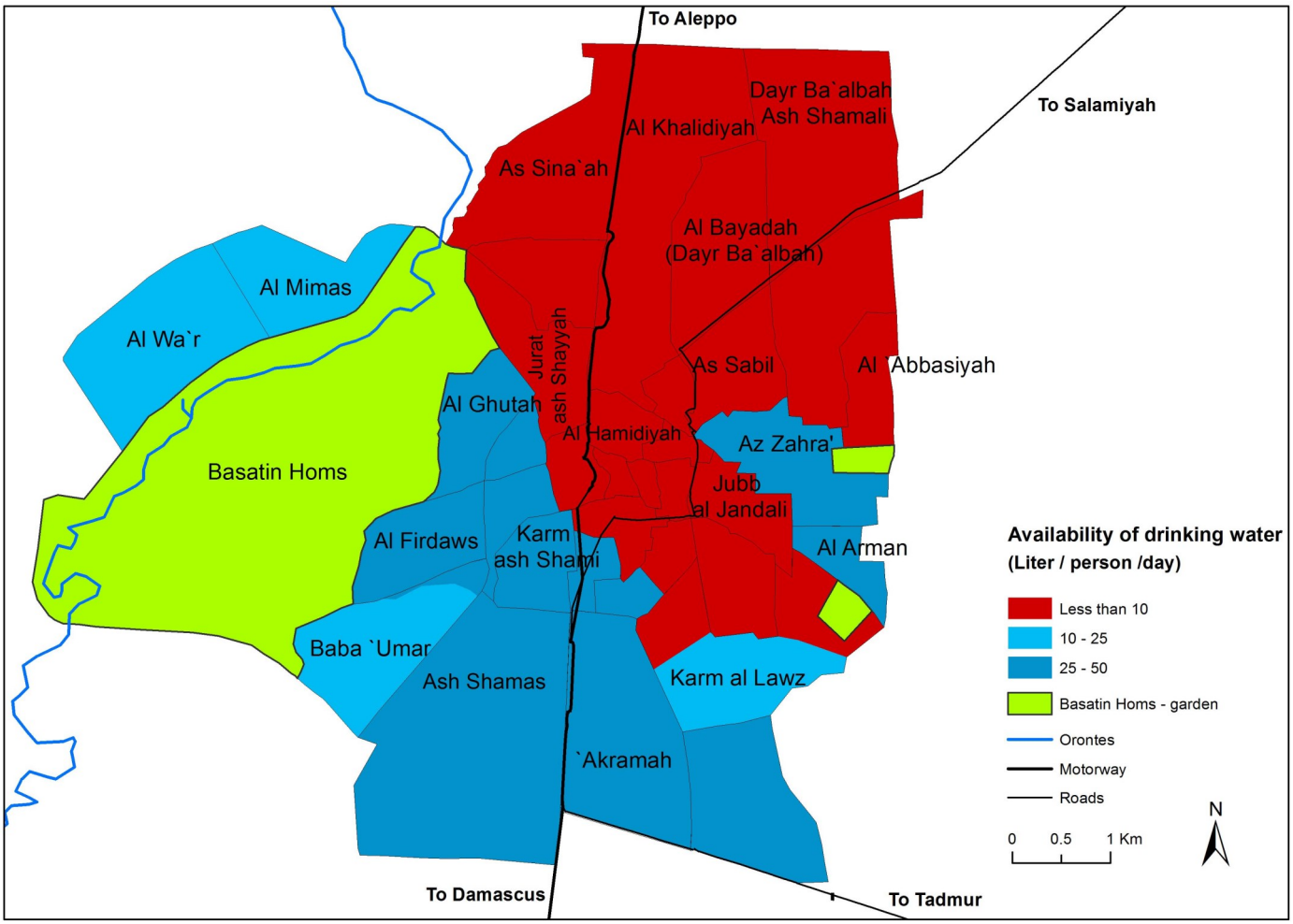
[1] WHO, 2013, Technical Notes on Drinking-Water, Sanitation and Hygiene in Emergencies, N° 9, WHO, Geneva.

Map 5: Availability of drinking water, February 2014



At the time of writing, the two pipe networks are functional. The Homs pipe network has so far suffered no major damage The Hama – Salamyah water pipe was damaged on January 26, 2014, north-west of Al Wa`r, and repaired within 3 weeks. However, the supply of besieged villages north of Homs is intentionally cut. Water supply was also interrupted in several neighborhoods of Homs; Bab as Siba, Qarabes, Al Qusur, Al Khalidiyaj, Al Bayadah, Ashereh, Nazhen, Jub al Jandali, Jurat ash Shayyah and in the old city.

