Science policy workshop

29 Luglio 2022

09.30-11.50 CEST

Previsione e gestione della siccità - strategie di adattamento

Focus: Siccità 2022 – evoluzione, impatti, politiche e soluzioni

Zoom: https://us06web.zoom.us/j/81011508564

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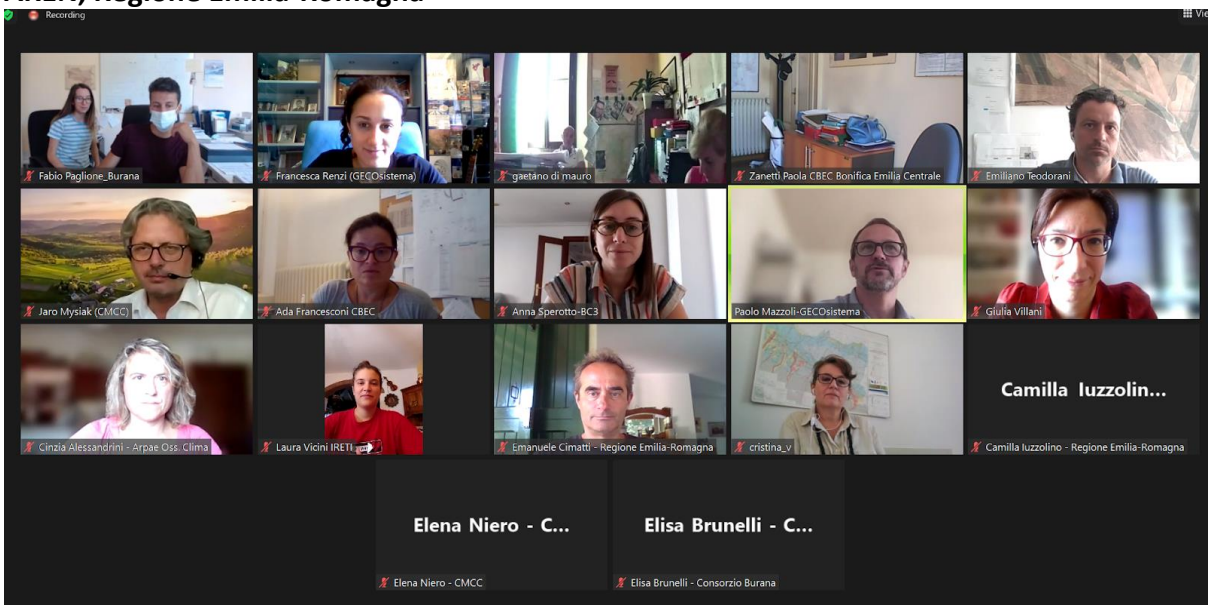
09.15 – 09.30	Registrazione e test videoconferenza
09.30 – 09.45	Benvenuto e introduzione dei partecipanti
09.45 – 10.15	**Sfide** - Siccità e sicurezza idrica nel Bacino del Fiume Po 15' *Situazione attuale e scenari futuri* Jaroslav Mysiak, Centro Euro-Mediterraneo sui Cambiamenti Climatici 15' *Riflessioni del pubblico e discussione*
10.15 – 11.15	**Modelli** – Modelli e simulazioni per la sostenibilità idrica 10' + 5' *Modelli idrologici e dati* Paolo Mazzoli / Stefano Bagli, Gecosistema srl 10' + 5' *Modelli socioeconomici* Jaroslav Mysiak, Centro Euro-Mediterraneo sui Cambiamenti Climatici Discussione
11.15 – 11.45	**Soluzioni** – **Adattamento trasformativo** 10' *Ricerca & Innovazione* 10' *Allerta & monitoraggio – dati e requisiti* 10' *Politiche & strumenti finanziari*
11.45 – 11.50	Conclusioni e passi successivi

