

# How to adapt water consumptions to climate change?

*A tool to planify sustainable mountain development*



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## Find the best development path in mountains to avoid shortages

Water amounts and consumptions are key elements of cities development. In mountain areas, large changes will occur in the natural distribution of water due to climate change and will impact development. Both climate and consumptions impacts are modeled in a tool to help to design sustainable development regarding water availability

Climate changes highly impact seasonality of mountainous rivers flows. As the main source of water supply in mountainous cities, it will induce changes in water management and consumptions by human activities. In order to avoid water shortages and to help a sustainable mountain development, a model taking into account hydrological changes as well as socio-economic choices was built. The model is performed in Megève ski resort station and is part of C3-Alps Alpine Space project.

### Method

- A hydrologic model is coupled with socio-economic consumptions model
- Natural water availability and water consumptions are calculated at each time step (hours)
- Climate change scenarios are choosed at the beginning of simulations. Precipitation and temperatures impact natural water availability
- Each use consumption and water supply network characteristics are represented as well as socio-economic development scenarios including priority of uses and legal obligations (e.g. minimal flows)
- If one use or more did not match its need for water an alert appears

### Results

- High shortage risks are identified especially during touristics periods (summer and winter vacations) (Fig.3)
- Artificial snow appears to help to counterbalance lack of natural snow but is highly consuming in water on short period (Fig. 2)
- Climate change affects reservoirs filling and seasonality of available water

### Applications

- Performed on the Megeve ski resort station
- Decision-support tool to help stakeholders to choose the best development plan regarding actual and future water availability
- Promote a sane debate about water uses consumption especially in mountainous touristic areas (real seasonal consumptions and percentage of total consumption of each use are identified Fig.1)
- Serious-game project to extend application and usefulness of the tool in schools or institutions is foreseen

More informations about C3-Alps project and Pilote sites:  
[www.C3Alps.eu](http://www.C3Alps.eu)

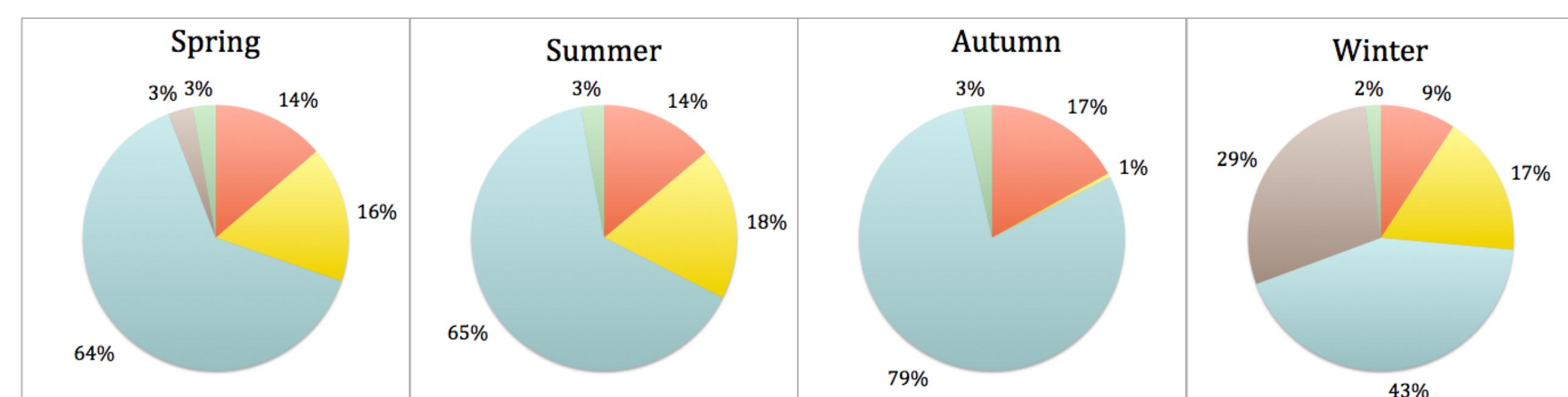


Fig.1 : percentage of water demands by use and season in Megeve Ski resort station (France)

