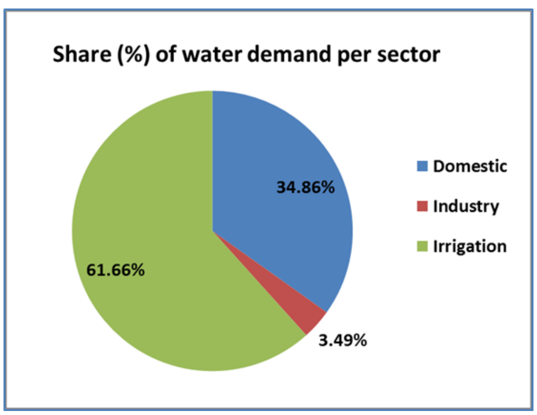
Policy Brief #1: The state of Water Resources in the Al Ostuan River Basin

Al Ostuan River Basin (ORB) Facts

Location:	Akkar casa, Northern Lebanon
Headwaters:	Akkar Al Atika and Qoubayat regions
Outlet:	Mediterranean Sea, Sahel area
Length:	44 km (the main river channel)
Drainage area:	145 km^2
Flow:	~2.3 m^3/sec (records from 2002-2012)
Land Use:	▪ 45% Agricultural (i.e. 66 km^2 including abandoned agricultural lands) ▪ 40% Forests, Grasslands, Scrublands ▪ 12% Urban, Commercial, Industrial

Water Demand and Supply

A total of 51 villages are located (as a whole or part of) within the Al Ostuan River Basin (ORB) boundaries, with a corresponding population of **105,000 people who rely in the ORB water resources.**



The urban water demand sums up to ~7 million m^3/year (or 183 lt/cap/day).

Agriculture is an important activity in the area, and the main cultivated crops are field crops in terraces (vegetables, legumes), fruit trees, and olives. The areas under irrigation schemes (only ~ 60% of the total agricultural area) are extended in the western and northeastern parts of the basin. **The irrigation water demand is 11 million m^3/year** (average of the 2003-2018 period). The irrigation demand is highly dependent on the precipitation and thus varies across the years from 8 (during wet years) to 13 million m^3/year (during dry years)

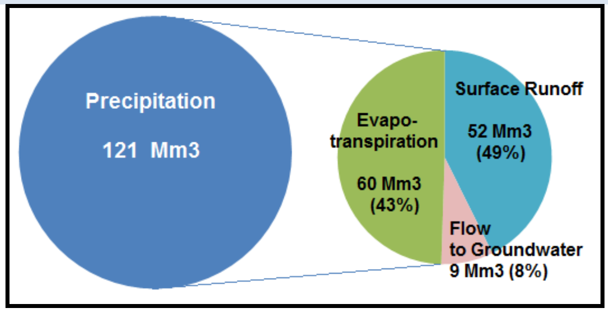
The main source of water is groundwater, as the river is highly polluted. Public water supply is provided by the North Lebanon Water Establishment (NLWE) Qoubayat and Halba Branches, yet it is **not covering all the villages in the ORB**. As a result, a **high number of private wells** are used in the basin, with no public control over the abstracted volumes, which has led to environmental impacts, such as the degradation of the groundwater resources and declining groundwater levels.

The water supply requirements are in fact higher than the actual water demand due to **network losses** and irrigation practices' efficiency. The losses in the urban water supply network are estimated to be 40% to 50%, while the irrigation efficiency is 80% since most irrigation networks are local and individual (only 30% of the agricultural area is under public irrigation schemes).