Participants: 17:
5 organizers:
Jaroslav Mysiak e Elena Niero **(CMCC)**
Anna Sperotto **(BC3)**
Paolo Mazzoli and Francesca Renzi **(GECOsistema)**
12 users:
Fabio Paglione and Elisa Brunelli **(Consorzio Burana)**
Paola Zanetti, Gaetano di Mauro and Ada Francesconi **(Consorzio di Bonifica dell'Emilia)**
Cristina Voltolini and Laura Vicini **(IRETI)**
Cinzia Alessandrini and Giulia Villani **(ARPAE)**
Emiliano Teodorani **(AREN Group)**
Emanuele Cimatti and Camilla Iuzzolino **(RER) – Water Protection and Management Area**

Institutions: Consorzio Burana, Consorzio di Bonifica dell'Emilia, IRETI, ARPAE, Gruppo AREN, Regione Emilia-Romagna



Brief introduction by **Paolo Mazzoli (GECOsistema)** and **Jaroslav Mysiak (CMCC)**
Presentation of the agenda
Short round of presentation by the participants anticipating some of the topics under discussion:

Fabio Paglione and Elisa Brunelli (Consorzio Burana)
Description of the complex period of drought that is being experienced in Italy from their point of view.
Problems in terms of managing the little water and in terms of derivation. Although there was no resource, the little that was there was necessary, so derogations were requested from Arpae on all the Apennine courses and for the first time in history it was requested to derivation in derogation from the guard levels imposed in the concession specification also for the Po river (limit situation for the PO)

Paola Zanetti, Gaetano di Mauro and Ada Francesconi (Consorzio di Bonifica dell'Emilia)

Consortium that also manages water on behalf of other subjects, using the hydraulic node of Castellarano. Many Co-holders of the derivation permissions for irrigation share the rights with Consorzio Burana. There is a concession for hydropower use (company 52% Central Emilia and remaining IREN). Industrial use (IREN - IRETI) also used by the Modena area, Hera. The derivation concession also provides water for environmental use, for a minimum environmental flow of the two channels for the benefit of the pre-existing operators (Municipality of Modena and Municipality of Reggio Emilia).
There is a fairly complex history, but today it sees the Emilia Centrale Consortium as the manager of the hydraulic node also on behalf of the other dealers. The consortium obviously has other main derivations, one on the Enza stream, in Cerezzola, Canossa, which is similar for the difficult problem of scarcity of water resources to that of the Secchia (indeed with more serious problems because the basin is smaller). The reflections on the hydraulic node of Castellarano may be partly useful also for other Apennine streams, perhaps even for the Enza.
Consorzio di Bonifica dell'Emilia has most of the irrigations linked to the derivations from the Po, with all the critical issues of this year. Although the first signs of crisis of the Po start from 2003, and from there the recurring crises have been more than one. they have never seen a year like this one, but it is already a bit that the Po gives us negative signals and perhaps some time has been lost. Colleagues Ada Francesconi who deals with the management of the hydraulic node, contributed to the construction of the power plant and follows the management of the entire hydraulic work and Gaetano di Mauro are introduced: surveyor responsible for an area that also includes the site of interest, management and maintenance of the structure and management of the staff of the structure.

Cristina Voltolini and Laura Vicini (IRETI)
Main activities: water plant management service and management of the industrial aqueduct for multiple uses.

Cinzia Alessandrini and Giulia Villani (ARPAE)
(Cinzia Alessandrini, Head of climate Observatory)
I work on various aspects of monitoring and forecasting both seasonal and long-term (on climate scenarios). In this period of drought, support to the Emilia Romagna region and Po basin district authority with precipitation and temperature data and future processing.

Emiliano Teodorani (AREN Group)
AREN Group, the company that owns and manages the hydroelectric plant in Muraglione, the Reggio Emilia bank of the Secchia river.

