



# SUWANU EUROPE

## State of play analyses for Po River Basin, Italy

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## Socio-economic characterization of the region

### General

Location (<https://mapchart.net/europe-detailed.html>)

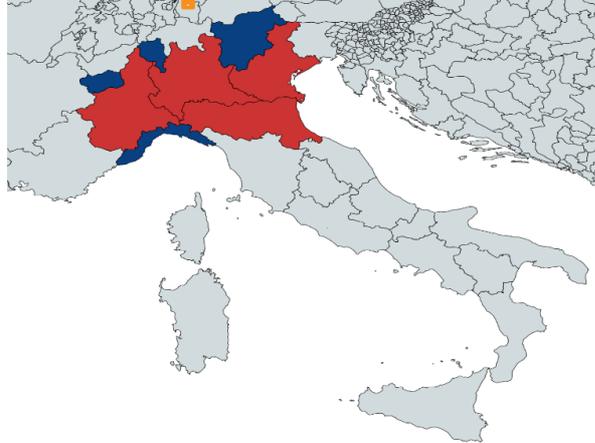


Figure 1. Po river basin. In red, the regions considered by SuWaNu EU, in blue those not considered for the project purposes.

The PO VALLEY is the largest and most important economic region in Italy. It is the centre of most Italian industry as well as Italy’s agricultural heartland. The Po River, called Po in Celtic idiom (it means “water”) “Eridano” or “Padus” in Latin, the origin of the term Val Padana (“Po Valley”), begins as a mountain stream near the peak of Monviso (3,841 m), in the Cottian Alps on the border with France. The Po river is running 652 km from west to east. It flows across seven regions (namely Piemonte, Valle d’Aosta, Liguria, Lombardia, Emilia Romagna, Veneto, Trentino Alto Adige), and it is, but we consider the main ones), joined by several rivers and streams flowing down from the Alps. Near Alessandria, it is joined by the river Tanaro, which flows from the south, originating in the Apennines. As a general consideration, the Po’s tributaries can be differentiated between those originating from the Alps and those arriving from the Apennines, which are subject to very different characteristics in terms of seasonal flood patterns.

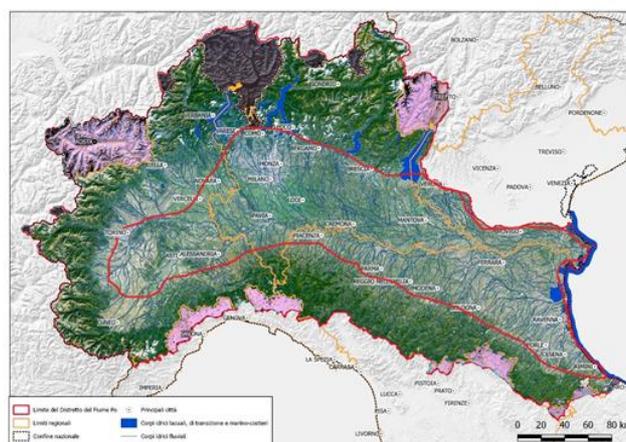


Figure 2. SuWaNu Eu considers only a part of the Po river Basin. The red boundaries highlight the area considered for the project (approximated.)

Together with its 141 tributaries, the Po catchment area stretches across 70,000 square km.

The area considered for the Italian pilot involves the main regions, in particular, four regions (namely Piemonte, Lombardia, Emilia Romagna, Veneto) and includes the large part of the most important towns, industrial and agricultural areas in Northern Italy. From the study, areas have been excluded the river basins portion about Liguria, Valle d'Aosta, Toscana, Marche and Trentino-Alto Adige, as well as those areas located in France and Switzerland (false colour in the figure). The Italian pilot focuses on the most urbanized and intensively cropped areas of the basin (red perimeter in the figure) where that water reuse is feasible and can offer good opportunities for all the involved stakeholders. In the study area operate 710 Wastewater Treatment Plants equipped with tertiary treatment technologies (ISTAT, 2015).

### Climate

Italy lies in the temperate zone. Because of the considerable length of the peninsula, there is a variation between the climate of the northern areas, which are closer to the European continent, and the southern zones, which are surrounded by the Mediterranean Sea.

Focusing on the investigated area, the Po. The Po valley has hot summers and severe winters (especially in the interior areas, far from the sea). The Po Valley has a mild continental climate and a humid subtropical climate with annual precipitation ranging from 750 to 1,200 mm, the highest rains occur in springs. Upper Po receives more precipitations than Lower Po. The average temperature is about 5°C in high Alps, 5-10°C in medium mountains and 10-15°C in other areas. The average winter temperature is of about 3 °C and the summer average 23 °C. Extreme temperatures are more and more frequent. Rain falls mainly in the spring and autumn and increases with altitude

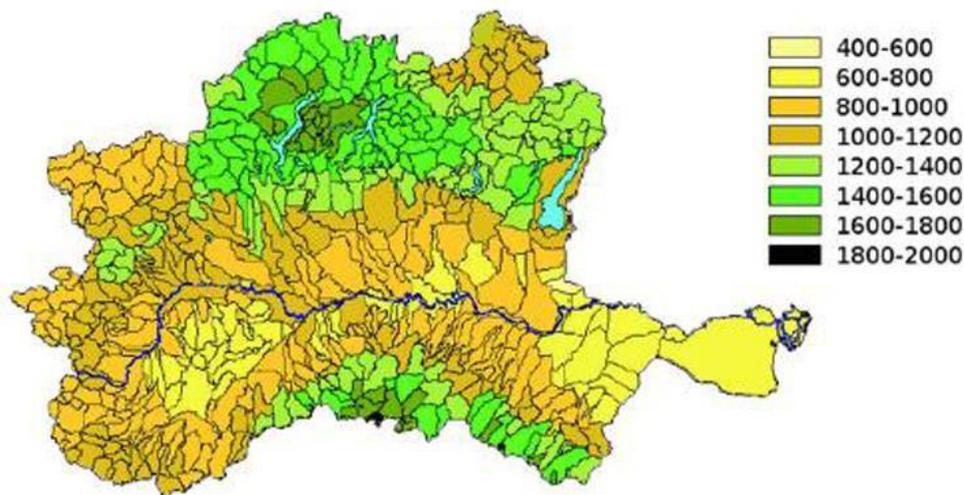


Figure 3. Annual total rainfall distribution in the Po valley

### Geography

The Po Valley is located in continental Italy. It is enclosed between the Alps to the north and the Apennines to the south. It extends from the Cottian Alps to the west, up to the Adriatic Sea to the east. The Po Valley represents 71% of the Italian flat land and 16 % of the entire surface of Italy. Its extension is approximately 46,000 km<sup>2</sup>. It is the largest plain in the whole of southern Europe. Many water bodies flow in the Po Valley: the main one is the Po river that crosses it from west to east and into which many tributaries converge. Besides the Po and its tributaries, the Adige, the Brenta, the Piave, the Tagliamento and the Reno flow into the Po Valley. Upon its soil characteristics, the Po Valley can be roughly divided into two parts: the high plain and the low plain. The high plain is in contact with the Alps to the north and the Apennines to the south.

It has an elevation above the sea level ranging from 200 to 400 m. It is formed by a stony and coarse ground, very permeable. In this area, there are large population centres and many industrial areas, while agriculture is not very developed. The low plain has a height above sea level that does not exceed 100 m. Here the soil is formed by thinner debris consisting mainly of clay and silt. This soil is less permeable but more fertile.

For this reason, intensive farming is widely practised in this area. In the areas of contact between the high plain and the low plain, a contrast is created between permeable soils and impermeable soils. This causes the waters to spring on the surface, giving rise to an intermediate area called the resurgences or fountains. This area has great historical and actual economic importance because it allows irrigation. Consequently, a clear demarcation is created between the vegetation of the higher, more arid, plain and that of the lower plain, more luxuriant due to the considerable presence of water.

