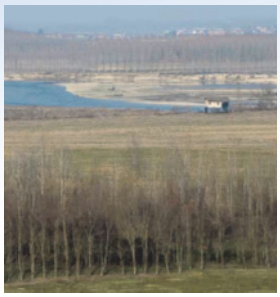
Po River Basin, Italy

Drought management in a wide, densely populated and highly developed area

General information
Location: Northern Italy (small part in Switzerland and France)
Area: 74,700 km^2
Permanent Population: 17 million
Density: 225 inhab./km^2 (Italy: 180)
Many urban centers known for their cultural and artistic heritage
Highly valuable environmental and landscape resources (Delta area UNESCO world heritage)
Climate and water availability
River length: 652 km N. of tributary rivers: 141
Average precipitation: 1,200 mm/yr (Maximum rainfalls in spring)
Total annual water volume supplied by precipitations: 78 billions m^3
Average temperature: 5°C in high Alps; 5-10°C in medium mountains; 10-15°C in other areas
Water available from Alpine lakes: 1.04 billions m^3
Main economic activities
40% of Italian GDP, 37% of Italian industrial activities and 35% of Italian agricultural production
Agriculture: 2,700,000 ha UAA Forage & arboreal crops
Industrial sectors: mechanics, textile and clothing, food

The Case Study context

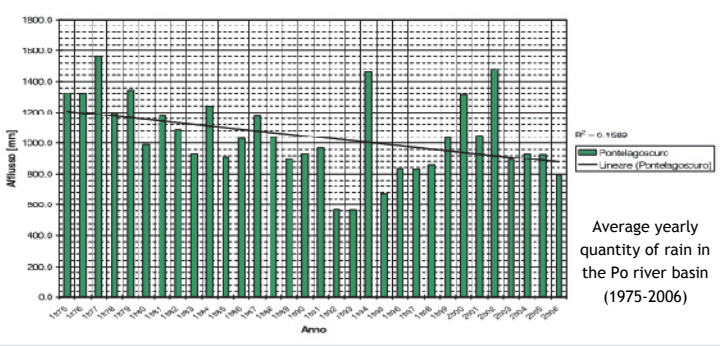


The Po river basin is the biggest in Italy. The availability of water is high, attributed to the climate conditions, the lakes and reservoirs in mountain areas. Water demand is also high (important uses are irrigation and hydroelectric production), particularly in summer when there is intensive use of water by farmers, even for cultivations of low added value. Moreover, the area is characterized by a very high concentration of population and industrial activities. The average annual water withdrawal is 1,900 m^3 per capita, a value much higher than those in other European countries (600m^3 per year and capita). Drought management plans have not been developed, with the exception of Emilia-Romagna region, and a 'reactive approach' is typically followed. For example, in the recent past drought events (2003 and 2006/2007) responses were based on: (i) voluntary agreements among the stakeholders involved in order to guarantee the minimum levels for the priority uses, and (ii) issue of states of emergency, by the national government.

Drought as a natural hazard: past & future

The average annual rainfall decreased by about 20% the last 30 years in the Po river basin, whereas since 1960 the average annual temperature increased by about 2°C. The intensity of single rainfall events increased –and, consequently, the number of extreme events– but the number of days with rainfall decreased, particularly in spring and summer.

The major drought events of the last decades occurred in 2003 and in 2006/2007.



Average yearly quantity of rain in the Po river basin (1975-2006)

In 2003, after a scarcely snowy winter, precipitations were very infrequent in spring, resulting to a significant decrease in water flows in the plain areas of Lombardy & Emilia-Romagna and in the Appenine regions by 60-65%. In 2006, and particularly in the last months of 2006 and in January 2007, precipitations were widely under the seasonal average (20% - 40%) and as result water flow in Po River was under the level registered in the same period in 2003.

The current framework for drought management and planning

There are no drought management plans developed for the Po river basin. Past management efforts mainly involve voluntary water allocation agreements and emergency measures.

Voluntary agreements among all relevant stakeholders aimed at maintaining minimum levels of water flows for irrigation and thermoelectric plants, employing water from alpine hydroelectric reservoirs and inducing a more provident and efficient water use for irrigation. The Po River Basin Authority was the key actor who arranged the agreements. National efforts refer to the issuing of states of emergency, where a commissioner is appointed in order to carry out extraordinary and urgent activities, coordinating several temporary government bodies at national and regional level.

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The Po River Basin Drought-R&SPI Case Study Forum

National authorities

Ministry for Environment and Territory and Sea
Ministry of Agricultural, Food and Forestry Policies
Ministry of Economic Development
Presidency of the Council of Ministers, Civil Protection Dpt.
Po River Basin Authority
Interregional Agency for the Po River (AIPO)
Public Authority in charge of managing energetic services (GSE)

Regional and local authorities

Lombardy Region
Piedmont Region
Veneto Region
Emilia-Romagna Region
Tuscany Region
Liguria Region
Aosta Valley Regional Government
Provincia Autonoma di Trento
Public authorities in charge with the management of lakes

Water Users

National Association for Reclamation, Irrigation and Land Improvement (ANBI)
Electricity companies
Farmers associations
Manufacturers associations
Water and sanitation suppliers (and their associations)
Tourist enterprises associations
Environmental and landscape protection associations

Other stakeholders

CERTeT, Bocconi University

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Current vulnerability to drought

The Po river basin is extremely vulnerable as there are no drought management plans. The Italian law provides several planning tools to regional governments in order to address drought hazard, such as the Water Protection Plans (Piano di Tutela delle Acque, PTA), but the issue of drought management is absent from most of the plans carried out by the regional governments, except for the cases of Emilia-Romagna and Veneto regions.

The Emilia-Romagna drought plan includes actions such as the identification of the areas threatened by drought risks, the establishment of a monitoring system, the analysis of economic, social and territorial impacts and vulnerabilities, and the definition of responses to drought crises.

In addition to the deficiencies of the water management framework, vulnerability to drought depends on the socio-economic characteristics of the area. The major water user is agriculture, accounting for an annual water withdrawal equal to 17 billion m^3/yr and an average annual water withdrawal per surface unit equal to 15 m^3/yr/ha. Irrigated areas amount to 1.1 million hectares. The predominant irrigation system is surface irrigation (almost 50% of irrigated areas), which is inefficient and not flexible, as it works on turns.

The energy production sector, in particular hydroelectricity, is highly water-demanding. Its vulnerability is increased by the old age of power plants (65% of which began operation before 1950), and by the lack of planning in their spatial development. Hydroelectric production is expected to grow, as it is one of the energy production alternatives for reducing the greenhouse effect.

Annual Water Volumes by Use

Type of use	Volume (10^6 m^3/yr)	Surface water (%)	Groundwater (%)
Drinking	2,500	20	80
Industrial*	1,537	20	80
Irrigation	16,500	83	17
Total	20,537	63	37

**Energy production excluded*

Research challenges within the context of Drought-R&SPI

The main research challenges for the Po River Basin are:

1. Improvement of methods for ex post and in particular ex ante evaluation of economic impacts, in relation to responses to drought mitigation options;
2. Assessment of the costs of measures aiming at making more flexible the water allocation system;
3. Assessment of the long-term sustainability of irrigation systems;
4. Evaluation of the effectiveness of options for long-term risk mitigation;
5. Assessment of the effects of climate change on Alpine outflow, considering in particular the scenario hypothesis that will occur when glaciers retreat and will not be able to balance the rainfalls reduction trend.