Map 6: Drinking water supply in the city of Homs, February 2014



In most rural areas where the availability of drinking water per capita is reported to be less than 10l/d, public networks are out of function as a result of the destruction of pumps, particularly in areas north of Hama, or due to permanent power cuts. In certain areas, water of unknown quality is supplied in limited quantities by mobile tankers, which can cost as much as SL 5000 / m^3. The Qalamoun region is one such case. The reported availability of drinking water does not necessarily reflect the situation of displaced people who have settled in isolated shelters with no connection to the public water network.

Agricultural water infrastructures and production

Prior to the conflict the Orontes basin contributed about 25% of the total agricultural production in Syria. Over 50% of the crop production was grown on around 295,000 hectares of land irrigated from surface and/or ground water resources. The basin comprises 6 state managed irrigation schemes making up a total of 134,590 hectares. (Table 1, Map 7).

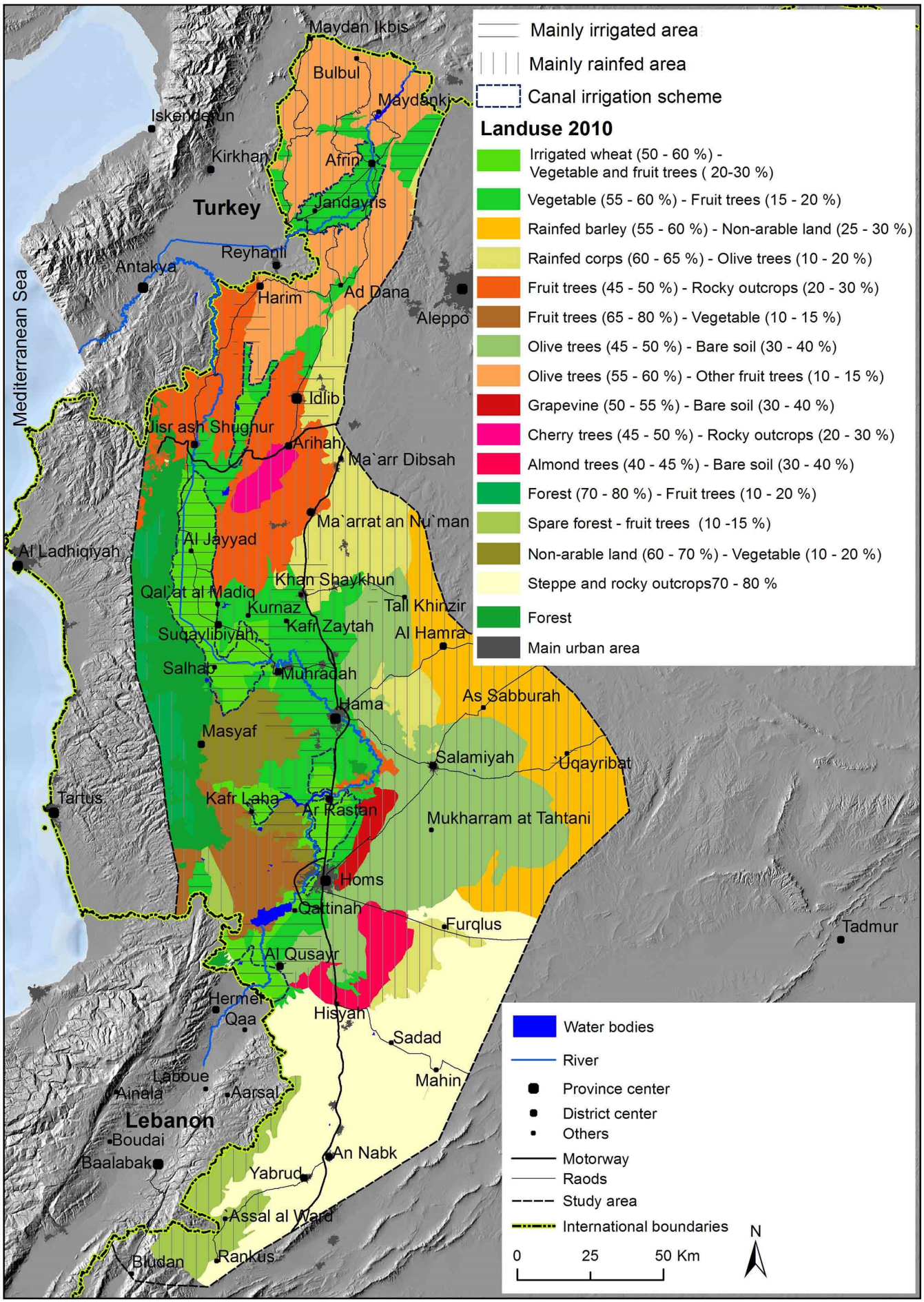
Table 1: Irrigation schemes

Irrigation schemes	Area (Hectares)	Main productions
Al Qusayr	6,800	Apricot trees, apple trees, vegetables
Homs - Hama	20,190	Wheat, sesame, vegetables
Al Hulah	2,200	Wheat, potatoes, vegetables