Water Resources Availability and Water Supply Reliability

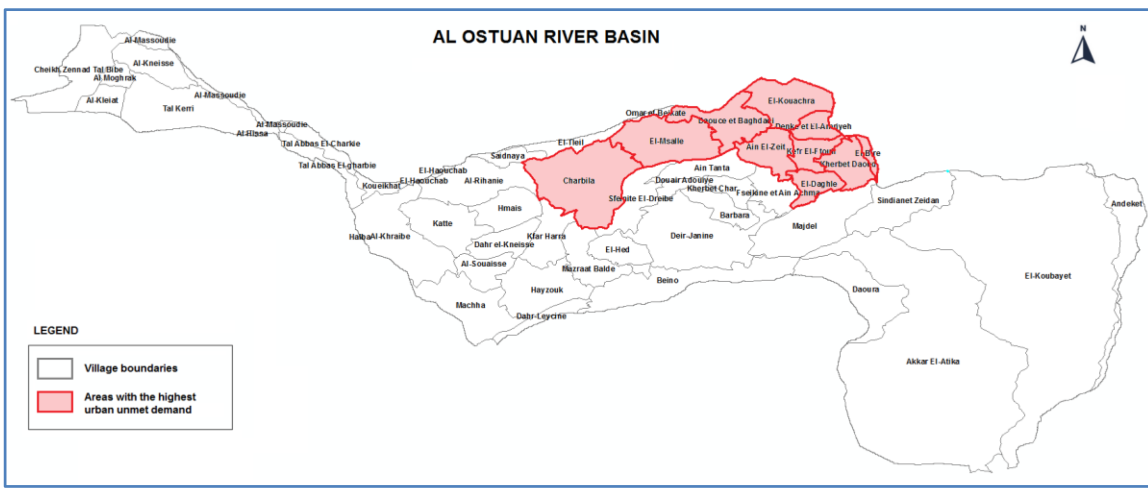
The long-term annual average precipitation in the basin is about 121 million m^3, of which 50% is lost to evapotranspiration, about 42% is turned into surface runoff and about 8% infiltrates in the groundwater. This indicates that most of the water available for potential exploitation ends up in the river.

Only 42% of the water needs are covered by the groundwater availability and supply in ORB.



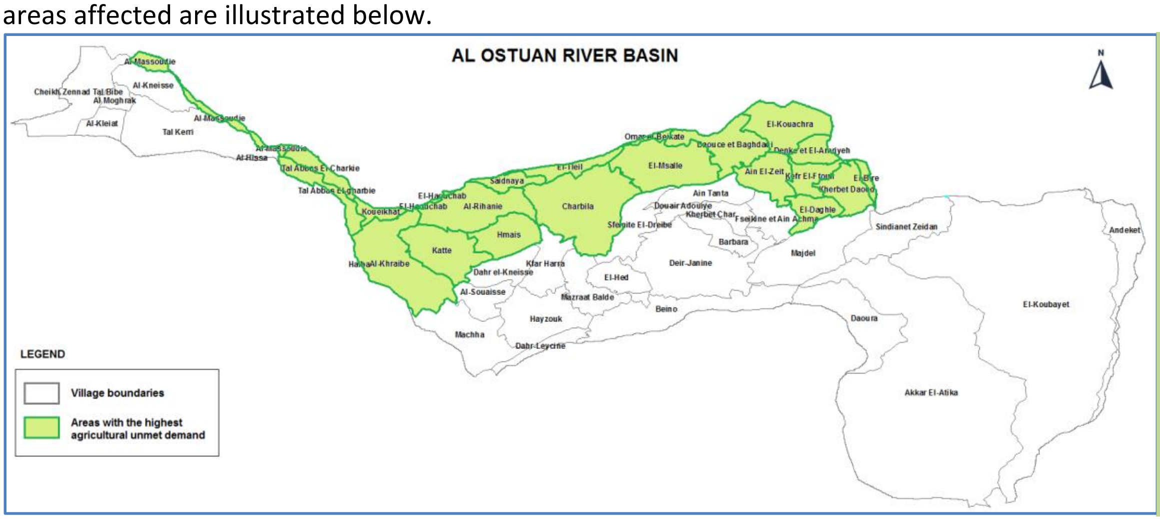
The balance between water demand and availability is negative, resulting in unmet demands in all the areas, every year. **The total annual unmet demand is, on average, 13.5 million m^3/year** (estimated based on the 16-year period 2003-2018), and has historically reached up to 18 million m^3 (in 2016).

This unmet demand is mainly attributed to the irrigation: ~10 million m^3/year on average (i.e. 74% of the agricultural water supply required), with maximum 12-13 million m^3 observed in 2017, 2016, 2010. The domestic/ urban sector is also highly affected: the average urban unmet demand is ~3.4 million m^3/year (or 88 lt/cap/day), with maximum observed ~5 million m^3. The villages with the higher urban unmet demand are illustrated below. All these villages are supplied by the NLWE Qoubayat Branch (system of Qoubayat wells 1/3, 2/3, 3/3) Daouce and Charbila lines.