#### Population

More than a third of all Italian citizens (about 23 million people), live in the Po Valley. In the Po river basin are located ten cities with populations surpassing 100,000 units, as well as Turin and Milan which both overpass 1 million persons. In many areas, the population density (355 inhab./km<sup>2</sup>) is almost double compared to the national average (203/km<sup>2</sup>). In the following figure, the population distribution in the Po Valley is shown<sup>1</sup>

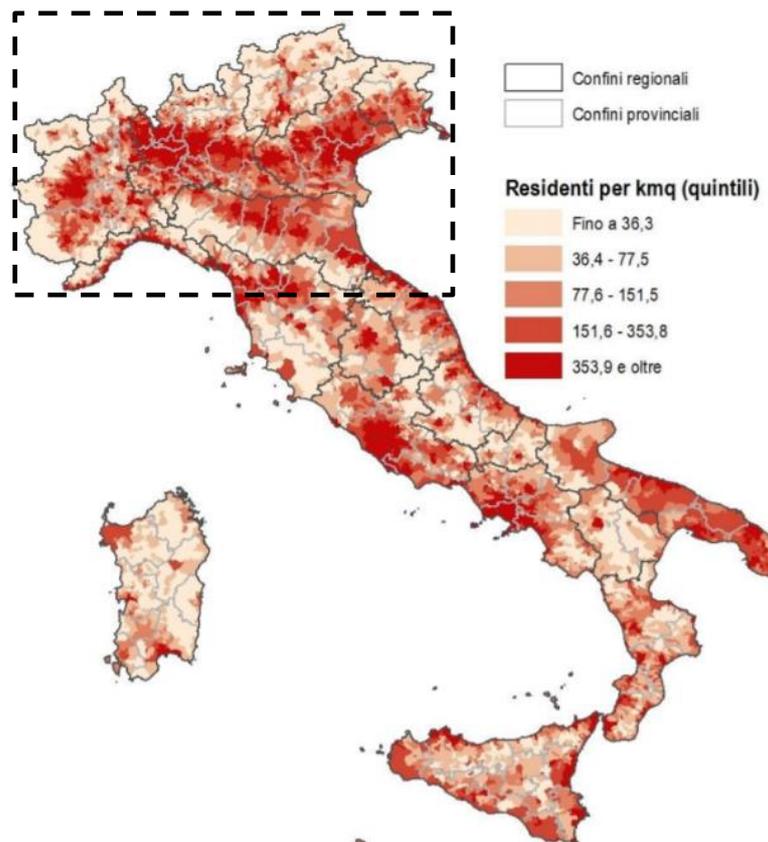


Figure 4. population distribution in the Po Valley

Economic data (GDP, the share of GDP by sector...)

<sup>1</sup> ISTAT, LA SUPERFICIE DEI COMUNI, DELLE PROVINCE E DELLE REGIONI ITALIANE.  
<https://www.istat.it/it/files/2015/04/Superfici-delle-unit%C3%A0-amministrative-Testo-integrale.pdf>

The Po valley draws the Italian economy with a GDP that reaches 738 billion euros, exceeding nations such as the Netherlands, Sweden or Poland. The fertility of the soil, the abundance of water, the ease of communication routes has favoured the development of economic activities. The daily work of man during centuries has increased the richness of this area through the reclamation of the marshy areas of the low plain and the irrigation of the upper part. The river's agricultural and industrial relevance has played a primary part in the political and social history of Italy—the basin today accounts for 40 % of the nation's gross domestic product—but suffered serious environmental consequences through the poor water management, industrial and sewage pollution, and agricultural runoff. All branches of industry are widely represented; the major poles are the metropolitan areas of Milan and Turin, but along the whole extension of the two piedmont axes there are industrial centres, which are not lacking even in the intermediate areas, particularly in Veneto, where industrialization has spread so uniformly in the territory.

#### Urban structure

Nearly half of the Italian towns >100.000 inhabitants are located in the Po Valley (18 out of 43). Out of the major centres, the urban network of Padania is well structured in a dense articulation of small cities, by now well-equipped also from services and of the commercial supply. The Po Valley is the most developed region of the country in almost all sectors of the economy, starting from very efficient and intensive agriculture.

The following map shows the tight interdependences and interrelations between the hydrological network of the Po tributaries, and of the Po river itself, with the main cities. The urban structure has developed along millennia on the banks of the main rivers, and then expanded following the expansion of the agricultural water networks, built to drain marshes and to irrigate the land.

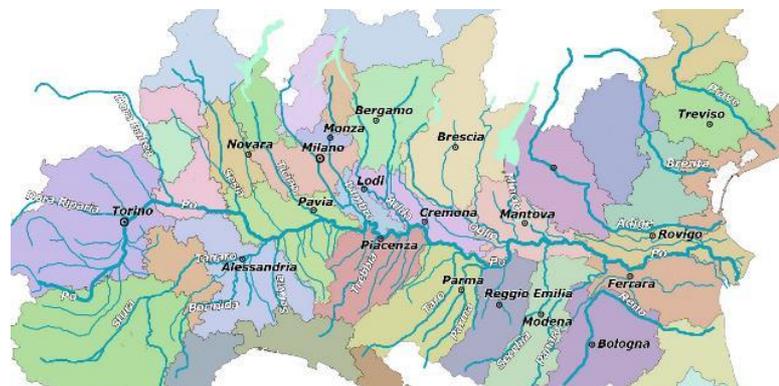


Figure 5 Relation between the hydrological network of the Po river and its tributaries and the main cities.

Agriculture: rain fed (ha), irrigated (ha), livestock, very general description here

The Po Valley is the most developed region of the country for the agro-food industry and the related agricultural sectors. Agriculture has a high productivity index, thanks to the diffusion of irrigation and mechanization. The production range is quite varied; the most common crops are cereal crops destined for human consumption (wheat, corn and rice) and forage crops (including maize). Industrial plants are mainly represented by beetroot, potato and tomato for processing, while textile crops (flax and hemp), once very important, have almost disappeared. In peri-urban areas and in some specialised areas horticulture is flourishing, while fruit growing reaches its greatest extent in Romagna. Very important, and indeed in vast areas, the main source of agricultural income is the breeding (cattle -4.188.000 heads -, pork – 2.791.000 heads-, and poultry), which feeds flourishing conservation and transformation activities.

Table 1: Irrigated area and irrigation volumes

	UAA (Agri ha)	Rainfed (ha)	Irr. Area (ha)	Irr. Vol. (m <sup>3</sup> /ha)	Irr. Vol. (hm <sup>3</sup> )	% of the IT total UAA	% of the IT total Irr. Areas	% of the IT total Irr. Vol.
<b>Po Valley (Only District)</b>	2.770.059	1.615.887	1.154.172	6.151	7.099.879	21,6	47,7	64,0
<b>By Regions (Total)</b>								
<b>Piemonte</b>	1.007.000	765.000	368.000	7.503	2.304.000	8,4	14,2	21,0
<b>Lombardia</b>	986.825	643.008	474.989	7.320	2.487.000	7,7	11,2	19,6
<b>Veneto</b>	879.554	566.879	398.774	6.882	2.301.000	7,2	10,3	17,9
<b>Emilia Romagna</b>	1.064.755	748.077	453.068	7.224	2.396.000	8,6	13,8	20,2

- Hydrological data (Water resources, water use and sector use)

The total annual water consumption in the Po District is of about 20.5 billion m<sup>3</sup>. Within this amount, 2.5 are for potable use, 1.5 for industrial use and 16.5 for agriculture. Groundwater extraction is of about 6 billion/ m<sup>3</sup>/ year. The remaining 14.5 billion/ m<sup>3</sup>/ year are collected from surface water bodies. The main portion of irrigated area in Italy, corresponding to almost 50%, is located in the Po river district, followed by the district of the Apennines in the south (with 19%), and the district of the eastern Alps (with 15% of the Italian irrigated area (Figure 5))<sup>2</sup>.

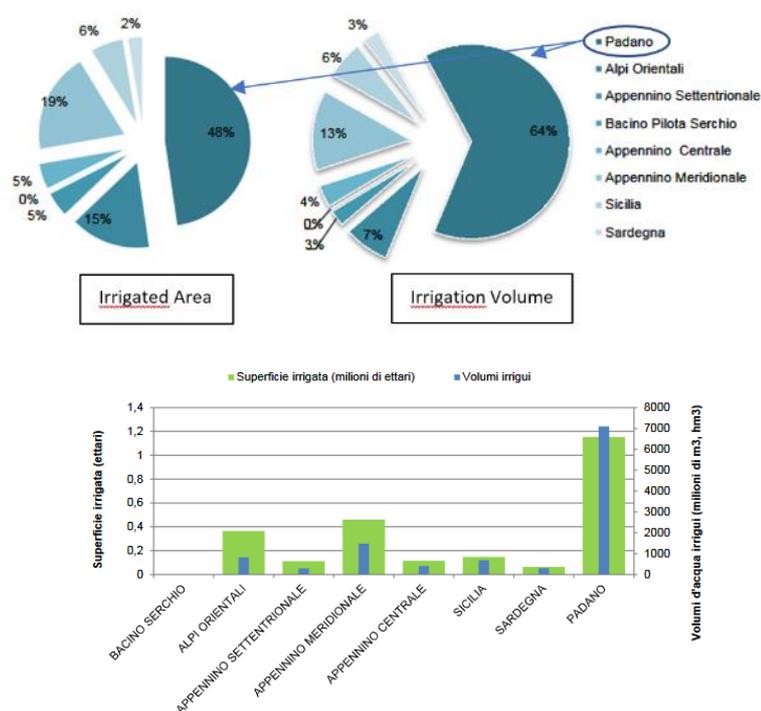


Figure 6. Irrigated area and percentage of the total irrigation volume in Italy per River Basin District

<sup>2</sup> Istituto nazionale di statistica -ISTAT, 2014. 6° Censimento Generale dell’Agricoltura. UTILIZZO DELLA RISORSA IDRICA A FINI IRRIGUI IN AGRICOLTURA. ISBN: 978-88-458-1805-9.