Anna Sperotto (BC3): researcher at the Basque Center for Climate Change (Doc place with Marie Curie project), which will apply the Secchia basin to its research activity on the management of water resources and drought in the context of climate change, but with a focus more on ecosystem services.

Emanuele Cimatti and Camilla Iuzzolino (RER) – Water Protection and Management Area of the Emilia Romagna Region. Application and direction of the Water Framework Directive / regulates water rules including rules for derogations from the DMV, water management in periods of drought and water scarcity until civil protection (water scarcity) is entered into the

competence of civil protection. It points out the exceptional nature of the drought taking place this year where, for the first time, the minimum functioning of the ERC, which was not known, was reached.

DISCUSSION (contributions from Stakeholders, reports from therapporteurs in the Annex)

First part on Challenges, drought and water security

Paola Zanetti (Consorzio di bonifica dell'Emilia Romagna) indicates that the reclamation consortia in Emilia-Romagna are all equipped with plans for the conservation of water resources and management and extreme situations such as drought. With respect to this specific water crisis that has affected both the Apennine tributaries and the Po, the consortia have implemented strategies already dictated by these plans: in the Apennine areas (*such as the Secchia n.d.r.*) everything that is done every year has been anticipated, statistically every year there is a water crisis and it is necessary to implement actions. The first thing to do is to divide the little resource between the two derivations of right and left also for alternate areas. Then if the crisis persists there are times when we cease to derive both; then there are a few days of recharge, and in the end, we return to drift. And finally there are the actions that go to limit the distribution, for example by interrupting marginal irrigation activities (personal gardens, parks) and taking care to minimize losses in the canals.

This year these actions were adopted very early compared to other years and not only on the Secchia but also on the Po river. There are problems in maintaining the connection between the lean bed and the branch plant, which must be kept continuously open with dredging interventions. The problem is not the altitude, but the configuration and set-up of the system. Water is present on the other side, but it is not possible to capture, because a lot of sand is captured together with water, which gives problems on the operation of the machines, it is therefore necessary to limit the number of machines in operation, which means self-limiting even with respect to the concessions and needs of the user.

A reflection is solicited that goes beyond the end user, emphasizing that between the derivative work and the end user (farmer) there is a network of 50/60km and there is a need for an improvement in the infrastructure of the distribution network, because by taking 100, the one distributed to users is only 30%, while usually the incentive measures for agriculture go only to the user (and therefore to act on 30%) and not to the network. The example of the drip distribution system is given, which, although virtuous in principle, obliges to keep the system of open-air distribution channels upstream invaded for the entire season, with consequent loss due to infiltration. The critical issue is therefore to adopt incentive measures in one direction without taking into account the infrastructure already present.

Another critical issue was the strong need for water linked to the irrigation of biomass corn. It is necessary to consider whether the energy and water effort actually reflects the production of energy that comes from that corn, in a situation that is among other things so contingent on the absence of water resources.

Another critical issue was the overlap of the Covid pandemic, with available staff (teams and or operators) reduced to 50%.

Fabio Paglione (Consorzio Burana) intervenes suggesting that the past year must prompt reflection and consult all the actors involved before taking legislative and political decisions such as the priority in distributing the resource. Communication between the various actors and with the end user is also essential to sit down at the table and define the possible scenarios and actions to introduce and stimulate the rational use of the resource (the example of biomass corn is reported to understand when it no longer makes sense to irrigate the crop in an overall cost-benefit balance). The distribution plant can make it expensive to satisfy the request and it must therefore be taken note of how the territory is made and the complexity of distributing water to the territory.

The reflection moves on the scenarios and their practical usefulness: it is important to evaluate the extreme scenarios available (such as the anomalous vintage 2022), evaluate the consequences from the agro-meteorological point of view (precipitation and needs for irrigation, drinking water, biomass, etc.) and then the decisions to be taken. To do this it is necessary to establish concrete paths of dialogue at the technical, operational and legislative level.

