

Adaptation to water resource scarcity and extreme rainfall events

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CHALLENGES

Water scarcity:

In the Iberian peninsula, climate change will cause a rainfall decrease at the end of the 21st century (Pérez and Boscolo, 2010), particularly in summer. This predicted decrease highlights the importance of assessing these impacts to implement adaptation measures. Regarding water supply reliability, current water management may not be robust enough. Methodologies and modelling tools to simulate water management may be necessary to test risk reduction and adaptation measures.

Highly intense rain events: Another expected effect of climate change is the increase of extreme rainfall events. As for the sewer systems, the morphology of Barcelona makes transport and discharge of rain water difficult. When considering climate change, the expected increase of extreme rain events and rise of sea level will add further stress to the urban drainage performance. Although Barcelona has made big efforts to build infrastructures to avoid flooding and reduce combined sewer overflows, future sewer works should consider the new climate conditions.

PARTNERS







- (1) Decision support system (DSS) for planning complex urban water systems for regions under water stress
- Development of a DSS prototype, integrating river basin hydrologic and hydraulic models with decision making analysis based on an Multicriteria (MCA) approach. Usually, river basin modelling and decision-making tools are not integrated. The considered approach takes benefit from the integration of both approaches.
- A DSS must give assistance in determining impacts negatively affecting the water system, considering operational, socio-economic and environmental aspects (MCA analysis).
- Barcelona's demonstration will be based on applying the developed prototype to the Ter-Llobregat river basin, which is used to supply water to Barcelona. River basin models obtained in the WATER CHANGE LIFE+ project will be used.
- (2) Conceptual scheme of catchment and conservation of water from high flow events
- This task is focused on promoting the use of alternative water resources. The historical water resources in the city of Barcelona have been a combination of surface water from Llobregat river and groundwater. Thus, increasing the range of quality of water recharge leads to better groundwater availability and also a better final quality.
- In this sense, the PREPARED studies will assess the performance and efficiency of Managed Aquifer Recharge (MAR) systems in terms of hydraulic and quality parameters for underground storage of low quality surface water (Llobregat river) or reclaimed water.

(3) Methodologies for urban runoff risk assessment

- To date, a literature review on how cities respond to climate change in their flood hazard assessment has been performed. In addition, a set of guidelines, on how to create future climate scenarios to be used as input to the urban runoff models, has been developed. The next step will be to implement future scenarios to urban runoff models, and generalise these results so they can be implemented in different pilot cases.
- Consequently, the Barcelona demonstration will implement this methodology in a pilot catchment in the 22th district. This will allow the analysis of the impacts of future changes on urban runoff, as well as the suitability of the guidelines developed.

(4) New methodologies for sediments monitoring in sewer networks

Due to the presence of mountains and parks in the upper part of the city, sediments are eroded, These sediments enter the sewer network, are then transported through the sewers, and finally settle in the lower part of the city causing several problems. Within Prepared a new methodology for sediment monitoring and modelling is being developed and it will be applied in a pilot catchment with the aim to improve the knowledge about the sediment behaviour. This approach will contribute to a reduction in the annual budget that the municipality spends on sewer sediment cleansing.



Guidelines for the recommended approach to take into account climate change in urban runoff models, developed in task 5.3.1

SUCCESS STORIES

Urban runoff risk assessment

Investments planned in 2006 in the Barcelona Master Drainage Plan, aimed at protecting the city against floodings and CSO, were budgeted for 580 M €. Since then, the Municipality has invested around 13% of this amount. This means that there is a huge budget that will be spent in the next decades. By applying the new methodologies, and taking into account the climate change, we will guarantee that this budget is spent in the most efficient way toprepare the city for future challenges.

Optimisation of water resources:

Integrated resource management in Barcelona has allowed economic development of a region with scarcity problems, in which groundwater resources play a very important role to cope with the increasing water demand.



Decantation pond of the MAR system at Sant Vicenç dels Horts



Testing a sonar-equipped monitoring system in Barcelona sewer network (system developed by INSA Lyon)

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