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Climate forecasts enabled knowledge services

Webinar series coordinated by Climateurope

Climate services for sustainable water resource management

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Potential benefits of using seasonal forecast data to inform decision-making in small hydropower plants: SHYMAT service

Eva Contreras

Fluvial Dynamics and Hydrology Research Group - Andalusian Institute for Earth System Research. University of Córdoba, econtreras@uco.es

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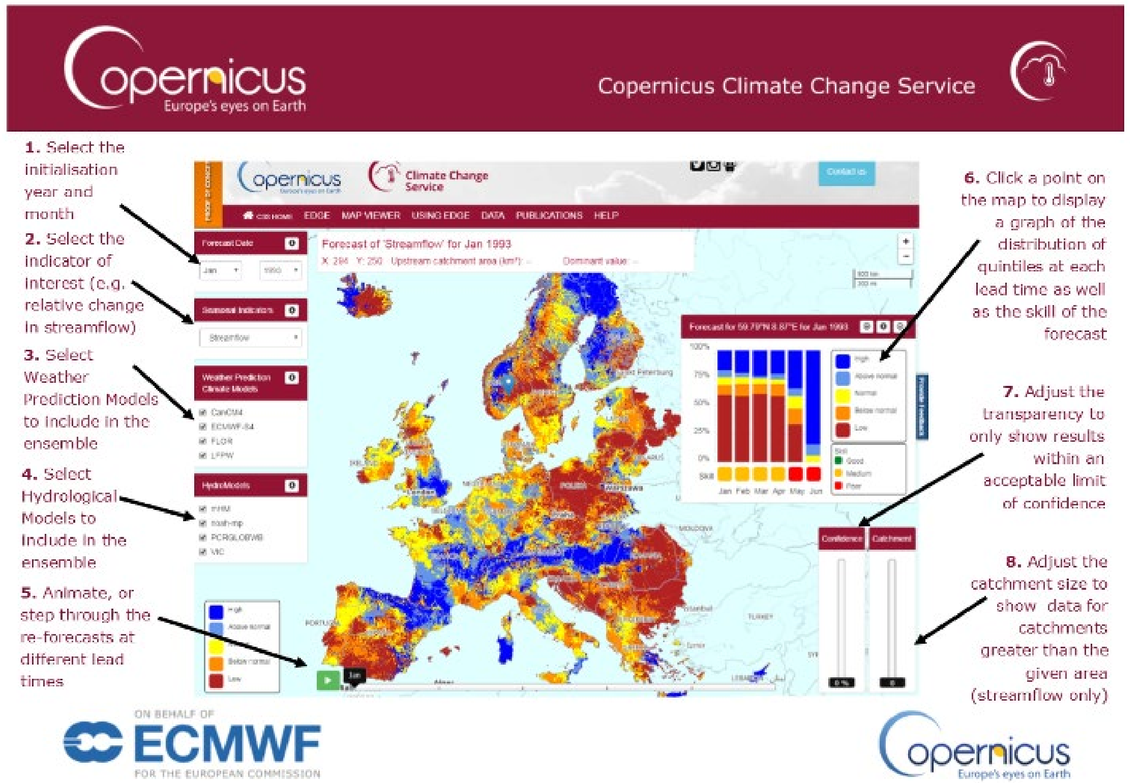
Seasonal forecast information available but...



Co-development and interactions with the users in the Energy sector in the **CLARA project:**

Most users rely on in-house evaluations and expert judgment in their day to day business, limiting use of "external" resources and carefully integrating climate-seasonal knowledge in their decision processes.

Main reasons:

- **Reluctance** to apply innovative forecasting CS
- **Flexibility and in depth customization**

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Main challenge

Link the forecast to the decision support process

(reliability, timescale, variable, local adaptation)

Challenges in RoR plants

- Run-of-River (RoR)
- Mountainous areas
- No dam or water storage
- Cost-effective and environmentally friendly energy technology

However…

- ✓ Production subjected to the run-of-river flow
- ✓ Minimum technical inflow of the turbines ➡ enough water to remain operational
- ✓ Extremely high inflows ➡ water will have to be “spilled” (a lost opportunity for generation)
- ✓ The operation has to accomplish with some environmental flow requirements.