Table 2 Water source

Po Valley (District)	Groundwater	Natural/artificial storage basins	Surface water (natural water bodies)	Agricultural water network (on shift)	Agricultural water network (on demand)	Other source
ha	174.815	31.918	122.576	521.199	272.854	30.809
%	15,1	2,8	10,6	45,2	23,6	2,7

Table 3 Irrigation methods

Po Valley (District)	Surface Irrigation	Flood Irrigation	Sprinkler	Micro-irrigation	Other Methods
ha	576.556	208.147	310.578	48.088	10.803
%	50,0	18,0	26,9	4,2	0,9

## Hydrology

The surface of the Po river basin closed at the Pontelagoscuro (FE) gauging section, is approximately 70,000 km<sup>2</sup>, only the district is around 46.000 km<sup>2</sup>, while the length of the main Po river stretch, from its origins to the sea, is about 650 km. Along its course it is fed by 141 tributaries and, after crossing the Po Valley, it flows into the Adriatic sea, with a delta of 380 km<sup>2</sup>. The last large territory of the Po river basin is formed by mountain catchments for 31,000 km<sup>2</sup> (44% of the entire basin area) and by plain for 39,000 km<sup>2</sup> (equal to 56%) (fig. 1). The wide artificial reclamation canal network of Lombardy, Veneto and Emilia Romagna provide a sensitive accumulation of water widespread distributed over the entire territory. From the hydrological point of view, an extremely important role is played by the huge amount of canals (especially in the vast plain area) which slow down the hydrological cycle, providing water supply for irrigation and industrial purposes and sustaining the flood lamination with the significant delay delivering water delivery to the main collector. For their storage and buffer capabilities, we must also remember the analogous situation exercised by the large pre-Alpine lakes (Garda, Iseo, Como, Maggiore), all regulated, as well as the artificial reservoirs. Mainly built for hydropower production. The total annual water volume in the basin is up to 78 billion m<sup>3</sup>, which is mainly supplied by rains. The existing reservoirs in the Po basin have a total volume that reaches 2.2 billion m<sup>3</sup> of water which, compared to 8.4 billion m<sup>3</sup> in reservoirs throughout Italy, represents 26% of the national lake reserves. Concerning the as for groundwater hydrology (which is less known), it, it has been highlighted that the Padano aquifer, whose consistency is estimated at over 5 billion m<sup>3</sup>, is among the biggest at European level. The. Following the monthly examination of the precipitation, five classes - provided the average monthly precipitation, which makes it possible to define the pluviometry regimes of the Po basin. During last decades, several classifications have been proposed, in terms of number, characteristics and aims, all of which originated from the classical schemes adopted in the past by the National Hydrographic Service, which envisage the five known classes of pluviometry types (fig. 3):

- The "of pluviometry are identified in the Po basin: the "continental", characterized by maximum summer and minimum winter precipitation, affecting;
- the "alpine sub-littoral", with maximum rainfall in spring-autumn and minimum winter and summer;
- the "sublitoraneo occidentale";
- western sub-littoral"; the "Padano sub-littoral" and
- the "Apennines sub-littoral", with two maximums and two minimums, with the highest autumn maximum and the lowest summer minimum.

Concerning the basin average annual precipitation (i.e. 1100 mm), equivalent to an average annual inflow volume of approximately 77 billion m<sup>3</sup>, the Po conveys to the sea only about 2/3

of its water discharge (namely about 47 billion m<sup>3</sup>, equal to 670 mm of uniformly distributed water height). The remaining volume of 30 billion m<sup>3</sup>, corresponding to 430 mm of the water height, represents consumption for evapotranspiration, irrigation and infiltration into the soil.

## Regulatory and institutional framework

### Legal framework

The current legal framework in Italy allows reusing around 233 million m<sup>3</sup>/year, mostly to irrigate crops<sup>3</sup>. The largest European water reuse scheme for agricultural irrigation is located in Rogoredo, near Milan, where rice, corn, grass and horticulture are supplied with approximately 86 million m<sup>3</sup>/year of reclaimed water.

In Italy, the national legislation sets out very high-quality standards for agricultural, urban, and industrial application, but regional authorities may impose even stricter quality standards. It should be noted that many regions have imposed stricter quality standards, bringing the quality of reclaimed water almost to the same standard as drinking water, even for non-potable uses<sup>4</sup>.

Compared to the Commission proposal for a Regulation on water reuse, the Italian framework is quite detailed concerning the parameters controlled (and monitored). However, the Italian framework neither differentiates water uses into classes, nor considers detailed differentiation of microbial and pathogens loads. The Italian legislative framework does not include requirements for the provision of information to the public unless signalling the pipes and the canals transporting treated wastewater.

The development of risk management plans, validation monitoring, and risk analysis are novel criteria that have not been considered by the Italian law enforced in 2003.

The following table<sup>5</sup> provides a summary of the key provisions, highlighting the main differences between the national legal framework and the Commission proposal.

Provisions in the EU regulation proposal	Comparison with the existing legislation in Italy
<b>1. Permits &amp; competent authorities: permits to supply reclaimed water are required together with compliance checks</b>	A relevant set-up already exists: the current framework has provisions for authorisation by the competent authority, which is usually the province. Regions supervise the authorisation through their Env. Agencies (ARPAE)
<b>2a. Use of reclaimed water: agricultural irrigation</b>	The proposal covers fewer uses: the national legislation covers additional uses of reclaimed water than agricultural irrigation, e.g. civil purposes and industrial purposes, and irrigation of green or recreation and sports areas
<b>2b. Classes of reclaimed water: 4 classes according to crops and irrigation technology</b>	The proposal defines classes of reclaimed water: the national legislation only defines the reclaimed water uses, rather than classes
<b>2c. Requirements for the reclaimed water for Legionella, intestinal nematodes (helminth eggs), E.coli, BOD5, TSS, turbidity</b>	Different parameters are covered: the national legislation sets out standards for E. coli, BOD5 and TSS that are similar to those set out in the proposal but does not cover the other parameters from the proposal.

<sup>3</sup> BIO Deloitte, ICFGHK and Cranfield University, 2015, Optimising water reuse in the EU, Final report (data referred to the year 2006).

<sup>4</sup> Angelakis et al. (2007) Wastewater recycling and reuse in EUREAU countries –Report for EUREAU

<sup>5</sup> JRC, 2014, Water Reuse in Europe, Relevant guidelines, needs for and barriers to innovation. Modified by A. Battilani 2019.

	However, it sets out standards for 55 parameters including EC, pH, heavy metals and metalloids, COD, nitrogen and phosphorus <sup>6</sup> .
<b>2d. Monitoring requirements: from once a week to twice a month depending on the parameter and class of reclaimed water</b>	Different monitoring requirements: the monitoring requirements are not set out in the national legislation, but rather in the regional legislation.
<b>2e. Validation monitoring: required before the reclamation plant is put into operation, upgraded or modified (relevant for food crops consumed raw)</b>	The proposal is more specific: provisions for validation monitoring were not identified in the Italian legislation. The validation is made by the controls and by the final inspection to be produced to obtain the authorisation
<b>3. Water Reuse Risk Management Plan</b>	The proposal is more specific: provisions for water reuse risk management plans were not identified in the Italian legislation. The legislation refers only to compliance with a code of good practice in the agricultural sector adopted by governmental decree in 1999.
<b>4. Information to the public</b>	The proposal is more specific: provisions for information to the public were not identified in the Italian legislation.

### Monitoring and control requirements

The Italian law 185/2003<sup>7</sup> - Article 7 set requirements for the monitoring and control of wastewater treatment plants also intended for direct water reuse. Monitoring is agreed upon with the competent authority, based on the monitoring programme referred to in Article 49, paragraph 1 of legislative decree n. 152 of 1999 (now 152/2006). It is carried out by the treatment facility owner. The owner of the recovery facility must, in any case, ensure a sufficient number of self-checks at the plant outlet recovery, no fewer than the number envisaged in regional legislation about specific uses. The results of the analysis must be made available by the control authorities. The wastewater recovery plant is also subject to control by the competent authority, according to article 49 of the legislative decree n. 152 of 1999 (now 152/2006), for the verification of the compliance with the provisions contained in the authorisation, referred to in Article 6.