Although there are plans on drought that have been discussed previously, this year all the consortia have had to distort these tools because it has been a year out of any forecast or hypothesis of adaptation. A new path must have begun in order to adapt to new vintages such as the one we have lived, given the technology we have (it refers in particular to projects to revive infrastructures). Worse than this year cannot happen, because worse than that everything turns off.

In response to the previous intervention, **Camilla Iuzzolino (Emilia-Romagna Region)** states that the situation can be even worse: it is in particular a disastrous year for the Po, but not for the rest of the region (those who do not source from the Po, however accustomed to the lack of summer water resources, have encountered difficulties but not exceptional, and the Romagna reservoirs have arrived at the summer season fortunately full).
We must start from the assumption that there is less resource available and there will be less. We need a "table" where to discuss these things together and on an adequate territorial scale, which however does not exist (in this form control room, now observatory, can not do much, if not mitigate the impacts of critical situations and try to ensure balance and safeguard priorities). The system should work thanks to the concatenation of competencies, decisions, etc. The real tables, therefore, would be the water balance plans, the PTA regional scale (no longer updated since 2005), etc. but while evaluating the intersectoral connections, they fail to affect much on all the strategic choices, often, among other things, of a national nature, including in agriculture, strategies and decision-making processes that among other things are changing a lot in recent years.
We can also talk about major interventions, but where there is no design and a table that holds together all the pieces in a strategic way *(invaded managers, consortia, users / demand, Region),* it is not easy to ensure effectiveness and overall consistency. The big problem is first and foremost at the level of the high system, then there are actually so many levels in which we should operate synergistically, at the local level.
In addition, there is a tendency to re-centralize everything at the national level, which means more funding, less logic/less territorial awareness and local knowledge (you can lose the

strategic vision without evaluating territorial effectiveness), but probably also less constraints.

Finally, the observatory on water withdrawals, a former control room, is a voluntary structure that brings together users and administrative skills, but in which a mutual bond is created in which, trying to find a balance between positions often opposed for interests, no one does their part to the end. It has played a fundamental role in maximizing communication and shared knowledge, acquiring and distributing knowledge in a homogeneous, methodical and continuous way, producing instead lower results on the action front (e.g. % reduction of withdrawals).

Paolo Mazzoli (GECOsistema) asks who, in case of drought and scarcity, directs the redistribution aspects of the resource for the different users, for example in the case of suspension and progressive reduction of withdrawals with a precise hierarchy (is it an aspect in the hands of the region or does it depend on a tavolo that is constituted on the spot?)

According to **Paola Zanetti (Consorzio di Bonifica dell'Emilia),** the current crisis has brought out the lack of governance regarding these issues (in line with the previous RER intervention). There is a wealth of knowledge now historical, also of data on the trend of withdrawals and weather forecasts that, intertwined with the knowledge of users, give an idea of what will happen next week, but it is necessary to grow both in sharing data and in reasoning together (*on actions*).
Returning to the problem of governance, the example of the aforementioned observatory and the indication "who can reduce" is recalled, while we must consider the broader picture that goes from production to the induced, and work on various fronts, and coordinates the various policies instead of carrying out separately *(energy, agricultural, investments in infrastructure, incentives to farmers, environmental protection*). For example, the effect that climate change induces on interconnected sectorsis cited: it is not only water, it is energy and how it is produced, and then there is a whole part related to excessive temperatures, which have caused interruptions in electricity supply but also problems with electrical equipment, and then the environment and, for example, for the growth of red algae, proliferated due to high temperatures. These are many very complex problems and as they are structured today at the legislative and organizational level the various bodies do not allow to put together all these issues. Each theme has its own niche: it lacks a 360-degree view.