Climate forecast information can provide a solution through the use of a Climate Service (CS)

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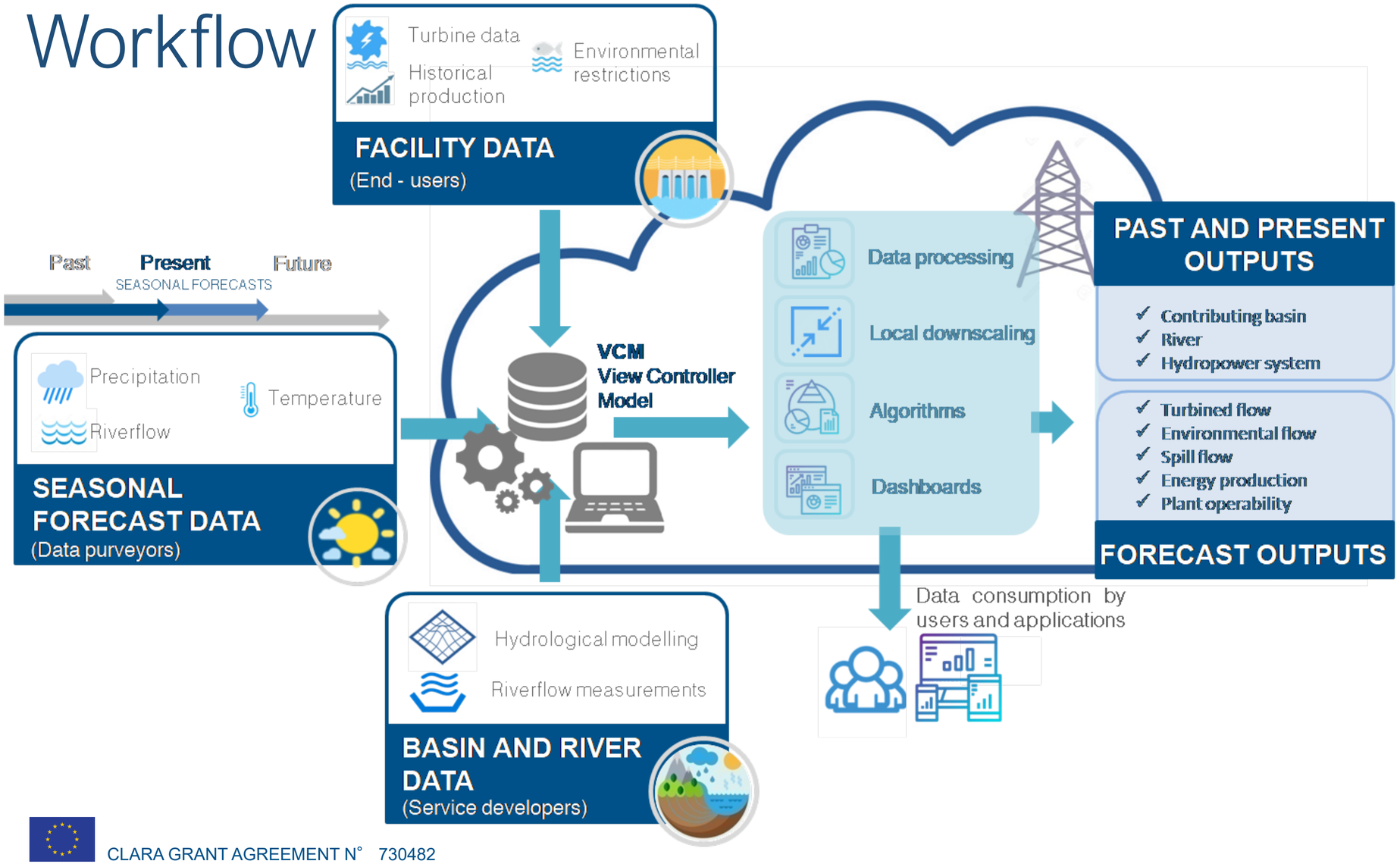
Workflow