Specific requirements for the reuse activity are set by Article 11: the manager/owner of the distribution network monitors the chemical and microbiological parameters of reclaimed water as well as the environmental agronomic and ecological effects of the reuse (mainly on soil). The health authority and the regional agencies for environmental protection (ARPAE) assesses any health, hygiene and environmental effects related to the use of reclaimed water. The monitoring results are transmitted to the region with annual cadence.

### Standards

All the food quality standards consider irrigation water as a key issue for food hygiene, safety and quality. In the area the most diffused certification schema follow the Global Gap standards ([https://www.globalgap.org/uk\\_en/documents/#fq=gg.subscope:\(%22fruit%22\)&fq=con\\_local es:\(%22en%22\)&fq=gg.document.type:\(%22checklist%22+OR+%22regulations%22+OR+%22cp](https://www.globalgap.org/uk_en/documents/#fq=gg.subscope:(%22fruit%22)&fq=con_local es:(%22en%22)&fq=gg.document.type:(%22checklist%22+OR+%22regulations%22+OR+%22cp)

<sup>6</sup> For the full set of parameters included into the Italian law see [https://www.gazzettaufficiale.it/do/atto/serie\\_generale/caricaPdf?cdimg=003G021000100010001&dgu=2003-07-23&art.dataPubblicazioneGazzetta=2003-07-23&art.codiceRedazionale=003G0210&art.num=1&art.tiposerie=SG](https://www.gazzettaufficiale.it/do/atto/serie_generale/caricaPdf?cdimg=003G021000100010001&dgu=2003-07-23&art.dataPubblicazioneGazzetta=2003-07-23&art.codiceRedazionale=003G0210&art.num=1&art.tiposerie=SG)

<sup>7</sup> The Italian law can be found at: <https://www.gazzettaufficiale.it/eli/id/2003/07/23/003G0210/sg>

[acc%22\)&fq=gg.standard.gg:\(%22ifa5%22\)\)](#) which considers mainly microbial loads and related pathogenic risks.

Besides, nearly all the big retailers, supermarkets and brokers buying directly on the local market apply their own HACCP and purchase quality standards, which involve irrigation water quality certification.

Similar standards also exist for irrigation equipment but are not usually considered by irrigation systems designer, unless for the sizing of the filter station.

### Other institutional aspects

Water reuse in nitrate vulnerable areas could also impact on current CAP greening requirements.

## Identification of key actors

A list of key actors with influence in water reuse sector is here provided. Although, the focus of this report is the target regions, other organizations at national level are also reported.

A short description of the role of each organization in the use of reclaimed water in agriculture is presented.

Organization	Role description
<b>Administration (National or regional level)</b>	
<b>Regional Government(s) (Piemonte, Lombardia, Veneto, Emilia-Romagna)</b>	<p>Participation in national government is a principal function of the Regions. They may initiate parliamentary legislation, propose referenda. About regional legislation, the regions have competence in certain fields — such as agriculture, forestry, and town planning — (within the limits of fundamental principles established by state laws).</p> <p>Together with Planning, Regions are also in charge of several further roles such as Authorisations/concession acts, and public Funding (e.g. rural development program and ERDF contributions)</p>
<b>AdB-PO - Po River Basin Authority</b>	<p>In 1989, Law 183 established the river basin as the basic unit within which all regulatory actions concerning water resource management, water pollution control and soil protection were to be coordinated for economic and social development and environmental protection. The law also established major basin authorities and entrusted them with planning responsibilities. The Po river basin Authority has been thus created.</p> <p>National river basin authorities, whose members include representatives of the central and regional administrations (7 + 1 Province in the Po basin), have as their main role the preparation of basin plans, which aim to:</p> <ul style="list-style-type: none"> <li>• protect water resources,</li> <li>• mitigate hydrogeological risks (such as floods, landslides and erosion, including that of riverbanks) and</li> <li>• Promote sustainable use of water resources in an environmentally conscious way.</li> <li>• Rule land-use to ensure the objectives mentioned above are met.</li> </ul>

<p><b>Italian Ministries of:</b></p> <ul style="list-style-type: none"> <li>- Environment</li> <li>- Agriculture</li> <li>- Health</li> </ul>	<p>Ministers are in charge of policies and planning activities concerning their specific perimeters of action.</p> <p>Ministers have two distinct but co-existing roles. Politically they are the supreme executive authorities appointed by Parliament, but they are also the administrative heads of the State, whose activities they direct by the political process. As administrators, the individual ministers can produce "regulations" (<i>regolamenti</i>), which are legal implements subordinate to legislation (e.g. Food safety, Health protection).</p>
<p><b>ISS - Istituto Superiore Sanità</b></p>	<p>The Institute conducts scientific research in a wide variety of fields among which population-based studies of risk factors for disease and disability.</p> <p>Research priorities are based on those outlined in the National Health Plan. The Institute is also involved in several major clinical trials, which are frequently conducted in cooperation with the Scientific Institutes for Research and Care (IRCCS) network and Hospitals.</p> <p>ISS is also responsible for setting hygiene and health protection parameters and BMPs</p>
<p><b>ARPA - Regional Agency for the Protection of the Environment (Piemonte, Lombardia, Veneto, Emilia-Romagna)</b></p>	<p>Public bodies with independent status for administrative, technical-juridical, asset management and accounting purposes.</p> <p>They operate under the oversight of the Chairman of the Executive Committee of the regional governments to ensure compliance with the policy guidelines issued by the Regions in the fields of forecasting, preventive actions and preservation of the environment.</p>
<p><b>Municipalities (very relevant cases of cities only)</b></p>	
<p><b>Metropolitan Cities (Turin, Milan, Bologna, Venice)</b></p>	<p>The Metropolitan Cities, as defined by law, includes large core cities and the smaller surrounding towns that are closely related to them about economic activities and essential public services, as well as to cultural relations and territorial features.</p>  <p>The main functions devolved to the new metropolitan cities are:</p> <ul style="list-style-type: none"> <li>• local planning and zoning;</li> <li>• provision of local police services;</li> <li>• transport and city services regulation (including facilitating water reclamation).</li> </ul>
<p><b>Private sector</b></p>	
<p><b>SMAT</b></p>	<p>SMAT is one of the "Integrated water services" lead company with about 300M m3 of drinkable water managed per year and more than 400 water treatment plants (with 340M m3 per year of treated wastewater).</p> <p>SMAT is active in the Turin Province, serving 289 Municipalities for a total amount of about 2.25 million people served. SMAT manages some of the largest, most advanced drinking water supply and wastewater networks and treatment systems in the EU.</p>
<p><b>iReti</b></p>	<p>Multi-utility, part of the IREN Group, iReti is the 3<sup>rd</sup> Italian operator for dimension within the "integrated water services" sector. iReti is</p>

	active in the following regions: Emilia Romagna, Liguria, Lombardia, Piemonte and Veneto.
<b><u>HERA</u></b>	Hera is among <b>nation's largest multi-utilities working in the “integrated water services”</b> sector, with about 350 municipalities served (mainly located in Emilia Romagna, Veneto, Friuli Venezia Giulia, Tuscany and Veneto regions) and about 3.6 million citizens.
<b><u>UniAcque</u></b>	UniAcque provides in-house management of the integrated water utility service in the Province of Bergamo with about 600.000 people served.
<b><u>MM (Milano Blu)</u></b>	MM is the Company in charge to manage the “Integrated water services” for the Milan metropolitan area with about 2 million served people for both drinkable water and wastewater treatment (about 290hm <sup>3</sup> per year)
<b><u>AcqueVenete</u></b>	Serving more than 500.000 peoples (108 municipalities), Acquevenete is one of the Veneto Region active players in the “Integrated water services”
<b><u>Veritas</u></b>	Veritas is a public multiutility operating in the “integrated water services” sector. It is the 8 <sup>th</sup> operator in Italy for dimension, serving about 930.000 inhabitant (and up to 40million tourists per year) in about 50 municipalities located in Veneto Region.
<b>Research centres/universities</b>	
<b><u>University of Turin</u></b> - DISAFA - Department of Agricultural, Forest and Food Sciences - DIST – Interuniversity Department of Regional and Urban Studies and Planning	The mentioned bodies represent the most active research centres on agriculture-water relations located within the project territorial borders. The activities range from porous media hydrology and soil-plant-atmosphere interactions up to irrigation, water reuse, multiple use of water, agricultural productions (quality and quantity) and so on.
<b><u>University of Milan</u></b> - DISAA – Department of Agricultural and Environmental Sciences - Production, Land, Agroenergy	
<b><u>University of Padua</u></b> - TESAF – Department of Land, Environment, Agriculture and Forestry	
<b><u>University of Bologna</u></b> - DISTAL – Department of Agricultural and food sciences	
<b>Associations (relevant associations)</b>	
<b><u>ANBI - Associazione Nazionale Bonifiche Irrigazioni e Miglioramenti Fondiari</u></b>	The National Association of Reclamation, Irrigation and Land Improvement put together 158 consortia (which are member in ANPI) for a total amount of 3.3 million hectares irrigated. Within the Project area, the following consortia participate in ANPI: PIEMONTE: <ul style="list-style-type: none"> <li>• Aggregazione dei Consorzi Irrigui Risorgive Mellea - Centallese A.C.I.R.M.C. (2° grado)</li> <li>• Angiono Foglietti</li> <li>• Associazione d'Irrigazione Ovest Sesia</li> <li>• Associazione Irrigazione Est Sesia</li> <li>• Baraggia Biellese e Vercellese</li> <li>• Canale Brobbio Pesio</li> </ul>