Al Asharinah & Al Ghab	65,568	Wheat, cotton, sugar beet, groundnuts, vegetables, sesame, potatoes, vegetables
Ar Ruj	15,500	Wheat, cotton, sugar beet, sesame, potatoes, vegetables
Afrin	24,900	Apricot trees, pomegranate, vegetables
Total	134,590	

Irrigation from groundwater expanded substantially in the past thirty years in particular in the district of Qusayr and east of the city of Homs. Close to 60% of water withdrawn for irrigation came from groundwater resources.

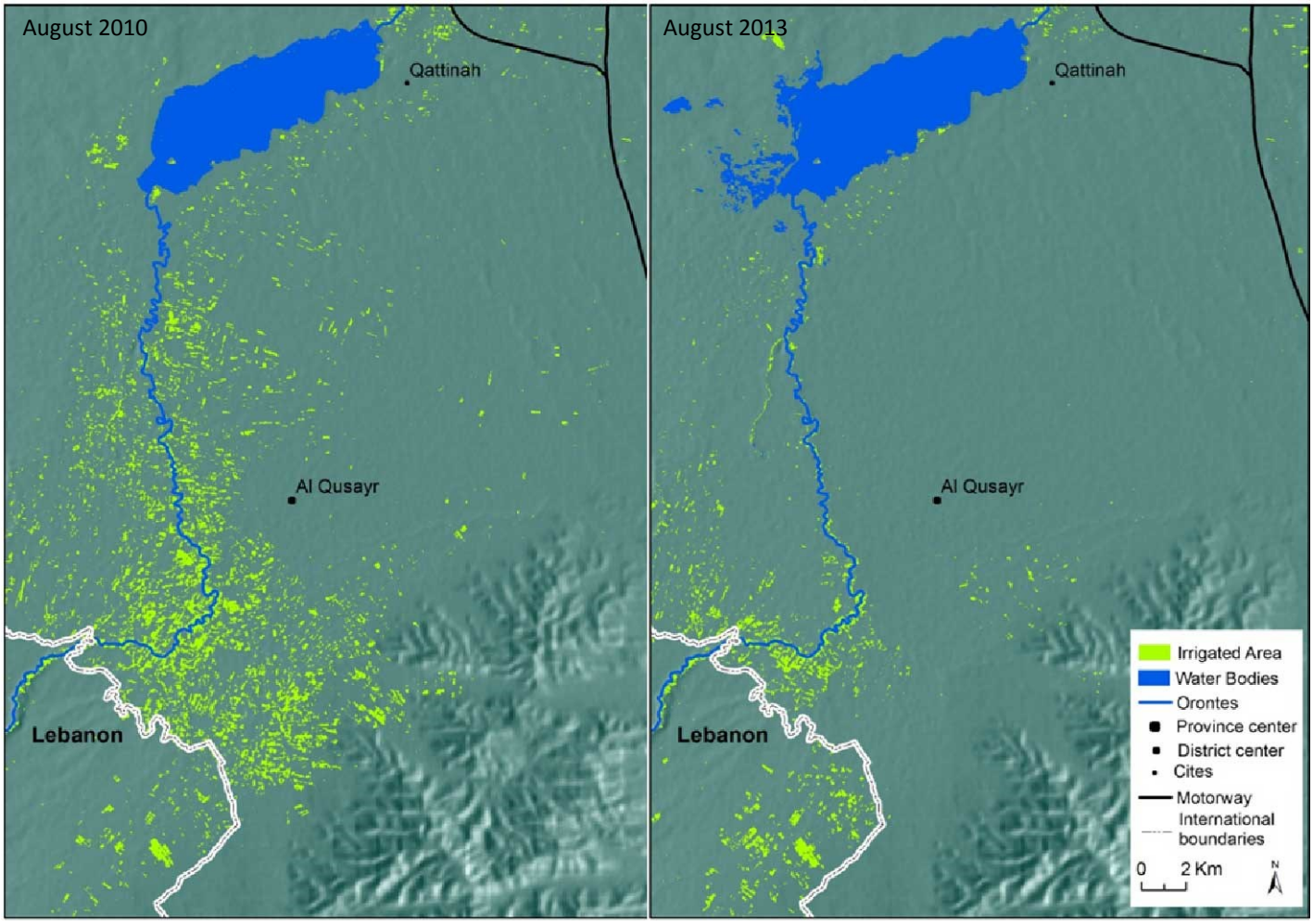
Crop production in the Orontes basin was reduced by over 70%, due to the sharp decline in irrigated areas. To a lesser extent, production decreased because of the reduction in cultivated areas and in the yields of rainfed crops. Irrigated areas shrunk more than half in the entire basin. The six major irrigation schemes, which used to provide more than half the production of the basin, have been strongly affected by the total or partial interruption of the water-supply. Part of the water infrastructure was destroyed during the fighting by bombing and passage of military vehicles, but the water-supply has often been deliberately cut by disconnecting the supply to the channels and by plugging wells. Access to irrigation water is as strategic as the drinking water supply for territorial control.

