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Impact of climate change on water resources in the catchment of the Wadi Mina (Northwest Algeria)

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ABSTRACT: The effects of climate change on flow regimes and water levels will affect our water supplies. The decrease in supplies of surface water and groundwater as well as increased demand for these resources would question all aspects of management of water resources.

The watershed of Wadi Mina is part of the larger of Wadi Cheliff. It is located about 300 km west of Algiers, between 0°20' and 1 10' East and 34 40' and 35 40' North, draining an area of 4,900 km² at the station of Sidi M'Hamed Ben Aouda dam, which is intended to supply drinking water to the city of Relizane, and the development of agriculture in the region. The reduction of rainfall since some decades led to a decrease in the amount of water stored in the dam, and has adversely affected the water needs of the people.

Through this work, we study the impact of climate change on surface water resources for tributaries and main stream watersheds. We chose two gauging stations in regard of the availability of water and climate data liquid flow rates, rainfall and temperatures at a monthly step. Both stations are: Wadi Al Abtal and Sidi Djilali AEK. The period chosen is that from 1970 to 2000. Data were used to validate and calibrate the model. We

used the GR2M conceptual model from the Cemagref in France, with two calibration parameters at the monthly time step. It has given satisfactory results for the calibration and validation phases. We simulated flows with the hypothesis of climate change, for 2020 and 2050, and for two scenarios: pessimistic and optimistic. Climate predictions were taken from a global model.

After calibration and validation of the model, the hydrological responses of basins, in the case of climate change for 2020 and 2050, were compared with the reference series (1970-2000).

For the basin of Wadi Mina at the station of Wadi Al Abtal (main stream), which drains 87% of the watershed, and the pessimistic scenario, the largest decrease was observed in autumn and summer (-13.5%) in 2020 and -20% in 2050, followed by the spring season with a 7% reduction by 2020 and 11% in 2050. In winter a slight decrease of about 3.6% by 2020 and 6% in 2050 was observed. For the optimistic scenario, in autumn, spring and summer reduced rates are 16%, 11.7% and 8.5% in 2020 and 43.8%, 27% and 18.5% in 2050.For the winter season, the reduction is similar to the pessimistic scenario for both horizons.

For the Wadi Haddad, it was observed a significant reduction in the hot season for the pessimistic scenario of about 15% and 18% in autumn and summer respectively in 2020, and 22% and 17% in 2050. In winter and spring, the decreases are smaller in the range of 4% and 9% in 2020 and 6% and 7% in 2050.

For the optimistic scenario, higher reductions are recorded in autumn and summer where they can reach 15% and 18% respectively in 2020 and 31% and 23% in 2050. In winter and spring these decreases are relatively small between 6 and 13%.

We note that the impact will produce a negative effect on water resources in the region. These resources are already limited. Projects must be done to overcome the shortcomings that may cause the reduction of water resources.

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