	<ul style="list-style-type: none"> <li>• Canale de Ferrari</li> <li>• Canali del Canavese</li> <li>• Cigliano - Borgo d'Ale - Villareggia - Moncrivello</li> <li>• Comprensorio Irriguo del Canavese (2° grado)</li> <li>• Consorzio di Irrigazione Comprensoriale di secondo grado Fossanese - Braidese</li> <li>• Consorzio di Irrigazione Comprensoriale di secondo grado Tanaro Albese - Langhe Albesi</li> <li>• Consorzio Irriguo della Bealera dei prati di Caselette</li> <li>• Consorzio Irriguo Savoia Aosta</li> <li>• Coutenza Canale Carlo Alberto</li> <li>• Coutenza Canali Cavour</li> <li>• Coutenza Canali Lanza, Mellana e Roggia Fuga</li> <li>• Est Orco</li> <li>• Irriguo di Chivasso</li> <li>• Ovest Torrente Orco</li> <li>• Rogge Campagna e San Marco</li> <li>• Sinistra Stura</li> <li>• Valle Gesso (2° grado)</li> <li>• Valli di Lanzo (2° grado)</li> </ul> <p>LOMBARDIA</p> <ul style="list-style-type: none"> <li>• Chiese</li> <li>• Chiese (2° grado)</li> <li>• Consorzio dell'Adda</li> <li>• Consorzio Incremento Irrigazione Territorio Cremonese</li> <li>• Consorzio Oglio</li> <li>• Consorzio Ticino</li> <li>• Dugali, Naviglio, Adda Serio</li> <li>• Est Ticino Villorosi</li> <li>• Garda Chiese</li> <li>• Gora Molinara nella Valle del Ticino</li> <li>• Media Pianura Bergamasca</li> <li>• Mincio (2° grado)</li> <li>• Muzza - Bassa Lodigiana</li> <li>• Navarolo - Agro Cremonese Mantovano</li> <li>• Naviglio Città di Cremona</li> <li>• Oglio - Mella</li> <li>• Società Lago d'Idro</li> <li>• Sponda Soliva</li> <li>• Terre dei Gonzaga in Destra Po</li> <li>• Territori del Mincio</li> </ul> <p>VENETO</p> <ul style="list-style-type: none"> <li>• Acque Risorgive</li> <li>• Adige Euganeo</li> <li>• Adige Po</li> <li>• Alta Pianura Veneta</li> <li>• Bacchiglione</li> <li>• Brenta</li> <li>• Delta del Po</li> <li>• Lessinio - Euganeo - Berico (2° grado)</li> <li>• Piave</li> <li>• Veneto Orientale</li> <li>• Veronese</li> </ul> <p>EMILIA ROMAGNA</p>
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	<ul style="list-style-type: none"> <li>• Burana</li> <li>• Canale Emiliano Romagnolo (2° grado)</li> <li>• Emilia-Centrale</li> <li>• Parmense</li> <li>• Piacenza</li> <li>• Pianura di Ferrara</li> <li>• Renana</li> <li>• Romagna</li> <li>• Romagna Occidentale</li> <li>• Ronchi di Soarza e San Giuliano</li> <li>• Utenti Canale Molini di Imola e Massalombarda</li> </ul>
<b>CER – Canale Emiliano-Romagnolo</b>	<p>CER is one of the points of reference for the Emilia Romagna regional Government, Institutional Water Stakeholders and Grower Associations for the sustainable use of water in agriculture, the irrigation water quality and the reuse of treated wastewater. The CER, as Consortium formed by Land and Water Requirement Consortia, act in a double way: as a main water stakeholder and as a research team carrying out researches on irrigation from more than 40 years.</p>
<b>Confagricoltura</b>	<p>The General Confederation of Italian Agriculture (CONFAGRICOLTURA) is the organisation that represents and protects Italian agricultural enterprises. It represents the majority of the cultivated land in Italy. It acknowledges the leading role of agricultural entrepreneurs in the establishment and development, (from both the economic, technological and social point of view) of Italian agriculture and agricultural businesses. Confagricoltura is locally present through regional federations, local offices and town representatives. The headquarter is based in Rome, and it is also active in Bruxelles, with its liaison office, and in other EU countries.</p>
<b>Coldiretti</b>	<p>Coldiretti is articulated through offices in every region and in each Italian province</p>
<b>CIA</b>	<p>The CIA - Italian Farmers Confederation is one of the largest agricultural organizations in Italy established in 1977 to sustain and promote the modern role of the farmer and his business.</p>
<b>UNC - Unione Nazionale Consumatori</b>	<p>UNC is the first consumer association in Italy with 134 local offices and about 2million people audience (namely members, users or followers).</p>
<b>Networks/projects</b>	
<b>Please refer to Section 6.</b>	
<b>Other types of organizations</b>	
The Interregional Agency for the Po River (AIPo)	<p>A public body that provides engineering and environmental services across the full spectrum of operations in support of interests of the Italian regions crossed by the Po river: Piemonte, Lombardia, Emilia – Romagna and Veneto.</p> <p>AIPo mission includes four broad areas:</p> <ul style="list-style-type: none"> <li>• planning, designing and building civil, hydraulic projects along the Po river and its tributaries (dealing with navigation, flood control, environmental protection, disaster response, etc.)</li> <li>• river and flood forecasting, drought forecasting, planning and management of natural resources and water resource system</li> </ul>

	<ul style="list-style-type: none"> <li>analysis of terrain morphology and hydrodynamic and rheological characteristics of terrain for both analytical, physical and geotechnical modelling</li> <li>supporting navigation AIPo has recently carried out an important program of development of its research branch.</li> </ul>
<b>Administration (National or regional level)</b>	
<b>Regional Government(s) (Piemonte, Lombardia, Veneto, Emilia-Romagna)</b>	Planning, Authorisations, Funding
<b>Po River District Authority</b>	Planning
<b>Ministry of Environment</b>	Policies, Planning
<b>Ministry of Agriculture</b>	Policies, planning
<b>Ministry of Health</b>	Food safety, Health protection
<b>Istituto Superiore Sanità (on behalf of the Ministry of Health)</b>	Set hygiene and health protection parameters and BMPs
Municipalities (very relevant cases of cities or networks, do not include an exhaustive list)	
<b>Metropolitan Areas (Turin, Milan, Bologna,..)</b>	Local planning and facilitate water reclamation

## Existing situation of wastewater treatment and agriculture

This section should provide a general background of wastewater treatment and agriculture sectors. Thus, we would describe the potential offer of reclaimed water coming from wastewater treatment plants and the demand of water for irrigation.

### Characterization of wastewater treatment sector:

- Identification of wastewater treatment plants
- Identification of municipalities without any treatment
- Quantification of wastewater produced, e.g. m<sup>3</sup>/year (treated and non-treated)
- Identification of wastewater treatment plants with existing reuse practices
- Identification of needs for further treatment to extend water reuse

A summary of the information detailed above will be provided in the table below:

The POTENTIAL supply of reclaimed water in the target region	Plant Number	Volume (hm <sup>3</sup> /y)		
		Coastal (hm <sup>3</sup> )	Inland (hm <sup>3</sup> )	BOTH (hm <sup>3</sup> )
Number of WWT Plants [> 100.000 p.e.]	61			1240449
Number of WWT Plants range [10.000 pe to 100.000 p.e.]	271			574268
Number of WWT Plants range [2.000 pe to 10.000 p.e.]	561			173395
Number of WWT Plants range [<2.000 pe]	2686			67545

NOTE: hm<sup>3</sup> = 1 million m<sup>3</sup>

### Characterization of agricultural sector:

#### General brief description of the agricultural sector in the region.

##### PIEMONTE

The region it is not bathed from the sea. The Alps Marittime, Cozie, Graie, Pennine and those Lepontines, mend the region from the perturbations of the north Europe; without a gradual hilly zone, finds the Piedmontese lowlands, where being cultivated to rice mostly cover as a mirror

## Deliverable 1.1: Regional state of play analyses

of water this territory. The hills are very undulated, and small villages, farms, old castles and plantations of fruit trees and vineyards rise.

