GestAqua .AdaPT | ADAPTATION WATER RESOURCES CLIMATE CHANGE

Water management adaptation strategies in a Mediterranean river basin

TASK REPORT - CLIMATE SCENARIOS

SUMMARY

In this report results obtained for the climate change scenarios characterization are briefly presented. In GestAqua.AdaPT multiple EURO-CORDEX model ensembles have been analyzed and two were selected based on the best fit to the reference period of 1971-2000. Both selected model ensembles (EC Earth-RACMO22E and E Earth-RCA4) were used to characterize future climate until the year 2100, including air temperature, precipitation, relative humidity, wind (speed and direction) and solar radiation.

METHODS

Climate scenarios were defined according to model ensemble results obtained from the EURO-CORDEX program (http://www.euro-cordex.net/), using a 12 km horizontal resolution and considering two carbon dioxide concentration patterns: RCP 4.5 and RCP 8.5.

Table 1 - Model ensembles from EURO-CORDEX.

Institution	RCM	GCM
Climate Limited-area Modelling Community	CCLM4	MPI-M-MPI-ESM-LR ICHEC-EC-EARTH CNRM-CERFACS-CNRM-CM5
Danish Meteorological Institute	HIRHAM5	ICHEC-EC-EARTH
Inst Pierre Simon Laplace and Inst National de l'Environnement industriel et des RISques	WRF331F	IPSL-IPSL-CM5A-MR
Koninklijk Nederlands Meteorologisch Instituut	RACMO22E	ICHEC-EC-EARTH
Swedish Meteorological and Hydrological Institute	RCA4	CNRM-CERFACS-CNRM-CM5 ICHEC-EC-EARTH IPSL-IPSL-CM5A-MR MPI-M-MPI-ESM-LR

The selection of model ensembles of Regional Climate model (RCM) forced by Global Climate Model (GCM) was performed by comparing simulation results with observed data for the period of 1971-2000. Nine geographical locations were considered although no significant differences were identified.

RESULTS

Considering that this project is focused on the reservoirs water balance, the climate models were selected according to their adjustment to the precipitation patterns. This way the two model ensembles chosen were the EC-Earth/RACMO22 and EC-earth/RCA4. In the present report only partial results of the project are presented.

Precipitation modeling results (2010-2100)

In Figures 1 and 2 monthly precipitation results from the two models and for the Monte Novo watershed are compared with observed precipitation in the nearby city of Évora.

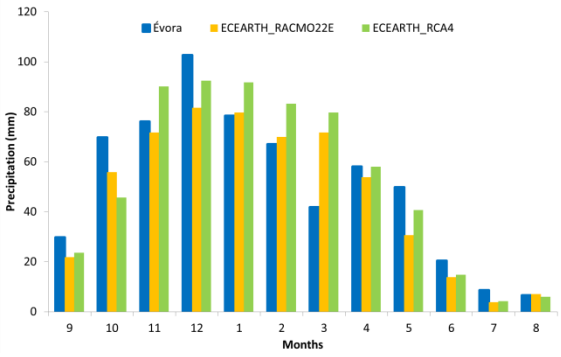

Figure 1. Precipitation patterns for RCP 4.5

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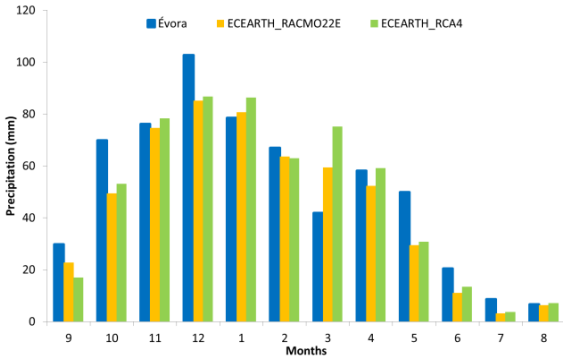

Figure 2. Precipitation patterns for RCP 8.5

In general all climate scenarios are characterized by increased precipitation in the period from January to March and reductions from April to November, thus resulting in longer dry seasons and annual precipitation concentration in fewer months of the year.

This situation may have implications on agriculture practices as well as in reservoir water balances and performance.

Temperature modelling results (2010-2100)

Average decadal temperature estimated by the two models is presented in Figures 3 and 4, for the Monte Novo watershed.

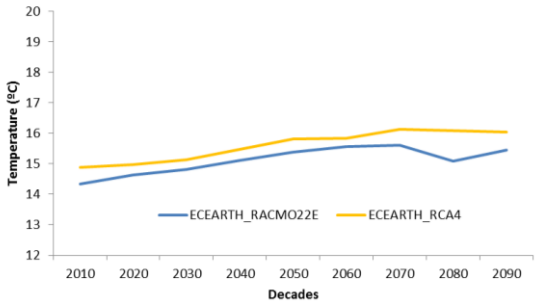

Figure 3. Average temperature for RCP 4.5

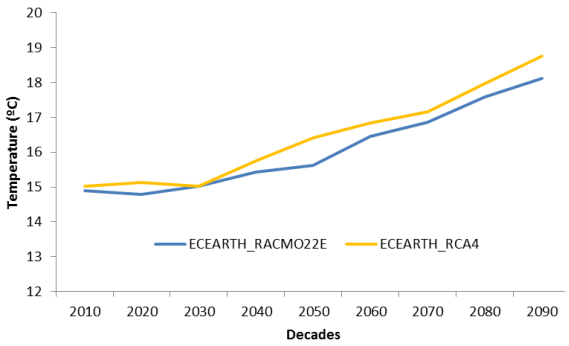

Figure 4. Average temperature for RCP 8.5

Temperature results show an increasing trend in the annual average temperature in the period 2010-2100 for both scenarios and both models. This increase is more significant for the RCP 8.5 scenario, particularly after 2050. These results are in line with the IPCC projections for temperature increase for these two RCP scenarios.

Climate scenarios are relevant for the following:

- Input data for Hydrological modeling;
- Input data for Hydrodynamic and water quality modeling;
- Data for future climate analysis;
- Extreme events analysis and risk management.