Map 7: Land use, 2010



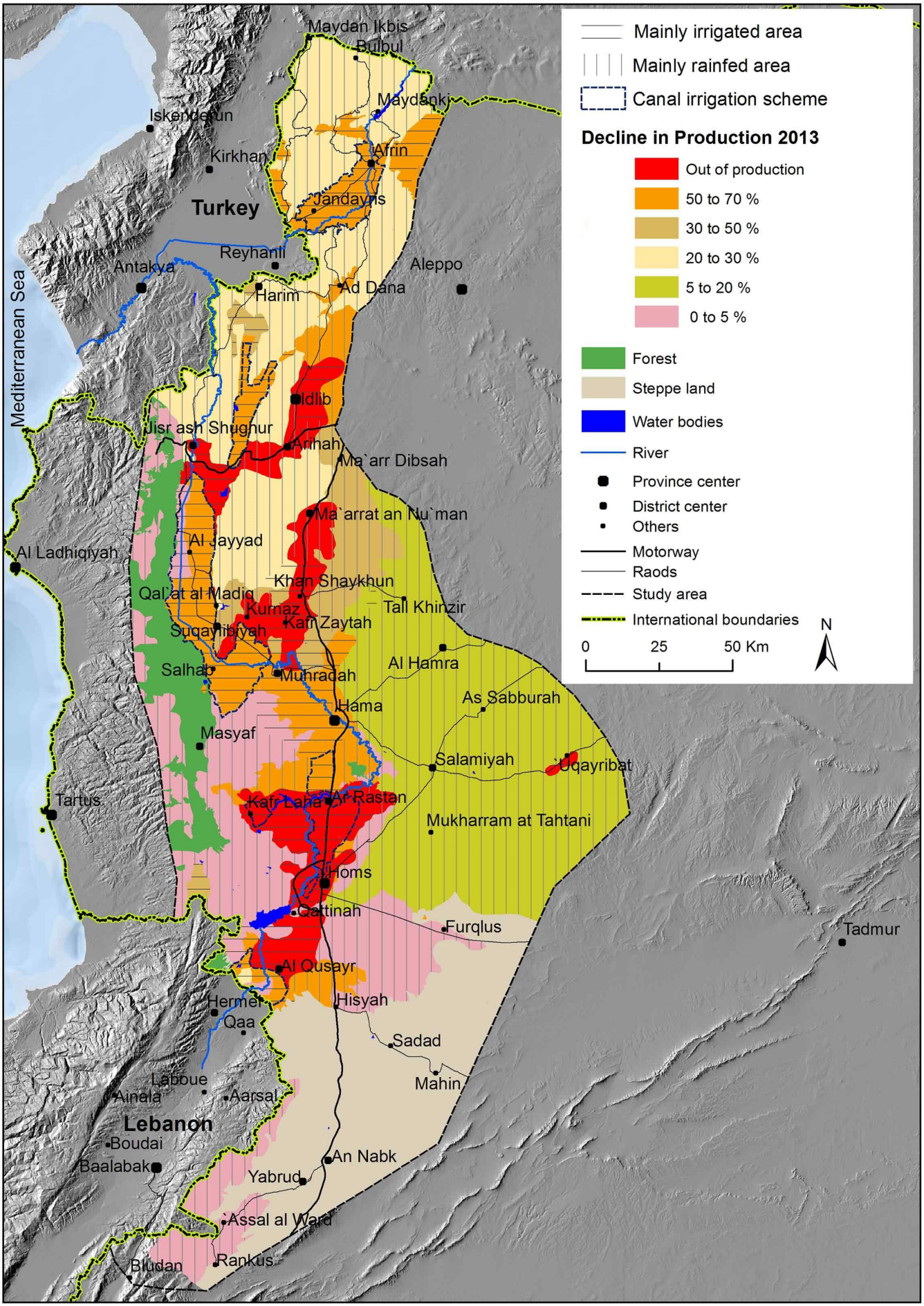
Supply in the district of Al Qusayr was interrupted in 2011, following the obstruction of springs and cutting the supply of the main channel. Part of the secondary channels was damaged by fighting in 2013. In addition, out of 6,342 agricultural wells, 2,620 were plugged. Half the pumps and motors were looted. In the largest part of the Al Qusayr district, 20,500 hectares of irrigated land have been dried off and are no longer cultivated, since nearly entire populations of 23 cities and villages have been expelled. As many as 5,565 pumping facilities, out of the 11,460 recorded in the area, were destroyed or looted.