Co-development process

Data providers, service purveyors and potential end-users were involved in **local meetings and Multi Users Forums**, during which end-users closely participated in the design of the tool and local data provision. Co-generation leads to a **correct scale of the forecast information** and the **right tools** to convey it, which results in a **more effective knowledge system** but also a more robust knowledge and **contextual applicability** of the seasonal climate forecast.

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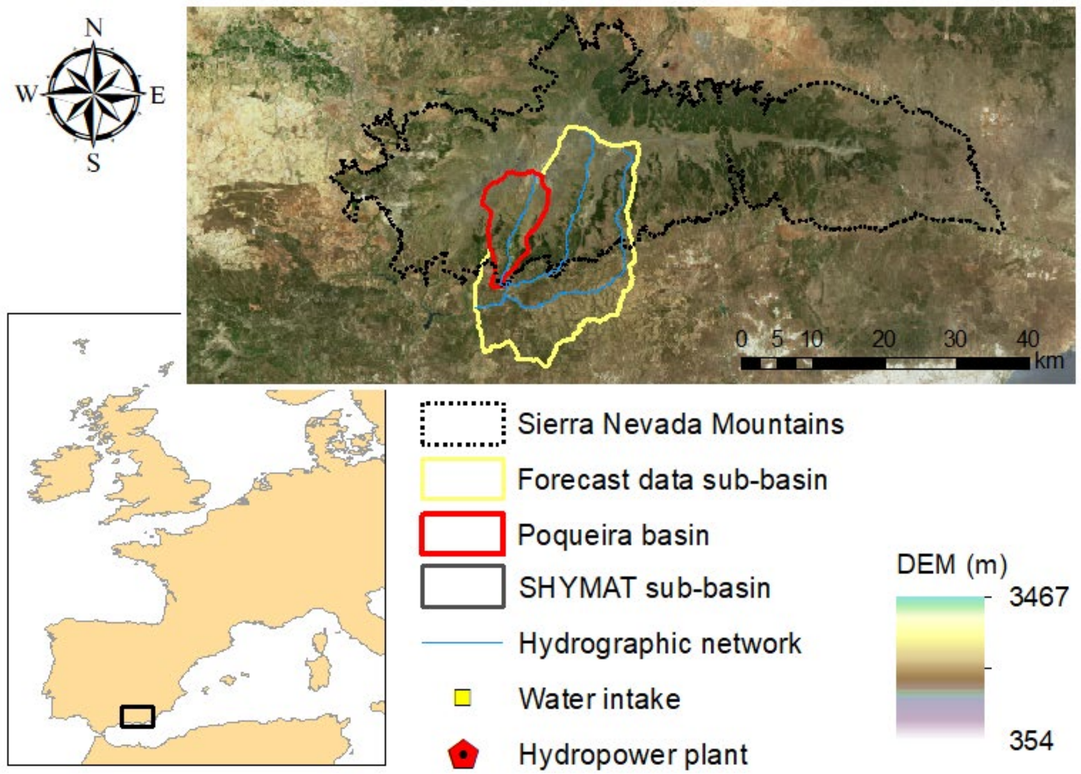
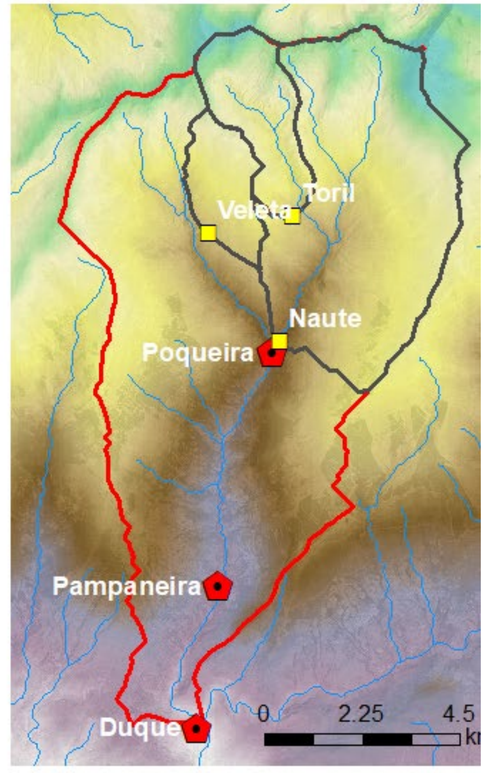
Pilot application

