Policy recommendations
Towards a higher resilience to drought in the Po basin

Drought characterization & early warning

Besides the huge water availability due to rainfall and the storage capacity provided by alpine lakes and reservoirs, Po river basin experienced in the latest years several drought/water scarcity events (the first in 2003, the last one in 2012 summer). This is why from 2007 a very advanced computer model system, called “DEWS-Po: Drought Early Warning System for the Po River” has been developed. This system can be profitably used both for crisis management and planning purposes, or even for “what-if scenarios” simulation. It provides advanced tools to simulate the hydrological and anthropic processes that affect river flows and allows to follow events with real-time evaluations. In early 2012 the same system enabled also forecasts.

DEWS-Po system gives a real-time representation of water distribution across the basin, characterized by high anthropogenic pressure, optimizing with specific tools water allocation in competing situations. The system represents an innovative approach in drought forecasting and in water resource management in the Po basin, giving deterministic and probabilistic meteorological forecasts as input to a chain for numerical distributed modelling of hydrological and anthropic processes. The system architecture is designed to receive in input hydro-meteorological actually observed and forecasted variables: deterministic meteorological forecasts with a fifteen days lead time, withdrawals data for different uses, natural an artificial reservoirs storage and release data. The model details are very sharp, simulating also the interaction between Adriatic sea and Po river in the delta area in terms of salt intrusion forecasting (Source: Alessandrini, Del Longo, Pecora, Puma, Vezzani, 2013).

Drought management: Towards a risk-based approach

The consultation with stakeholders helped to identify and select several measures for drought risk mitigation for agriculture and energy production (the main sectors affected by past drought events). Different types of options are in fact recommended and appreciated by stakeholders (either supply management, demand management or monitoring options):

- The evaluation process has first of all put in emphasis on the role of monitoring and information activities, both for agriculture and energy. They were evaluated as quite feasible, they do not entail considerable social, economic and environmental costs, and they can be effective in reducing the negative effects of drought events. Therefore these activities in the Po basin should be strengthened and improved.

- On the contrary, the recovery options in agriculture, such as the subsidies for farmers, that in several cases have been implemented after the drought events, are not appreciated by stakeholders and experts. They are supposed to be too expensive, not feasible, and apparently without any capacity to mitigate the drought risks. Moreover, the quantitative ex-post analysis of the socio-economic impact of drought events have underlined that farmers not always might be damaged (but they can even gain from them).

- Increasing storage capacity, both for agriculture and energy, although frequently seen as an effective measure for drought risk mitigation, is not considered feasible and acceptable enough nowadays in the Po basin. Seemingly, options that entail relevant investments, such as the demand management options for the energy sector, are not so appreciated.
Drought management: Towards a risk-based approach (continued)

- The measures that entail a better efficiency of the public institutions, such as the one related to the controls on illegal withdrawals, are quite appreciated. So, they should be defined, planned and implemented in the future.

- Changes in the legal framework (withdrawals permits, pricing mechanisms) received a bad evaluation, actually revealing a conservative approach. Deeper analyses and studies on their effects are therefore recommended.

- Options that concern technological advances, such as the one related to the upgrade of the irrigation techniques, are quite popular among stakeholders and experts. So, investments in this field should be promoted and supported.

### Qualitative-quantitative evaluation of policy options by stakeholders

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<th>Position</th>
<th>Evaluation criteria</th>
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- (a) Contribution to reduction of drought negative effects (from 1: very low to 5: very high)
- (b) Economic feasibility (from 1: not feasible to 5: highly feasible)
- (c) Technical feasibility (from 1: not feasible to 5: highly feasible)
- (d) Institutional feasibility (from 1: not feasible to 5: highly feasible)
- (e) Environmental effects (from 1: not acceptable to 5: highly acceptable)
- (f) Average general evaluation, which synthesizes all the above listed criteria, and is calculated as their arithmetic mean
- (g) Technical-economic feasibility, which is the arithmetic mean of technical, economic, and institutional feasibility (b, c and d)
- (h) Social, environmental and institutional acceptability, which consists of the arithmetic mean of (d), (e) and (f)

Science-Policy Interface

The Case Study Dialogue Fora realized in the Po basin were quite effective. They were able to gather a significant number of actors and institutions around the table, they stimulated an interesting and intense discussion, and they allowed to achieve the goals that each of the fora had. That is to say, to discuss the past drought responses and the vulnerability to drought, to imagine the future scenarios, and to evaluate the policy options for drought risk mitigation.

In the future, Science-Policy interface in the Po basin should aim at: (a) involving a wider spectrum of sectors, not only stakeholders from agriculture and energy as done so far (for example, environment should be involved and represented much more); (b) improving more and more the ability to communicate and exchange data, information, and scientific results, between scientists and stakeholders.