The Piedmontese rivers are all tributaries of Po, and they have an alpine regime, seen the thin winter and the floods in spring and summer. This is owed from the reservoirs of the glaciers and from the rains that in spring, when they start to melt, they go down quickly from the streams and they meet in the rivers. Po river with a great course of water is born from the Plan of the King from Monviso, and it crosses the whole region. The principal tributaries of left are Dora Riparia, Stura of Lanzo, Orco, Dora Baltea that goes down from Valley of Aosta, Sesia, Ticino and Toce that meets its waters in Maggiore Lake. In a small number, they are the tributaries of right with Tanaro where Bormida and the Scrivia meet. All the mountains that surround Piedmont are sprinkled by hundreds of micro-lakes said alpine lakes. The greatest lakes that Piedmont possesses are the western shore and the zone north to border with Switzerland of Lake Maggiore and those of Lake of Orta and the of Viverone.

In Piedmont, the most important crop is that of the rice, of the maize, of the wheat, of some vegetables and of the fruit. The production of the wine is modest but of quality. We remember some qualities appreciated of the Piedmontese productions: Barbera, Barbaresco, Barolo, Nebbiolo, Dolcetto and Grignolino. The abundance of the natural pastures allows the breeding of livestock, above all cattle. It is produced therefore a considerable quantity of meat, of butter and of cheese.

PIEMONTE	agricultural area used	total crops	total woody agrarian cultivations	kitchen gardens	total permanent pasture and meadow	total trees for wood	total woodlands	agricultural area unutilized	other areas	total
hill	45.195	23.980	31.602	15.937	20.774	4.647	24.704	13.871	34.907	45.224
mountain	9.352	3.127	4.368	3.078	6.596	655	5.602	1.839	7.136	9.352
plain	26.474	22.771	6.472	7.185	7.035	1.656	5.640	5.184	22.390	26.476
total	81.020	49.878	42.441	26.201	34.405	6.957	35.946	20.894	64.432	

### LOMBARDIA

In the mountainous part we find very tall tops and the glaciers that are impossible to miss, but the constitution of the mountains is less hard than from the other parts, with less steep slopes and very wide and open valleys. The Region is rich in water and therefore with electric energy. The rivers go down quickly, but they are braked from the lakes and from the fact what crossing the lowland, are many artificial made channels of irrigation that enrich the crops. Going down to valley we often find a phenomenon typical of Lowland Padana, that is the fog. To contrast of this phenomenon, we find a cheerful one in the panning zone of the lakes which posse a mild climate. The zones of cultivation alternate with grey landscapes of industrial establishments. Often the cities don't have a well-defined border and are united by the production of oil with the other peripheral urban zones, forming only one urban complex. The whole region is crossed by a sharp pain road net that sustains an intense local traffic, also toward the sea and the mountains.

The principal rivers of Lombardia, tributaries to the left of Po, are: Ticino, tributary and emissary of Lake Maggiore that passes for Pavia; Adda is born in Valtellina and flows to Colico in Lake of Como of drawers and goes out to Lecco bathing Praises; Brembo and Serio one that owes their

## Deliverable 1.1: Regional state of play analyses

name to the respective valleys, Val Brembana and Val Seriana meet their waters in the river Adda; Oglio crosses Val Camonica and enters and goes out in Lake of Iseo and it is thrown in Po and ends in Mincio that goes out of Garda Lake to Peschiera and bathes Mantua. The waters of the rivers feed a sharp net of artificial channels that regulate and distribute water in the most arid zones. The most important is the Great Naviglio, the Shipping in Pavia, the Shipping of Martesana and the Channel Villoresi. In the lakes zone we remember the oriental shore of Lake Maggiore, Lake of Lugano where the northern part belongs to Switzerland, Lake of Chest of drawers, Lake of Iseo and the western bank of Lake of Garda.

Although Lombardy has a big mountainous part where the earth is almost void of output, the agricultural production of the region is among the tallest in Italy. The part exploited for the agricultural work is in the central southern part where, thanks to the fertility of the ground, and to the abundance of irrigation and the modern systems used for cultivation, the whole year is exploited for the cultivation of wheat, rice, vegetables and forage. In the tall lowland cultivations that prevail are sugar beets, potatoes and maize which do not need very fertile grounds. The cultivation of vines is found in the hilly zones of the low mountains, while in tall mountains we find the pastures. Lombardy has the supremacy in general in Italy for the breeding cattle cow's milk. The production of meat, milk, butter and cheese has a large production in the Italian market. Some cheeses such as the gorgonzola and the belpaese are exported abroad. Lombardy is also the first in the breeding of the pig, with a large production of packaged meat.

LOMBARDA	agricultural area used	total crops	total woody agrarian cultivations	kitchen gardens	total permanent pasture and meadow	total trees for wood	total woodlands	agricultural area unutilized	other areas	total
hill	12.974	7.052	7.514	1.566	4.098	366	4.250	2.447	8.744	13.017
mountain	14.544	2.469	4.953	2.293	12.119	2	10.033	2.664	7.399	14.544
plain	33.789	30.896	3.810	3.895	7.942	2.052	3.977	5.878	29.074	33.933
total	61.308	40.416	16.276	7.755	24.159	2.420	18.259	10.988	45.216	

### VENETO

The Venetian territory introduces manifold aspects: the mountainous part has valleys and greens woods while the lakes are rising in the middle of the pastures. The hills have covered of vineyards above all from elms and oaks. Lake of Garda, with its mild climate, lets flourish olive and oleanders, while the lowland is being cultivated by vineyards and orchards. The roads have an intense traffic and they don't even miss the grey industrial establishments. Some highlands are alternated by a wood based bare and rocky panorama and lawns where small villages and place of stay rise with modern hotels.

The two great rivers of Veneto, Po and Adige, are respectively also the first one and the second of Italy for length. Po marks for a long line the border between Veneto and Emilia Romagna, while Adige is being born in tall Adige and enters in Venetian lowland to north in Verona. Other rivers of Venetian territory are Piave, Brenta and Livenza. To Veneto the oriental shore of Lake of Garda belongs and between the numerous alpine lakes we find that of Alleghe in the zone of Belluno and that of Misurina in the proximities of Three Tops of Lavaredo

In the Venetian region it is primarily produced wheat, maize and fruit plants. Very developed are also the industrial crops as that of the tobacco, of the hemp, of the sugar beet, of the rice, of

the soy, of the carrots, of the apples, of the pears, of the bowline, of the peas and of the beans. The production of wine is its most notable: in fact, Veneto is to the third place. Some Venetian typical wines are very appreciated abroad also, among which remember Valpolicella, Bardolino, Prosecco and Soave. Purely other Venetian specialties are: the red chicory of Treviso, the asparaguses of Bassano and the cherries of Marostica. The Venetian breeding has developed in cattle and in particular way in pig, in the provinces in Treviso and Padua. We remind you besides that Veneto has the absolute supremacy in the breeding of the poultry. The silkworm is still raised, activity by now abandoned by the other regions; with this breeding Veneto has the supremacy of the production of cocoons and natural silk. Besides the fishing of tall sea is practised the lagoon fish breeding. This technique is typical of the valleys, where different kinds of fishes (the eel, the mullets, the orates and the mullets), are fenced and embank up to the adult age, for then to be captured when they want to go out in the open sea. Chioggia is the first one or one of the first Italian fish markets, from which the fresh fish is sent in city of sea as Naples or Genoa.

VENETO	agricultural area used	total crops	total woody agrarian cultivations	kitchen gardens	total permanent pasture and meadow	total trees for wood	total woodlands	agricultural area unutilized	other areas	total
hill	31.851	11.893	22.606	8.941	15.348	355	15.346	3.214	28.859	31.877
mountain	10.807	2.607	2.682	5.385	9.895	6	7.799	1.596	9.582	10.809
plain	103.098	91.321	40.633	32.814	14.550	2.086	4.389	9.064	94.791	103.192
total	145.756	105.821	65.921	47.141	39.793	2.446	27.535	13.873	133.233	

#### EMILIA ROMAGNA

The conformation of the Region is divided in two completely different sections from each other: the first one, situated in the southern part of the Region, is all mountainous and hilly; the second, the northern one is all level. The mountain is characterized by a feeling of abandonment and loneliness, putting each other in clear contrast with the nature that instead introduces other very inhabited parts rich with a variety of cultivations, and roads full of traffic and as well as different rivers and channels that irrigate the country. The orchards are cultivated as far as the eye can see and the fields with old farms adorn these coloured landscapes. Also, on the Adriatic shore we find two conflicting aspects: the wild and silent valleys and of the lagoons and the beaches overcrowded with lots of tourist structures along the coastal.