Fabio Paglione (Consorzio Burana) replies that with regard to the derivations, and brings an example of interventions to be shared in a hypothetical table, or the reduction, in the plant inSabbioncello of the scope of more than half of the concession, is an action to be undertaken ideally after starting from the need to distinguish and prioritize the final user: what we put on the table, breeding, energy production. It is necessary to think at the scale of basin and region to start making choices: to have all the actors who talk to each other concretely.
The example of the knowledge of the volumes available for the sockets is cited, which, in spite of the concessions granted, are not present in the river except in favorable years. This knowledge allows you to "accustom" the territory served to have less water.
With regard to temperatures and therefore to climate change, the parent problem of everything, the consequences are confirmed at the plant level, of difficulty in operating and environmental (algae)

Paolo Mazzoli (GECOsistema) asks the participants how from the most plant point of view, the other side of the user, the industrial and hydroelectric one, has faced and managed, in Castellarano but not only, this particular period of crisis and if there are any particular strategies.

Ada Francesconi (Consorzio di Bonifica dell'Emilia Centrale) describes the plant of the Consorzio di Bonifica dell'Emilia Centrale as a detail, since in fact already normally between the beginning of June and early September it is stopped regardless of the peculiarities of this year. However, this year also in the months of February, March and April (which normally have a large production) was characterized by a very low production (from 1 million kWh in 2020 against 30,000 kWh this year).

From the point of view of management, there is the advantage that despite being a flowing water system it still has a minimum of control volume behind the crossbar, which also allows you to take advantage of the releases of enel's upstream power plants. So one of the difficulties of hydroelectric plants is precisely that of being able to regulate the operation with these hi discharges that are quite sudden, even for the maneuvers of hydraulic machines. In this case the compromise / foresight that has been put in place is a slightly lower regulatory quota for the hydroelectric plant, with the aim of storing and water so as not to lose it.

The other issue is the management of the distribution of flow rates in the event that there are more hydraulic machines, as in this case: with the smallest machine you can swirl even rather low flow rates, managing to go even when there is no such important resource. Micro Regulation, allowing to accumulate the resource and regulate it, is considered in the design phase when you have more plants.

In addition, from an economic point of view there are financial charges (repayment of loans, fees and so on), which are still to be honored regardless of how the year went and this poses problems for operators in the sector.

Emiliano Teodorani (AREN Group) says that for his case, there is no possibility of doing micro-regulation, because the plant is flowing water and is placed on a preesistente crossbar. From an operational and managerial point of view there are not many opportunities.

Teodorani confirms the collapse of production on the basis of the months of operation (usually until June, this year already in spring). In the Secchia basin a good part of the contribution to the flow of the river comes from the snow cover in the upper parts of the basin, which this year has been dramatically absent. The deficit has already affected the winter season, which is then reflected in the following months, underlining how we begin to talk about emergencies often when it is already too late.

Teodorani proposes a reflection on hydropower as a "solution", in the long term, to the problem of CC, because withdrawal (however not dissipative) of resources in competition and with other users, but for the production of clean energy, at the base of the strategies for the fight against CC.

From the point of view of management, little can be done except to plan maintenance; it reiterates the need to support the hydroelectric sector, planning agreed solutions and between the public and private actors involved.

Paolo Mazzoli (GECOsistema) suggests that implants can offer a possibility of knowledge that perhaps did not exist before on the territory, in the form of measurement systems. Normally the presence of the system can be used to significantly increase knowledge by translating it into a measuring station that was not available before.

According to **Cristina Voltolini (IRETI),** this year the problems they usually have for small mountain aqueducts have expanded, ordinances have been made decided at regional level: the municipalities have had limitations on uses such as irrigation gardens or washing machines or on the filling of swimming pools.
It brings some examples of adaptation strategies to be adopted. A strategy that is being implemented is to move more and more funds on the search for losses, because there is an average of losses of 32%: from 22% province of Reggio, 52% province of La Spezia.