✓ **Three small hydropower plants system** located in Poqueira River (Southern Spain), with a generating capacity 10 - 12 MW.

✓ Managers normally take decisions based on **historical information** of the inflows.





✓ **Water availability very heterogeneous** over the years:

Annual precipitation regime highly variable: 200 to 1000 mm. (Pérez-Palazón et al., 2015)

Mean annual fractional snow cover area for the period 2000-2013: 0.9 to 0.16 $m^2 \cdot m^{-2}$. (Pimentel et al., 2017)

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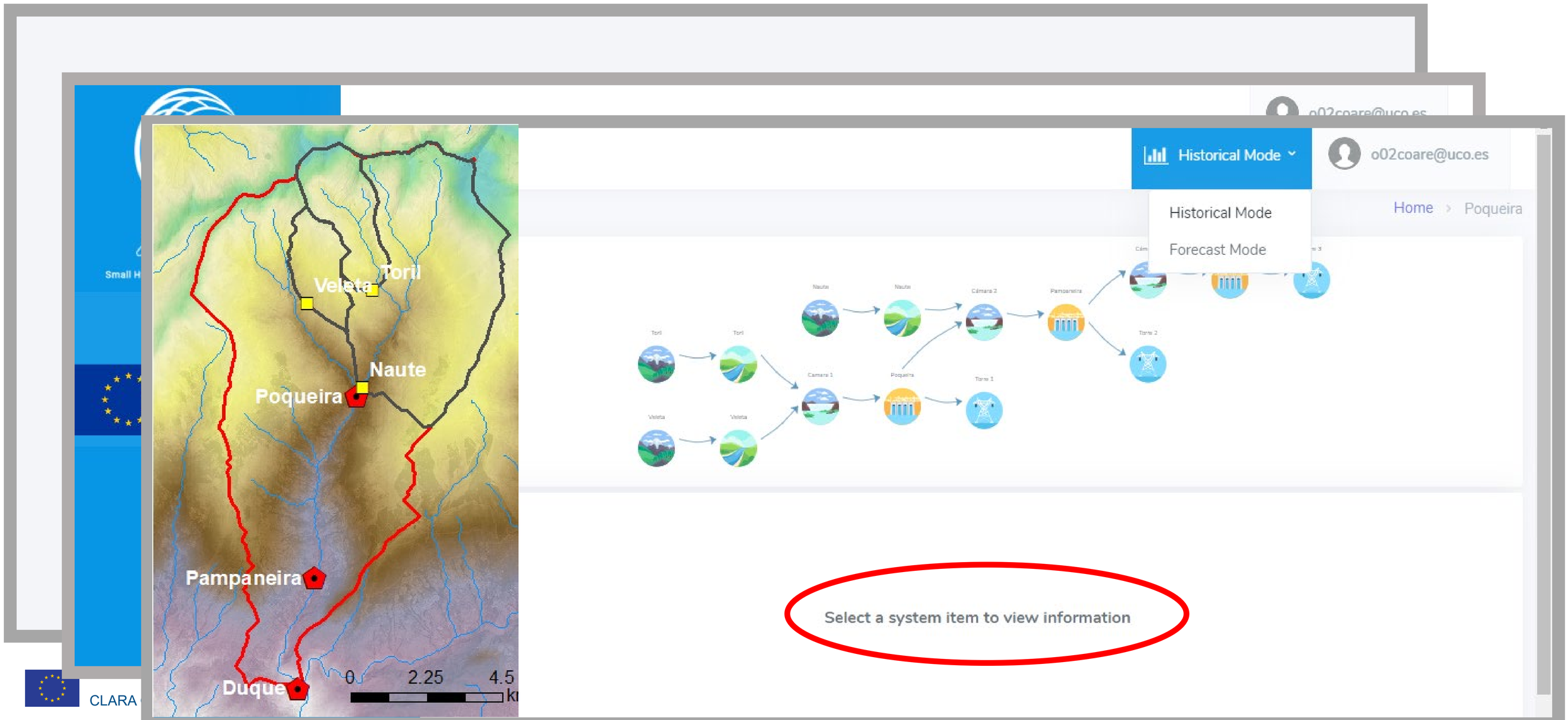