The rivers are divided in tributary and sub-tributary of Po and others that flow in the sea directly. Besides the Po, are its tributaries: Trebbia, Panaro, Parma, Enza, Bucket and Taro. The rivers that flow in the Adriatic Sea directly are Rhine and Marecchia. The particularity of these rivers is their torrential character, they rather dry in the summer and subjects to floods in winter.

The agriculture of the Region is among the most advanced in Italy. We find a wide variety of products and an abundance of some of them. This fertility is owed to the favourable geographical and climatic position and also because modern techniques of cultivation and organization of commerce are used. The Emilia Romagna prospers in the crops of wheat and sugar beets; and also, the production of rice, bowline, wine and fruit. Only in this sector of the fruit big cultivations are those of plums, cherries, apricots and pears. In the sector vinicolos there are some wines that are very important such as the Lambrusco, St. Giovese, the Albana. Within the vegetable, categories are notable quantities of onions, peas and tomatoes. Also cultivated are hemp and flax. The most practised breeding is that of cattle and swine. Emilia Romagna produces a fifth of the national product of butchered livestock and a sixth of the milk. The pig meat is used for the production of meats. From the milk, traditional cheeses are produced: nuisance and Parmigiano. The breeding of chickens is also well developed. The most intense zone for fishing is the Valleys of Comacchio, where they raise over each other and where eels are fished. The most abundant fish are blue fish.

EMILI A ROMA GNA	agricult ural area used	total crops	total wood y agrari an cultiva tions	kitch en gard ens	total perma nent pastur e and meado w	total trees for wood	total woodl ands	agric ultur al area unutil ized	other areas	total
hill	240310	174355	32664	301	31799	2376	61822	1024 0	27076	34182 3
mount ain	111946	55259	1291	105	55115	849	82470	3096	14004	21236 5
plain	700329	582156	98330	504	19333	2122	11493	8811	63711	78646 6
total	105258 5	811770	13228 4	910	106248	5347	15578 5	2214 7	10479 0	

Quantification of the water demand<sup>8</sup>:

Crop	Number of hectares	Water demand (hm <sup>3</sup> /year)*	Existing use of reclaimed water (hm <sup>3</sup> /year)
Corn	359.027,78	897.6	n.a.
Rice	236.441,47	2364.4	n.a.
Other Cereals	57.832,92	14.5	n.a.
Legumes (dry)	5.606,76	8.4	n.a.
Potato	2.641,64	7.9	n.a.
Sugarbeet	11.881,49	23.8	n.a.
Textile plants	685,78	1.4	n.a.
Rapeseed	2.282,76	4.6	n.a.
Sunflower	609,61	1.2	n.a.
Vegetables	55.821,19	167.5	n.a.
Maize (fodder)	121.204,94	424.2	n.a.
Fodder crops	109.170,11	545.9	n.a.
Other staple crops	22.843,04	13.7	n.a.
Vineyard	14.015,50	14.0	n.a.
Olive	857,55	1.7	n.a.
Citrus	59,78	0.2	n.a.
Orchards	44.683,35	156.4	n.a.
Plant nurseries	4.399,13	17.6	n.a.
Pastures	97.502,38	85.3	n.a.
Forestry	6.604,98	0.0	n.a.

NOTE: \*= estimated, transportation and distribution losses not considered; hm<sup>3</sup> = 1 million m<sup>3</sup>;  
n.a. = data not available

The Po Valley is one of the areas of the European continent where the effects of climate change are more visible (namely, a “hot spot”). From 1960, average annual temperatures in the Po Valley have increased by 2°C, and in the last thirty years, the annual rains in the area have decreased on average by 20% and almost 50% during spring and summer. According to Ispra, in

<sup>8</sup> Istituto nazionale di statistica -ISTAT, 2014. 6° Censimento Generale dell’Agricoltura. UTILIZZO DELLA RISORSA IDRICA A FINI IRRIGUI IN AGRICOLTURA. ISBN: 978-88-458-1805-9. Adapted and modified by A. Battilani 2019

the latest water crises, the pluviometry deficit - the difference between pluriannual rainfall average and how much it falls - reached 30-40% in 2012 and 2017. Moreover, even 40-50% in 2007.

The 2017 drought, although with jeopardised intensity and affecting in different ways the crops, caused losses of about 2 billion euro to the agricultural sector, not considering long term damages to natural ecosystems and to the agro-ecosystems. The damages mostly related to quantitative production losses, but also to lower quality of agricultural production involving price reductions, stock rejection and penalties for farmers.

#### **Non-irrigated sector in the region.**

In the area, the only those crops that are not irrigated are those that cannot pay back the cost of the irrigation. Some niche production is not irrigated aiming to higher quality or organoleptic characteristics, able to compensate with the higher price the production losses. One of the most diffused rainfed crop is the winter wheat, although pilot studies indicate that it would greatly benefit of targeted irrigations in sensible phenological stages.

#### **Agribusiness description**

The food sector is one of the most important Italian industries, employing around 385,000 people and generating a total turnover of more than EUR 142 billion in 2018, with both domestic and export sales being robust. There has been a modest increase in turnover since the fourth quarter after years of rather stagnant domestic consumption. Many Italian food businesses (especially in the pasta and bakery segments) benefit from the strong international reputation of the “Made in Italy” trademark, in particular in Piemonte, Lombardia, Veneto and Emilia Romagna Regions.

The 4 regions food and beverages sector value added growth is expected to increase 2.2% in 2017 and 2.4% in 2018, mainly driven by exports, while domestic demand is expected to remain stable. Profit margins are also expected to remain stable, although on a generally low level. Food producers and processors are often highly geared in order to maintain working capital requirements. However, due to its anticyclical business performance lending to the food industry remains appealing to banks and other financial institutions, enabling them to diversify asset investments.

Italian food sector production, processing and retail remain heavily fragmented, with a very competitive business environment. Even the biggest Italian food retail businesses are small compared to other major international players. The average size of food producers is typically small, which often hampers international expansion. At the same time e-commerce is increasingly challenging traditional brick-and-mortar food retailers. In order to consolidate their market, position a concentration process among Italian food retailers is ongoing.

## Existing related initiatives

This section should extend the information provided in section 5 about networks and projects.

NAME	PURPOSE	PARTNERS
<b>TRELAGHI</b> <b>Eutrophic reduction through natural technics of three little Italian lakes waters</b> <b>(LIFE02 ENV/IT/000079)</b>	<p>The project attempts a eutrophic reduction in three small lakes using natural techniques, notably by reducing the amount of phosphates and nitrates entering the lakes from residential settlements, farms and the food industry.</p>	<p><b>COORDINATOR:</b> Comunità Montana Val Cavallina</p> <p><b>PARTNERS:</b> Regione Lombardia - Direzione Generale Agricoltura; CNR - ISE "Istituto Italiano di Idrobiologia"; Provincia di Torino; Politecnico Di Milano - Dipartimento Di Progettazione dell'Architettura; Università di Sassari - Dipartimento di Scienze Ambientali Agrarie e Biotecnologie Agroalimentari; Università degli studi di Udine - Dipartimento di Georisorse e Territorio; Consorzio Interuniversitario nazionale per la Biologia Molecolare delle Piante; Parco Naturale di Interesse Provinciale del Lago di Candia; Comune di Ranzanico (BG); Comune di Monasterolo del Castello (BG); Comune di Endine Gaiano (BG); Val Cavallina Servizi srl; Comunità Montana n2 "Su Sassu Anglona - Gallura"; Centro Culture Sperimentali Aosta srl; Fitotecnologie Applicate sas</p>
<b>RIWAC</b> <b>Project for recovery and reuse of industrial waters and trivalent chromium generated by tannery waste processing</b> <b>(LIFE05 ENV/IT/000812)</b>	<p>Implement an innovative process that combined two processes. In particular, it aimed to combine the process for ammoniacal water recovery with the production process, for chromium (III) recovery.</p>	<p><b>COORDINATOR:</b> SICIT 2000 S.p.A.</p> <p><b>PARTNERS:</b> SICIT CHEMITECH S.p.A. - Chiampo, Italy; Stazione Sperimentale per l'Industria delle Pelli e delle Materie Concianti - Napoli, Italy; Asociación de Investigación de las Industrias del Curtido y Anexas -Igalada, Spain; Centro Tecnológico das Indústrias do Couro - Alcanena, Portugal; António Tort Tosal - Igalada, Spain; Constantino Mota SA - Alcanena, Portugal; Sveco s.r.l.- Vicenza, Italy; RINO MASTROTTO GROUP S.p.A Divisione CALBE - Trissino, Italy</p>
<b>PERBIOF</b> <b>A new technology for treating municipal and/or</b>	<p>Develop at demonstration scale an innovative technology for treating municipal and/or industrial wastewater. The technology was based on a submerged biofilter</p>	<p><b>COORDINATOR:</b> CNR - Istituto di ricerca sulle acque.</p> <p><b>PARTNERS:</b> Azienda Mediterranea Gas e Acqua SpA,</p>