Figure 1: Summer irrigation in the district of Al Qusayr, 2010 - 2013



Source: Landsat LT51740352010225MOR00 & LC81740352013217LGN00

Map 8: Changes in crop production 2010 - 2013



The Homs irrigation schemes, was abandoned in 2012. The latter scheme is fed by the Qattinah water reservoir whose main channel was destroyed, upstream of Homs. Almost all secondary channels were heavily damaged by bombing and are no longer usable.

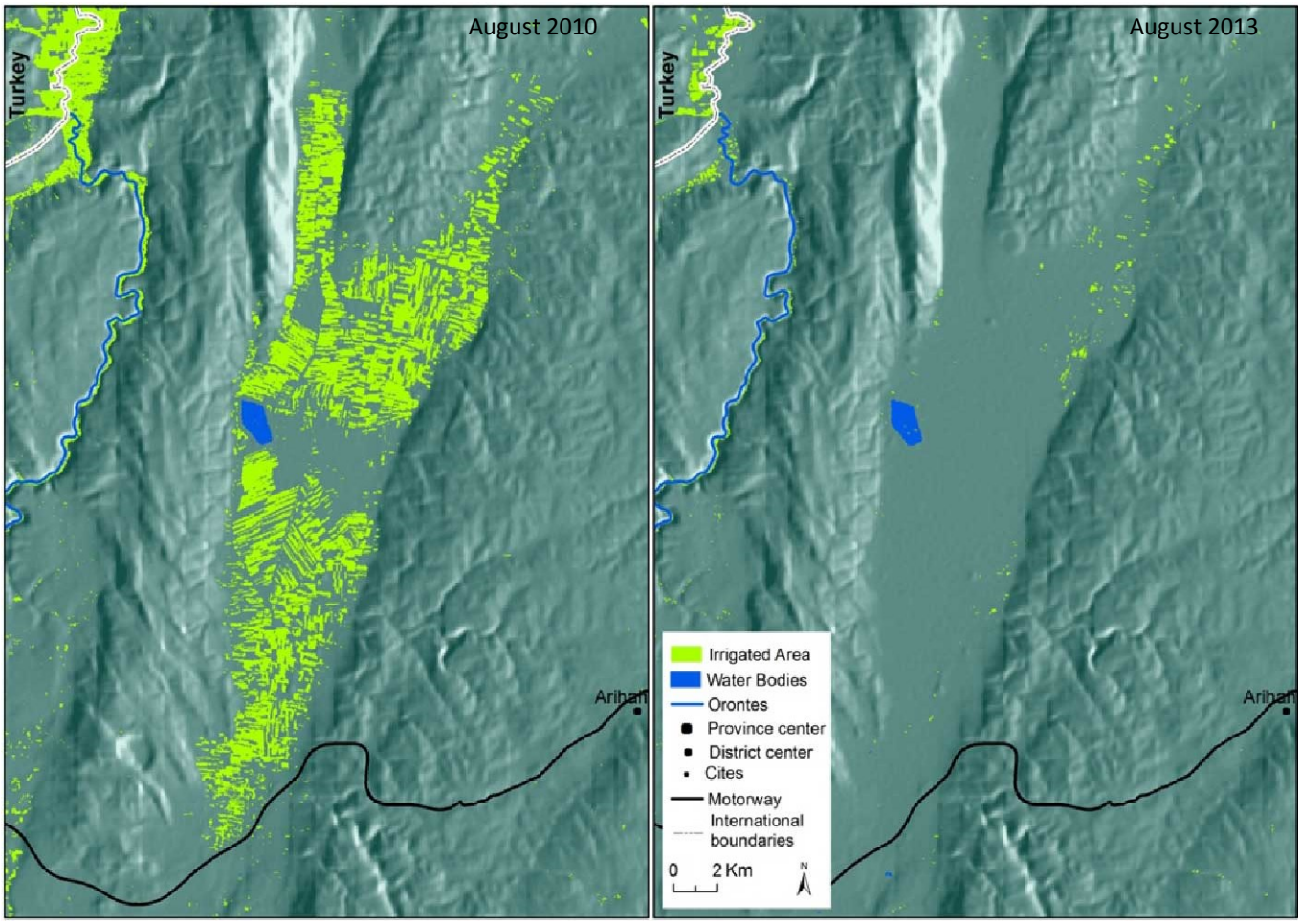
The outskirts of the city of Hama have been relatively untouched by fighting. Damage to water systems is limited. The irrigated area has however dropped by over 60**%.** The land north of the city in the districts of Kafr Zaytah, Kurnaz and Qal `at al Madiq is irrigated from groundwater and has now dried up due to the lack of fuel and electricity to power the pumps. In addition, 6,500 hectares in the Kafr Buhum and Harbinafsah districts, used to be irrigated by the public network. The latter is not damaged, but there is no water supply due to the destruction of the Qattinah main channel. The greatest damage is in the area of Murk - Kafr Nabudah – Halfaya, where 42% of wells were plugged and 71% of pumps were destroyed or looted.