Another strategy (with sponsorship and help from the Region) was the reuse for irrigation purposes of a part of the water of the Mancasale purifier, so in the irrigation period it is possible to release 200 liters per second of clean water in a cable for irrigation use. But purification is expensive from the point of view of treatment. It may be interesting to use this water not only for irrigation use, but also to fill tankers for other (service) uses.

Also for IRETI, there was the problem of lifting systems sensitive to high temperatures and interruptions in electricity supply.

The most critical issues are recorded in mountain aqueducts. With the storage of the underground aquifer we see levels such as those of 2003, with a different inertia of the underground aquifer. Derogations have been made from the DMV and an attempt is being made to consume as little water as possible.

Second part on available and usable models and data

Cinzia Alessandrini (ARPAE) describes the role of ARPAE, which does not intervene in the policy issues of the region, in the management of plants or equipment that can be used to provide irrigation resources, or water resources in general, but provides upstream support to all the realities involved through chemical servicesor with modeling.

The water balance modeling and the Colt forecast service are active to give indications on irrigation needs for the following season and performance evaluation a posteriori, to assess whether the forecast was effective or not (all visible on the site). This is a useful indication/forecast especially in situations of water scarcity, because support for irrigation and decision-making systems is fundamental. It emphasizes the value of forecast information to support decisions in the event of drought.

As for hydrological models, at the level of hydrological-hydraulic modeling, ARPAE for many years has developed a system called DEWS, Drought Early Warning System.

Then, as hydraulic modeling, the Ribasim model is used, which is a model of the basic budget that tries to give a forecast at +10 days and is working especially on the Po auction. However, in Emilia-Romagna it was also developed on the main exits downstream of all the waterways, so it was implemented not in the mountain part but in the part of the closure of the basin. Obviously it can be improved, especially for the whole part of derivations, because for all the part of knowledge of the derivations, the more there is real data of derivations the more the model is performing. (*From the discussion it emerges that the model is also active in the basin upstream of Castellarano, but not in forecast mode and that the data of the historical simulations have been requested*)

PRESENTATIONS by **Paolo Mazzoli (GECOsistema)** hydrological models and data and **Jaroslav Mysiak (CMCC)** econometric models (see attachments)

When it comes to adaptation strategies and availability forecasting, some users are more interested in management than planning. Paolo Mazzoli (GECOsistema), after providing a brief summary of the data available and requested from users, asks the participants what information is most useful, for example time horizon, short-term availability scenarios, climate change forecasts or very short and medium term.

Camilla Iuzzolino (Emilia-Romagna Region) declares her interest in hearing what users have to say about the data they need (forecast or actual use, etc.) to direct efforts and investments in the best way. We are also considering an agreement to further share both qualitative and quantitative data with the reclamation consortia.

Ada Francesconi (Consorzio di Bonifica dell'Emilia Centrale) states that for their type of hydroelectric, short-term models could be useful on the management part, in order to make predictions with respect to the management of the plants and implement strategies of plant modifications, as far as possible, to be able to maximize the protections according to both precipitation and the uses of the resource on the territory. A more concrete challenge concerns the future of hydropower, also from the point of view of the possibility of realizing small plants.

A long-term forecast, even on hydrological changes, not at the level of the balance sheet but at the level of variation of the hydrological regime on the considerations on the sizing of the plants, could be a useful thing (such as *peaks and lean represented by the Duration Curve*). Future reflections will have to be made to rethink the use of peak flow rates and on the management of flow rates. In the current situation there are full or soft of which it is often lost or not possible to use most of them, in the face of maximum flow rates that are those derivable from the plants. We should try to limit, use, store and laminate these flows.

With regard to the management of the hydraulic risk of the territory, the Reclamation Consortium must also manage the drainage network, cope with the problem of intense rainfall, and the management of the rolling tanks; these are still widespread and very numerous storage on our territory: this water could be put into a system to make a reasoning of use at times when we will need it.