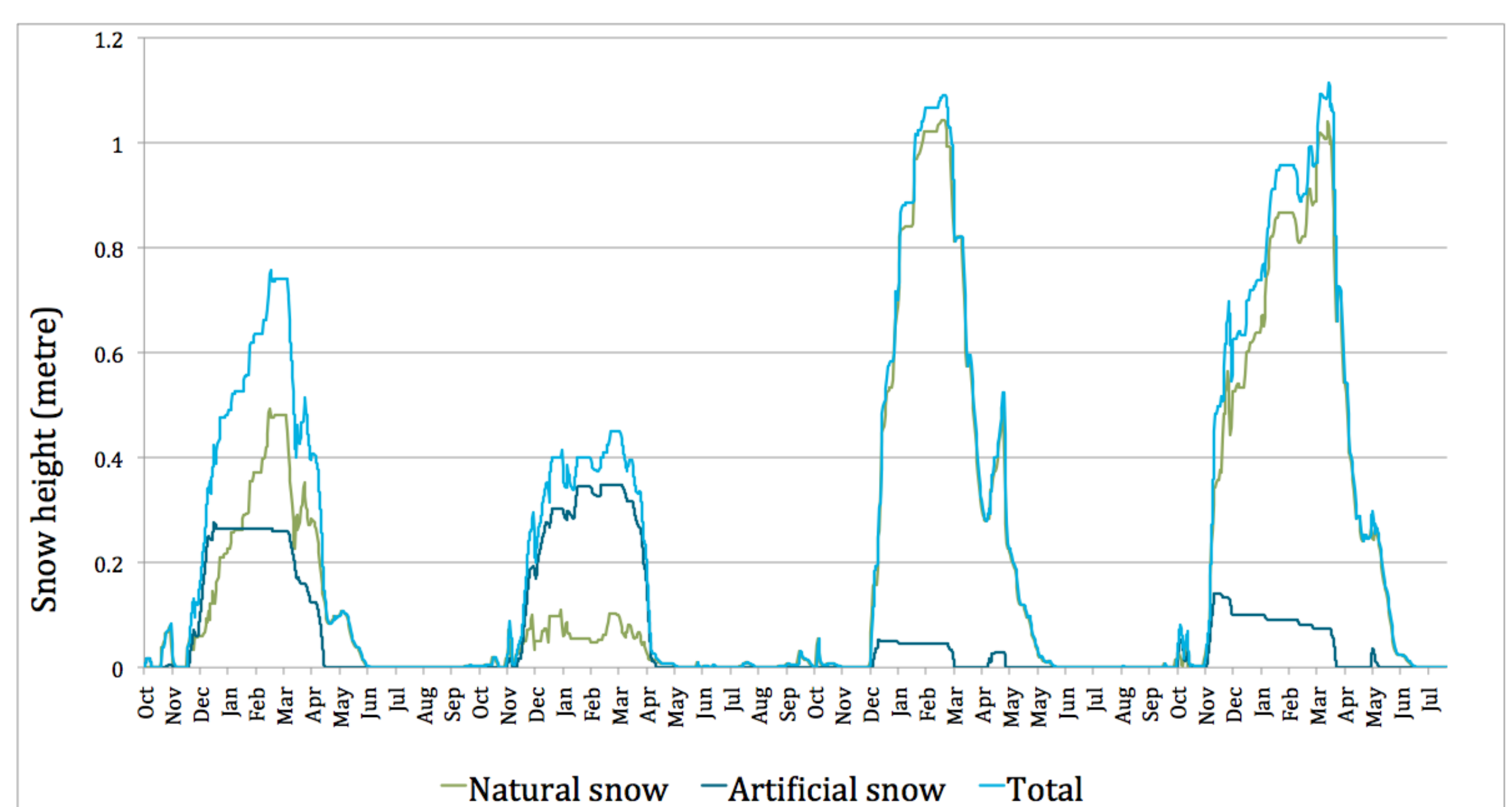


Fig.2 : Artificial snow production modelling depending on natural snow amount

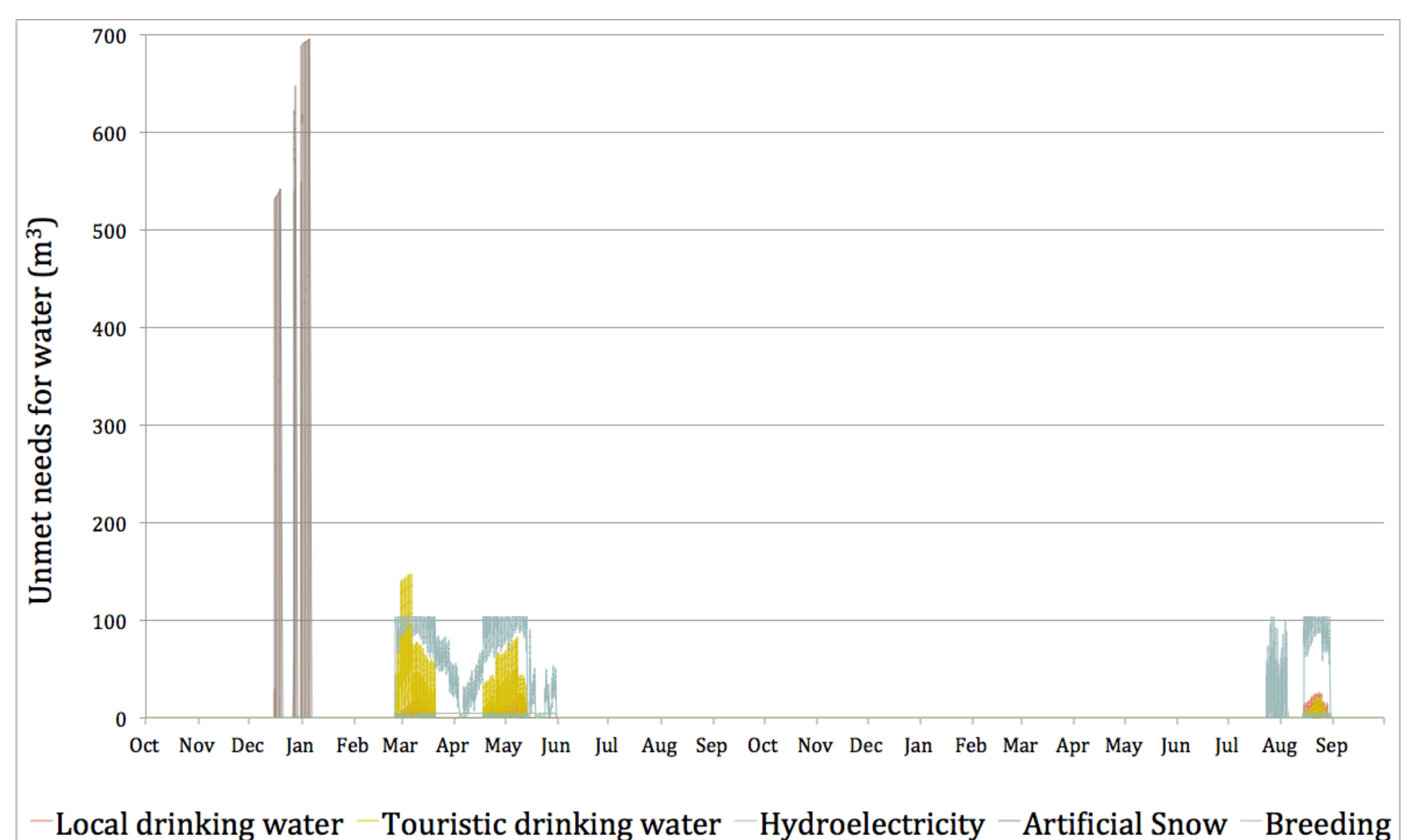


Fig.3 : unmet needs for water (e.g. water shortage) for the different uses

Principaux partenaires de l'évènement\* :



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