The water supplied by the Qoubayat wells cannot meet all the current urban water needs

The agricultural areas with the highest unmet demand are located in the northern part of the Al Ostuan basin, where extensive irrigation areas of field crops, citrus fruit trees, and olives cover approximately 21 km^2. The areas affected are illustrated below.



The available water cannot cover all the irrigation needs.

The current water supply cannot meet the water demand in the Al Ostuan River Basin. The Reliability of the system (i.e. percent of the timesteps that the demand of a site is fully satisfied) in supplying the requested demand ranges among the users: the urban water supply reliability is as low as ~29% in some sites (mainly in the east and southeast areas: Dahr-Leycine, Machha, Hayzouk, Al-Souaisse, Dahr el-Kneisse, Al-Khraibe, Koueikhat, Tal Abbas El-Charkie, Tal Abbas El-Gharbie, Al-Massoudie. The reliability in the irrigation water supply is as low as ~22% in some sites: Al-Khraibe, Koueikhat, Tal Abbas El-Charkie, Tal Abbas El-Gharbie, Al-Massoudie, Al-Kleiat, Cheikh Zennad Tal Bibe, Al-Kneisse, Al Moghrak, Tal Kerri, Al-Hissa, Al-Massoudie.

Reliability = Likelihood that demand is met	Urban users	Irrigation users
Very High (>95%)	38%	37.5%
High (80-95%)	0%	0%
Medium (60-80%)	0%	0%
Low (40-60%)	38%	13%
Very Low (<40%)	24%	50%

The Table shows the percent (%) of user for each use category (domestic, irrigation) that fall under the 5 reliability classes (very low, low, medium, high, very high) for the 16-year period 2003-2018. **Overall, 24% of the urban water users and 50% of the agricultural users have very low reliability of water supply (i.e. <40% reliability).**

Water Quality and Pollution

The lack of Wastewater Treatment Plants (WWTPs) and the direct discharge of untreated urban wastewater into the river, as well as the uncontrolled agricultural runoff and solid waste damping has led to high pollution levels in the Al Ostuan river and caused severe environmental damage.

During a field survey and analysis in 17 sites along the river (conducted in October 2019), it been observed that the chemical parameters of Nitrate and Nitrite had high values, as a result of the intense agricultural activities and the uncontrolled use of fertilizer, and the lack of WWTPs. The concentration of heavy metals was above the accepted standards, which is related to the fertilizers and industrial effluents, while the microbiological parameters (fecal coliforms and E.coli) were all found to be above the acceptable limits, since wastewater effluents are directly discharged in the river.

Action is needed… *our Water, our Future, our Responsibility!*

The prevailing water stress and water pollution in ORB directly impact the health and wellbeing of the communities, the local agriculture, and the tourism sector. Integrated water resources management plans or other policy instruments are lacking, and management is not based on pro-active and preparedness approaches. The current conditions will be exacerbated in the future, as population growth projection and climate variability will increase the current water demands.

It is thus **important that demand management is promoted and practiced at the basin**, through the adoption of various interventions and measures (technological, legislative, regulatory, financial, etc.) to achieve efficient water use by all sectors of the community. These measures should target to reduce demand and/or introduce water conservation (for example: reduce leakage, unlicensed connections to water networks and boreholes, promote subscription to the network, install water saving fixtures, increase irrigation conveyance and application efficiency, create incentives, water tariffs, water markets, etc.), while in parallel can target to increase water supply and the water available for use (for example: greywater and wastewater reuse, water recycling, desalination, rainwater/stormwater harvesting, natural water retention measures). Caution to potential adverse environmental impacts is important in any case.

Measures to combat pollution should be immediately implemented: wastewater treatment facilities adopted at the source as the first step for decentralized and small cluster services, operation and maintenance of

WWTPs, effective collection and transfer mechanism for septic tanks sewage to treatment facilities via sewer lines, control over solid waste dumping, control of agricultural runoff and fertilizers' use.