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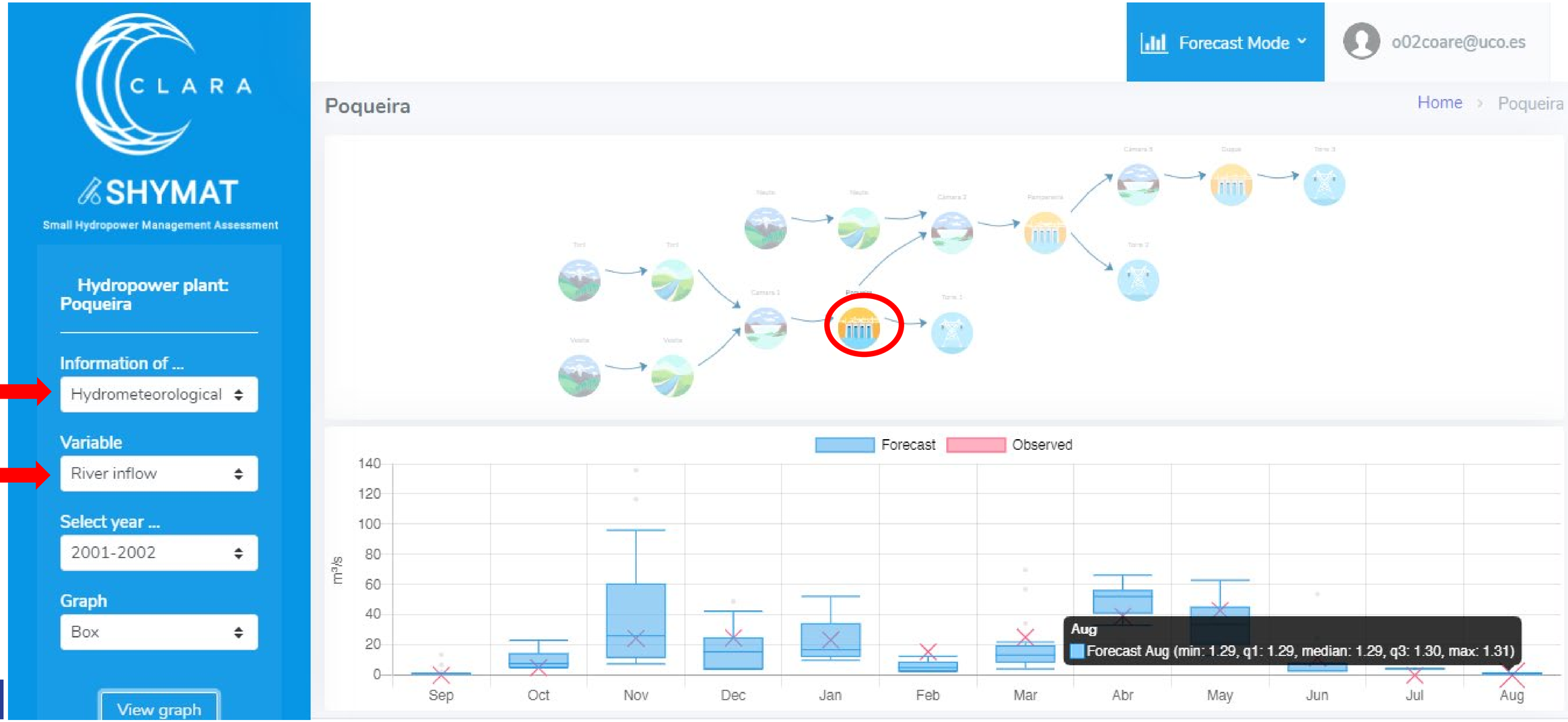
Information 1: River inflow, knowledge of the water available in the system