The decline in irrigated areas in the Acharne and Al Ghab plains can be explained by the fall in the level of the Apamea and Qastun reservoirs, which are currently at the minimum threshold level required to supply irrigation canals. The water volume flowing in the Al Ghab plain network fell from an annual average of 500 million m^3 in 2010-2011 down to 70 million m^3 in 2012-2013. In the north-western part of the Al Ghab plain, which is supplied by the Jurin spring, most of the land is still irrigated.

The Ar Ruj area in the province of Idlib is irrigated from groundwater. Pumping stations were damaged and the 15,000 hectares perimeter was completely dried up. About 13,000 hectares of formerly irrigated land are currently used for the production of rainfed wheat and barley. Almost 2,000 hectares located near a military base are inaccessible. The irrigation network supplying 30,000 hectares located in the Afrin district is almost out of service due to the lack of fuel for pumping stations. These lands are currently used for the production of rainfed crops.

The main rainfed cropping areas are located at the periphery of the basin to the east and north in areas relatively untouched by the fighting. Production has declined by 20% to 30% due to the lack of fuel, fertilizers, seeds prices which have drastically increased. Furthermore, farmers are faced with the risk of crop destruction, by fire especially, and of losing access to their fields at harvest time.

Figure 2: Summer irrigation in the Ar Ruj scheme, 2010 - 2013



Source : Landsat LT51740352010225MOR00 & LC81740352013217LGN00

Before the conflict, the Orontes basin was one of the prime tree production regions in Syria, with 471'00 hectares of orchards, mainly olive groves. It also accounted for a large part of the livestock production. In early 2014, the state of orchards was assessed in 112 villages in the provinces of Idlib, Homs and Hama. Nearly 15% of 26,000 hectares of orchards have been destroyed. These surfaces were burned accidentally or intentionally or cut for military reasons or for collecting firewood, whose price has tripled over the past three years. Furthermore, 40% of surfaces are no longer accessible, mainly in the districts of Al Qusayr, Ar Rastan and An Nayrab.

Damage to cattle and sheep were evaluated in the villages of the Orontes basin located in the provinces of Idlib and Homs. Cattle herds were depleted by 90% and 60%, the number of sheep dropped by 60% and 40% respectively in the provinces of Idlib and Homs.

The effects of the conflict on poultry production have been partially assessed in the province of Idlib. The production capacity was reduced by 60% between 2010 and 2013. Out of a total of 206 production units in 2010, 122 were no longer in business in 2013, due to the total or partial destruction of buildings and production equipment and/or because of the lack of food supply.