According to **Emiliano Teodorani (IREN)** from the point of view of an investor who can evaluate further investment possibilities beyond the Castellarano node but throughout the region, what would be needed is a reliable model, which returns the curve of average duration of several decades of the flow rates at any point of the river auction not monitored.
A management of the resource in laminar mode for the peaks of flood would be desirable but from the political point of view who realizes the works, who invests, who manages them, who agrees all the utilities?

For **Camilla Iuzzolino (Emilia-Romagna Region)** what is missing is the ability to frequently update and extract data. In addition, when you want to make data available, even in strategic terms, the data must be more substantial. Therefore, both the quality of the data and its return to a scale of greater detail (stretches of waterways) must be improved. A more geographically appropriate, more robust and reliable figure, which considers values that are more realistic uses. This is linked to the ability to update and recalibrate the model according to all the activities that take place in the area and the continuous updated information on the uses that the consortia send. An effort is underway to update the model system, which is not only regional, but has been chosen by the district authority as a general chain for the entire Po valley district, with which the regions will have to interface for their territorial scope. It must then be thought of as an interface suitable for the outside, to bring out the data of the model that now, in fact, is only for internal and planning use.

Gaetano Di Mauro (Consorzio di Bonifica dell'Emilia Centrale) points out that the issue of the importance of collaboration and communication in terms of exchange of data and information has emerged several times and; in their case, the exchange of data with Enel, with the operators of the upstream power plants, is especially important for the reasons already mentioned by Ada Francesconi.

In the specification, the conformation of the Castellarano cross, which in addition to the barrier on the river has a reservoir laterally, allows to store flows of about 800,000 m^3 that can not be retained directly in the dam body, to be reused possibly for modulated releases during the irrigation season.

As for the Secchia, specifically the Consorzio di Bonifica dell'Emilia Centrale has two basins, which underlie the operation of power plants. Knowing the periods and flow rates of operation with which Enel operates these plants and sharing what may be the flow rates arriving from the upstream basin, can make it possible to anticipate these peaks of releases: useful to avoid perdere precious resources. And this is now possible thanks to direct contacts.

Camilla Iuzzolino (Emilia-Romagna Region) considers the previous proposal interesting, but it would be data to be managed in real time and normatively it is not yet so easy to ask for the return in real time of the released volumes. This is also an important issue to include in the reasoning on the arrangement of data, as well as using them for scenarios and modeling to support assessments, planning and strategic strategies.

It should be noted that it is necessary to move from direct contacts to a more structured path for data sharing, some of which is already under way with agriculture and consortia, and that even with the hydroelectric part there would be work to be done in this sense, also taking

advantage of the tendering of large derivations for hydroelectric use. which in the Emilia-Romagna Region all expire in 2029, with a procedure starting from 2024, during which management methods and availability of data will constitute preferential criteria. Updating everything there will be an improvement.

According to **Cristina Voltolini (IRETI)**, the important problem raised by the Region is also to have good data to be included in the models, not only sharing but also control and quality of data.
There is also the risk of data pollution of the monitoring stations: every year it would be necessary to recalibrate the runoff curves (with specific skills) and to establish control sections calibrated to the sources to make the hydrogram.
What the aqueduct operators ask for a forecast model is to give indications (in the wake of the quadrant scheme shown in Dr. Mysiak's performance) to identify the arrival of extreme situations and anticipate the peaks that, if in conjunction with the intraday peaks of demand, can determine critical situations on the network.

FINAL CONCLUSIONS by Jaroslav Mysiak and Paolo Mazzoli
In addition to renewing the request for transmission of local data in the possession of users (as summarized in the presentation of Ing. Mazzoli).

In closing, the usefulness of targeted news directly on the channels (social and other) of users for the communication of the work that is taking place in the Lab is reiterated, collecting the first adhesion by **Emanuele Cimatti (Emilia-Romagna Region),** who is available to promote the activities also on the Facebook Page "Acqua risparmio vitale" managed by the Region.