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Information 2: Environmental river flow, compliance with River Basin Plan restrictions

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Small Hydropower Management Assessment

Hydropower plant: Poqueira

Information of ...

Hydropower plant op

Variable

Environmental river f

- Environmental river flow
- Discharge
- Spilling of water
- Days of operation

Graph

Box

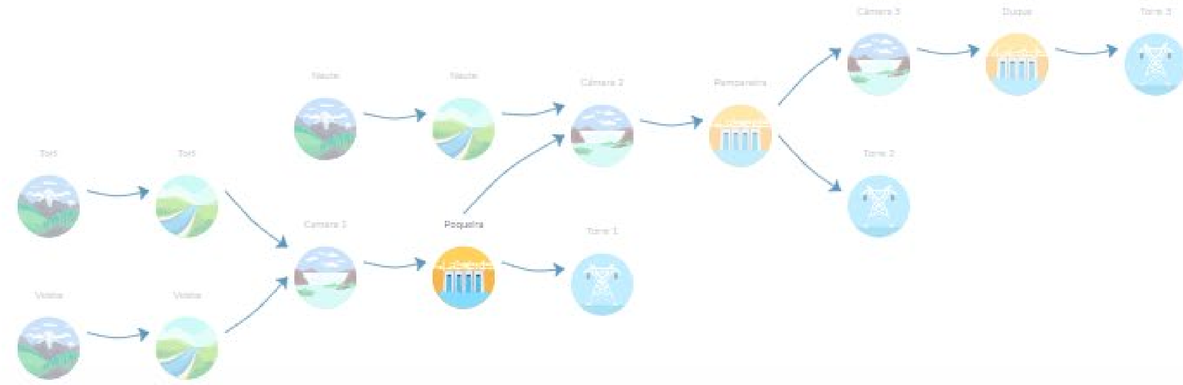
View graph

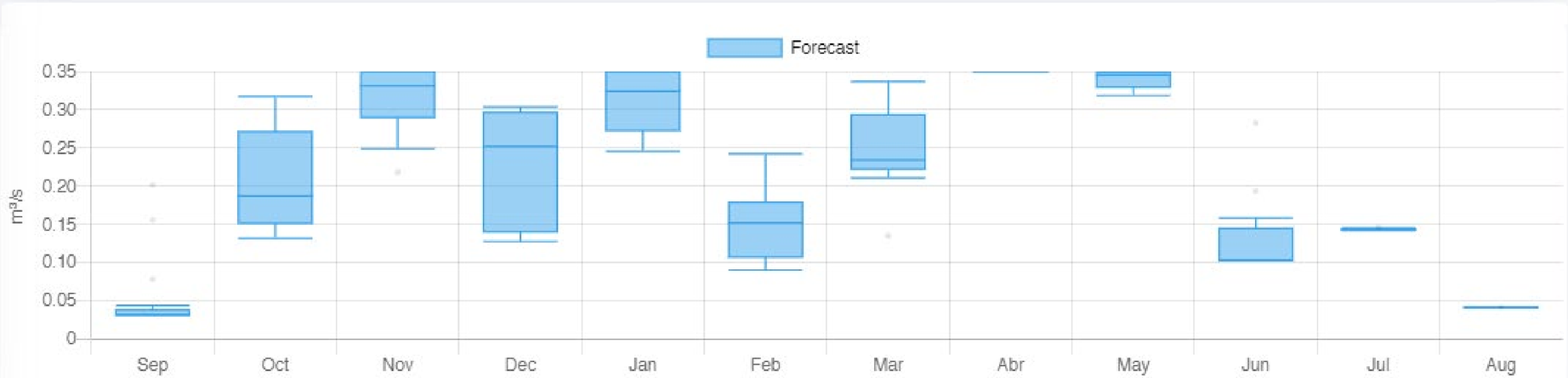
Forecast Mode

o02coare@uco.es

Poqueira

Home > Poqueira





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Information 3: Discharge, water available for energy production

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Information 4: Spilling of water, giving managers the opportunity to quickly tune up additional turbines

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Information 5: High production / shutdown periods, for maintenance and repair tasks planning

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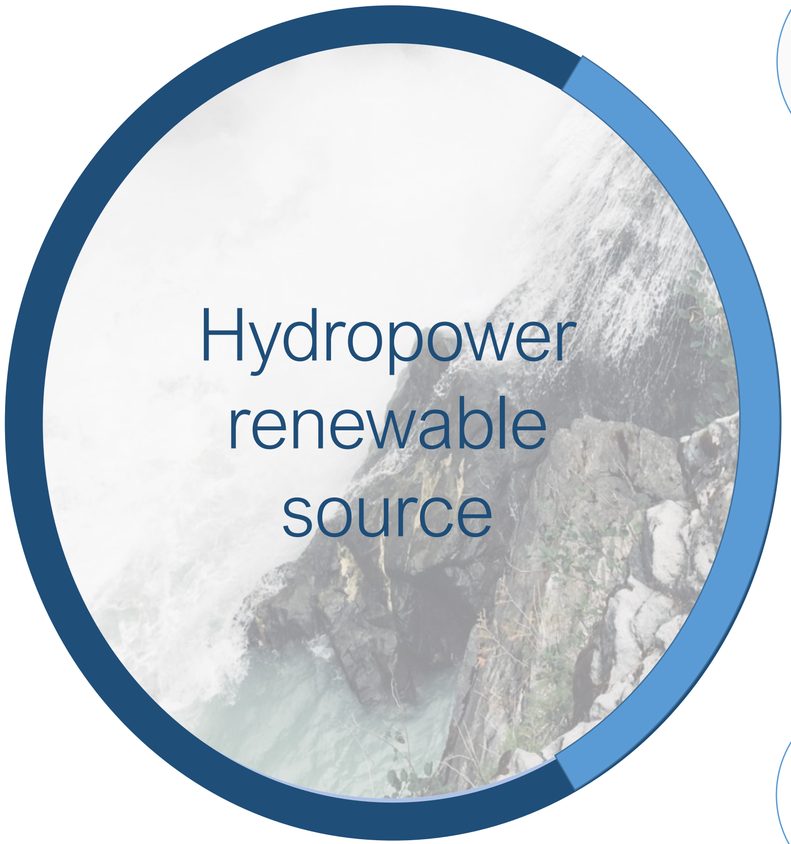
Information 6: Energy production, for market issues

Final remarks



Seasonal forecast

Hydrometeorological information

Historical, real time and modelling data

Hydrology of the basin and operation data

Operation supporting

Anticipate the operability for (1) **maintenance and operation tasks**, (2) compliance with **environmental river flow restriction**, (3) the use of **additional turbines**

Prediction of energy production

Estimation of production from river streamflow forecast information, (4) for **market issues**.

Thank you for your attention

Eva Contreras, econtreras.@uco.es

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Eva Contreras, Javier Herrero,
Cristina Aguilar and María José Polo
from University of Cordoba
Fluvial Dynamics and Hydrology Research Group—
Andalusian Institute for Earth System Research (IISTA)

www.uco.es/dfh/
infodfh@uco.es

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Contacts

clara_info@cmcc.it

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Small Hydropower Management Tool (SHYMAT)

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