<b>industrial wastewater with low environmental impact (LIFE05 ENV/IT/000868)</b>	where all the phases of the biological treatment were carried out in a single operative unit. The proposed technology is characterized by high depuration efficiencies (more than 10 times higher than conventional ones) and very low sludge production.	Italy ; Université de Savoie-Ecole Nationale Supérieure du Génie de l'Environnement et de la Construction (ESIGEC), France ;
<b>KOLISOON</b> <b>A new automated method for the analysis of Escherichia coli in wastewater effluent (LIFE06 ENV/IT/000235)</b>	Develop and build an automated on-line early warning device suitable for E.coli detection in water/ wastewater and to demonstrate and to disseminate this new approach to other organisations involved in wastewater management.	<b>COORDINATOR:</b> Istituto Superiore di Ricerca e Formazione sui Materiali speciali per le Technologie Avanzate - ISRIM SCARl  <b>PARTNERS:</b> TAM SpA (Tutela Ambientale Magentino), Italy; ADR-SE (Agentia pentru Dezvoltare Regionala SUD-EST), Romania; EUROCEI, Centro Europeo de Empresas e Innovación, S.A., Spain.
<b>PURIFAST</b> <b>Advanced Purification Of Industrial And Mixed Wastewater By Combined Membrane Filtration And Sonochemical Technologies (LIFE07 ENV/IT/000439)</b>	Demonstrate the technical and economic feasibility of an advanced wastewater treatment system based on Ultra Filtration (UF) and an innovative Advanced Oxidation Process (AOP). This would reduce the toxicity of purified effluents compared with other AOP technologies and enable the reuse of the water in the textile production processes, with a consequent reduction in freshwater consumption.	<b>COORDINATOR:</b> Next Technology Tecnotessile - Società Nazionale di Ricerca.  <b>PARTNERS:</b> Lavo S.r.l., Italy; University of Florence – Department of Civil Engineering, Italy; University of Florence – Department of Mathematics, Italy; IWW Rheinisch-Westfälisches Institut für Wasserforschung gemeinnützige GmbH, Germany; Polymem SA, France; Inge GmbH, Germany; Gestione Impianti Depurazione Acque S.p.A., Italy; Tintoria KING COLOR S.R.L., Italy.
<b>SLUDGE'S WEALTH</b> <b>Ennobling of sludge for energy use and industrial (LIFE09 ENV/IT/000186)</b>	Demonstrate the cost effectiveness of a new sludge waste treatment plant for offshore oil rigs and similar units. The project planned to develop a pilot process based on a hybrid microwave and hot air heating technology with associated equipment to allow the crumbling of semi-dried sludge without any external mechanical action.	<b>COORDINATOR:</b> COOMI SOC. COOP.  <b>PARTNERS:</b> -none
<b>GREEN LIFE</b> <b>GREEN Leather Industry for the Environment (LIFE13 ENV/IT/000840)</b>	To develop new technologies to reduce the environmental impact of the leather processing industry. It specifically plans to introduce an enzymatic and oxidative liming process to produce leather of the	<b>COORDINATOR:</b> DANI S.P.A.  <b>PARTNERS:</b> GRM (GRUPPO MASTROTTO S.P.A.), Italy; STC (IKEM S.R.L.), Italy; ILS (ILSA

	same quality, with reduced environmental costs.	S.P.A.), Italy; ADC (ACQUE DEL CHIAMPO S.P.A.), Italy.
<b>LIFE ELECTRO-SLUDGE</b> <b>Innovative Electro Dewatering system for the maximisation of the urban sludge Dry Solid content.</b> <b>(LIFE14 ENV/IT/000039)</b>	To design, develop and demonstrate an innovative electro-osmotic dewatering system that is able to dewater urban sludge from wastewater treatment plants and thus obtain a dry solid content (DS) equal to, or greater than, 30%.	<b>COORDINATOR:</b> AST srl <b>PARTNERS:</b> POLIMI (Politecnico di Milano), Italy; CAP (CAP Holding S.p.A.), Italy.
<b>LIFE DeNTreat</b> <b>Decentralized innovative treatment of ammonium-rich urban wastewater</b> <b>(LIFE16 ENV/IT/000345)</b>	Demonstrate innovative decentralised wastewater pre-treatment modules, based on the Anammox (ANAerobic AMMonium Oxidation) microbial process, and to show that this technology can sustainably reduce nitrogen pollutants linked to discharges from the textile industry, hence reducing the nitrogen content of urban wastewaters.	<b>COORDINATOR:</b> LARIANA DEPUR S.p.A <b>PARTNERS:</b> CENTRO TECNOLOGICO DAS INDUSTRIAS TEXTIL E DO VESTUARIO DE PORTUGAL, Portugal; Stamperia di Cassina Rizzardi S.p.A., Italy; European Apparel and Textile Confederation, Belgium; Politecnico di Milano, Italy.
<b>LIFE LESSWATT</b> <b>Innovative wireless tool for reducing energy consumption and GHGs emission of water resource recovery facilities</b> <b>(LIFE16 ENV/IT/000486)</b>	Target both the environmental issues related to the energy consumption of Water Resource Recovery Facilities (WRRF) and their direct GHG emissions. The project will develop an innovative tool for assessing and minimising both direct and indirect contributions of aerated compartments in WRRFs to the facility's overall carbon footprint.	<b>COORDINATOR:</b> Dipartimento di Ingegneria Civile e Ambientale - Università degli Studi di Firenze <b>PARTNERS:</b> West Systems S.r.l., Italy; Consorzio Cuoioedepur SpA, Italy; Universiteit Gent, Belgium; UTILITATIS pro Acqua Energia Ambiente, Italy.
<b>LIFE OptiMa-N</b> <b>Optimisation of nitrogen management for groundwater quality improvement and conservation.</b> <b>(LIFE04 ENV/IT/000454)</b>	Fostering environmentally and economically sustainable practices that enabled farmers to balance production and environmental goals, via crop rotation techniques, use of cover crops and improved quantities of fertilise inputs.	<b>COORDINATOR:</b> Centro Ricerche Produzioni Animali S.p.A. <b>PARTNERS:</b> Fondazione CRPA Studi Ricerche ONLUS, Italy; Azienda Agraria Sperimentale Stuard, Italy.
<b>LIFE REQUPRO</b> <b>A model to REclaim and reuse wastewater for Quality crop PROduction</b> <b>(LIFE11 ENV/IT/000156)</b>	Contribute to the protection of water resources through efficient re-use of treated wastewater for irrigation of agricultural land, thus replacing the use of surface water and groundwater resources. This objective will be achieved by developing a model of water reclamation and re-use for irrigation of high quality crops.	<b>COORDINATOR:</b> Centro Ricerche Produzioni Animali - CRPA SpA <b>PARTNERS:</b> IREN Emilia, Italy; Consorzio di Bonifica dell'Emilia Centrale, Italy; Consorzio di Bonifica di secondo grado per il Canale Emiliano Romagnolo, Italy; Autorità di Bacino del Fiume Po, Italy.

## Discussion and conclusion remarks

The PO VALLEY is the largest and most important economic region in Italy. It is the centre of most Italian industry as well as Italy's agricultural heartland (with an increase in Tourism also). At the same time this area is progressively increasing its fragility as a consequence of Climate change effects (such as elongated drought in summer as well as early snowmelt in springtime – Cassardo et al., 2018). This may exert unfavourable impacts for agriculture, but also for other activities related to water supply (e.g. industry, hydroelectric power generation, tourism, etc) with a consequent competition for having access to the water resource.

Within this context the water reuse may represent a valuable source of alternative/additional water volumes for both the environmental and human needs. But this opportunity requires the involvement of several actors along the chain such as territorial bodies (from national government down to local bodies), multiutilities in charge of managing the "integrated water services", users and user's associations (for both sensitization, awareness creation, and good practices adoption).